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RULES FOR TESTING MACHINES

Chapter 1 GENERAL

1.1 General

1.1.1 Scope

1 The Rules apply to testing machines, and other related devices, hereinafter referred to as testing machines, etc. specified in the following (1) to (4) to be certified by the Society.

- (1) Testing machines and associated equipment used for determining mechanical properties including strength, rigidity and hardness of materials or products.
- (2) Reference test pieces for verification of testing machines.
- (3) Items similar to those mentioned in (1) and (2) above, such as loading devices.
- (4) Other items deemed appropriate by the Society.

2 Testing machines etc. not specified in **Chapter 2** and subsequent Chapters of the Rules may be certified provided that they are deemed by the Society to comply with appropriate national standards or equivalent other standards recognized by the Society.

1.1.2 Testing Machines with Novel Design Features*

1 Drawing and data on the functions, construction and accuracy of testing machines with novel design features, are to be submitted to the Society in advance.

2 In addition to the Rules, other requirements may be applied for the testing machines with novel design features, if necessary.

1.2 Inspections

1.2.1 Application for Inspection*

1 Application for inspection is to be made, as a rule, by the owner of the testing machines, etc. (hereinafter referred to as the “owner”) to be inspected.

2 In the case of multi-purpose testing machines, application for inspection may be made for a portion of the multiple testing functions.

3 In the case where a testing machine is capable of altering its maximum capacity by changing the measuring range, the application for inspection is available for one of the varying capacities.

1.2.2 Place of Inspection*

1 Inspections are to be carried out under conditions in which the testing machines and associated equipment have been installed or set at the place where these machines are used. However, a part or whole of the inspection may be carried out for testing machines and associated equipment that the Society deems appropriate, at a place deemed to be appropriate by the Society.

2 Inspections of reference test pieces are to be carried out at the place where the Society’s reference machines are located.

1.2.3 Preparation for Inspection and Others*

1 The applicant for the inspection on testing machines and associated equipment are to make preparations necessary for the inspection. The preparations are to include maintenance services for testing machines and necessary facilities and records for the execution of the inspection. Inspection, measuring and test equipment, which Surveyors rely on to make decisions affecting certification are to be individually identified and calibrated to a standard deemed appropriate by the Society. However, the Surveyor may accept simple measuring equipment (*e.g.* rulers, measuring tapes, micrometers) without individual identification or confirmation of calibration, provided they are of standard commercial design, properly maintained and periodically compared with other similar equipment or test pieces.

2 The applicant for the inspection on testing machines and associated equipment is, as a rule, to attend the inspection, and to

provide the necessary assistance to the Surveyor according to his requests during the inspection.

3 The inspection may be suspended where necessary preparations have not been made, any appropriate attendant mentioned in the previous -2 is not present, or the Surveyor considers that the safety for execution of the inspection is not ensured.

4 Where repairs are deemed necessary as a result of the inspection, the Surveyor will notify his recommendations to the applicant of the inspection. Upon this notification, the repair is to be made to the satisfaction of the Surveyor.

1.2.4 Execution and Due Date of Inspection*

1 The initial inspection specified in **Chapter 2** and subsequent Chapters is to be carried out according to the type of testing machines etc. in the following cases of (1) or (2), in order to verify whether the requirements specified in the relevant Chapters have been complied with or not.

- (1) The inspection is to be carried out by the Society for the first time.
- (2) The inspection is to be carried out again by the Society after the certificates of the Society have expired.

2 The renewal inspection specified in **Chapter 2** and subsequent Chapters is to be carried out according to the type of testing machines, associated equipment and force proving instruments (hereinafter referred to as the “testing machines and equipment”) in the following cases (1) through (3), in order to verify whether the requirements specified in the relevant Chapters have been complied with or not. However, records of the maintenance works on important components done prior to undergoing a renewal inspection are presented, and when the quality management for the maintenance works are to be deemed appropriate by the Society, a part of the inspections are to be omitted. In case of (2) and (3), the Society may require to carry out an inspection equivalent to the initial inspection.

- (1) When certificate is to be renewed.
- (2) When the safety device and principal parts of testing machines, associated equipment and calibration devices are to be changed.
- (3) When testing machines and associated equipment are to be reinstalled (excluding hardness testing machines).

1.3 Certificates, etc.

1.3.1 Issue of Certificates, etc.

1 Certificates, inspection records and identification plates will be issued by the Society for the testing machines that have been verified to be in compliance with the Rules.

2 Certificates and inspection records will be issued by the Society for reference test pieces that have been verified to be in compliance with the Rules.

3 The owner may apply for reissuance of a certificate when the valid certificate is lost or damaged.

1.3.2 Retention of Certificates, etc.*

All certificates and inspection records are to be retained by the owner, and they are to be presented to the Society when requested. Identification plates are to be securely attached on the appropriate location of the testing machine by the owner for display.

1.3.3 Renewal of Certificates

The renewal interval of a certificate for a testing machine and associated equipment is, in principle, not to exceed twelve *months*.

1.3.4 Invalidation of Certificates

A certificate may be invalidated in any of the following cases

- (1) When testing machines and equipment are not subjected to the inspection specified in **1.2.4-2**.
- (2) When the inspection results of testing machines and equipment are regarded as being unsatisfactory by the Society.
- (3) When a certificate is returned by the owner.
- (4) When the inspection fees specified in **1.4** and other charges stipulated by the Society are not paid.
- (5) When an adjustment that affects accuracy is performed.
- (6) When an abnormality or a failure that affects accuracy is confirmed.
- (7) When the testing machine is relocated.

1.3.5 Markings*

1 Testing machines are to be marked with the following items (1) through (3)

(1) General markings:

Kind, use, type or name and manufacturing number, the identification number assigned by the Society, date of manufacture, as well as the manufacturer’s name of testing machine are to be marked.

(2) Markings for operating conditions:

Any operating conditions necessary for maintaining the function and accuracy of the testing machines are to be marked.

(3) Marking of the associated functions:

Additional function, if any, is also to be marked.

2 Reference test pieces are to be marked with particulars as deemed appropriate by the Society.

1.4 Inspection Fees, etc.

1.4.1 Inspection Fees, etc.

1 The following fees shall be charged by the Society to the applicant in accordance with provisions separately provided when either of the following is relevant:

(1) When a inspection is carried out in accordance with the Rules.

(2) When reissue or renewal of certificates, etc. are carried out.

2 When tests and inspection are carried out, travelling expenses are to be charged in accordance with the provisions separately provided.

3 In addition to the fees, expenses and charges specified in -1 and -2 above, all expenses incurred by inspections are to be borne by the applicant.

Chapter 2 TENSILE TESTING MACHINES AND COMPRESSION TESTING MACHINES

2.1 General

2.1.1 Scope

The requirements of this Chapter apply to tensile testing machines, compression testing machines, and combined tensile and compression testing machines (hereinafter referred to as “testing machines” in this Chapter).

2.1.2 Automatic Tensile Testing Machines and Compression Testing Machines*

For tensile testing machines and compression testing machines, on which loading device, measuring device, test data processing device are partly or wholly automated, their constructions and functions are to be satisfaction of the Society.

2.1.3 Working Range of Testing Machines

The working range of a testing machine is, in general, to be from the lower limit of the test force to the maximum capacity of the measuring range. The lower limit of the test force shall not be less than 1/5 of the maximum capacity. In the case of a testing machine capable of changing the measuring ranges, the respective working range of such a testing machine is to be specified according to the maximum capacity of the each measuring range.

2.1.4 Considerations for Safety

Sufficient consideration is to be given to the safety of operators when constructing and installing a testing machine.

2.2 Construction

2.2.1 Construction*

1 A testing machine is to be composed of a loading device that applies a test force to a test specimen gradually, gripping or holding devices of a test specimen, test force indicating and recording devices. The testing machine is also to be of a construction capable of withstanding the service force up to its maximum capacity. The test force indicating device is to be capable of withstanding the impact force occurring at the moment of breakage of a test specimen without any loss in performance.

2 The loading device is to be provided with the safety devices specified in the following (1) and (2). However, part of the safety devices may be omitted when the Society deems appropriate.

(1) A safety device for the test force

(2) A safety device for the moving range

3 The testing machine is to be so constructed that the verification of test force is possible by attachment of a suitable force proving instrument.

4 The testing machine is to be provided with a part or the whole of a gripping device, compression device, and a bending device, which are suitable for the test specimen to be tested by the testing machine.

5 Any testing machine for measuring proof stress is to be provided with an extensionmeter deemed to be appropriate by the Society.

6 A testing machine capable of controlling the loading speed is to be provided with a loading speed control device deemed to be appropriate by the Society.

2.3 Installation of Testing Machines

2.3.1 Installation of Testing Machines*

The testing machines are to be properly and suitably installed at a place free from the influences of external vibrations and impacts, etc.. The foundation for installation, and the connection between the foundation and testing machine are to be sufficiently rigid corresponding to the type and maximum capacity of the testing machine. However, a testing machine may be accepted to be merely set on a foundation which is sufficiently rigid and stable, when the Society deems it to be appropriate.

2.4 Initial Inspection and Renewal Inspection

2.4.1 General*

- 1 The safety of a testing machine for operators is to be verified.
- 2 The effectiveness of the devices and construction etc., specified in 2.2 is to be inspected.

2.4.2 Inspection of Function*

- 1 Inspection for breakage is to be carried out as follows.
 - (1) Abnormalities of each part due to shock by the breakage of test specimen, installation conditions and the function of test force pointer and leaving pointer are to be inspected. It is to be verified that the error of test force indicator at the zero point caused at the moment of the breakage of the test specimen does not exceed 1/1000 of the maximum capacity for testing machines provided with a test force indicating pointer or digital indicating device, and does not exceed 1/500 of the maximum capacity for testing machines in which the test force is read out on recording paper.
 - (2) It is to be verified that the test specimen does not break in the grips, and that gripping is uniform.
- 2 Inspection of the maximum test force is to be carried out to verify that the functions of the loading device and force indicating device are to be normal, and their operations are smooth.
- 3 Verification of operation of safety devices is to be carried out as follows.
 - (1) The safety device for test forces to work at forces not exceeding 1.1 times of the maximum capacity of the testing machine for preventing a further increase in force is to be verified.
 - (2) The safety device for the moving range of a testing machine to be capable of forcing the motion to stop as soon as the moving parts reach the limit of their moving range is to be verified.
- 4 An inspection for sensitivity of a test force indicating device is to be carried out to verify that the device is sensitive with the force not exceed 1/1000 of the maximum capacity of the smallest measuring rang for testing machines provided with a test force indicating pointer, and not exceeding 1/500 of the maximum capacity of the smallest measuring rang for testing machines provided with a paper recording device or a digital indicating device.
- 5 The verification of test force is to be carried out to confirm the accuracy of the testing machines according to the procedures deemed appropriate and with force proving instruments specified otherwise by the Society.

Chapter 3 CHARPY PENDULUM IMPACT TESTING MACHINES

3.1 General

3.1.1 Scope

The requirements of this Chapter apply to Charpy pendulum impact testing machine (hereinafter referred to as “testing machine” in this Chapter).

3.1.2 Automatic Impact Testing Machines

For impact testing machines, on which pendulum lifting-dropping device, measuring and data processing device are partly or wholly automated, their constructions and functions are to be satisfaction of the Society.

3.1.3 Definition

- (1) anvil: The portion of the base of the machine forming a vertical plane which restrains the test piece when it is struck by the pendulum. The plane of the supports is perpendicular to the plane of the anvils.
- (2) striker: The portion of the hammer that contacts the test piece; the edge that actually contacts the test piece may have a radius of 2 mm (the 2 mm - striker) or a radius of 8 mm (the 8 mm - striker).
- (3) test piece supports: The portion of the base of the machine forming a horizontal plane upon which the piece rests prior to being struck. The plane of the supports is perpendicular to the plane of the anvils.
- (4) actual absorbed energy: The total energy required to break a test piece when tested by a testing machine.
- (5) nominal initial potential energy: The energy assigned by the manufacturer of the testing machine.

3.1.4 Considerations for Safety

Sufficient considerations are to be given to the construction and arrangement of testing machines in order to ensure that operators are safe from any dangers arising from the swing motion of the pendulum, as well as scattered fragments of a broken test piece.

3.2 Construction

3.2.1 Construction

Testing machines are to be composed of a foundation, an installation, a machine framework, a pendulum, anvils, test piece supports and an indicating equipment for the actual absorbed energy (hereinafter referred to as the “indicating equipment” in this Chapter). All of the components and their connections are to have a construction capable of withstanding the nominal initial potential energy of the machine.

3.3 Installation

3.3.1 Installation

Testing machines are to be installed on a rigid foundation having a sufficient thickness. The connections between the foundation and testing machine are to be sufficiently firm and stable.

3.4 Initial Inspection

3.4.1 General

- 1 The safety of operators is to be verified.
 - 2 The effectiveness of the devices and construction, etc., specified in 3.2 is to be inspected.
 - 3 Inspections specified in 3.4.2-2 and subsequently are to be carried out after execution of the impact tests specified in 3.4.2-1.
- However, a portion of the inspection items may be conducted at works, etc. prior to the inspection under the installed condition when the Society deems such to be acceptable.

3.4.2 Inspection of Function*

1 Impact test

Impact test is to be carried out with a square test piece of which the absorbed energy is approximately 90% of the nominal initial potential energy. It is to be verified that the performance of each structural component of the testing machine is satisfactory to test normally, and the condition of the installation is to be inspected. Particularly, the bearing portion of the rotating shaft of the pendulum and the mounted part of the anvil, are to be verified to ensure that their rigidity is such that their deformations and vibrations at the moment of breakage of the test piece are extremely small.

2 Direct verification

The following items are to be verified according to the procedures deemed appropriate by the Society:

- (1) Foundation/installation
- (2) Machine framework
- (3) Pendulum, including the hammer and the striker
- (4) Anvils and supports
- (5) Indicating equipment

3 Indirect verification

The indirect verification with reference test pieces complying with the requirements in [Chapter 6](#) is to be carried out to verify the accuracy of the testing machines according to the procedures deemed appropriate by the Society.

3.5 Renewal Inspection

3.5.1 Renewal Inspection*

The limited direct verification among the Initial Inspection may be omitted when the Society deems it appropriate.

Chapter 4 **HARDNESS TESTING MACHINES**

4.1 **General**

4.1.1 **Scope**

The requirements of this Chapter apply to Brinell hardness testing machines, Rockwell hardness testing machines, Vickers hardness testing machines, and Shore hardness testing machines.

4.1.2 **Automatic Hardness Testing Machines***

For hardness testing machines, on which loading device, measuring and data processing device are partly or wholly automated, their constructions and functions are to be satisfaction of the Society.

4.1.3 **Operating Conditions for Hardness Testing Machines**

Standard testing conditions such as loading conditions for testing operations are to be provided in advance for Brinell hardness testing machines, Rockwell hardness testing machines, and Vickers hardness testing machines.

4.1.4 **Reference Plane for Setting up the Testing Machines**

In order to set up the indenter mounting shaft (excluding Shore hardness testing machines) or the measuring cylinder (in the case of Shore hardness testing machines) vertically, a level gauge or a reference horizontal plane is to be provided on the testing machine. The reference horizontal plane may be provided on the upper surface of the anvil of the testing machine or on the top surface of the anvil elevating screw, etc.

4.1.5 **Installation of Testing Machines**

Hardness testing machines (excluding Shore hardness testing machines) is to be set on a sufficiently stable foundation, and its reference surface for setting the testing machine is to be parallel with the horizontal plane. Furthermore, the hardness testing machine is to be set in such a way that it is free from any influence due to impacts and vibrations. When the Society deems it necessary, the installation of the hardness testing machine is to be firm enough.

4.1.6 **Tests and Inspection**

The hardness testing machine is to be checked to verify that it is compliance with the requirements specified in 4.2 through 4.5 and its function and accuracy are to be verified by carrying out the tests and inspections specified therein.

4.2 **Brinell Hardness Testing Machines**

4.2.1 **Scope**

The requirements of 4.2 apply to Brinell hardness testing machines (hereinafter referred to as the “testing machines” in 4.2) of hydraulic type, lever type, or pendulum type to measure Brinell hardness.

4.2.2 **Construction and Function of Testing Machines**

1 Testing machines are to be capable of measuring the diameter of an indentation in a test piece produced by pressing the indenter which is in contact with the test surface of test specimen under the specified test force for the specified period, and then removed the test force completely. The motions of the testing machine are to be smooth.

2 Testing machines are to be provided with a device capable of measuring the diameter of an indentation produced by the indenter, or such a device is to be provided in a space where the testing machine is used.

3 Testing machines are to be so constructed that the verification of the test force is possible using a suitable force proving instrument.

4 The machine frame and anvil are to have sufficient rigidity so that the deformation of the indenter mounting shaft or effects on accuracy of a testing force are not caused when a test force is applied.

5 The loading device is to be capable of applying or removing a test force gradually without any impacts or vibrations.

6 The loading devices are to be capable of applying a test force on a steel ball or cemented carbide alloy ball indenter through the indenter mounting shaft in the direction perpendicular to the anvil plane.

4.2.3 Initial Inspection***1 Construction and installation**

The construction and installation of the testing machine are to be inspected according to the procedures deemed appropriate by the Society.

2 Inspection of function

The function of the testing machine is to be verified to be normal, and its motions smooth by carrying out hardness tests on the testing machine. Hardness testing machines provided with a digital hardness indicating device is to be inspected for stability of the hardness detector and data processing equipment.

3 Direct verification

The following verifications are to be carried out according to the procedures deemed appropriate by the Society:

- (1) Verification of the test force with force proving instruments specified otherwise by the Society.
- (2) Verification of the indenter
- (3) Verification of the measuring device
- (4) Verification of the testing cycle

4 Indirect verification

The indirect verification is to be carried out by measuring hardness according to the procedures deemed appropriate and with reference blocks specified otherwise by the Society.

4.2.4 Renewal Inspection*

Items of the Initial Inspection excluding the verification of the test force and the indirect verification may be omitted when the Society deems it to be appropriate.

4.3 Rockwell Hardness Testing Machines**4.3.1 Scope**

The requirements of 4.3 apply to Rockwell hardness testing machines (hereinafter referred to as the “testing machine” in 4.3).

4.3.2 Construction and Function of Testing Machines

1 Forcing an indenter into the surface of a test piece in two steps (the preliminary test force and the total test force (the preliminary test force plus the additional test force)), a testing machine is to be capable of measuring the permanent depth of indentation under the preliminary test force after removal of the additional test force. The motions of the testing machine are to be smooth.

2 The testing machine is to be so constructed that the verification of test force is possible using a suitable force proving instrument.

3 The machine frame and anvil are to have a sufficient rigidity, and the condition of joints of the test piece elevating device etc. are to be stable against the test force.

4 The testing machine is to be provided with an anvil capable of carrying out Indirect verification using a reference hardness block.

5 The loading device is to be capable of applying or removing the preliminary test force and additional test force gradually without any impacts or vibrations.

6 The loading device is to be capable of applying a test force which is to be applied on an indenter through the indenter mounting shaft in the direction perpendicular to the anvil plane.

4.3.3 Initial Inspection***1 Construction and installation**

The construction and installation of the testing machine are to be inspected according to the procedures deemed appropriate by the Society.

2 Inspection of function

Inspection of function by carrying out hardness tests is to be carried out to verify that that the function of the testing machine is normal, and its motions are smooth. The testing machine provided with a digital hardness indicating device is to be verified for stability of the hardness detector and data processing equipment.

3 Direct verification

The following verifications are to be carried out according to the procedures deemed appropriate by the Society.:

- (1) Verification of the test force with force proving instruments specified otherwise by the Society
- (2) Verification of the indenter
- (3) Verification of the measuring device
- (4) Verification of the testing cycle

4 Indirect verification

The indirect verification is to be carried out by measuring hardness according to the procedures deemed appropriate and with reference blocks specified otherwise by the Society.

4.3.4 Renewal Inspection*

Items of the Initial Inspection excluding the verification of the test force and the indirect verification may be omitted when the Society deems it to be appropriate.

4.4 Vickers Hardness Testing Machines

4.4.1 Scope

The requirements of 4.4 apply to Vickers hardness testing machines (hereinafter referred to as the “testing machines” in 4.4) for measuring Vickers hardness of test forces in the range from 9.807 *mN* up to 490.3 *N*.

4.4.2 Construction and Function of Testing Machines

1 Testing machine is to be capable of measuring the length of diagonals of a indentation on a test piece produced by pressing a indenter in the form of a right pyramid with a square base which is in contact with the test surface of the test piece under a specified test force for a specified period of time, and then completely removing the test force. Each component of the testing machine is to move smoothly.

2 Testing machine is to be so constructed that the inspection of test force is possible using a suitable force proving instrument.

3 Testing machine is to be provided with an anvil permitting to carry out indirect verification using a reference hardness block.

4 The loading device is to be capable of forming a indentation by applying or removing the test force gradually without any impacts and vibrations.

5 The loading device is to be capable of applying a test force which is to be applied on an indenter through the indenter mounting shaft in the direction perpendicular to anvil plane.

4.4.3 Initial Inspection*

1 Construction and installation

The construction and installation of the testing machine are to be inspected according to the procedures deemed appropriate by the Society.

2 Inspection of function

An inspection of function by carrying out hardness tests is to be carried out to verify that the function of the testing machine is normal, and its motions are smooth. The testing machine provided with a digital indicating device is to be verified for the stability of a hardness detector and the data processing equipment.

3 Direct verification

The following verifications are to be carried out according to the procedures deemed appropriate by the Society:

- (1) Verification of the test force with force proving instruments specified otherwise by the Society
- (2) Verification of the indenter
- (3) Verification of the measuring device
- (4) Verification of the testing cycle

4 Indirect verification

The indirect verification is to be carried out by measuring hardness according to the procedures deemed appropriate and with reference blocks specified otherwise by the Society.

4.4.4 Renewal Inspection*

Items of the Initial Inspection excluding the verification of the test force and the indirect verification may be omitted when the Society deems it to be appropriate.

4.5 Shore Hardness Testing Machines

4.5.1 Scope

The requirements of 4.5 apply to the visual measuring type (Type *C*) and the indicating type (Type *D*) Shore hardness testing machines (hereinafter referred to as the “testing machine” in 4.5) to measure Shore hardness using a diamond hammer.

4.5.2 Construction and Function of Testing Machines

Testing machine is to be capable of measuring the rebounding height of a diamond hammer that is dropped from a specified height on to the surface of a test piece being tested. The motions of the testing machine is to move smooth.

4.5.3 Initial Inspection and Renewal Inspection*

1 Installation and function

Prior to the indirect verification, the following items are to be confirmed to verify the installation and the function of the test machine. In case where testing machines are provided with digital indicating devices, the stability of the hardness detector and data processing equipment are to be verified.

- (1) The test machine is installed properly.
- (2) The handle of the test machine is capable of pushing the reference block with approximately 200 *N*.
- (3) The handling of the hammer is capable of striking the reference block properly.

2 Indirect verification

The indirect verification is to be carried out by measuring hardness according to the procedures deemed appropriate and with reference blocks specified otherwise by the Society.

Chapter 5 (Deleted)

Chapter 6 REFERENCE TEST PIECES FOR CHARPY PENDULUM IMPACT TESTING MACHINES

6.1 Scope

6.1.1 General

This requirements of this chapter apply to reference test pieces used for the indirect verification of Charpy pendulum impact testing machines (hereinafter referred to as the “reference test pieces”).

6.2 Material

6.2.1 Material*

Reference test pieces are to be of material deemed appropriate by the Society and to be produced under the quality control to which a special attention is to be paid, on the melting, the rolling, the heat treatment and the machining of the material etc. in order to obtain an uniform strength throughout each batch.

6.3 Shape and Dimensions

6.3.1 Shape and Dimensions*

The shape and dimensions of reference test pieces are to be in accordance with the provision as deemed appropriate by the Society.

6.4 Inspection of Reference Test Pieces

6.4.1 Inspection of Dimension and Shape

The dimensions, shape and surface condition of the reference test pieces are to be inspected.

6.4.2 Determination of Reference Energy by Impact Test*

The reference energy is to be determined according to the procedures deemed appropriate by the Society with the Society’s reference machines.

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GUIDANCE FOR TESTING MACHINES

Chapter 1 GENERAL

1.1 General

1.1.2 Testing Machines with Novel Design Features

1 The wording “testing machines with novel design features” referred to in **1.1.2 of the Rules** means the following:

- (1) Testing machines with a new measuring system or a new loading system
- (2) Testing machines with a new function

In (1) and (2) above, however, the term “new” means that the testing machine in question is subjected to a inspection of the Society for the first time for a particular manufacturer.

2 Submission of data and drawings for testing machines with novel design features, and tests and inspection procedures for such testing machines are to be in accordance with the following.

- (1) Specifications for the construction, function, accuracy and its attachments of the testing machine.
- (2) Data and drawings for the operating system, control device and safety devices of the testing machine.
- (3) Operating manuals of the testing machine.
- (4) General assembly and arrangement drawings of the testing machine.
- (5) Test records and data concerning the function and accuracy of the testing machine.
- (6) Documents concerning the methods for shop tests and inspection of the testing machine (tests and inspection procedures for the testing machine at a inspection during manufacture or a complete inspection on the function, accuracy, etc. and acceptance criteria therefore, etc.).
- (7) Maintenance procedures for the testing machine in its service.
- (8) Other data and documents as deemed necessary by the Society.

1.2 Inspection

1.2.1 Application for Inspection

An Application for inspection may be submitted for testing machines under maintenance, by the person in charge of maintenance in place of the owner of the testing machines.

1.2.2 Place of Inspection

The wording “testing machines and associated equipment that the Society deems appropriate” referred to in **1.2.2 of the Rules** means the following:

- (1) Inspections relating to a testing machine that essentially does not require permanent installation at a fixed place for its function and accuracy, and the relocating or moving of such a testing machine is considered to have no influence on the function and accuracy of the testing machine in question.
- (2) Inspections of a testing machine other than that specified in (1) above, where the relocating or moving of such a machine has no influence on the function and accuracy of the test machine in question even if part of the inspection is not carried out at the place of installation.

1.2.3 Preparation for Inspection and Others

The attendance of the applicant at the inspection referred to in **1.2.3-2 of the Rules** may be omitted for hardness testing machines for which the inspection is carried out at the manufacturer's firm or maintenance shop of the testing machines in accordance with the provision in **1.2.2-1 of the Rules**.

1.2.4 Execution and Due Date of Inspection

1 The wording “principal parts of testing machines” referred to in **1.2.4-2(2) of the Rules** means the following parts relevant to the accuracy of testing machines:

- (1) Tensile testing machines and compression testing machines
 - (a) Rams, cylinders, loading screw rods, loading levers and fulcra, crossheads and their spherical seats, etc., for a loading device.
 - (b) Scale plates, a force indicator inter-locking mechanism, measuring rams and cylinders, shock-absorbers, pendulum and weights for measurements, levers and fulcra for measurements, a force detecting device of the electric force measuring mechanism, measuring circuits for detecting outputs the from force detecting device (amplifiers, automatic balancing circuits), indicators, and recording devices, etc., for a force indicating device.
- (2) Impact testing machines
Pendulums (including hammers, striking edges, bearings), test piece supports and anvils, pendulum dropping devices (including stopping devices and release mechanisms), pointers and angular scale plates, etc. of indicating mechanisms.
- (3) Hardness testing machines
 - (a) Loading weights, loading levers and fulcra, rams and cylinders, oil pressure gauges, anvil elevating screws, etc. for Brinell hardness testing machines.
 - (b) Loading weights, loading levers and fulcra, indenter mounting shafts, indenters, hardness indicators, anvil elevating screws, etc. for Rockwell hardness testing machines.
 - (c) Loading weights, loading levers and fulcra, indenter mounting shafts, indenters, measuring microscopes, anvil elevating screws, etc. for Vickers hardness testing machines.
 - (d) Machine frameworks, hammers, hardness indicators or indicator scales, etc., for Shore hardness testing machines.

2 The wording “records of such maintenance work” referred to in **1.2.4-2 of the Rules** generally means the following records.

- (1) Type of testing machine.
- (2) Identification number assigned by the Society.
- (3) Manufacturer, type, serial number and date of manufacture of testing machine.
- (4) Date of the previous inspection.
- (5) Date of maintenance.
- (6) Location and reasons of maintenance.
- (7) Details of maintenance work.
- (8) Self-inspection records of the function or accuracy of the testing machine before and after maintenance work.
- (9) Name of the person or organization responsible for maintenance work.
- (10) Others items related to the maintenance of function and accuracy of testing machines.

3 The wording “quality management for the maintenance works are to be deemed appropriate by the Society” referred to **1.2.4-2 of the Rules** means that the persons or organizations responsible for the maintenance works have facilities, technologies and quality management system deemed adequate by the Society, and the machines are to be comply with the requirements of the Rules.

1.3 Certificates, etc.**1.3.2 Retention of Certificates, etc.**

1 Inspection records may be reissued upon application made within one *year* from the date of inspection.

2 Identification plates are, in principle, to be attached beside the name plate showing the general particulars of the testing machine on the body of the testing machine or on the force indicator in a clearly and readily recognizable fashion.

1.3.5 Markings

1 Regarding general marking items of testing machines, marking concerning the “use” may be limited to testing machines for special use only.

2 Markings for operating conditions of testing machines is to include the following particulars:

- (1) The permissible range of operating conditions for the testing machine or its associated equipment if it is necessary for the maintenance of the function and accuracy of a testing machine.

- (a) Marking of the type or viscosity of the operating oil for hydraulic testing machines.
 - (b) For testing machines using load cells in the mechanism for indicating or recording the test force, the temperature conditions (the range of operating temperature or temperature coefficient).
- (2) For pendulum weights and loading weights used for a testing machine, the relevant capacity and test force, etc.
- (3) For the accessories and associated equipment of a testing machine having relevance to function and accuracy.
- 3** The wording “additional functions” referred to in **1.3.5-1(3) of the Rules** means, for example, the following:
- (1) Measuring proof strength
 - (2) Loading speed control
- 4** “Particulars as deemed appropriate by the Society” specified in **1.3.5-2 of the Rules** are to be as follows:
- (1) Reference energy value and standard deviation of the set
 - (2) Symbol or number indicating the batch division
 - (3) Number in the batch

Chapter 2 TENSILE TESTING MACHINES AND COMPRESSION TESTING MACHINES

2.1 General

2.1.2 Automatic Tensile Testing Machines and Compression Testing Machines

The wording “satisfaction of the Society.” referred to **2.1.2 of the Rules** means compliance with the following requirements corresponding to each specification of the testing machine, in addition to the requirements of the Rules.

- (1) Control device, measuring device and data processing device are to work normally within permissible values for errors under specified operation condition of voltage, temperature, humidity and etc..
- (2) Protective device, in principle, is to consist of means to deal with following problems;
 - (a) Over load
 - (b) Over stroke
 - (c) Abnormality in speed
 - (d) Abnormality in data
 - (e) Other abnormalities
- (3) Emergency stopping device is to be provided.
- (4) Overall tests are to be carried out in accordance with the test plan deemed appropriate by the Society.

2.2 Construction

2.2.1 Construction

1 The expression “when the Society deems appropriate” referred to in **2.2 of the Rules** means the case of a testing machine in which a test force is applied manually.

2 The “extensometer” specified in **2.2.1-5 of the Rules** is to comply with the provisions for “Class of machine 2” of *ISO 9513*. The aforementioned standard, in principle, refers to the most recent version published.

3 The “loading speed control device” referred to in **2.2.1-6 of the Rules** is to be approved by the Society on the basis of the inspection plan submitted by the applicant.

2.3 Installation of Testing Machines

2.3.1 Installation of Testing Machines

The expression “to be properly and suitably installed” referred to in **2.3 of the Rules** means the following in general.

- (1) A testing machine is to be so installed that its tension center line is vertical (in the case of the vertical type) or horizontal (in the case of the horizontal type). For this reason, it is recommended that a reference horizontal plane for installation be provided on the testing machine.
- (2) In installing a testing machine, the horizontalness to the reference horizontal plane is to be controlled to within 1/1000.

2.4 Initial Inspection and Renewal Inspection

2.4.1 General

The wording “inspected” referred to in **2.4.1-2 of the Rules** means that the following items are to be confirmed.

- (1) The loading device is to be capable of applying a test force on a test specimen up to the maximum capacity gradually and smoothly without exerting any forces other than the tensile force or compression force on the test specimen. The loading device is also to be capable of holding forces for periods necessary during inspection of test force, deformation measurements, tests of proof stress, etc.

- (2) A testing machine is to be provided with part or the whole of the following devices suitable for the test specimens to be tested:
- (a) Tension loading device.
The gripping device for test specimens is to be capable of holding the test specimen in alignment with the tension centre line of the testing machine without exerting any forces other than the tension force on the test specimen during the test.
 - (b) Compression loading device
 - i) The compression loading device is to be capable of holding a test specimen in alignment with the compression centre line of the testing machine without exerting any forces other than the compression on the test specimen during the test.
 - ii) The centres of the upper and lower pressurizing surface are to be in alignment with the compression centre line of the testing machine.
 - iii) When the upper pressurizing plate is equipped with a spherical seat, the center of the spherical surface is to be in alignment with the centre of the pressurizing surface of the pressurizing plate.
 - iv) The construction and materials of the upper and lower pressurizing plate are to be sufficiently durable for carrying out the compression tests up to the maximum capacity of the testing machine, the surfaces of the pressurizing plate are to be smooth and flat, and to have a hardness suitable for each respective test.
 - (c) Bending loading device
 - i) The bending loading device is to be provided with a bed having a pair of specimen support and fittings for pushing, and their construction and material are to be sufficiently durable for the compression up to the maximum capacity of the testing machine.
 - ii) The bending loading device shall be equipped with a support and pushing metal adequate for its test specimen and so constructed that it withstands the test force.
 - iii) In case the specimen supports are movable on the bed, the scale indicating the distance between the specimen supports is to be marked on the bed and to set the reference point on the scale set at the center of the bed.
 - iv) The portions of the specimen supports and fittings for pushing which come into contact with test specimens are to have a sufficient hardness and smoothness.
- (3) A test force indicating or recording device is to allow easy readings of the force applying to a test specimen, and is to be capable of indicating or recording a force at all time and without remarkable lead or lag following up the changes of the force. The wording “to allow easy readings of the force applied to a test specimen” means to be provided with a force indicating pointer, scale plate or a recording pen and paper in accordance with the provisions of *ISO 7500-1* for the force indicating device in which a test force is indicated on a scale plate with a load indicating pointer, or the force recording device in which a force is read out on recording paper. The aforementioned standard, in principle, refers to the most recent version published.
- (4) A force indicating or recording device using load cells is to be marked with the permissible range of service temperatures or temperature coefficients as operating conditions.
- (5) Any device for indicating or recording a forces is to have an adjusting mechanism capable of compensating the changes in the weight of a test specimen, gripping device, compression loading device, bending loading device and other mechanism in the indication on a scale plate or recording paper. The provision of such an adjusting mechanism may be omitted according to the operating condition.
- (6) For testing machines provided with a device indicating test forces on a scale plate or on recording paper, the scale plate or the recording paper is to be of equally spaced divisions, and the number of graduations corresponding to the maximum capacity of a testing machine is not to be smaller than 200 for a scale plate, or 100 for test force recording paper. However, in a testing machine which has a mechanism of not uniform division, unequally spaced division may be used, but it should be uniformly divided for test force based on the mechanism. Furthermore, the scale interval (the measured value per one scale) may be changed partially, if necessary.
- (7) Testing machines provided with a device indicating forces using test force pointer are to be capable of indicating the maximum test force until a test specimen breaks using a leaving pointer or equivalent.

2.4.2 Inspection of Function

1 The “inspection for breakage” specified in **2.4.2-1 of the Rules** is to be in accordance with the following requirements (1) through (3).

- (1) In an inspection for the breakage test to assess the effects due to the shock by the breakage of a test specimen, as a standard procedure, test specimens are to break with a test force not less than 80% of the maximum capacity of the test machine. However, notched test specimens may be used in the tests. The number of test specimens used in the test is to be normally three.
- (2) If the tensile test machine is not used with a test force near the maximum capacity of the testing machine because of its type and objective of service in an ordinary occasion, the test force specified in **(1)** above may be modified to 50% or more of the maximum capacity when the Society considers that the preparation of the test specimen or the execution of the breaking test is difficult.
- (3) In the breaking test for an inspection of a gripping device of test specimens, the test specimen is, in principle, to be made of mild steel, and to have the same sectional dimensions at the gripping portion and the parallel portion, and to break with a test force more than 50% of the maximum capacity of the testing machine. Round test specimens is to be the standard. However, if round test specimens are not used in ordinary tensile tests, suitable test specimens such as rectangular test specimens may be used. The number of test specimens used in this inspection is to be three, in general. This test may be combined with the test specified in **(1)** above, as well.

2 The wording “force proving instruments specified otherwise by the Society” specified in **2.4.2-5 of the Rules** means instruments complying with the one of the following requirements **(1)** through **(3)**:

- (1) The manufacturer’s name, the serial number, the date of manufacture, the type, the maximum capacity of the force proving instrument and the name of the owner are to be registered in the Society. The force proving instrument is to be subjected to inspections of the Society or National Metrology Institute of Japan every twenty four *months*, and used for inspections of testing machines only. Further, the procedures regarding the maintenance, use and control of the accuracy are to be approved by the Society.
- (2) The dead weights or additional dead weights, as a force proving instrument, are to be conform to the requirements of the Measurement Law of Japan, or are to be measured with an error of mass within 1/1000 by a balance that has conformed to the provisions in the Measurement Law of Japan, and the maintenance of the weights is deemed satisfactory by the Society’s surveyor.
- (3) Other instrument deemed to be equivalent to **(1)** and **(2)** above by the Society.

3 The wording “the procedures deemed appropriate by the Society” specified in **2.4.2-5 of the Rules** means procedures in accordance with the provisions of *ISO 7500/1*. The aforementioned standard, in principle, refers to the most recent version published.

4 “The accuracy” specified in **2.4.2-5 of the Rules** is to comply with the provisions for “Class of machine 1” of *ISO 7500/1*. The aforementioned standard, in principle, refers to the most recent version published.

Chapter 3 CHARPY PENDULUM IMPACT TESTING MACHINES

3.4 Initial Inspection

3.4.2 Inspection of Function

1 The number of “impact tests” referred to in **3.4.2-1 of the Rules** is to be three times as many as standard. An unnotched test piece may be used.

2 The expression “it is to be verified that the performance of each structural component of the testing machine is satisfactory to test normally” referred to in **3.4.2-1 of the Rules** means to verify the following items:

- (1) Release of the pendulum from the pendulum dropping device.
- (2) No side vibration, etc. during the swing of the pendulum.
- (3) No excessive vibrations or displacements of the machine framework, pendulum and anvil at the moment when the hammer strikes the test piece.
- (4) Smoothness of the load pointer and the leaving pointer of the indicating device at the moment when the hammer strikes the test piece. Further, the adequacy of the inertial and frictional resistance of the leaving pointer.
- (5) Any looseness likely to have been created at important connecting parts of the testing machine assembly after the striking of the pendulum.
- (6) The construction used to prevent rebounding of the broken test pieces back to the pendulum, e.g. a sufficient allowance in space on the sides of the anvil.
- (7) No changes in the pendulum, tip of edge, and corners of anvil, etc. after the striking of the hammer.
- (8) Any abnormalities in the installed conditions of the testing machine after the striking of the hammer.
- (9) Any abnormalities in the deformations of the test piece struck by the hammer

3 During the “the condition of installation is to be inspected” specified in **3.4.2-1 of the Rules**, submission of the drawings related to the foundation and installation of the testing machine, and relevant explanations may be requested by the Society’s surveyor when he deems such to be necessary.

4 The wording “the procedures deemed appropriate by the Society” specified in **3.4.2-2 of the Rules** means procedures specified in *ISO 148-2*. The aforementioned standard, in principle, refers to the most recent version published.

5 The wording “the procedures deemed appropriate by the Society” specified in **3.4.2-3 of the Rules** means the procedures in *ISO 148-2*. The aforementioned standard, in principle, refers to the most recent version published.

3.5 Renewal Inspection

3.5.1 Renewal Inspection

1 The wording “when the Society deems it appropriate” specified in **3.5.1 of the Rules** means the following cases:

- (1) where the routine maintenance is carried out satisfactorily.
 - (2) where the results of the indirect verification are satisfactory.
- 2 “The limited direct verification” specified in **3.5.1 of the Rules** includes:
- (1) An inspection of installation of the machine
 - (2) Measurements of the following items:
 - (a) Anvils: radius and gap
 - (b) Striker: edge radius and position within anvil gap
 - (c) The angle between the line of contact of the striker and the horizontal axis of the test piece, only when the striker is changed
 - (d) Friction losses due to bearings and pointer
 - (e) Loss due to wind resistance

Chapter 4 **HARDNESS TESTING MACHINES**

4.1 **General**

4.1.2 **Automatic Hardness Testing Machines**

The wording “satisfaction of the Society.” referred to **4.1.2 of the Rules** means compliance with the following requirements corresponding to each specification, in addition to the requirements of the Rules.

- (1) Control device, measuring device and data processing device are to work normally within permissible values for errors under specified operation condition of voltage, temperature, humidity and etc..
- (2) Protective device, in principle, is to consist of means to deal with following problems;
 - (a) Over load
 - (b) Abnormality in data
 - (c) Other abnormalities
- (3) Overall tests are to be carried out in accordance with the test plan deemed appropriate by the Society.

4.2 **Brinell Hardness Testing Machines**

4.2.3 **Initial Inspection**

1 Construction and installation

“The procedures deemed appropriate by the Society” specified in **4.2.3-1 of the Rules** are to be as follows:

- (1) The horizontalness of a testing machine is to be within 1/1000, as a standard.
- (2) The testing machine is to be installed on a foundation or floor.
- (3) “General condition” specified in *ISO 6506-2* is to be confirmed. The aforementioned standard, in principle, refers to the most recent version published.

2 In the “construction” referred to in **4.2.3-1 of the Rules**, the rigidity of the machine frame and anvil is to be measured in terms of the displacements of the machine frame and anvil under the condition in which a test force of 29420 *N* being applied. The standard levels of sufficient rigidity are to be as follows:

- (1) In the case of a “C-shape” machine frame, the displacement measured on the loading axis center line is to be within 0.5 *mm*.
- (2) In the case of a “gate” type machine frame with a 3-meters span or thereabouts, displacement measured on the loading axis center line is to be within 2 *mm*. In the gate type machine frames, it is recommended that the construction is such that the backlash of the elevating screws can be eliminated.

3 Direct verification

- (1) The wording “the procedures deemed appropriate by the Society” specified in **4.2.3-3 of the Rules** means the procedures specified in *ISO 6506-2*. The aforementioned standard, in principle, refers to the most recent version published.
- (2) The wording “force proving instruments specified otherwise by the Society” specified in **4.2.3-3(1) of the Rules** means those in accordance with the provisions in **2.4.2-2**.
- (3) In **4.2.3-3(1) of the Rules**, if plural weights are used under the same nominal test force, the dispersion of their masses is to be confirmed within 0.1% of the mean of their masses.

4 Indirect verification

- (1) The wording “the procedures deemed appropriate by the Society” specified in **4.2.3-4 of the Rules** means the procedures specified in *ISO 6506-2*. The aforementioned standard, in principle, refers to the most recent version published.
- (2) The wording “reference blocks specified otherwise by the Society” specified in **4.2.3-4 of the Rules** means the reference blocks verified in accordance with *ISO 6506-3* by the Society or other firms deemed appropriate by the Society. The aforementioned standard, in principle, refers to the most recent version published.

4.2.4 **Renewal Inspection**

The wording “when the Society deems it to be appropriate” referred to in **4.2.4 of the Rules** means the case in which

maintenance reports are maintained properly and routine maintenance have been carried out satisfactorily. However, the verification of the indenter is to be carried out every two years.

4.3 Rockwell Hardness Testing Machines

4.3.3 Initial Inspection

1 Construction and installation

“The procedures deemed appropriate by the Society” specified in **4.3.3-1 of the Rules** are to be as follows:

- (1) The horizontalness of a testing machine is to be within 1/1000, as a standard.
- (2) A testing machine is to be installed on an exclusive foundation provided with a shock absorber.
- (3) “General condition” specified in *ISO 6508-2* is to be confirmed. The aforementioned standard, in principle, refers to the most recent version published.

2 Direct verification

- (1) The wording “the procedures deemed appropriate by the Society” specified in **4.3.3-3 of the Rules** means the procedures specified in *ISO 6508-2*. The aforementioned standard, in principle, refers to the most recent version published.
- (2) The wording “force proving instruments specified otherwise by the Society” specified in **4.3.3-3(1) of the Rules** means those in accordance with the provisions in **2.4.2-2**.

3 Indirect verification

- (1) The wording “the procedures deemed appropriate by the Society” specified in **4.3.3-4 of the Rules** means the procedures specified in *ISO 6508-2*. The aforementioned standard, in principle, refers to the most recent version published.
- (2) The wording “reference blocks specified otherwise by the Society” specified in **4.3.3-4 of the Rules** means the reference blocks verified in accordance with *ISO 6508-3* by the Society or other firms deemed appropriate by the Society. The aforementioned standard, in principle, refers to the most recent version published.

4.3.4 Renewal Inspection

The wording “when the Society deems it to be appropriate” referred to in **4.3.4 of the Rules** means the case in which maintenance reports are maintained properly and routine maintenance have been carried out satisfactorily. However, the verification of the indenter is to be carried out every two *years*.

4.4 Vickers Hardness Testing Machines

4.4.3 Initial Inspection

1 Construction and installation

The wording “the procedures deemed appropriate by the Society” specified in **4.4.3-1 of the Rules** means the procedures to confirm the “General condition” specified in *ISO 6507-2*. The aforementioned standard, in principle, refers to the most recent version published.

2 Direct verification

- (1) The wording “the procedures deemed appropriate by the Society” specified in **4.4.3-3 of the Rules** means the procedures specified in *ISO 6507-2*. The aforementioned standard, in principle, refers to the most recent version published.
- (2) The wording “force proving instruments specified otherwise by the Society” specified in **4.4.3-3(1) of the Rules** means those in accordance with the provisions in **2.4.2-2**.
- (3) In **4.4.3-3(1) of the Rules**, if plural weights are used under the same nominal test force, the dispersion of their masses is to be confirmed within 0.1 % of the mean of their masses.

3 Indirect verification

- (1) The wording “the procedures deemed appropriate by the Society” specified in **4.4.3-4 of the Rules** means the procedures specified in *ISO 6507-2*. The aforementioned standard, in principle, refers to the most recent version published.
- (2) The wording “reference blocks specified otherwise by the Society” specified in **4.4.3-4 of the Rules** means the reference blocks verified in accordance with *ISO 6507-3* by the Society or other firms deemed appropriate by the Society. The aforementioned standard, in principle, refers to the most recent version published.

4.4.4 Renewal Inspection

The wording “when the Society deems it to be appropriate” in **4.4.4 of the Rules** means the case where maintenance reports are preserved properly and the routine maintenance has been carried out satisfactorily.

4.5 Shore Hardness Testing Machines

4.5.3 Initial Inspection and Renewal Inspection

- (1) The wording “the procedures deemed appropriate by the Society” specified in **4.5.3-2 of the Rules** means the procedures specified in *JIS B 7731*. The aforementioned standard, in principle, refers to the most recent version published.
- (2) The wording “reference blocks specified otherwise by the Society” specified in **4.5.3-2 of the Rules** means the reference blocks verified in accordance with *JIS B 7731* by the Society or other firms deemed appropriate by the Society. The aforementioned standard, in principle, refers to the most recent version published.

Chapter 5 (Deleted)

Chapter 6 REFERENCE TEST PIECES FOR CHARPY PENDULUM IMPACT TESTING MACHINES

6.2 Material

The wording “Material deemed appropriate by the Society” specified in **6.2 of the Rules** means the material specified in *ISO 148-3*. The aforementioned standard, in principle, refers to the most recent version published.

6.3 Shape and Dimensions

The wording “the provisions as deemed appropriate by the Society” specified in **6.3.1 of the Rules** means *ISO 148-3*. The aforementioned standard, in principle, refers to the most recent version published.

6.4 Inspection of Reference Test Pieces

6.4.2 Determination of Reference Energy by Impact Test

The wording “the procedures deemed appropriate by the Society” specified in **6.4.2 of the Rules** means the procedures specified in *ISO 148-3*. The aforementioned standard, in principle, refers to the most recent version published.