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

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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 F1063 for equivalent procedures and tolerances for retail systems.~~

1.3 This practice is not intended for use with other ski boot or bindings systems, such as alpine touring or pin/tech systems. Use of ski boots or ski bindings that do not meet the requirements for alpine ski equipment can cause unexpected release and retention characteristics.

1.4 This standard does not apply to a ski/binding/boot system that is rented to one individual for the majority of a season and not returned to the rental inventory until the end of the season (often referred to as a seasonal rental); such systems will follow the practice provided in Practice F1063.

NOTE 1—Refer to Practice F1063 for equivalent procedures and tolerances for retail systems.

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

[1] This practice is under the jurisdiction of ASTM Committee F27 on Snow ~~Skiing~~and Water Sports and is the direct responsibility of Subcommittee F27.50 on Shop Procedures (Retail and Rental).

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2. Referenced Documents

2.1 *ASTM Standards:*[2]

F939 Practice for Selection of Release Torque Values for Alpine Ski Bindings

F1063 Practice for Functional Inspections and Adjustments of Alpine Ski/Binding/Boot Systems

3. Terminology

3.1 *Definitions:*

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

3.1.2 *incomplete system*—applies when a skier provides one of the components of a ski/binding/boot system, such as his or her own boots. In this case, the system is treated in accordance with 7.3.

3.1.3 *unit (also called "rental unit")*—a half pair of ski equipment (ski-binding-boot system), consisting of a boot, a binding, and a ski or any individual system components (for example, a single boot or a single ski-binding).

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

3.1.5 *measured release value*—release torque value determined by the use of a testing device of the type defined in Annex A1.

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

3.1.7 *inspection range*—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 chart.

3.1.7.1 *Discussion—*

Any of the three methods described above for determining the range may be used as differences will be insignificant.

3.1.8 ~~*Class I deviation—*~~*in-use range (also called "re-adjustment range")—*~~a minor deviation~~ the maximum difference between the reference torque value and the test result that does not require corrective ~~action, defined as ±16 to 30 %, or~~ action. Defined ±30 % of the reference torque value, or ±6 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 ~~as~~ determined on the binding manufacturer's adjustment chart. ~~Class I deviations~~ Results in this range are used to determine the frequency of sampling. Results that are beyond the inspection range but still in this range do not require corrective action.

3.1.8.1 *Discussion—*

Any of the three methods described above for determining the range may be used as differences will be insignificant.

~~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.~~

3.1.9 *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).~~

[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

3.1.10 *corrective action*—procedures other than readjustment of the visual indicator setting ~~to~~that include repair or replacement of system ~~components.~~components or removing components from a rental fleet.

~~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.~~

3.1.11 *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 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.~~

3.1.12 *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~~ component.~~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 3.1.23).~~

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

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

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

3.1.15 *reference boot*—a boot that is typical of the boots in inventory and is chosen using the method in A4.1 and satisfies the requirements of A1.1.3.

3.1.16 *reference torque value*—the nominal release torque value derived from a document compatible with Practice F939 such as Annex A3 or information supplied by the binding or test device manufacturer.

3.1.17 *manufacturer pre-mounted ski-binding system*—a combination of new skis and new bindings that have passed inspection and testing by the original equipment manufacturer prior to delivery to the rental shop.

3.1.18 *rental skier days*—the number of rental skiers processed through a ski rental facility in a 24-h period.

~~3.1.20 *rental unit*—hereinafter unit(s), a half pair of ski equipment (ski-binding-boot system), consisting of a boot, a binding, and a ski or any individual system components (for example, a single boot or a single ski-binding).~~

~~3.1.21 *seasonal rental*—a rental system that is rented for the entire or majority of a season, that will not return to the rental inventory until the end of the season. Such system will follow the practice as provided in Practice F1063.~~

~~3.1.22 *system*—a group of interacting components, usually comprised of a ski, binding, and boot.~~

~~3.1.23 *test result*—the middle quantitative value of three repetitions of the same test.~~

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

~~3.1.25 *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~~ components of boot/binding systems are inspected and tested individually for compatibility and ~~interchangeability using a testing~~ proper function. Testing must be conducted with a device as defined in Annex A1 of Practice F1063.

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 ski/binding/boot system and associated release/retention ~~value~~characteristics 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.~~ manufacturers (for example, in manufacturer-provided technical manuals). 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~~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~~ a system that provides appropriate release/retention ~~value.~~characteristics.

5.2 This practice is applicable to rental facilities that use releasable ~~Alpine~~alpine ski bindings. It is not intended as a method for evaluating equipment ~~design.~~designs or types, such as alpine touring equipment. Mixing components of different system types (for example, using an alpine touring boot in an alpine binding) is discouraged.

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 annually by the rental facility and calibrated biannually by a qualified technician 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~~ski/binding/boot 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 shell size, is taken and tested in accordance with the procedures in ~~Section~~9.1.1 and ~~9~~9.1.2. If ~~a boot fails, all boots in the category~~ for any shell size and type, a boot does not produce acceptable results, all new boots 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~~9.1.1 and ~~9~~9.1.2. If any boots in this sample ~~fail,~~ do not produce acceptable results, all remaining ~~boots in the category~~ new boots of that make, model, and shell size 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~~ random sample of each make, model, and shell size is taken and tested in accordance with the procedures in ~~Section~~9.1.1 and ~~9~~9.1.2. If a boot ~~fails,~~ does not provide acceptable results, 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~~ make and model are visually inspected. If another boot of the same make, model, and shell size does not pass visual inspection, then all boots of that make, model, and shell size are tested in accordance with the procedures in Section 9. Any boot in this series of testing that does not produce acceptable results needs to be repaired, replaced, or removed from the rental fleet.

~~7.1.4 Boots that meet the criteria for compatibility but do not meet the criteria for interchangeability are used in non-interchangeable 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.~~

7.1.4 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~~9.1.3.

~~7.1.7 Bindings used in a non-interchangeable 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.~~

7.1.5 ~~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,~~ Each binding in the rental fleet is tested in the preseason except for new manufacturer pre-mounted ski-binding systems that include systems in which the toe and heel components are slid onto pre-mounted or integrated tracks. For these new manufacturer pre-mounted ski-binding systems, a 5 % (but not less than 16 nor more than 80-unit) random sample of bindings is tested in both ~~directions~~ twist and forward lean by the procedure in ~~Section~~ ~~9~~9.1.3. ~~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~~.

7.1.6 If a binding does not produce results in the inspection range when using a test reference boot, the binding manufacturer's troubleshooting procedures are initiated and all bindings in the category are tested in accordance with the procedures in 9.1.3. The bindings may be retested once after the troubleshooting procedures. If the bindings continue to produce results outside the inspection range, they must be removed from the rental fleet.

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~~9.2.

7.2.1 ~~The inventory fails the sample if a Class I deviation is detected in~~ If more than 20 % of the units in the ~~sample,~~ sample produce results outside the inspection range but within the in-use range, or if a single ~~Class II deviation is detected.~~system produces results outside the in-use range, follow the manufacturers troubleshooting procedures and initiate daily testing as required by Section 8.

7.2.2 If a ~~Class II deviation is detected in the sample,~~ system produces results outside the in-use range, the cause must be identified and the entire rental inventory inspected ~~for the defect~~ and appropriate corrections made. All pertinent procedures as defined by the binding manufacturer are reviewed and corrective action taken with the entire rental inventory.

7.2.2.1 ~~Class I deviations, when detected,~~ Systems that produce results outside the inspection range but within the in-use range, 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~~ If the customer is offering his or her own boots, the boots must pass a visual inspection, must be representative of the condition of the shop's boot inventory, and be compatible with the facility's rental ski/bindings. If the customer's boots meet these requirements, then 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.~~practice. If the boots do not meet these requirements, then these boots are not to be used with the facility rental skis/bindings.

NOTE 2—It is appropriate to offer alternative rental or retail options to the customer for boots, if the customer's boots do not meet the requirements described in 7.3.2.

7.3.3 If the customer is offering his or her 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 F1063. ~~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.~~

NOTE 3—It is appropriate to offer alternative rental or retail options to the customer for skis/bindings, if the customer's skis/bindings do not produce acceptable results during inspection/testing per 7.3.3.

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~~3.1.13).

8.2 *Sampling Frequency*—A sample of the size specified in 8.1 is taken every seven days of operation. If the in-season produces any results outside of the in-use range, or if 20 % or more systems are outside the inspection range and within the in-use range, then daily sampling is instituted.

8.2.1 If daily sampling has been initiated, it continues until the results of two consecutive in-season checks produce results in the inspection range or less than 20 % of systems are outside the inspection range and within the in-use range; normal sampling frequency is then resumed.

8.3 *Sampling ~~Frequency~~—Size and Frequency for Lower Volume Facilities*—~~A sample of the size specified in~~Facilities that have an average daily output of fewer than 160 rental ~~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,~~ skier days/day (averaged on a weekly basis) may adopt an alternate procedure and sample size, 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 system produces a result outside the in-use range at any time, corrective action as described in 7.2.2 ~~daily schedule~~ is ~~instituted.~~taken.

~~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~~range of the value specified by the ~~manufacturer in~~ manufacturer.~~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~~ inspection range specified by the ~~manufacturer in~~manufacturer. If ~~9.1.1.3.~~not, or the difference between the clean and lubricated test results is greater than 20 %, initiate the binding manufacturers troubleshooting procedures and restart testing for the boot.

~~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.~~

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

9.1.2.4 Remove from inventory any boot that does not satisfy 9.1.2.1, 9.1.2.2, and ~~9.1.2.4~~9.1.2.3~~,~~ and cannot be corrected.

9.1.2.5 Do not use ~~in an interchangeable~~ a ski/binding/boot system or any boot that does not satisfy 9.1.2.1, 9.1.2.2, 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~~equipment in accordance with A4.1~~rental program should be inspected using the boot to which they are to be mated.~~.