Designation: F 1064 – 03

Standard Practice for Sampling and Inspection of Complete and Incomplete Alpine Ski/Binding/Boot Systems in Rental Applications[1]

This standard is issued under the fixed designation F 1064; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

INTRODUCTION

Adhering to these guidelines may help to reduce the risk of injuries resulting from improper mechanical functioning of releasable binding systems. However, skiing involves inherent and other risks. Injury can result from simply falling down, impact with an object, or from many other actions. Many injuries are unrelated to system function. Furthermore, even a properly functioning system cannot protect the skier in all situations. Therefore, it is to be clearly understood that compliance with these guidelines in no way guarantees that injury can be prevented.

1. Scope

1.1 This practice establishes a uniform method for the sampling and inspection of complete and incomplete Alpine ski/binding/boot systems used in rental operations. This practice is appropriate for use in rental applications in which all or part of the functional components of the system are supplied by the rental facility.

1.2 This practice should be followed by any facility that rents complete or incomplete Alpine ski/binding/boot systems to an end user.

NOTE 1—Refer to Practice F 1063 for equivalent procedures and tolerances for retail systems.

2. Referenced Documents

2.1 *ASTM Standards:*

F 939 Practice for Selection of Release Torque Values for Alpine Ski Bindings[2]

F 1063 Practice for Functional Inspections and Adjustments of Alpine Ski/Binding/Boot Systems[2]

3. Terminology

3.1 *Definitions:*

3.1.1 *Class I deviation*—a minor deviation that does not require corrective action, defined as ±16 to 30 %, or two horizontal rows up or down from the selected reference torque value as determined on the binding manufacturer's adjustment chart. Class I deviations are used to determine the frequency of sampling.

3.1.2 *Class II deviation*—a minor deviation that prompts inspection of the entire inventory and corrective action, defined as ±31 to 45 %, or three horizontal rows up or down from the selected reference torque value as determined on the binding manufacturer's adjustment chart.

3.1.3 *Class III deviation*—a major deviation that prompts corrective action and a review of all procedures, defined as more than ±45 %, or more than three horizontal rows up or down from the selected reference torque value as determined on the binding manufacturer's adjustment chart. The in-season sampling and inspection program is designed to render the occurrence of a Class III deviation unlikely.

3.1.4 *clean versus lubricated tolerance*—the accepted difference between clean and lubricated test result(s), defined as not more than 20 % of the clean test, used whenever a functional test for binding-boot compatibility is required.

3.1.5 *correction factor*—the value that must be added or subtracted from the initial visual indicator setting to bring the test result within the inspection tolerance (see 3.1.9).

3.1.6 *corrective action*—procedures other than readjustment of the visual indicator setting to include repair or replacement of system components.

3.1.7 *deviation*—the difference between the test result(s) and the selected reference torque value, usually expressed as a percentage of the selected reference torque value.

3.1.8 *initial visual indicator setting*—the visual indicator setting derived from the binding manufacturer's release/retention adjustment chart.

3.1.9 *inspection tolerance*—the accepted difference between the reference torque value and the test result. Defined as ±15 % of the reference torque value, or ±3 Nm for twist and ±10 Nm for forward lean, whichever is greater, or one horizontal row up or down from the selected reference torque value determined on the binding manufacturer's adjustment

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[2] *Annual Book of ASTM Standards*, Vol 15.07.

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chart. Use as the criteria for prompting consultation of the binding manufacturer's troubleshooting procedures or application of a correction factor, should procedures not be available.

3.1.9.1 *Discussion*—In the case when an algorithm or table is used to provide a value, either may be used (differences may be insignificant).

3.1.10 *interchangeable*—applies to the free exchange of boots within a rental inventory without testing each new combination of system components.

3.1.11 *clockwise versus counterclockwise tolerance*—the accepted difference between test results about an axis perpendicular to the plane of the ski, usually from the toe piece component, and defined as within the inspection tolerance (see 3.1.9).

3.1.12 *limit for correction*—the accepted difference between the reference torque value and the test result(s), defined as ±30 % of the reference torque value, or ±5 Nm for twist and ±20 Nm for forward lean, whichever is greater, or two horizontal rows up or down from the selected reference torque value determined on the binding manufacturer's adjustment chart. Used as the upper and lower limit for application of a correction factor.

3.1.13 *measured release value*—release torque value determined by the use of a testing device of the type defined in Annex A1 (see 3.1.21).

3.1.14 *noninterchangeable*—applies to the establishment of specific binding-boot combinations that are tested each time a new combination is created.

3.1.15 *random sampling*—a procedure in which every sampling unit in the inventory has an equal chance of being included in the sample.

3.1.16 *reference binding*—a unit that is typical of the bindings in inventory.

3.1.17 *reference boot*—a boot that is typical of the boots in inventory and satisfies the requirements of A1.1.3.

3.1.18 *reference torque value*—the nominal release torque value derived from a document compatible with Practice F 939 such as Annex A3 or information supplied by the binding or test device manufacturer.

3.1.19 *rental skier day*—the number of rental skiers (units) processed through a ski rental facility in a 24-h period.

3.1.20 *system*—a group of interacting components, usually comprised of a ski, binding, and boot.

3.1.21 *test result*—the middle quantitative value of three repetitions of the same test.

3.1.22 *troubleshooting*—the binding manufacturer's recommendations or procedures for analyzing system failure.

3.1.23 *visual indicator setting*—the setting displayed on the binding's release/retention adjustment scale.

4. Summary of Practice

4.1 Prior to the beginning of each season, boots and bindings are inspected for compatibility and interchangeability using a testing device as defined in Annex A1 of Practice F 1063.

4.2 At specified intervals throughout the operating season samples are taken from rental inventory and inspected. Test results are used to determine sampling frequency and prompt corrective action when specified tolerances are exceeded.

5. Significance and Use

5.1 The purpose of this practice is to aid in providing the end user with an appropriate functioning system and release/retention value by providing the rental facility with an ongoing program for monitoring the appropriateness of functional characteristics of the system. It is assumed that these procedures are integrated into the maintenance and operating procedures specified by the equipment manufacturers. This practice is not intended to create additional or redundant requirements for the rental facility. However, this practice should be the basis for the development of rental procedures if the equipment manufacturer's maintenance and operating procedures do not specifically state that they are in compliance with this practice. This practice will aid the rental facility in providing the end user with an appropriate release/retention value.

5.2 This practice is applicable to rental facilities that use releasable Alpine ski bindings. It is not intended as a method for evaluating equipment design.

6. Test Device

6.1 All tests specified in this practice are made with a device that indicates torque. Such a device should be inspected by the rental facility in accordance with Annex A2.

7. Equipment Inspection Requirements

7.1 *Preseason Inspection*—Prior to the beginning of each season and whenever new inventory is added, an inspection should be made of the components of the release/retention system. Units that do not meet the specified tolerances are repaired, modified, or replaced.

7.1.1 A visual inspection for compatibility and interchangeability is performed on all boots in accordance with the procedures recommended by the binding manufacturer.

7.1.2 As a check on boots that are new to inventory, a single unit sample, by make, model, and size, is taken and tested in accordance with the procedures in Section 9. If a boot fails, all boots in the category are visually inspected for the defect and as a check, a 16-unit (or less if 16 are not available) random sample is taken and tested in accordance with the procedures in Section 9. If any boots in this sample fail, all remaining boots in the category are tested.

7.1.3 As a check on boots that have been accepted into inventory in a prior season, a 5 % (not less than 16 nor more than 80-unit) sample is taken and tested in accordance with the procedures in Section 9. If a boot fails, all boots in that make, model, or age category are visually inspected for the defect. If the defect is found in another boot category, all boots in that category also are tested in accordance with the procedures in Section 9.

7.1.4 Boots that meet the criteria for compatibility but do not meet the criteria for interchangeability are used in noninterchangeable rental programs only.

7.1.5 Preseason tests for compatibility or interchangeability, or both, of the boot need not be made if the binding manufacturer's current operating procedures specifically state that the boot is not a functional component of the release system and that such tests are unnecessary.

7.1.6 Bindings used in an interchangeable rental program are inspected for appropriate function and valid visual indicator setting in accordance with the procedures in Section 9.

7.1.7 Bindings used in a noninterchangeable system are tested for appropriate function and valid visual indicators whenever a new system is created, whenever called for as a result of the sampling procedure, or when recommended by the binding manufacturer.

7.1.8 Bindings that incorporate a single means of adjustment for all release directions are tested in either twist or forward lean but need not be tested for both during the preseason inspection. However, a 5 % (but not less than 16 nor more than 80-unit) random sample is tested in both directions by the procedure in Section 9. If a binding fails, a visual inspection for the defect is conducted on all bindings. All bindings, in any binding category in which a defective unit is found, are tested in accordance with the procedures in Section 9.

7.2 *In-Season Inspection*—At regular intervals, as specified in Section 8, samples are taken from the rental inventory and evaluated in accordance with the procedures in Section 9.

7.2.1 The inventory fails the sample if a Class I deviation is detected in more than 20 % of the units in the sample, or if a single Class II deviation is detected.

7.2.2 If a Class II deviation is detected in the sample, the cause must be identified and the entire rental inventory inspected for the defect and appropriate corrections made.

7.2.2.1 Class I deviations, when detected, need not be corrected.

7.2.3 If a Class III deviation is detected in the sample, all pertinent procedures as defined by the binding manufacturer are reviewed and corrective action taken to the entire rental inventory.

7.3 *Incomplete Inspection*—An inspection of the type described in 7.3.1, 7.3.2, or 7.3.3 is conducted each time an incomplete rental system is assembled during the rental transaction.

7.3.1 The equipment is assembled, adjusted, and inspected according to normal rental procedures as defined in this practice, provided a new-to-inventory inspection, as described in this practice, has been conducted on the make, model, and shell size of the boot presented to the facility during the rental transaction. The condition of the boot presented to the facility should be representative of the shop's boot inventory.

7.3.2 The equipment is assembled, adjusted, and inspected according to normal rental procedures as defined in this practice, provided the boot meets the specific requirements of the binding manufacturer.

7.3.3 If the customer is offering his own skis/bindings for use with the shop's boots, then the equipment should be assembled, adjusted, and inspected according to the normal procedures used during the inspection of user owned equipment as defined in Practice F 1063. This procedure also may be followed whenever the customer's boot fails the inspection in 7.3.2, or the boot does not meet inventory requirements in 7.3.1.

8. Sampling Requirements

8.1 *Sample Size*—Sample size is 5 % of inventory, but not less than 16 nor more than 80 units.

8.1.1 Sample size may be based on average daily output if rental output drops below 50 % of capacity over the sampling interval.

8.1.2 The sample is taken at any time during the sampling interval or may be spread over the period.

8.1.3 The sample represents both inventory available for rental and equipment in the condition in which it is returned, with an equal number of units drawn from each group. All units within such sample should be selected randomly (see 3.1.15).

8.2 *Sampling Frequency*—A sample of the size specified in 8.1 is taken every seven days of operation. If the facility fails a sample, daily sampling is instituted. Daily sampling is continued until two consecutive samples have passed. Normal sampling is then resumed. After two consecutive weekly (seven days of operation) samples have been conducted without a sample failure, the facility may institute a reduced sampling schedule of one sample per 14 days of operation. If any sample fails on the reduced schedule, a daily schedule is instituted.

8.2.1 Facilities that have an average daily output of fewer than 160 rental skier days/day (averaged on a weekly basis) may adopt an alternate procedure and sample, over the sampling interval, 5 % of average daily output, and delay evaluation of the inspection results until a total of 16 sampled units have been accrued. However, if a single Class II or Class III deviation is detected at any time, corrective action as described in 7.2.2 and 7.2.3 is taken. This alternative method is used with a normal (weekly) or daily sampling schedule but is inappropriate for a reduced schedule.

9. Sampling and Inspection Procedures

9.1 *Preseason Check*—Perform all tests in accordance with Annex A1.

9.1.1 *Boot Inspection*—Unless otherwise specified by the binding manufacturer, inspect boots as follows:

9.1.1.1 Select two reference bindings of the same model.

9.1.1.2 Clean and lubricate both bindings where the boot will contact them.

9.1.1.3 Adjust both bindings to obtain the test result as specified by the binding manufacturer using a typical boot of the sole length to be inspected.

9.1.1.4 Clean the lubricant from one binding with a liquid dishwashing detergent or cleaner recommended by the binding manufacturer. Clean all contact points and clearly label the binding to indicate that it has been cleaned. Clearly label the remaining binding to indicate that it has been lubricated.

9.1.1.5 Select all boots of a given sole length and visually inspect as specified by the binding manufacturer.

9.1.1.6 Make all necessary binding-to-boot adjustments as specified by the binding manufacturer to accommodate the selected boots.

9.1.1.7 Using the clean binding and the release testing device, observe the twist test result in one direction only.

9.1.1.8 Using the clean binding and the testing device, observe the forward lean test result, unless the binding manufacturer specifies that the test is not required to further verify compatibility.

9.1.1.9 Using the lubricated binding and the testing device, observe the twist test result(s) in both directions.

9.1.1.10 Using the lubricated binding and the testing device, observe the forward lean test result unless the binding manufacturer specifies that the test is not required to further verify compatibility.

9.1.2 *Boot Evaluation*—Evaluate the test results for each boot as follows:

9.1.2.1 In each lubricated binding twist test, the clockwise versus counterclockwise test results should be within the inspection tolerance of the value specified by the manufacturer in 9.1.1.3.

9.1.2.2 The test result in twist, observed in the clean test should be within the limit of the value specified by the manufacturer in 9.1.1.3.

9.1.2.3 The test result in the forward lean lubricated test should be within the inspection tolerance of the value specified by the manufacturer in 9.1.1.3.

9.1.2.4 The forward lean test result observed in the clean test should be within the limit of correction of the forward lean release value specified by the manufacturer in 9.1.1.3.

9.1.2.5 Remove from inventory any boot that does not satisfy 9.1.2.2 and 9.1.2.4, and cannot be corrected.

9.1.2.6 Do not use in an interchangeable ski/binding/boot system any boot that does not satisfy 9.1.2.1 and 9.1.2.3 and cannot be corrected.

9.1.3 *Binding Inspection*—Inspect all bindings as follows:

9.1.3.1 Select a reference boot with sole length as specified by the binding manufacturer or that is commonly used with equipment. Bindings to be used in a noninterchangeable rental program should be inspected using the boot to which they are to be mated.

9.1.3.2 Clean and then lubricate the boot.

9.1.3.3 Adjust the binding's visual indicator to the setting specified by the binding manufacturer or that will be preset and used during the season.

9.1.3.4 Exercise the binding/boot system through the range of elastic travel as specified by the binding manufacturer. This exercise should include at least one release of the boot or plate from the binding in each direction of release specified by the manufacturer.

9.1.3.5 Using the testing device, observe the test results in each direction of release specified by the manufacturer.

9.1.3.6 Make all other inspections specified by the binding manufacturer.

9.1.4 *Binding Evaluation*—Evaluate the test results for each binding system as follows:

9.1.4.1 The clockwise and counterclockwise test results in twist should be within the inspection tolerance. If the test results fall near the opposite limits of the inspection tolerance, the binding manufacturer's procedure for evaluation on non-symmetrical release shall be implemented.

9.1.4.2 The test results in each direction of release should be within the inspection tolerance.

9.1.4.3 Remove from inventory any binding that does not satisfy 9.1.4.1, 9.1.4.2, and the requirements of the binding manufacturer unless it can be repaired or a correction factor is applied. Consult the binding manufacturer to verify that all correction procedures meet the manufacturer's criteria.

9.2 *In-Season Routine Sampling and Inspection*—Sample the inventory in accordance with Section 8 and perform all tests in accordance with Annex A1.

9.2.1 *Preconditioning for Sample Inspection*—A visual inspection or preconditioning, or both, in accordance with the manufacturer's recommendations should be made each time the equipment is rented and prior to sample testing. All procedures routinely performed immediately prior to equipment rental should be performed prior to sample inspection of such equipment. All procedures recommended to be performed by the end user should be performed prior to sample inspection of returned equipment.

9.2.2 *Inspection*—Inspect each sample unit in the following sequence:

9.2.2.1 Make a visual inspection of all binding-to-boot fitting indicators.

9.2.2.2 Observe the test result in forward lean.

9.2.2.3 Inspect forward lean elastic travel in accordance with A1.1.

9.2.2.4 Observe the test result in twist (one direction only).

9.2.2.5 Inspect elastic travel in all other directions of release in accordance with A1.1.

9.2.2.6 Perform all other tests and inspections required by the binding manufacturer.

9.2.3 *Evaluation*—Evaluate the results of the sample inspection as follows:

9.2.3.1 Classify test results that exceed the service tolerance by deviation. Count any unit that fails a functional or visual inspection as a Class I deviation.

9.2.3.2 Note any Class II or III deviations in the sample and take corrective action stipulated in 7.2.2 and 7.2.3.

9.2.3.3 Note the percentage of Class I deviations in the sample and determine the pass-fail status of the sample as defined in 7.2.1.

9.2.3.4 Determine the schedule for sampling based on the inspection results and the criteria defined in 8.2.

ANNEXES

(Mandatory Information)

A1. FUNCTIONAL AND RELEASE TEST REQUIREMENTS

A1.1 Description of Functional Inspections

A1.1.1 *Test for Elastic Travel and Recentering*—The system should be exercised to check that the boot or plate can travel a distance specified by the manufacturer and return freely to within 2 mm of the original position. This test should be made in all directions of release and in a manner specified by the binding manufacturer. If no displacement is specified, then 5 mm measured at the toe or heel (as appropriate) should be used and the test made by any device or method capable of displacing the boot or plate the necessary distance.

A1.1.2 *Test for Symmetrical Release*—The system should be tested for twist release in both the clockwise and counterclockwise directions with a device of the type specified in Annex A2. (Not necessary for in-season inspection).

A1.1.3 *Test of Binding/Boot, Compatibility*—The boot should be of a shape, composition, construction, and condition acceptable to the binding manufacturer. Functional inspections specified by the binding manufacturer to determine the compatibility of the boot and binding should be performed. If no functional inspection procedures are specified by the binding manufacturer, a functional inspection should be made to determine the difference in release torque between a clean, dry system and the same system after lubrication of all binding-boot interfaces. This inspection should be made in all directions of release specified by the binding manufacturer, using a testing device of the type specified in Annex A2.

A1.1.3.1 The lubricant used for this test should be applied in a thin film and may be of a type normally accepted in the maintenance of the binding such as a grease or silicone spray lubricant or a soap/detergent and water solution.

A1.1.3.2 If there is reason to believe that the binding-boot interface has been contaminated with a lubricant prior to the clean tests, a common dishwashing soap or detergent may be used, provided all surfaces are flushed with clean water afterward.

A1.2 Release Torque Inspection

A1.2.1 *Tests for Twist Release*—This test is made to determine the torque required to release the binding in twist about an axis perpendicular to the plane of the boot sole. This test is made using a device of the type described in Annex A2. Test results may be used to calibrate the binding to the desired release torque or to validate the visual indicator and determine an appropriate visual indicator correction factor, if appropriate. Tests may be made of the entire release system or using a reference boot (preseason tests only). No correction factor should be applied until all troubleshooting procedures recommended by the binding manufacturer have been carried out.

A1.2.2 *Tests for Forward Lean Release*—This test is made to determine the torque required to release the binding in forward lean. This test is made using a testing device of the type described in Annex A2. If no independent means is provided to adjust the forward lean release, this test is used to check that the ratio of twist to forward lean is as specified by the manufacturer. Test results may be used to calibrate the binding to the desired release torque or to validate the visual indicator and determine a visual indicator correction factor if appropriate. Tests may be made of the entire release system using a reference boot (preseason tests only). No correction factor should be applied until all troubleshooting procedures recommended by the binding manufacturer have been carried out.

A1.2.3 *Other Release Tests*—Tests of the type in A1.2.1 and A1.2.2 should be made in any other direction specified by the manufacturer and in any directions for which an independent release adjustment is provided.

A1.3 Test Conditions

A1.3.1 *Visual Indicator Setting for Functional Tests*—Functional tests are made at approximately mid-range on the visual indicator adjustment scale of the binding unless the binding is to be locked or sealed at a specified setting. Unless otherwise specified by the manufacturer, 20, 43, or 67 Nm in twist and 75, 165, and 271 Nm in forward lean are used as appropriate.

A1.3.2 *Visual Indicator Setting for Validating Release Indicator*—Tests to validate the visual indicator are made at approximately mid-range on the visual indicator adjustment scale of the binding or the selected preset visual indicator setting, unless otherwise specified by the manufacturer.

A1.3.3 *Preconditioning Binding*—The binding is cycled three times in all directions prior to calibration of the visual indicator setting or validation of the visual indicator.

A1.3.3.1 The use of a lubricant in this test is not intended to improve performance of the system in use, but to reduce the influence of the friction.

A1.3.3.2 Unless the procedure of the shop includes preconditioning prior to each rental, bindings tested as part of the in-season sampling and inspection program are not preconditioned.

A1.3.4 *Temperature*—Tests are performed at temperatures between 10 and 25°C (55 and 80°F).

A1.3.5 *Load Rate*—Tests should be performed at a load rate specified by the manufacturer of the testing device or in accordance with the binding manufacturer's recommendations. If no recommendations are provided, the load required to release the boot or plate from the binding should be applied smoothly such that the time to achieve release is between 1 and 5 s.

A2. SYSTEM TESTER INSPECTION REQUIREMENTS

A2.1 Same as Annex A1 of Practice F 1063.

A3. RELEASE TORQUE SELECTION PROCEDURES

A3.1 See Appendix X1 through X3 of Practice F 939.

APPENDIXES

(Nonmandatory Information)

X1. EXAMPLE OF TEST METHOD FOR REPRODUCIBILITY AMONG OPERATORS

X1.1 See Appendix X1 of Practice F 1063.

X2. DIAGNOSTIC PROCEDURE FOR VISUAL INSPECTION OF INTERFACES

X2.1 See Appendix X2 of Practice F 1063.

X3. FLOWCHARTS OF PRACTICE F 1064 PROCEDURES

X3.1 See Figs. X3.1-X3.3 for flowcharts outlining the procedures in Practice F 1064.

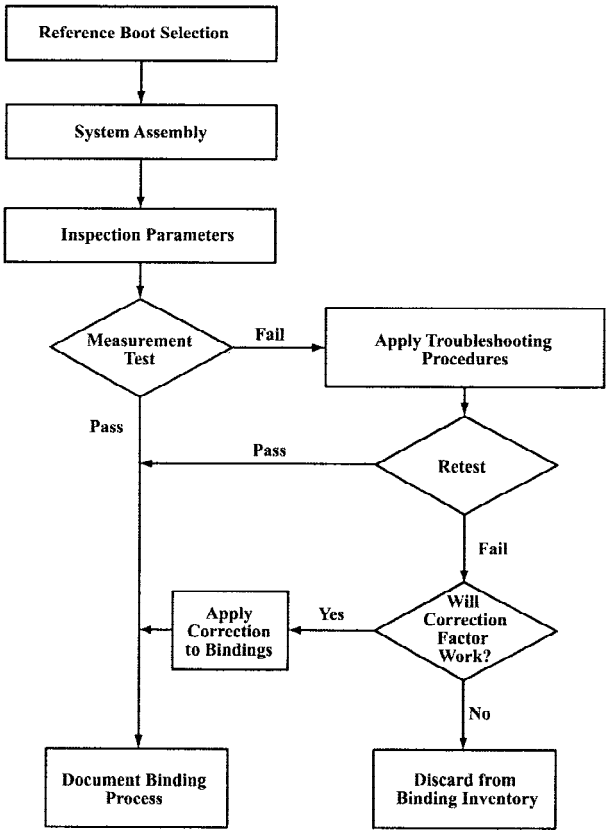

FIG. X3.1 Preseason Binding Inspection

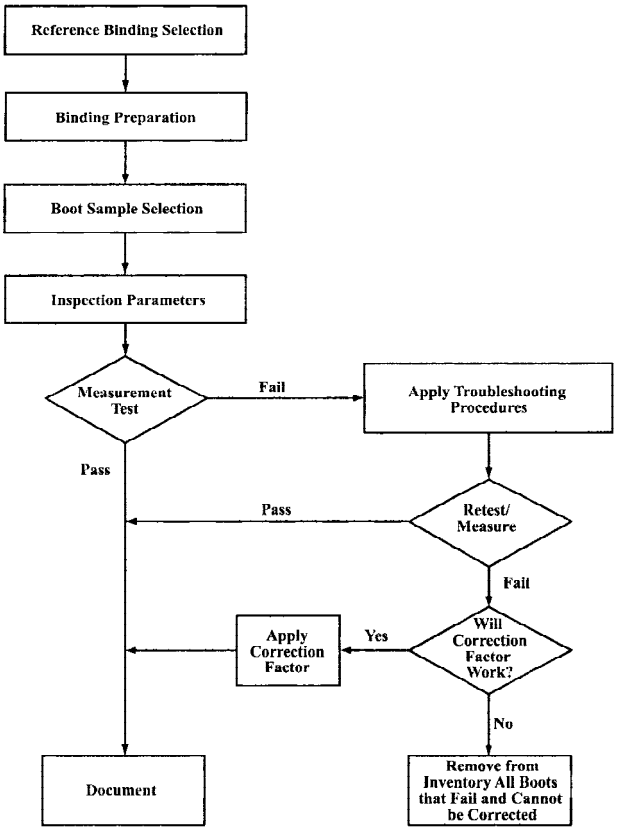

FIG. X3.2 Preseason Boot Inspection

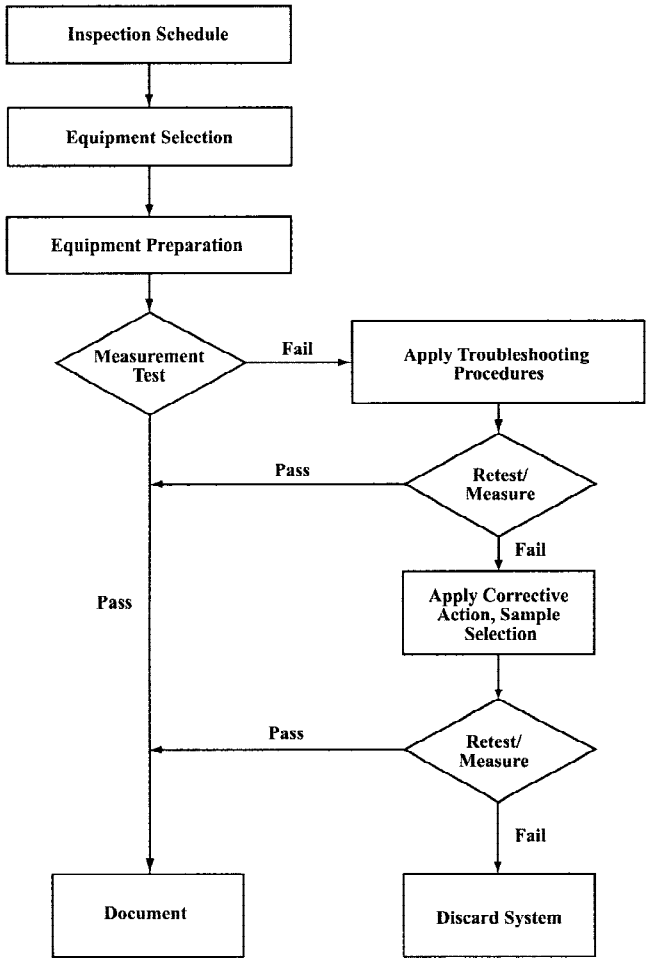

FIG. X3.3 In-Season Sampling

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