



EQUIPMENT SPECIFICATIONS AND CERTIFICATIONS MANUAL

A **Future** FOR
THE **Sport**



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Introduction

Purpose

This manual is published by the United States Bowling Congress to establish specifications and standards to be used by manufacturers, rules officials, bowlers and other interested parties.

Reason

As the sanctioning body for the sport of bowling, USBC has a responsibility to its membership to ensure fair play and to ensure that technological advances in the design and manufacture of bowling equipment are in the best interests of the sport.

While USBC encourages innovation, USBC sets equipment specifications to protect the traditions of the sport, to prevent an over-reliance on technological advances rather than on practice and skill, and to preserve skill differentials throughout the game.

The Equipment Specifications Committee, acting for and on behalf of the USBC Board, are authorized to have final authority to alter or change specifications. All proposed amendments to certification regulations or measurement specifications must be submitted in writing to USBC Headquarters.

Function

In addition to the basic specifications which appear in the USBC Playing Rules, this manual includes all technical specifications covering specific items of equipment as well as equipment approval procedures. This also includes certification and lane dressing specifications and procedures. These items are appropriately identified throughout the manual.

The USBC Equipment Specifications Department is responsible for monitoring developments in equipment technology in order to protect the nature of the sport of bowling. As custodians of the rules of bowling, USBC has the sometimes-difficult task of judging whether innovations in bowling equipment may bring about a benefit to those who play, or whether such developments constitute a threat to the nature of the sport. To preserve the character and integrity of the sport, and assure fairness of play for all USBC members, USBC may create new specifications and/or modify existing specifications when technological advancements may alter the fundamental nature or character of the sport.

USBC has the inherent right to refuse for testing anything that USBC believes to be offensive to a portion of our membership or which could involve the USBC implicitly condoning a violation of local laws.

USBC reserves the right to visit any manufacturing facility which produces USBC approved products for the purpose of insuring that only products that meet USBC specifications have the USBC mark of approval.

Please be advised that this information was accurate at the time of printing. Since changes or updates are made from time to time, please see [bowl.com](http://www.bowl.com) for the latest information.

Bowling Ball Requirements

Except for House Balls, any bowling ball used in USBC certified competition must be approved and identifiable as a ball listed on the [USBC Approved Ball List](#) located on the Equipment Specifications page on www.BOWL.com.

For identification purposes, each ball must have some form of serial number (this may be re-engraved). Additionally, the ball's original brand name or logo, and ball series name must also be engraved on each ball (these may not be re-engraved). No additional logos or designs may be added to a previously approved ball without written consent from the USBC.

Since all bowling balls manufactured prior to the creation of the USBC Approved Ball List (January 1991) have been previously approved, the acceptance of the ball is at the discretion of the tournament director and/or league official.

House Balls

As a courtesy to league and tournament participants, House Balls may be used during USBC certified competition even though they are not specifically posted on the USBC Approved Ball List.

A ball can be determined to be a House Ball provided the ball is:

1. Provided by the bowling center in which the event is being held.
2. A Non-High-Performance ball
(as defined in the Bowling Ball Approval Specifications section).
3. Not custom drilled for the bowler's hand.

Surface

The surface of the ball shall be free of all depressions or grooves of specific pattern, except for holes or indentations used for gripping the ball, scribe marks for drilling purposes, identification lettering and numbers, and incidental chipping or marking caused by wear. Engraved pictures, logos, and/or designs from the manufacturer are not considered grooves of a specific pattern.

If a crack is located within the bowler's track area, or if a fissure is present anywhere, the ball is not permitted for use during USBC certified competition. A crack is defined as a partial break or split that appears on the surface of the ball, which is no more than 3" long and no more than 1/8" wide. A fissure is defined as a break or split 3" long or greater and/or 1/8" wide or greater, usually occurring from some breaking or parting.

Cracks around or between gripping holes within the span may only be repaired using an approved ball plug. Fissures may not be repaired.

No foreign material may be placed on the outer surface of the ball, except for ball polish.

If the surface of the ball is altered by sanding or polishing, the entire surface of the ball must be sanded or polished in the same manner.

Plug, slugs, grips, and/or tape may not extend beyond the surface of the ball.

Weight

The weight of the ball shall not exceed 16.00 pounds. There is no minimum weight requirement.

Hardness

The use of chemicals, or other methods, to change the hardness of the surface of the ball after it is manufactured is prohibited. (*Note: This is covered in the rulebook under rule 17a. Unfair Tactics*)

Ball Manufacturing Specifications

The USBC Equipment Specifications Committee may establish specifications for a bowling ball as to roundness, size, materials, and physical properties. A manufacturer producing any new ball shall submit samples to the USBC Equipment Specifications Department for testing. Any re-released ball must meet all current specifications.

Physical Specifications

At time of manufacture, all balls must meet the following technical specifications when tested at room temperature (70-77 degrees Fahrenheit) at USBC headquarters using the official USBC test equipment. It is the manufacturers responsibility to makes sure all approved products continue to comply with USBC specifications.

Specification	Minimum	Maximum
Diameter	8.500"	8.595"
Roundness	None	0.010" total run out
Hardness(average)****	73D	
Radius of gyration*	2.447"	2.813"
Radius of gyration (average within a weight class)*	2.460"	2.800"
Differential radius of gyration*	None	0.060"
Coefficient of restitution*	0.650	0.750
Coefficient of friction*	None	0.320
Mohs' Hardness	None	6.0
Surface Roughness – Ra*	None	65 µin
Surface Roughness – Ra (average within a weight class)*	None	50 µin
Oil Absorption **	2:15 (min:sec)	None
Top Weight (10.00 pounds and greater) ***	None	5 oz.

*These specifications are for balls weighing 13.00 pounds or greater.

** Oil absorption spec effective Aug 1, 2020

*** Top weight spec is a manufacturing spec for undrilled balls effective January 1, 2020

**** Minimum hardness changed to 73D on Dec. 31, 2020. Production of models previously approved below 73D must cease after July 31, 2022.

1. Diameter - A bowling ball shall not be less than 8.500" in diameter, nor more than 8.595" in diameter at the time of manufacture.
2. Roundness - A bowling ball shall be spherical and shall not be out of round by more than 0.010" total indicator readout (TIR) at the time of manufacture.
3. Hardness - The average surface hardness from 10 readings around the bowling ball shall not be less than 73 durometer D when measured in compliance with ASTM D2240-15 at 70-77 degrees Fahrenheit.

NOTE: Minimum hardness changed to 73D on Dec. 31, 2020. Production of models previously approved below 73D must cease after July 31, 2022.

4. Radius of Gyration - The radius of gyration of a 13.00 lb. or more bowling ball, about any axis, shall not be less than 2.447", nor more than 2.813".
 - a. The average of all samples tested from a single weight class may not be below 2.460", nor above 2.800".

5. Differential Radius of Gyration - The maximum differential radius of gyration between any two axes of the same ball shall not exceed 0.060 inches.
6. Coefficient of Restitution - The coefficient of restitution of a 13.00 lb. or heavier bowling ball shall not be less than 0.650 nor greater than 0.750.
7. Coefficient of Friction - The coefficient of friction of a 13.00 lb. or heavier bowling ball shall not exceed 0.320. Test conducted at a relative humidity between 30% and 50%.
8. Mohs' Hardness - The Mohs' hardness of a bowling ball with a particle coverstock shall not exceed 6.0 on the Mohs' hardness scale.
9. Surface Roughness Ra - The surface roughness Ra of a bowling ball shall not exceed 65 μ in (micro inches).
 - a. The average of all samples tested from a single weight class may not exceed 50 μ in.
10. Oil Absorption- The lower spec limit for oil absorption for a ball is 2:15 (min:sec).

Material

At time of manufacture:

1. The ball shall be constructed of solid material i.e., no liquids and without voids in its interior.
2. Any material added to or included in the coverstock shall be equally distributed throughout the entire coverstock of the ball, except for materials used in logos and other required markings.
3. The density of any piece/component in a ball (e.g. core, coverstock, weight block, etc.) shall not exceed 3.80 g/mL (i.e., no pure metals or high density materials).

Following approval of a ball, the introduction of substances that are not comparable to the original material used in manufacturing of a bowling ball is prohibited. Likewise, introducing liquids or voids is prohibited.

Identification

1. Each ball must be uniquely identifiable by the following:
 - a. Brand name/logo
 - b. Ball series name
 - c. Individual serial number
 - d. USBC star logo (As of March 1st, 2006) Figure 3



Figure 3

2. Center of Gravity (CG) Marking Location:
The center of gravity of an undrilled ball must be clearly identifiable by a unique mark or indicator.
3. Pin and Low RG Axis
The pin of a bowling ball indicates where the top of the weight block is within the ball. One end of the low RG axis of the ball must be located within a 1" radius of the center of the pin. Exceptions to this would include "pancake" type core designs.

4. Preferred Spin Axis (PSA), High RG Axis
The PSA is the axis which a ball will migrate to and spin around when rotational energy is applied to the bowling ball; this will always be the high RG axis of the ball. For ball manufacturing specifications, this term applies to only undrilled balls with asymmetrical core designs. The PSA of a bowling ball should be clearly identifiable (if applicable) by a unique mark or indicator. The PSA should be within a 1.5" radius of the center of the marking or indicator on the ball.

Balls with a measured intermediate differential of 0.000" – 0.003" must not have a PSA marking or indicator. A PSA marking or indicator is optional for balls with a measured intermediate differential of 0.004" – 0.009". A PSA marking or indicator is required for balls with a measured intermediate differential of 0.010" or greater.

Bowling Ball Submittal

1. Bowling ball manufacturers shall comply with all USBC Equipment Specifications and Certifications Manual specifications in the production of balls for each brand produced and offered for sale and assume responsibility for such compliance by any other individual, firm, corporation or agent authorized or licensed by the ball manufacturer to use the approved ball formula and manufacturing procedure on the manufacturers' behalf.
2. Manufacturers must submit two random samples of the same model for testing, subject to the following weight requirements:
 - a. One sample to be between 15.00 and 15.40 pounds
 - b. One sample of either a 14 lb. or 16 lb. model, whichever weight is designed with the greater differential RG
3. International release of a domestic model will be approved based on similarity if the ball:
 - a. Uses the same core shape as an approved, domestic release and same density for all core pieces
 - b. Uses the same coverstock material as the domestic release (change of color(s) accepted)
 - c. Continues to pass all current ball specifications

A 15 lb. sample of the international release must be submitted to USBC for the purpose of adding it to the [USBC Approved Ball List](#). USBC Has the right to test these balls for similarity to the previously approved domestic model. All spot-checking rules still apply.

4. All product testing and approval is specific to that location of manufacture.
 - a. If manufacturing equipment of a previously approved product changes locations, that product must be re-submitted for approval testing. All testing fees shall apply.
 - b. Any ball model which has shifted manufacturing facilities must be re-submitted for approval testing. All testing fees shall apply.
5. Allow 20 business days for bowling ball approval.

Bowling Ball Approval Specifications

1. All bowling balls intended for use in any USBC certified competition shall be submitted for and required to obtain USBC approval and must be approved prior to use in any USBC certified competition. All bowling balls produced and offered for sale to USBC members for use in certified competition must comply with current USBC specifications and requirements.
2. A [USBC Equipment Specifications Bowling Ball Application Sheet](#) must accompany all bowling balls submitted for approval. The form can be found on the Equipment Specifications page on www.BOWL.com.
3. Balls which do not pass approval testing may be resubmitted with:
 - a. The necessary corrections made to bring the ball within USBC specifications.
 - b. A significant name change and/or significant color change.

NOTE: A pin color change will be accepted for balls being resubmitted due to diameter or roundness issues.

4. Approval of a ball model is specific to that formulation. If any physical changes are made to the ball, it must be resubmitted as a new model for approval testing. All testing fees shall apply.
5. Authority for approval or rejection of bowling balls is vested in the USBC Equipment Specifications Department based solely on the test results. If a manufacturer wishes to dispute the decision on a bowling ball, the issue may be appealed to the USBC Equipment Specifications Committee within 30 days of notification. The committee will make their final decision at the next scheduled meeting.
6. It is the manufacturers responsibility to ensure that all USBC approved balls comply with all specifications at time of manufacture.

Phase II Testing

Each ball model submitted for approval must meet all the physical specifications. Balls that fall within the ranges set forth below will be subjected to additional testing ("Phase II Testing"). Phase II Testing requires that manufacturers submit an additional 8 balls for testing and confirmation of compliance with ball specifications.

Phase II Testing is required when any test ball falls within specified range below:

Specification	Lower 8-additional range	8 Additional Not Required	Upper 8-additional range
Diameter	---	---	Greater than 8.595"
Roundness	---	---	Greater than 0.010" TIR
RG	2.447" - 2.473"	2.474" - 2.786"	2.787" - 2.813"
Differential RG	---	0.000" - 0.049"	0.050" - 0.060"
Differential RG- previously approved core	---	0.000" - 0.054" or 0.000"-0.049"	0.055" - 0.060" or 0.050" - 0.060" when the measurement is more than 2 standard deviations over the mean of the previously approved core.
COR	---	0.681 - 0.738	0.739 - 0.750
COF	---	0.000 - 0.289	0.290 - 0.320
Surface roughness- Ra	---	0 - 41 µin	42 - 65 µin
Oil Absorption (min:sec)	2:15 - 9:30	Greater than 9:30	---

The Phase II Testing requirement applies to all new ball models even when ball has an interior core that has previously been approved.

1. Diameter- Eight additional balls must be submitted (specific weight to be determined by USBC testing) for balls with a measured diameter above 8.595".
 - a. All eight additional samples must meet the physical specifications for diameter and have a different pin color than the original samples
2. Roundness- Eight additional balls must be submitted (specific weight to be determined by USBC testing) for balls with a measured total runout greater than 0.010".
 - a. All eight additional samples must meet the physical specifications for roundness and have a different pin color than the original samples.
3. Radius of gyration- Eight additional balls must be submitted (specific weight to be determined by USBC testing) for balls with a measured radius of gyration between the minimum of 2.447" and 2.473" or between 2.787" and the maximum of 2.813".
 - a. In the case of low end of the specification, the average radius of gyration (about a specific axis) of all samples of similar weight must be no lower than 2.460", with no single ball below 2.447". In the case of the high end of the specification, the average radius of gyration (about a specific axis) of all samples of similar weight must be no higher than 2.800" with no single ball above 2.813".
4. Differential radius of gyration- Eight additional balls must be submitted (specific weight to be determined by USBC testing) for balls in the following ranges:
 - a. New core design- 8 additional balls are needed if the differential RG is between 0.050" and 0.060". The average differential radius of gyration of all samples of similar weight must be no higher than 0.055" for the ball to be approved without participation in the supplemental testing.
 - b. For previously approved core with same component densities- 8-additional balls are needed if the differential radius of gyration is above 0.055". Also, any model that has a differential radius of gyration that is 2 standard deviations greater than the mean of a previously approved model and a differential Rg greater than 0.050", will also require 8-additional test balls. This is required as there is a possibility that the core density might have been modified and should not be considered a previously approved core. In both cases, the average differential radius of gyration of all samples of similar weight must be no greater than 0.055" for the ball to be approved without participation in the supplemental testing.
 - c. If the average differential radius of gyration of all samples of similar weight class is higher than 0.055", with no single ball above .060", the ball must go through the 24-ball supplemental testing process. If the supplemental testing process proves that the ball as submitted will be manufactured with less than 0.6% non-conformance (as calculated through DPMO- defective parts per million opportunities), the ball will be approved.

Supplemental Testing

The supplemental testing process requires the manufacturer to test 24 samples from the same model and weight for the specification in question and report the values to USBC. These balls are to be from a different batch of balls than the balls submitted for the 8-additional test balls, plus the

24 balls should be from 2-3 different batches (minimum 8 per batch) when a ball model consists of multiple batch runs. USBC can compare the mean and standard deviations of the supplemental data to the samples tested by USBC using the test for equal variance to assure they come from the same population. If the samples are from the same population, and process capability shows the model can be produced with less than 0.6% defects (6,000 out of 1,000,00 DPMO-Defects Per Million Opportunities), the product will be approved. If the data indicates the 24 samples fail the test for equal variance, they would need to be submitted to USBC and tested. If the submitted samples do not pass the test for equal variance, or if testing indicates the model will be produced with more than 0.6% DPMO, the model will not be approved.

NOTE: Appropriate statistical tests include, but are not limited to, two-sample t-tests, ANOVA Tests, Barlett's tests, and all non-parametric equivalents.

5. Coefficient of restitution - Eight additional balls must be submitted (specific weight to be determined by USBC testing) for balls with a measured coefficient of restitution between 0.739 and the maximum of 0.750.
 - a. All eight additional samples must be below the maximum coefficient of restitution specification of 0.750.
6. Coefficient of friction (for balls weighing 13.00 pounds or greater) - Eight additional balls must be submitted (specific weight to be determined by USBC testing) for balls with a measured coefficient of friction between 0.290 and the maximum 0.320.
 - a. All eight additional samples must be below the maximum coefficient of friction specification of 0.320.
7. Surface Roughness - Eight additional balls must be submitted (specific weight to be determined by USBC testing) for balls whose measured surface roughness, Ra, is between 42 µin. (micro inches) and 65 µin for any ball submitted for approval
 - a. The average surface roughness of all samples of similar weight must be less than the maximum average surface roughness specification of 50 µin. with no single ball above 65 µin.
8. Oil Absorption - Eight additional balls must be submitted (specific weight to be determined by USBC) for balls with a measured oil absorption time of less than 9:30 (min:sec).
 - a. The average oil absorption time of all samples must be no shorter than 9:30 (min:sec) or have a Cpk value greater than 2.00 for the ball to be approved without participation in the supplemental testing process.

NOTE: for oil absorption, $Cpk = \frac{\text{Sample Average} - \text{Lower Spec Limit}}{3 * (\text{Sample St.Dev})}$

- b. The supplemental testing process for oil absorption requires the manufacturer to submit 24 additional samples from the same model. These balls are to be from a different batch of balls than the 8-additional test balls, plus the 24 balls should be from 2-3 different batches (minimum 8 per batch) when a ball model consists of multiple batch runs. If the process capability, based on all 34 balls tested for oil absorption, shows the model can be produced with less than 0.6% defects (6,000 out of 1,000,000 DPMO-Defects Per Million Opportunities) the product will be approved. In other words, not more than 0.6% of the balls can be calculated to have an oil absorption time below 2:15 (min:sec).
 - c. Production of previously approved ball models with an oil absorption rate faster than 2:15 (min:sec) must stop after Jan. 31, 2022.

Ball Markings

Each ball model submitted for approval must meet all the marking specifications. Additional testing for balls that do not meet the marking requirements is as follows:

1. Pin and Low RG axis
 - a. 8-additional balls must be submitted (specific weight to be determined by USBC) for balls whose low RG axis is not within a 1" radius of the center of the pin.
 - i. All 8-additional samples must have the low RG axis within a 1" radius of the center of the pin.
2. PSA and High RG axis
 - a. 8-additional balls must be submitted (specific weight to be determined by USBC) for balls where the center of the PSA marking is not within a 1.5" radius of the high RG axis of the ball.
 - i. All 8-additional samples must have the high RG axis within a 1.5" radius of the PSA marking.
 - b. 8-additional balls must be submitted for balls that have a PSA marking and the measured intermediate differential is 0.000"- 0.003".
 - i. All 8-additional samples must have an intermediate differential of 0.000"- 0.003" and the PSA marking removed or have an intermediate differential of 0.004" or greater.
 - c. 8-additional balls must be submitted for balls that do not have a PSA marking and the measured intermediate differential is 0.010" or greater.
 - i. All 8-additional balls must have a PSA marking that is within a 1.5" radius of the high RG axis or an intermediate differential of 0.003"-0.009".
3. Balls which are not approved based on marking requirements may be corrected and resubmitted for approval. For pin and low RG axis resubmissions, the corrected ball must be submitted with a different color pin. Balls which are not approved will not be reconsidered for approval unless the ball has the necessary corrections made to adhere to all specifications and is resubmitted with a name and/or significant color change. Balls resubmitted must meet all current specifications.
4. For balls to be considered the same, they must measure statistically similar on any test. Gauge discrimination will be considered.

Non-High Performance Bowling Balls

1. For a ball to be considered non-high performance it must have the following:
 - a. Polyester or basic urethane coverstock.
 - b. "Pancake", "Bullet" or similar 3-piece core design.
 - c. Differential Radius of Gyration measuring less than 0.025 inches.
2. First production of a non-high performance ball must be submitted for approval testing. Subsequent color or logo/name changes are considered under the blanket approval of that ball model upon submission of a ball approval application and photograph of the new ball. The photograph should showcase all required markings on the ball.
3. In the case where a non-high performance ball has been approved for a single brand and is now being manufactured by the same manufacturer for another brand, only a ball approval application, photograph of the ball seeking approval showcasing all required markings and

- appropriate testing fee are required.
4. For balls to be considered the same, they must measure statistically similar on any test. Gauge discrimination will be considered.

Approval Status

1. USBC possesses the right to announce ball [approval](#) and/or [non-conformance](#) in its publications on www.BOWL.com or through any other media as USBC deems necessary.
2. All boxes in which approved bowling balls are distributed must be clearly marked with the USBC approval logo. All published advertisements will include the USBC approval logo or approval pending logo. The approval pending logo shall be used advising USBC members that the ball is pending USBC approval and to check www.BOWL.com for its status.



Figure 3b

3. If USBC determines that balls being produced do not comply with current USBC specifications and requirements outlined in the USBC Equipment Specifications Manual, it may, at any time, send written notice of cancellation or revocation of the ball model to the ball manufacturer.
4. USBC may withhold approval of any bowling ball to preserve the essential character and integrity of the sport of bowling or for fairness of play. In addition, "USBC Approved" status may be revoked and withdrawn if USBC determines through testing and analysis of scientific data that such bowling balls may affect the essential character or integrity of the sport of bowling or fairness of play. In the event of a withdrawal, the ball manufacturer shall terminate production and distribution of any ball marketed as "USBC Approved" as of the date determined by USBC. The ball manufacturer will be responsible to pay for outside laboratory fees when additional, independent, scientific testing and analysis is required.

Re-Testing and Spot Checking

The USBC possesses the right to spot check bowling balls during the course of the year. USBC approval may be revoked if it is determined that the production balls do not comply with current specifications outlined in the USBC Equipment Specifications and Certifications Manual.

USBC can, in its sole and absolute discretion, re-test a production ball model. USBC may select brands at random throughout the year for spot check testing or may in its sole discretion re-test any specific model based upon a suspicion or belief that a production ball model differs significantly from the test balls or does not comply with current specifications and requirements outlined in the USBC Equipment Specifications and Certifications Manual. The selected model will be tested, and those results will be compared to the original sample balls submitted for testing.

If this initial re-testing or spot check testing produces results that fall outside of USBC specifications or it is determined that the results are statistically different from the original sample balls, then a secondary round of testing will be performed from a different batch. If this secondary round of testing produces similar results and the ball is outside of specifications, the manufacturer in question will be placed on probationary status for no less than 1 year accompanied by a fine not to exceed \$8,000 in addition to any previously received testing fees.

If this secondary round of testing produces results that again are different from the original test balls, but the results pass specifications, the manufacturer must resubmit the ball for approval and is subject to the fine, "Ball found not to have the same core or cover" (see violation/ fine table in Bowling Ball Fines and Penalties section).

Spot-Checking Requirements

Ball models that are most likely candidates for spot checking:

1. Approved ball models within the 24-additional range for any specification.
2. Approved balls that are advertised as having any property within the 24-additional range for any specification.
3. Approved balls that measured within 1.0 point of the hardness spec limit.

Spot Check Procedures

1. USBC will purchase 4 balls from one model for each ball brand from ball distributors and test for:
 - a. Any specification for which the initial approval samples met the "Spot Checking Requirements" above.
 - b. Any specification within standard ball approval testing when deemed necessary.
2. The number of spot check balls will increase to 4 additional balls when a spot check ball measures close to spec limit per chart below:

Specification	Specification Limit	Test additional balls if any spot check ball is found closer to spec limit than:
Diff Rg	0.060	.057
Rg (min)	2.447	2.460
Rg (max)	2.813	2.800
COR (max)	0.750	.739
COR (min)	0.650	.660
COF	0.320	.290
Ra	65	50
Oil absorption	2:15	4:00
Hardness	73	74

3. Increase spot check balls to an additional 24 balls with any of the following conditions.
 - a. any spot check ball is found to be outside of specifications.
 - b. any spot check ball is significantly different than the original test balls and is closer to a spec limit.
 - c. the statistical calculation for the initial 8 spot check balls exceeds 0.6% non-conformance rate (6000 DPMO).

The 24 additional balls will be purchased from the field with a range of different serial numbers to acquire balls from different batches. Balls will only be tested for the specification that was outside of the spec limits to determine the extent of the non-compliance. Additional balls may be spot checked when deemed appropriate.

4. A statistical analysis will be used to determine the results from all spot-checked balls to determine:
 - a. Mean (average).
 - b. Standard deviation.
 - c. % non-conformance based on DPMO (defects per million opportunities).
 - d. Ball models found with a defect rate between 0.6% and 5.0% defects will be given an opportunity to make corrections and fix the out of spec situation.
 1. The existing production balls can remain in the field. The manufacturer must notify USBC of the changes they are making to correct the out of spec issue. For the next five production batches, a total of 24 balls from each batch are required to be inspected by the manufacturer for the spec violation to prove that the process can make balls that pass specifications. Each batch must have a Cpk of 1.33 or greater and the combined 5 batches must have a Ppk of .83 or greater to prove they meet specifications. Once passing both Cpk and Ppk, no additional supplemental testing is required.
 2. The results from the 24 balls from each batch will be sent to USBC along with the ball serial numbers. The manufacturer will retain the balls for 30 days for USBC to potentially request samples be sent to measure and confirm the test results.
 - e. Ball approval can be revoked if the process capability shows the model has greater than 5.0% defects (50,000 out of 1,000,000 DPMO-Defects Per Million Opportunities) outside of any spec limit.
 - f. If issue is isolated within a single batch, or across the entire model
5. Test results will be sent to the manufacturer when results fall outside of existing specifications.
6. USBC reserves the right to modify the spot check procedure as needed to ensure that approved balls meet all specifications.

Bowling Ball Testing Fee

Testing	Cost
Basic test fee for initial ball approval (13-16 pounds)	\$550
Non-high-performance balls that are manufactured by the same manufacturer and are previously approved for another brand.	\$100
Basic test fee for balls manufactured under 13 pounds only	\$250
Balls tested on an expedited basis	\$1,300

International models that are substantially similar to models already approved and released in the U.S. may be approved without testing provided the manufacturer stipulates the international model:

1. Uses the same core shape and density for all core pieces as the domestic release
2. Uses the same coverstock material as the domestic release (except colors can change)
3. Continues to pass all current ball specifications
 - a. A 15 lb. sample of the international release must be submitted to USBC for the purpose of adding it to the [USBC Approved Ball List](#). USBC Has the right to test these balls for similarity to the previously approved domestic model. There is no testing fee for this approval. All spot-checking rules still apply.

Bowling Ball Fines and Penalties

Violations	Fine
Penalty for balls found to be outside of any specification	Up to \$8,000 fine; manufacturer must also pay full restitution to consumers who purchase nonconforming balls; 1-year probation.
Failure to identify a USBC approved ball with either the USBC approval or pending logo in any advertisement, bowling publication or other means	\$750 per ball model, plus any legal fees incurred by USBC
Identifying in a publication or on any ball or ball box, a ball as USBC approved when it is not USBC approved	\$750 per ball model, plus any legal fees incurred by USBC
Balls found to not have the same required markings as that which was previously approved	\$2,000 per ball model plus any amounts expended to correct the non-compliant ball release, and any legal fees incurred by USBC
Any ball found not to have the same core and/or cover stock as that which was previously approved	\$4,000 per ball model plus any amounts expended to correct the non-compliant ball release, and any legal fees incurred by USBC
Second-hand quality ball (X-Comp, X-Blem, X-Out, etc) found to not have the same core and/or cover stock as the original first quality model	\$4,000 per ball model plus any amounts expended to correct the non-compliant ball release, and any legal fees incurred by USBC
Balls released prior to approval NOTE: Ball release is defined as shipping balls to distributors or pro-shops for sale.	\$4,000 per ball model plus any amounts expended to correct the non-compliant ball release, any damages incurred by USBC together with any legal fees incurred by USBC
Intentional misconduct including but not limited to falsifying documents, destroying or concealing evidence, or making false or misleading statements to USBC during ball approval or testing process.	Up to a \$10,000 fine and up to two years' probation.

1. During the probation period the manufacturer must submit 20 sample balls for each new release.
2. Failure to remit payment in a reasonable amount of time will result in revocation of approval status and cessation of approval testing on new products.
3. Late fee charge of 1.5% per month will apply for all outstanding invoices not paid within 30 days.
4. Ball manufacturers will be responsible for all shipping costs, including the return of additional test balls when required.

Drilling Specifications

Holes

The following limitations shall govern the drilling of holes in the ball:

1. Holes or indentations for gripping purposes shall not exceed five and shall be limited to one for each finger and one for the thumb, all for the same hand with no drilled holes exceeding 1-9/16" diameter and 4-1/2" deep. (Note: This includes holes required to install removeable devices). The player is required to use all the gripping holes on every delivery with the same hand except when using a house ball.

A house ball is defined as:

- i. Being supplied by the center in which the certified competition is being held.
- ii. Having a polyester or basic urethane coverstock.
- iii. Having a differential RG less than 0.025 inches.
- iv. The ball is not drilled to fit the bowler specifically.

NOTE: *A ball left in a bowling center by a bowler for public use is not considered a house ball.*

Any gripping hole that does not have the thumb or fingers inserted into it throughout the approach would be classified as a balance hole, which is not allowed. Any secondary hole drilled inside of a gripping hole that is not intended for gripping purpose is considered a void and not allowed except for vent holes.

If a bowler does not have a thumb hole, there must be a scribed or engraved "+" near the center of the palm to indicate the grip orientation. The ball must be delivered in the marked orientation (i.e., palm must cover the "+").

2. Balance holes are not permitted.
3. No more than one vent hole for each finger and/or thumb hole not to exceed 1/4" in diameter. USBC considers a vent hole to be any non-gripping hole that intersects with a gripping hole at any depth. Any hole intended for use as a balance hole that intersects with a gripping hole will instantly be considered a vent hole. This hole may not exceed 1/4" at any point throughout the depth of the hole.
4. One mill hole for inspection purposes not to exceed 5/8" in diameter and 1/8" in depth.

Balance

The following tolerances shall be permissible in the balance of a bowling ball used in certified competition:

1. For a ball weighing more than 10.00 pounds
 - a. Not more than 3 ounces difference between the top half of the ball (gripping holes side) and the bottom half of the ball (side opposite the gripping holes).
 - b. Not more than 3 ounces difference between the half of the ball to the left and the half of the ball to the right of the center of grip (side weight).
 - c. Not more than 3 ounces difference between the half of the ball toward the thumb hole side of the center of grip and toward the finger holes side of the center of grip (thumb/finger weight).
 - d. A ball used without any gripping holes or indentations may not have more than 3 ounces of difference between any two halves of the ball.
 - e. If a bowler does not have a thumb hole and drills a ball to meet the new 3 oz. of imbalance requirement, there must be a scribed or engraved "+" near the center of the palm to indicate the grip orientation. The ball must be delivered in the marked orientation (i.e., palm must cover the "+").
2. For a ball weighing 8.0 pounds to 10.00 pounds
 - a. Not more than 2 ounces difference between the top half of the ball (gripping holes side) and the bottom half of the ball (side opposite the gripping holes).
 - b. Not more than 3/4 ounce difference between the half of the ball to the left and the half of the ball to the right of the center of grip (side weight)
 - c. Not more than 3/4 ounce difference between the half of the ball toward the thumb hole side of the center of grip and toward the finger holes side of the center of grip (thumb/finger weight).
 - d. A ball used without any gripping holes or indentations may not have more than 3/4 ounce of difference between any two halves of the ball.

3. For a ball weighing less than 8.00 pounds
 - a. Not more than $\frac{3}{4}$ ounce difference between the top half of the ball (gripping holes side) and the bottom half of the ball (side opposite the gripping holes).
 - b. Not more than $\frac{3}{4}$ ounce difference between the half of the ball to the left and the half of the ball to the right of the center of grip (side weight).
 - c. Not more than $\frac{3}{4}$ ounce difference between the half of the ball toward the thumb hole side of the center of grip and toward the finger holes side of the center of grip (thumb/finger weight).
 - d. A ball used without any gripping holes or indentations may not have more than $\frac{3}{4}$ ounce of difference between any two halves of the ball.

Determining the Grip Center

The center of grip is to be determined by measuring from the front edge of each finger hole to the front edge of the thumb hole. If more than two fingers holes are used, the center of grip will be determined by averaging the distance between each finger hole and the thumb hole. (See Figures 4, 5, 6, & 7.)

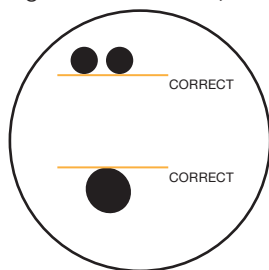


Figure 4

BLACK -
INSIDE THUMB HOLE/
FINGER HOLES

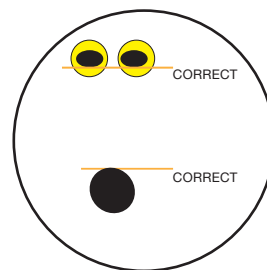


Figure 5

BLACK -
INSIDE THUMB HOLE/
FINGER GRIPS

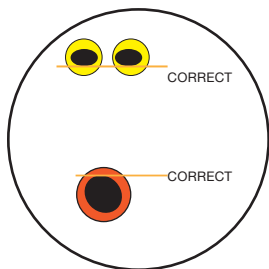


Figure 6

ORANGE --
THUMB SLUG OR SLEEVE

BLACK -
INSIDE THUMB HOLE/FINGER GRIPS

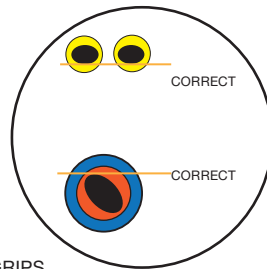


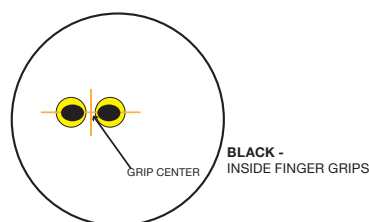
Figure 7

BLUE -
INTERCHANGEABLE THUMB
OUTER SLEEVE, IF PRESENT

ORANGE -
INTERCHANGEABLE THUMB INSERT

BLACK -
INSIDE THUMB HOLE/FINGER GRIPS

The following example shows specifically how to determine grip center as it relates to bowlers who do not use their thumb. The center of the bridge is the center of grip for a ball with no thumb hole and only two gripping holes.



Plug and Designs

1. Ball plug or slugs may be used for re-drilling a ball. When a slug is used, there must be a hole drilled completely through the slug leaving no void at the base.
2. In all cases, there shall be no interior voids.
3. Plugs and designs must be made of material like, although not the same as, the original material out of which the ball was made. Plugs and designs must comply with other specifications of a bowling ball.
4. No foreign material may be placed on the outer surface of the ball or in the balance hole, including but not limited to paint, marker or whiteout.
5. Density must be within a range of 0.9 g/mL and 1.5 g/mL.

Two-Handed Techniques

Two-handed Delivery

Both hands impart force on the ball to get it down the lane; normally done by swinging the ball between one's legs. Differing greatly from the two-handed approach, this style is most commonly used when youth start to learn how to bowl. Individuals who deliver the ball from the chest using both hands would be using a two-handed delivery.

Two-handed Approach

Not to be confused with the two-handed delivery, this style places both hands on the ball and are left on the ball throughout the swing until the release. An evolution of the thumb-less technique, this can be done with or without the thumb on the dominant hand in the ball.

It's important as it relates to USBC rules regarding averages and drilling specifications to know which hand is the dominant hand. This is determined by the side of the body by which the ball swings and, if utilized by the player, the hand which is used to grip the bowling ball.

Holes

The limitations governing the drilling of holes in the ball can be found in Drilling Specifications. Note that for two-handed techniques, the holes or indentations for gripping purposes must be capable of being used by the same hand.

Ball Accessories

Cleaners

Cleaners may be used provided:

1. They do not affect the hardness of the ball.
 - a. Does not change the durometer-D hardness by greater than 2 points when tested per the [Standard Operating Procedures](#) for hardness.
2. They are totally removed from the ball before competition
 - a. Does not leave a residue that alters the ball's FTIR spectrum by more than 5% (less than 95% similarity result)
3. They have been approved for use by USBC

Any cleaner that is used must be approved by USBC and be found on the [“Approved Cleaners”](#) list on the Equipment Specifications page on www.BOWL.com. All cleaning products must display the USBC Approved Before/After logo. (See figure 1).



Figure 1

NOTE: *Effective August 1, 2019 no liquid cleaners may be used to wipe off your bowling ball during USBC certified competition without permission from an event official. If there is a substance on the ball that cannot be removed with the dry towel alone, you may contact the league or tournament official about using a cleaning product. Please see the USBC Playing Rules for more information.*

Mechanical Aids

A bowling ball must be delivered entirely by manual means and shall not incorporate any device, either in the ball or affixed to it, which is either detached at the time of delivery or is a moving part in the ball during delivery. Any person whose hand, or major portion thereof, has been amputated may use special equipment to aid in grasping and delivering the ball provided the special equipment is in lieu of the amputee’s hand (see USBC rule book for further clarification).

Devices

Moveable devices are not permitted for use in a bowling ball at any time.

Removable devices shall be permitted provided such devices are:

1. Used for changing the span, pitch, or size of the gripping holes
2. Constructed of a non-metallic material
3. Locked into position during delivery
4. Not greater than 1.5 g/mL in density

Devices may not be employed for:

1. Adjusting the static balance or dynamic properties of the ball
2. Creating a void within the ball

NOTE: *Tape in a gripping hole is not considered a device and is allowed.*

USBC Tenpin Specifications

It is the pin manufacturers responsibility to ensure that all USBC approved pins meet all the pin specifications at time of manufacturing.

Approval agreement of any pin must be manually signed by an authorizer company representative and countersigned by a designated USBC officer.

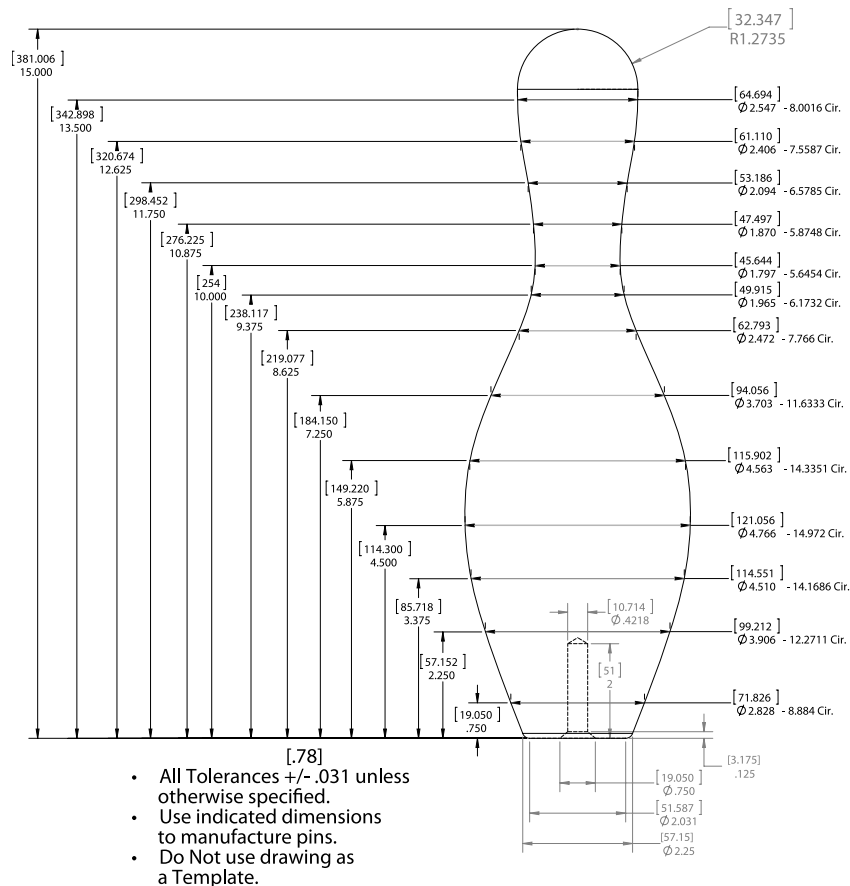
Bowling Pin Dimensions

SPECIFICATIONS		TOLERANCE		
STATION		Diameter	Minimum	Maximum
13 1/2"	Above Base	2.547"	2.516"	2.578"
12 5/8"	Above Base	2.406"	2.375"	2.437"
11 3/4"	Above Base	2.094"	2.063"	2.125"
10 7/8"	Above Base	1.870"	1.839"	1.901"
10"	Above Base	1.797"	1.766"	1.828"
9 3/8"	Above Base	1.965"	1.934"	1.996"
8 5/8"	Above Base	2.472"	2.441"	2.503"
7 1/4"	Above Base	3.703"	3.672"	3.734"
5 7/8"	Above Base	4.563"	4.532"	4.594"
4 1/2"	Above Base	4.766"	4.735"	4.797"
3 3/8"	Above Base	4.510"	4.479"	4.541"
2 1/4"	Above Base	3.906"	3.875"	3.937"
3/4"	Above Base	2.828"	2.797"	2.859"
Base – with 5/32" radius – Flat Diameter		2.031"	2.000"	2.062"

SPECIFICATIONS	TOLERANCE		
	Target	Minimum	Maximum
Weight	3 lbs, 8 oz	3 lbs, 6 oz	3 lbs, 10 oz
Height	15.000"	14.969"	15.031"
Hole Depth*	2.000"	1.969"	2.031"
Hole Size	27/64" (0.422")	0.406"	0.453"
Cup Diameter*	3/4" (0.750")	0.734"	0.781"
Radius at Base	5/32" (0.156")	0.125"	0.187"
Center of Gravity	5 25/32" (5.781")	5-5/8" (5.625")	5-15/16" (5.937")
Radius of Gyration Squared	13.90"	13.20"	14.60"
Moisture Content	9%	6%	12%
Coefficient of Restitution	0.670	0.605	0.735

*Standard, not specification

Bowling Pin Measurements



General Pin Specifications

Hardness

Hardness of the coating shall be established by a scleroscope hardness test. Minimum and maximum hardness values shall be established for each approved pin at time of original testing. Average hardness shall be calculated from 10 measurement readings from 1 to 1.5 inches apart at the largest diameter on the pin, 4.75 inches above the pin base. The specification for each pin will be set at the average of these readings with a tolerance of ± 10 points.

Design

The top of the pin shall have a uniform arc with a radius of 1.273 inches. A $\pm 1/32$ -inch tolerance shall be permitted. The taper from station to station shall be gradual so that all lines have a graceful curve.

Finish and Coatings

Pins used in USBC certified competition shall only bear the name and trademark of the original manufacturer or distributor and be marked "USBC Approved." Except for reasonable wear, neck markings and color, the pins in each pair of lanes must be uniform in appearance including permit number, finish and labels. The coating shall be solid color and/or transparent (clear) with the exception of neck markings, identifications symbols and names, which must be contrasting color.

At no time, may a pin be painted or any supplemental finish be applied that has not been evaluated and approved by USBC.

NOTE: For permit renewals, materials must meet a percent similarity specification. If pins fail to meet these specifications, USBC will conclude the pin is a different pin than initially submitted, therefore denying permit renewal.

FTIR Similarity Specification Limits:

Specification

FTIR Percent Similarity

Pin Base

94.0

Pin Coating

92.50

Bases

No part of the base shall protrude beyond the base attachment, but that portion of the base within the base attachment may be recessed as much as .025 inches. As an alternate specification, the area of the base within the base attachment may be concave so that it is recessed at least .025 inch at the junction with the base attachment, gradually declining toward the center to a depth of .125 inch. When any portion of the pin protrudes beyond the base attachment, such pin is unacceptable for USBC certified competition until necessary corrections have been made to comply with the foregoing specifications.

All pins shall be rounded at the outer edge of the base by the manufacturer on a 5/32 inch (.156) radius with a $\pm 1/32$ inch (.031) tolerance. The diameter of the base, exclusive of the rounded edge, shall not be less than two inches. For the life of the pin, any base diameter less than two inches is unacceptable for USBC certified competition.

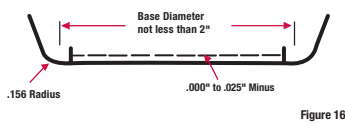


Figure 16

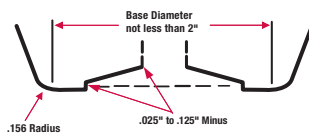


Figure 17

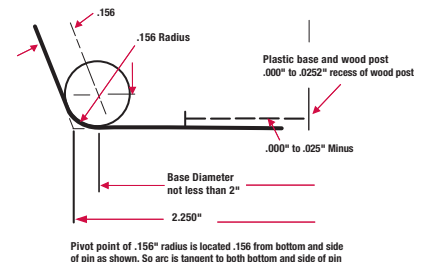


Figure 18

Base Attachments

Base attachments must be USBC approved and manufactured in accordance with the specifications established by the USBC Equipment Specification and Certification Committee.

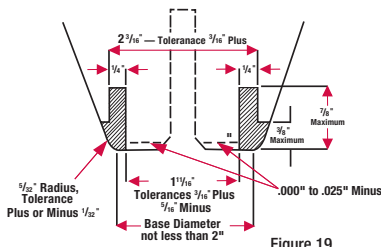


Figure 19

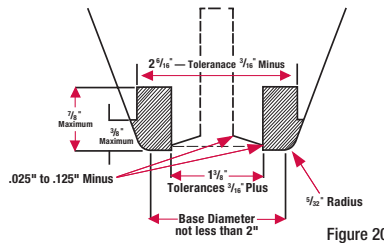


Figure 20

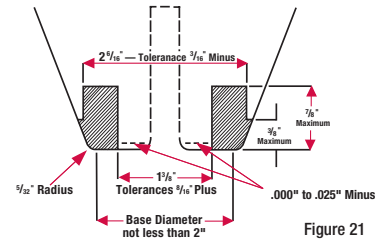


Figure 21

Label and Marking

Pins manufactured for USBC certified competition shall bear the name and trademark of the original manufacturer or distributor and be marked "USBC Approved." All pins shall bear two labels for the life of the pin. One half of the pin shall be the designated area for a manufacturer's label and it shall include the following items in its design:

1. The trade name.
2. The USBC Permit Number under which USBC approval was authorized.
3. The USBC Certification Mark in a size measuring at least 3/4 inch in diameter.

See Certification Mark below.

The following designation (in full or acceptable abbreviation form) must appear on the manufacturer's label when applicable:

1. "Controlled Weight"
2. "Densified"
3. "Plastic Coated"
4. Reference to type of reinforcement (i.e. "nylon reinforced")
5. Synthetic

Manufacturers or distributors shall use a distinctive label, reserved exclusively for pins meeting USBC specifications. In addition to the manufacturer's label, a second label shall be a special "USBC Label" made in conformity to design provided by the USBC. It shall be affixed diametrically opposite the manufacturer's label and not measure less than 2" in diameter.



Figure 22
minimum 2" diameter



Figure 23
minimum 3/4" diameter

USBC® Registered Service Mark

United States Bowling Congress is the owner of the following certification marks applied to tenpins by the manufacturer to certify the tenpins meet USBC specifications.

Tenpins having the proper certification mark are approved for use in certified USBC competition.

1. Applies to all tenpins



Figure 24

2. Applies to approved plastic-coated wood tenpins



Figure 25

3. Applies to approved synthetic tenpins



Figure 26

4. Applies to all test pins



Figure 27

USBC Plastic Coated Tenpin Specifications

Wood Specifications

USBC approved pins shall be made of new (unused), sound, hard wood and must comply with all technical specifications. By "sound wood" we mean the wood shall be free of any decay that has advanced to a point where it can be recognized by color or softening of the wood and shall not have the following defects:

1. Cracks due to drying of the wood
2. Skip, torn or chipped grain in ball zone exceeding a two-square-inch area or having a maximum depth greater than 1/8 inch
3. Open glue joints in laminated pins due to either uneven facing surfaces, inadequate glue pressure or poor gluing
4. Cross grain exceeding slope of 1 inch in 10 inches
5. Knots and bark pockets with maximum dimension exceeding 1/4 inch in neck, 3/8 inch at pin bottom, 1 inch in head and 1¾ inches in ball zone

Each pin may be constructed of one piece, or two or more laminated pieces, provided all laminations runs parallel to the vertical axis of the pin.

Adhesives

Adhesives used in laminating pins should be of such types that they will withstand the forces of temperature, moisture and play that occur in service of a bowling pin, and they should be sufficiently durable to provide satisfactory quality joints during the life of the pin. Only adhesives conforming to the quality required by commercial standards, or federal specifications for the appropriate adhesive, should be used.

The bonding quality of the glue must not be affected by any process being used in the manufacturing of the approved pin.

Note: It is advisable to obtain certification from the adhesive manufacturer that the adhesive is acceptable for laminating wood for bowling pins. Each lot of adhesive should be certified as conforming to the applicable specifications. Gluing procedures should conform to those described in the Forest Products Laboratory (U.S. Department of Agriculture) manual entitled "Fabrication and Design of Glued Laminated Wood Structural Members." Mixing, spreading, storage, working and assembly life should be in accordance with the manufacturer's recommendations.

Coating Thickness

Coating thicknesses of plastic-coated pins will be developed independently with each manufacturer from the average thickness measurements as determined at the time of original testing. These tolerances are individually applicable at the head, neck, ball line and base locations based on the average of 10 equidistant measurements around the pin. In addition, the measured coating must fall within the maximum/minimum tolerance for each of the 10 measurements.

Coating Average	Tolerance
0.001-0.075"	± 0.015"
0.075-0.100"	±0.020"
0.101 and greater	±0.025"

Center of Gravity

A manufacturer of USBC approved pins shall have a device approved by USBC to pinpoint the exact center of gravity. A daily spot check of pins in production to ensure specification compliance is mandated.

Controlled Weight Pins

Controlled weight pins may be classified as USBC approved upon compliance with the following requirements:

1. To control the weight of wood core tenpins in order to provide uniformity within applicable weight requirements, the pin may be constructed with voids in its core, provided that such voids do not affect the pin balance around the longitudinal axis or appreciably alter pin performance characteristics through its normal life. The pin must otherwise conform to all specifications for a wood core plastic-coated pin.
2. Any void in a pin must extend through the center block. If not, the void must be balanced by an equal and oppositely placed void on the same axis and such axis must not be oblique to the longitudinal axis.
3. The manufacturer shall employ a USBC accepted device to check such pins accurately for center of gravity tolerances.
4. Spot checks of pins in production shall be made daily to ensure that they meet specification.

Synthetic Pins

Any pin that is not made of wood shall be classified as synthetic and must be submitted to USBC for testing and approval before it can be used in certified competition.

1. Manufacturer to supply USBC the type of material
2. USBC will determine scleroscope hardness after pin passes scoring test
Test on Shore (Model C-2) scleroscope with diamond head hammer.

Calculations obtained from the average of 10 readings varying 1 to 1.5 inches apart at 4 ³/₄ inches above the pin base. Pin will set its own specification which is the pins average from the original submitted test pins ± 10 points.

Synthetic Pin Balance

Pins to be balanced around the vertical axis with a maximum tolerance of five grams.

Synthetic Radius of Gyration Squared

Pins will set their own radius of gyration squared value based on the samples submitted at the time of original testing. The tolerance will be ± 0.7 inches squared.

Synthetic Pin Center of Gravity

Pins will set their own center of gravity and tolerance based on the measured values at the time of original testing provided the tolerance does not exceed plus/minus 5/32 inch.

The pin manufacturer shall have a device approved by USBC to pinpoint the exact center of gravity. A daily spot check of pins in production to ensure specification compliance is mandated.

Pin Requirements for Certified Competition

Broken or Damaged Pins

Should a pin be broken or otherwise badly damaged during the game, it shall be replaced at once by another pin as nearly uniform in weight and condition with the pins in use. The league or tournament officials shall determine whether pins shall be replaced. A broken pin does not change the score made by the bowler. The pins knocked down are counted, after which the broken pin is replaced.

NOTE: A broken pin is described as, but not limited to, the following:

1. Any pin with the core exposed where it was originally manufactured with a plastic coating.
2. The plastic base is broken, loose, or cracked.
3. Any breakage of the core.

Finish and Coatings

Except for reasonable wear, neck markings and color, the pins in each pair of lanes must be uniform in appearance including permit number, finish and labels.

USBC Tenpin Testing and Approval Process

Any Manufacturer of bowling pins intended for use in any USBC certified competition shall be required to obtain approval prior to use in any USBC certified competition. All bowling pins produced and offered for sale to proprietors for use in certified competition shall comply with current USBC specifications and requirements.

A USBC Equipment Specification [Bowling Pin Application](#) Sheet must accompany all bowling pins submitted for approval

New Pin Submission Timeframe

May 1	Letter of intention to test must be submitted to USBC Equipment Specifications Department. Products must be in USBC possession at the same time.
May 15	Pins must pass threshold and Bowlscore ramp tests.
August 1	All products being tested must be installed.

New Pin Submission Requirements

Pins must pass each item below before proceeding to next item:

1. Complete [Bowling Pin Application Sheet](#)
2. Four pins submitted and pass threshold testing
3. 40 pins submitted and pass Bowlscore testing
4. Adequate number of pins to complete field testing (See USBC Process for Pin Testing)

Pin Permit Renewal Timeframe

June 1	Any pins received after this date will be subject to an expedited fee.
July 31	This is the last day for approvals for the upcoming season. Any pins received after this date will be approved for the following season.

Permit Renewal and/or Label Change

1. Complete [Bowling Pin Application Sheet](#)
2. Four pins submitted for threshold testing

Note: For permit renewals, all coatings and finish materials must meet a percent similarity specification. If pins fail to meet these specifications, USBC will conclude the pin is a different pin than was initially submitted, therefore denying permit renewal. If the FTIR results determine the similarity falls below spec limit and within 5% of the spec limit, the pin must pass a bowlscore test to prove the material change does not affect scoring. If the FTIR results are more than 5% from the spec limit, the pin must pass a full scoring test.

Change of Manufacturing Location or A Production Lapse of Greater Than Six Months

1. Complete [Bowling Pin Application Sheet](#)
2. Four pins submitted for threshold testing
3. 40 pins submitted for Bowl Score testing

USBC Procedure for Pin Testing

1. Official test may be conducted in any Dallas/Fort Worth area commercial center agreeable to the proposer and USBC provided at least 250 bowlers conduct their schedule on the same group of lanes.

2. The test pin and control pins are rotated weekly on lanes which coincide with the selected leagues.
3. The leagues selected for durability data must bowl the required number of week to fulfill the durability test.
4. Scoreability data will be compiled weekly in the following manner:
 - a. Computer input will record all scores on a weekly basis.
 - b. Scoring comparisons are based on the average of a minimum of 250 individual bowlers who complete a minimum of 12 games on both the test and control pin.
5. Product acceptability is based on the test product qualifying within the criteria adopted as:
 - a. "USBC Scoring Level Policy for Approval."
6. Test specifications including lane maintenance procedures and lane dressing pattern shall be agreed upon by the proposer and USBC prior to commencement of the test.

USBC Scoring Level Policy

250 bowlers must complete 12 or more games on the control products and the test product.

Calculations: Bowlers' averages on the test product and control product are arranged side by side on a spreadsheet and the mean difference in average between the test product and control product is calculated.

The data is tested for normality in order to determine the statistical test used:

1. Data is normally distributed (Including mathematical transforms) – Paired-t Test
2. Data is not normally distributed – Wilcoxon Signed Rank Test

Statistical test is evaluated for two criteria:

1. The mean of the difference must fall between -3 and +2
2. The confidence interval around the mean of the difference must include 0

The product will pass provided the two statistical criteria are met.

Pin Durability Test

Field tests by USBC must indicate that newly submitted pins will remain in play for at least 1,000 impact games per set if they are wood core and 2,000 impact games per set if they are synthetic. An impact game is predicated on usage in automatic pinsetting devices using 20 or 21 pins, i.e. each 10 frame game is equal to 1/2 impact game.

Wood core:

Coating loss at the ball line not to exceed 5% on any pin

Breakage not to exceed 2% at the neck

Synthetic:

Breakage not to exceed 5% in the area below the neck and including the base.

Breakage not to exceed 2% at or above the neck

Bowling Pin Testing Fee and Fine Structure

The following fees apply to bowling pin testing:

Threshold testing per permit number	Basic fee: \$400 Expedited fee: \$1,000
Additional pins testing fees	Bowlscore: \$1,000 Bowlscore expedited fee: \$2,000 COR testing Per Pin: \$45 RG testing per pin: \$45
Field test	\$5,000 plus manufacturer pays for the full set of control pins and test pins

Fines:

Fine for pins released prior to USBC approval	\$4,000 per permit number plus any amount expended to correct the non-compliant pin release and any damages incurred by USBC
Fine for failure to identify a USBC approved pin with either the USBC approval or test pin logo in any advertisement, bowling publication or other	\$750 per occurrence plus any legal fees incurred by USBC
Fine for identifying, in a bowling publication or other, a pin as approved when it is not	\$750 per occurrence plus any legal fees incurred by USBC

NOTE: Late fee charge of 1.5% per month will apply for all outstanding invoices not paid within 30 days.

The pin manufacturer will be responsible for all shipping costs, including the return of additional test pins when required.

Spot Checking

The USBC possesses the right to spot check pins during the year. USBC approval may be revoked if it is determined that the production pins are significantly different than the submitted test pins or do not comply with current specifications and requirements outlined in the USBC Equipment Specifications and Certifications Manual.

Process

As of January 2012, USBC may select brands at random throughout the year for spot check testing. The selected permit will be tested and those results will be compared to the original threshold pins submitted for testing.

If this initial spot checking testing produces results that fall outside of USBC specifications, or it is determined that the results are statistically different from the original threshold pins, then a secondary round of testing will be performed from a different batch. If this secondary round of testing produces similar results, the manufacturer in question will be placed on probationary status for no less than 1 year accompanied by a fine not to exceed \$10,000 in addition to any previously received testing fees.

USBC Process for Product Testing

USBC Product Testing Procedures

Official test may be conducted in any Dallas/Fort Worth area commercial center agreeable to the proposer and USBC provided at least 250 bowlers conduct their schedule on the same group of lanes.

1. The test product is to be installed on pairs of lanes which coincide with the selected leagues. Installation can be side by side or staggered at the option of the proposer.
2. The leagues selected for durability data must bowl at least 28 weeks, which will provide for lane schedule equity of all teams.
3. Scoreability data will be compiled weekly in the following manner:
 - a. Computer input will record all scores on a weekly basis
 - b. Scoring comparisons are based on the average of a minimum of 250 individual bowlers who complete a minimum of 12 games on both the test product and the approved (control) product
4. Product acceptability is based on the test product qualifying within the criteria adopted as "USBC Scoring Level Policy for Approval."
5. Test specifications including lane maintenance procedures, product and lane dressing pattern shall be agreed upon by the proposer and USBC prior to commencement of the test.

Regulation Bowling Lane

A regulation bowling lane, including flat gutters, kickbacks and approach, must be constructed of wood and/or other materials which have been tested according to USBC procedures for the specified time period and approved.

Note: For areas beyond the pin deck not covered in the USBC Equipment Specifications and Certification Manual, standard installation procedures are acceptable unless, upon inspection, it is deemed that an area in question may affect specifications and/or scoring. In these instances, the USBC Equipment Specifications and Certification Department should be contacted.

Synthetic Products

All non-wood material used in the manufacturing of lane components must be presented to USBC for evaluation and possible testing before use in certified competition. If approved, they may not be altered by the use of coatings, etc. unless these coatings have been presented to USBC for evaluation and possible testing. In addition, all products must contain an approval label with the following requirements:

1. The label must be permanent, lasting the life of the product.
2. The label must be clearly visible after the product is installed in the bowling center.
3. The label must identify the company as the manufacturer.
4. The label must contain an approval number assigned by USBC and state that it is "USBC Approved"

Approach

Extending from and exclusive of the foul line there shall be an unobstructed level approach which shall be:

1. Not less than 15 feet in length.
2. Free from depressions exceeding 1/4 inch.
3. Not less than the width of the lane.

Foul Line

The foul line shall be:

1. Not less than $\frac{3}{8}$ inch nor more than 1 inch in width.
2. At a minimum, the entire width of the lane.
3. Distinctly marked upon or embedded between the lane and approach.

It may be required that the foul line be plainly marked on the walls, posts, division boards or any point on a line with the regular foul line.

(For more information on the foul line see the section on Automatic Foul Detecting Device.)

USBC Regulation Bowling Lane Dimensions Typical Cross Section of Bowling Lane — Round Gutters from foul line to pin deck area.

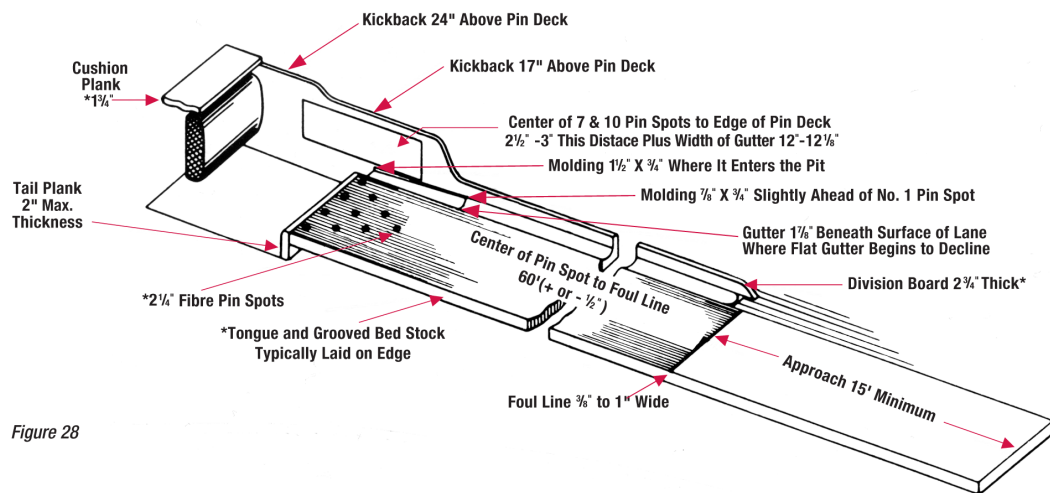


Figure 28

* NOTE: This particular measurement is not an USBC specification but is an accepted Standard for installing bowling lanes.

Composition

The lane must be constructed entirely of wood and/or synthetic materials which have been approved by USBC.

Length

1. The overall length of a regulation lane, including the pin deck, has a reference dimension of 62 feet, $\frac{10}{16}$ inches, measured from the lane side of the foul line to the rear edge of the pin deck (not including the tail plank).
2. It must be 60 feet, plus/minus $\frac{1}{2}$ inch, from the lane side of the foul line to the center of the No. 1 pin spot.
3. It must be $34 \frac{3}{16}$ inches, plus/minus $\frac{1}{16}$ inch, from the center of the No. 1 pin spot to the rear edge of the pin deck (not including the tail plank).

Width

The lane shall be $41 \frac{1}{2}$ inches wide, plus/minus $\frac{1}{2}$ inch.

Surface

1. The surface must be free of all continuous grooves or ridges.
2. **Effective Aug. 1, 2019:** For all new center installations, the lane surface shall have a limit of $\pm 0.030''$ ($30/1000''$) over a 42'' span for each of the following:
 - a. Crosswise tilt
 - b. Crowns and depressions
3. For all new installations, the lane surface shall have a limit of 0.040'' ($40/1000$ of an inch) over a 42'' span for lengthwise tilt. Lengthwise tilts are only measured for new bowling centers.

NOTE: Does not include overlay installations. These are considered a replacement installation and not a new center as it pertains to lengthwise tilt.

4. For all installations older than 12 months, the lane surface shall have a limit of $\pm 0.040''$ ($40/1000$ of an inch) over a 42'' span for each of the following
 - a. Crosswise tilt
 - b. Crowns and depressions
5. At the pin deck, the lengthwise surface shall not have a tilt from front to back of more than $3/16$ inches ($.187''$) within a 42-inch span.
6. The same lane finish coating shall be applied from edge board to edge board.
7. The coefficient of friction of all lane surfaces shall not exceed 0.290 when measured with a USBC approved device.
 - a. All bowling lane finish coatings as well as all synthetic lane surfaces must be submitted to USBC for coefficient of friction testing before use in certified competition.
8. All approved lane surface coating containers must bear a label stating, "This product complies with USBC specifications when applied as directed by the manufacturer."

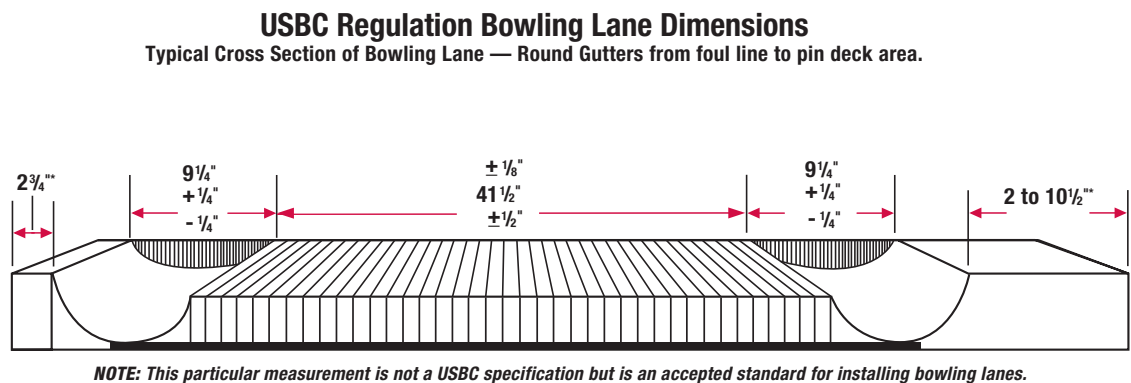


Figure 29

**NOTE: This particular measurement is not a USBC specification but is an accepted standard for installing bowling lanes.*

Resurfacing

Resurfacing shall be defined as removing all substance(s) used in coating the lane from foul line to the pit down to the bare wood, leaving the lane as flat as possible, then refinishing with lacquer, urethane or similar thin USBC approved transparent material.

All lanes upon which certified leagues and tournaments are conducted shall be resurfaced in accordance with USBC requirements.

In case only some of the lanes in a center require resurfacing, both lanes of all-natural pairs affected shall be resurfaced.

Upon completion of planing or resurfacing, and prior to the application of finish coatings, each lane shall be stamped or stenciled with the name of the firm or individual who resurfaced each lane, the city in which such firm or individual is located and the month and year of such resurfacing.

The stamp or stencil shall extend across at least three (3) boards and be placed on the bare wood surface in line with a point 5-7 feet in front of the headpin and approximately 2-5 inches from the 7-pin side of the lane.

Lane and Approach Markings or Designs

Lane and approach markings shall only be permitted in accordance with the following specifications:

1. Measured from the foul line, a maximum of seven guides may be embedded in or stamped on the approach at each of the following points: 2-6 inches; 3-4 feet; 6-7 feet; 9-10 feet; 11-12 feet; and 14-15 feet. Each series of guides shall be parallel to the foul line and each guide shall be circular in shape and shall not exceed $\frac{3}{4}$ inch in diameter.
2. At a point 6-8 feet beyond the foul line and parallel thereto, there may be embedded in or stamped on the lane a maximum of 10 guides. Each guide shall be uniform, circular in shape, and shall not exceed $\frac{3}{4}$ inch in diameter.
3. At a point 12-16 feet beyond the foul line, there may be embedded in or stamped on the lane a maximum of seven targets. Each of the targets shall be uniform and may consist of one or more dowels, darts, diamond, triangles, or rectangular designs. The overall surface covered by each target shall not be more than $1\frac{1}{4}$ inches in width and six inches in length. Each target must be equidistant from one another and set in a uniform pattern.
4. At a point 33-44 feet beyond the foul line, there may be a maximum of four targets. Each target must be uniform in appearance and shall not be wider than a single board or longer than 36 inches.
5. Embedded markings or designs shall be of wood, fiber or plastic and shall be flush and level with the surface of the lanes and approaches.
6. When the markings are stamped on wood lanes, they shall be applied to the bare wood and then covered with lacquer, urethane, or similar liquid transparent material generally used in resurfacing. All such installations in any one center shall be uniform as to design and measurements and at least on natural pairs of lanes.
7. Glow/Cosmic bowling may only be certified on lanes that meet all of the specifications listed under Lane and Approach Markings or Designs.
8. Glow/Cosmic lane designs must only be visible in glow conditions.
9. Advisories about crossing the foul line:
 - a. On-Lane Decals: In an area within two inches, but not closer than one-half inch of the foul line, there may be an advisory about crossing the foul line. The wording/lettering/symbols of the advisory may be 1 to $1\frac{1}{2}$ " tall. The advisory shall run parallel to, and shall not extend more than two inches from the edge of the foul line. The advisory must be first submitted to the USBC Equipment Specifications Department for prior approval.
 - b. Embedded in lane panels: In an area within $4\frac{3}{4}$ inches to the foul line, there may be an advisory about crossing the foul line embedded into the lane panel/surface. The wording/lettering of the advisory must be: 1 to $1\frac{1}{2}$ inches tall, oriented parallel to the foul line, and no more than two lines of text. Any caution or warning symbols may be no larger than 3.5 inches tall by 4 inches wide. The advisory must be first submitted to the USBC Equipment Specifications Department for prior approval.
10. For certification process, a center shall have each lane numbered and not duplicated. The number may or may not be visible to the general public but must be easily seen by the inspector, e.g. on the back side of the masking unit.

Designs and Logos

Special Events

Some special events (such as PBA events, televised events, etc.) may be allowed to imprint or display (physically or virtually) designs or logos on the playing area (lane, approach, etc.) while still maintaining USBC certified status. This requires prior written consent from USBC. All other lane specifications must be met in accordance with this manual (e.g. no decals above the surface of the lane, etc.). Contact the USBC Equipment Specifications Department for an application sheet, association fees, and more information.

Logos

Bowling centers may be allowed to imprint or display (physically or virtually) designs or logos, within the approved area on the approach while still maintaining USBC certified status. (See Figure 30)

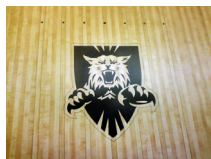


Figure 30

The approved logo area is defined as the approach area between the first and second sets of dots from the back of the approach, with a 6" buffer on each side.

NOTE: See figure below for definition of acceptable locations of approach markings or dots.

Bowling Lane with Safe Area for logo

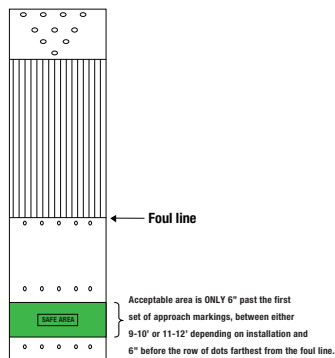


Figure 31

The logo must not cover any of the approach markings. The logo itself must be placed within or under the top surface so as to not have a different texture or feel. All other lane specifications must be met in accordance with this manual (e.g. no decals above the surface of the lane, etc.).

Synthetic Bowling Lane

All synthetic bowling lanes must be USBC approved and meet all specifications for regulation bowling lanes in addition to the following:

Identification

On synthetic lane surfaces, each panel must have at least one label that meets all of the following requirements:

1. The label, identifying the manufacturer, must be permanent, lasting the life of the product and clearly visible after it is installed.
2. The label must contain an approval number assigned by USBC and state "USBC Approved."
3. The color of the label can be similar to the colors used in the pattern as long as they are visible upon inspection.

4. The label must be located on the lane per manufacturer's agreement with USBC.
5. The size of the label shall be limited to the width of the board (approximately 1 1/16 inches) and shall not exceed 2 inches in length.

USBC approval is based on specifications and sample material provided at the time of application and the foregoing conditions. Any modifications or anticipated change in construction, materials, and/or installation procedures must be reported to USBC to ensure continued approval under these terms.

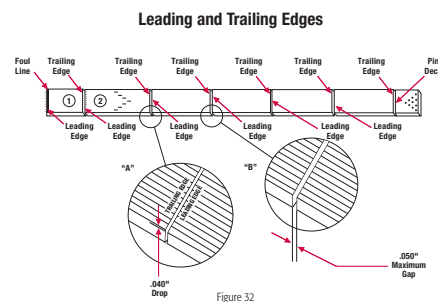
Different colors of the same approved synthetic lane (same manufacturer with same model family or permit number) may be combined to make up different color approaches and/or different color lanes provided the lane meets all other specifications.

Gaps and Drop Off

On synthetic lane surfaces, either panelized or overlay, where two panels meet, the following specifications must be met:

1. The leading edge of one panel shall be flush with, or not more than 40/1000 inch below the trailing edge of the adjoining panel at any point across the width of the lane.
2. The leading edge of the first panel shall be flush with, or not more than 80/1000 inch below the trailing edge of the foul line at any point across the width of the lane.
3. The gap between the leading and trailing edge of adjoining panels, across the width of the lane, shall not exceed 50/1000 inch at the time of installation.

(See Figure 32)



Lane Surface Submittal Specifications

Lane surface manufacturers shall comply with all USBC Equipment Specifications and Certifications Manual specifications in the production of lane panels.

1. New surface submission
 - a. A completed application needs to be submitted (see [Lane Surface Application Form](#))
 - b. Manufacturers must submit a sample of each of the following lane panel types for testing: (A minimum of three samples are required).
 - i. One sample needs to be from a 'dot panel' with the dots included within the sample.
 - ii. One sample needs to be from the 'arrow panel' with the arrow markings included within the sample.
 - iii. One sample needs to be from a 'common panel'.
 - iv. If the lane surface contains a panel from any other 'non-common panel' that has markings (e.g., down lane markers) then a sample of that panel is required as a fourth panel.
 - c. Each sample must be 6 inches in width by 36 inches in length

(15.25 cm by 91.5 cm, respectively).

- d. If the lane surface model is approved:
 - i. A unique permit number will be issued for the model, and it will be placed on the "Current Lane Surface Manufacturing Permits" list on bowl.com.
 - ii. Once assigned, the permit number must be printed legibly on all panels produced for the approved model.
 - iii. The permit for an approved model is good for two years, at which time the permit must be renewed.
- e. Each colored lane surface must be submitted for initial approval.

2. Lane Surface Permit Renewal

- a. A completed application needs to be submitted.
 - b. 3-4 samples (following lane surface submission guidelines) must be submitted for testing to renew the two-year permit of the lane surface model starting in October prior to the renewal year.
 - c. The samples must be 6 inches in width by 36 inches in length (15.25 cm by 91.5 cm, Upon approval, the model will be allowed to retain the permit number issued to the original lane surface respectively).
 - d. Surfaces with more than one color of the same model may have permits for all colors of that model renewed by submitting samples from the most common color provided:
 - i. All the initial color samples had similar test results. (This is done by comparing samples from the original Lane Surface Submissions of each color for statistical differences in test parameters.)
 - ii. There have been no changes to the approved product.
3. Allow 20 business days for all lane surface testing.

Lane Surface Testing Fee Structure

The following fees apply to lane panel testing:

- 1. New surface approval testing: \$800
- 2. Permit Reinstatement' testing: \$800
- 3. Lane surface permit renewal testing (Two-year permit): \$100
- 4. Colored lane panels of an existing approved lane surface: \$300
- 5. Expedited testing: \$1,000

The following parameters will be tested:

Parameter	Lower Specification Limit	Upper Specification Limit
Durometer	92.5	n/a
Ra	n/a	21.1 μin.
Rs	n/a	5288 μin.
Panel Thickness	NEMA Std. LD3-2005	NEMA Std. LD3-2005
COF	n/a	0.29
Sward Hardness	35 D	n/a

Pin Deck Area

Composition

The pin deck may be constructed entirely of hardwood. Synthetic materials, alone or in combination with other materials, may be used provided these materials have been tested and approved by USBC.

Edge Boards

The edge boards must be rounded on a radius of not more than $\frac{5}{32}$ inch. If the radius is removed, such radius must be restored. The edge board may be constructed entirely of hardwood without testing. Synthetic materials, alone or in combination with other materials, may be used provided these materials have been tested and approved by USBC.

Edge Strip Specifications

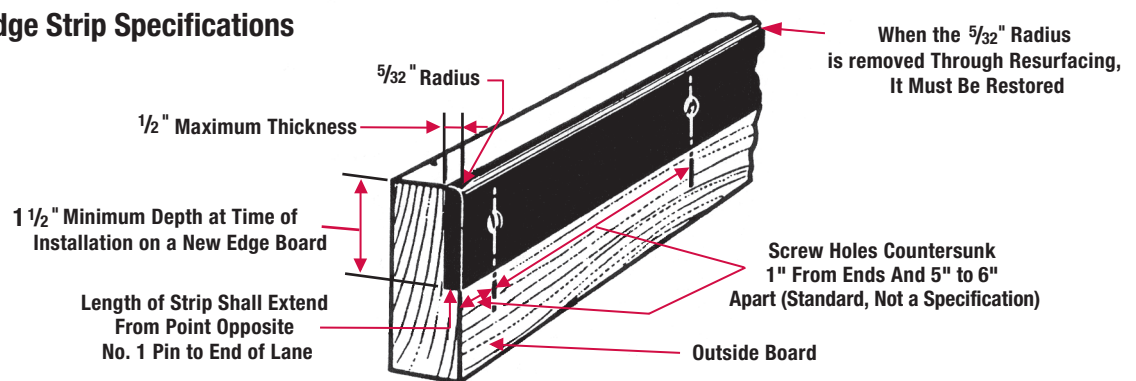


Figure 33

Synthetic Edge Strip

A synthetic edge strip, measuring not more than $\frac{1}{2}$ inch in thickness and:
Not less than $1\frac{1}{2}$ inches in depth, at time of installation on a new edge board
Not less than one inch in depth, at time of installation on an existing edge board
A synthetic edge strip may be attached to the side of the pin deck nearest the gutters and at a minimum, shall extend from a point opposite the No. 1 pin to the pit. It must be installed vertically so the synthetic material exposed on the pin deck surface is not in excess of $\frac{1}{2}$ inch.

Synthetic Pin Decks

If the pin deck surface includes the tail plank, the end of the lane must be visibly identified with a minimum mark of at least two inches in length on the 10-pin side of the pin deck for the life of the pin deck.

If nonwood pin decks are in use with either wood or nonwood lane surfaces, the leading edge of the pin deck must be flush to, with not more than $\frac{40}{1000}$ inch below, the trailing edge of the adjoining lane section across the width of the lane.

The gap between the pin deck and the adjoining lane section, across the width of the lane, shall not exceed $\frac{50}{1000}$ inch at time of installation.

Pin Spots

There must be 10 visible pin spots on the pin deck that meet all specifications.

All pin spots, upon which the pins must be set, shall be clearly identified for the life of the pin deck and be 2¼ inches in diameter, plus/minus 1/16 inch, and meet the following location specifications:

1. Spaced 12 inches, plus/minus 1/16 inch, (non accumulative) in an equilateral triangle.
2. 3 inches, plus/minus 1/16 inch, from the center of 7, 8, 9 and 10 pin spots to the pit (not including the tail plank).
3. 2¾ inches, plus/minus ¼ inch, from the center of the 7 and 10 pin spots to the adjacent side of the pin deck.
4. 12 1/16 inches, plus/minus 1/16 inch, from the center of the 7 and 10 pin spots to the nearest kickback.
5. The No. 1 pin spot shall be equidistant from both edges of the lane kickbacks with a tolerance of plus/minus 1/8 inch, and never less than 30 inches from its center to the kickbacks.
6. 31 3/16 inches, (reference dimension) from center of the No. 1 pin spot to a perpendicular line drawn through the centers of the back row of spots.
7. 34 3/16 inches from the center of the No. 1 pin spot, to the pit (not including the tail plank).

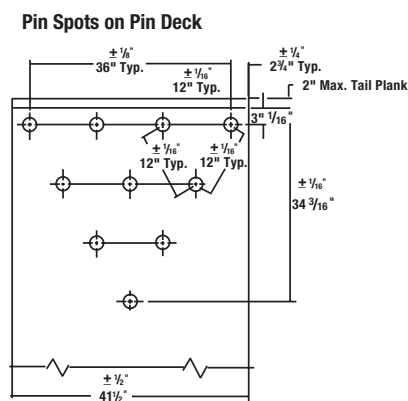


Figure 34

Tail Plank

A tail plank, not to exceed two inches in thickness, may be attached to the rear of the lane. The tail plank may be constructed entirely of hardwood without testing but synthetic materials, alone or in combination with other materials, must be approved by USBC before use.

The exposed edge of the tail plank may be covered with a piece of synthetic material which must have a radius of 5/8 inch, plus/minus 1/8 inch at the intersection of the top edge and rear face of the tail plank. At no time may there be more than five inches of flat playing surface, including the tail plank, in back of the centers of 7, 8, 9, and 10 pin spots.

Reinforced Tail Plank

Optional Methods

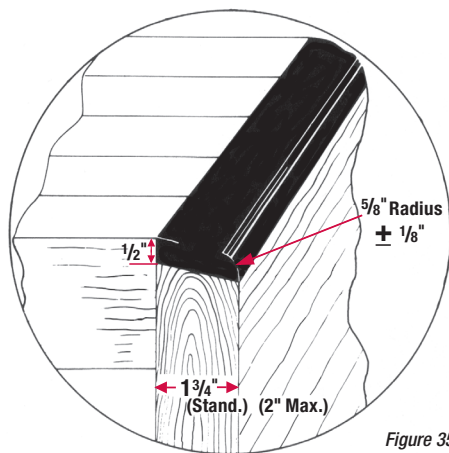


Figure 35

Fiber or Phenolic Applied on Slanting Joint

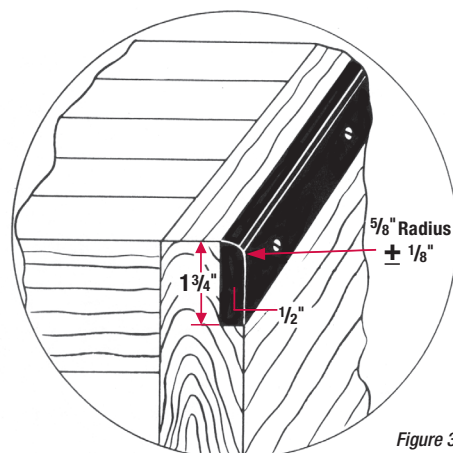


Figure 36

Fiber or Phenolic Applied on Right Angle Joint

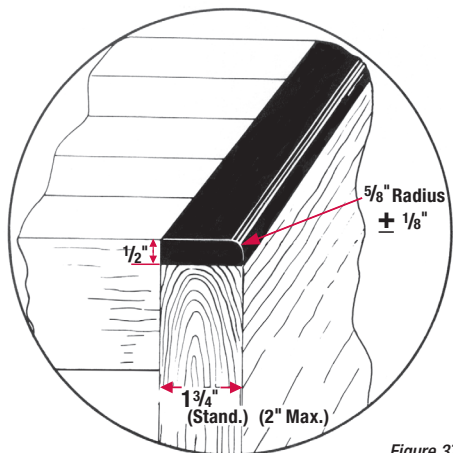


Figure 37

Fiber or Phenolic Applied on Exposed Edge

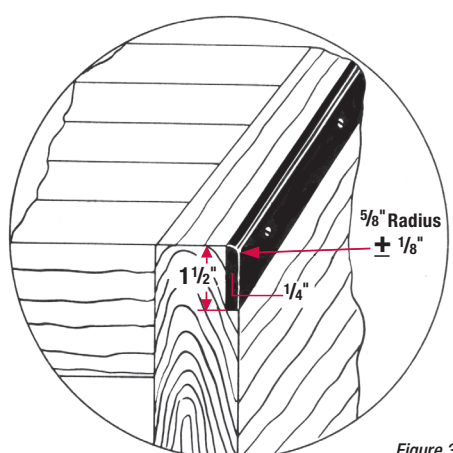


Figure 38

Fiber or Phenolic Applied on Right Angle Joint

Pin Slide Control Products

Products to control the sliding of pins across the pin deck may be used provided:

1. The product has been tested, found to be Acceptable or Approved for use by USBC, and published on the "Pin Slide Control Products" list on the Equipment Specifications page of BOWL.com.
 - a. Products are tested for:
 - i. Influence on scoring – BowlScore test using control set of pins. Product must pass chi-squared test, indicating no advantage in pinfall and/or scoring.
 - ii. Equipment damage or malfunction
2. They are only applied behind the head pin to the back row of pins.
3. The product remains intact and in good condition (applies to adhesive disks).
4. If the product deteriorates to the extent that the pin no longer rests upright and in a stable position, the product must be removed and/or replaced immediately.
5. All chemical products must demonstrate that they can be easily removed (by hand or lane machine) to prevent build-up.
 - a. "Build-up" is defined as a result of reapplying a product repeatedly without continuous cleaning and removal of the product. Build-up must be removed prior to certified competition.
6. Chemical products may not contain micro-particles or abrasive materials as they may cause damage to balls, pins, and pin decks.
7. All chemical products must be removed prior to annual center certification inspection
8. Use of an unapproved product, or non-conforming product can result in change of center certification status.

Other Pit Area Specifications

Gutters shall be placed on each side of the lane and shall begin at the foul line and extend parallel with the lane to the pit.

Round Gutters

1. The width shall be 9¼ inch, plus/minus ¼ inch.
2. They must be concave in shape.
3. They must measure at least 1 7/8 inch in depth at the center at time of manufacture.

Flat Gutters

Flat gutters must be constructed of wood or other materials which have been tested and approved according to USBC procedures for the specified time period.

1. The width shall be 9¼ inches, plus/minus ¼ inch, including the molding. When measured from the lane edge to a kickback plate, this width becomes 8 3/4" to 9 3/8"
2. From a point opposite or within 15 inches ahead of the No. 1 pin spot, the gutter must have square bottoms and must be at least 1 7/8 inch beneath the surface of the lane.
3. Opposite the center of the rear row of pin spots, the depth shall be 3½ inches, plus/minus 1/8 inch.

Reinforced Flat Gutters

1. The dimensions shall be the same as flat gutters.
2. The reinforcing material may cover the entire length and width of the bottom, or be four inches, plus/minus ½ inch, in width and cover the total length.

3. If vulcanized fiber reinforcing is used, it shall not exceed 3/16 inches in thickness.
4. If laminated phenolic reinforcing, Grade "C" or "CE" is used, it shall not exceed 1/8 inch in thickness. See Figures 39-42.

Flat Gutter Molding (Solid Hardwood)

A strip of molding extending the entire length of the flat gutter shall be securely fastened to the bottom of the flat gutter. The molding may be constructed entirely of hardwood without testing. Synthetic materials, alone or in combination with other materials which have been approved by USBC after testing, may be used.

1. They may not exceed 7/8 inch high, at the leading edge, gradually increasing to a maximum of 1 1/2 inches high opposite the 7 and 10 pin spots. (Measured from the top surface of the flat gutter to the top of the molding.)
2. They may not exceed 3/4-inch in width.
3. The top exposed edge shall be rounded to a radius of 5/8 inch, plus/minus 1/8 inch.

Reinforced Flat Gutter

Optional Methods

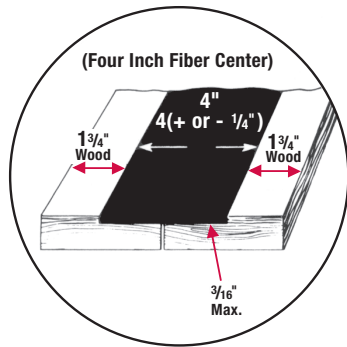


Figure 39

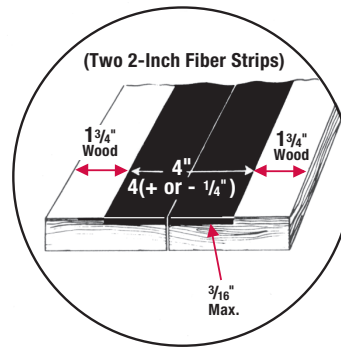


Figure 40

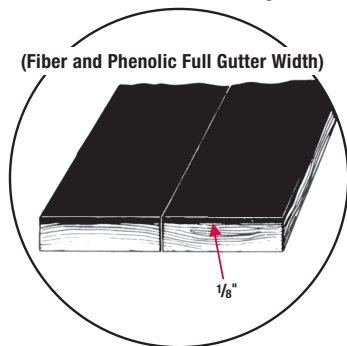


Figure 41

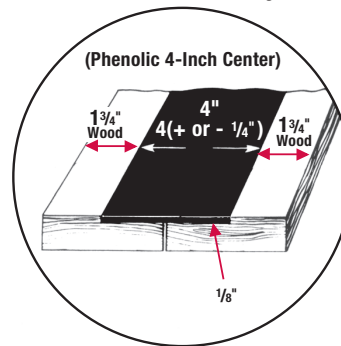


Figure 42

Reinforced Flat Gutter Molding

1. They must meet all physical dimensions of solid hardwood flat gutter molding.
2. The wearing surface may be reinforced from the pit to at least the point opposite the No. 1 pin spot.
3. If vulcanized fiber is used, it may not exceed $\frac{1}{4}$ inch when used on the side or $\frac{1}{2}$ inch thick when used on the top. (See drawings – figures 43-46)
4. If laminated phenolic material Grade “C” or “CE” is used, it shall be $\frac{1}{8}$ inch thick. See Figures 43-46.

Kickbacks

The kickback may be constructed entirely of hardwood without testing. Synthetic materials, alone or in combination with other materials which have been approved by USBC after testing, may be used. The kickbacks, or side partitions, shall be placed parallel to the lane and shall meet the following requirements:

1. It shall extend from a point opposite or within 15 inches ahead of the No. 1 pin spot to the rear cushion wall.
2. The distance between the wood faces of the two kickbacks shall be 60 $\frac{1}{8}$ inches, plus/minus $\frac{1}{8}$ inch.
3. The height above the lane shall be 20 $\frac{1}{2}$ inches, plus/minus 3 $\frac{1}{2}$ inches.

The kickbacks, behind the tail plank, may be covered with impregnated fiber glass, hard vulcanized fiber, or laminated phenolic (Grade “C” or “CE”).

Kickback Plates

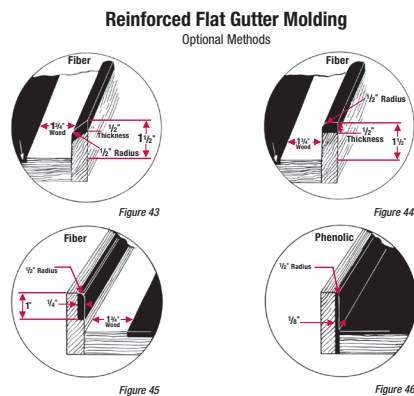
The kickbacks may be covered with a single layer of reinforcing material, not to exceed $\frac{3}{16}$ inch in thickness. The following materials may be used:

1. Hard vulcanized fiber.
2. Laminated phenolic (Grade “C” or “CE”).
3. Rigid thermoplastic vinyl copolymer.

Other materials may be used provided they have been tested and approved by USBC.

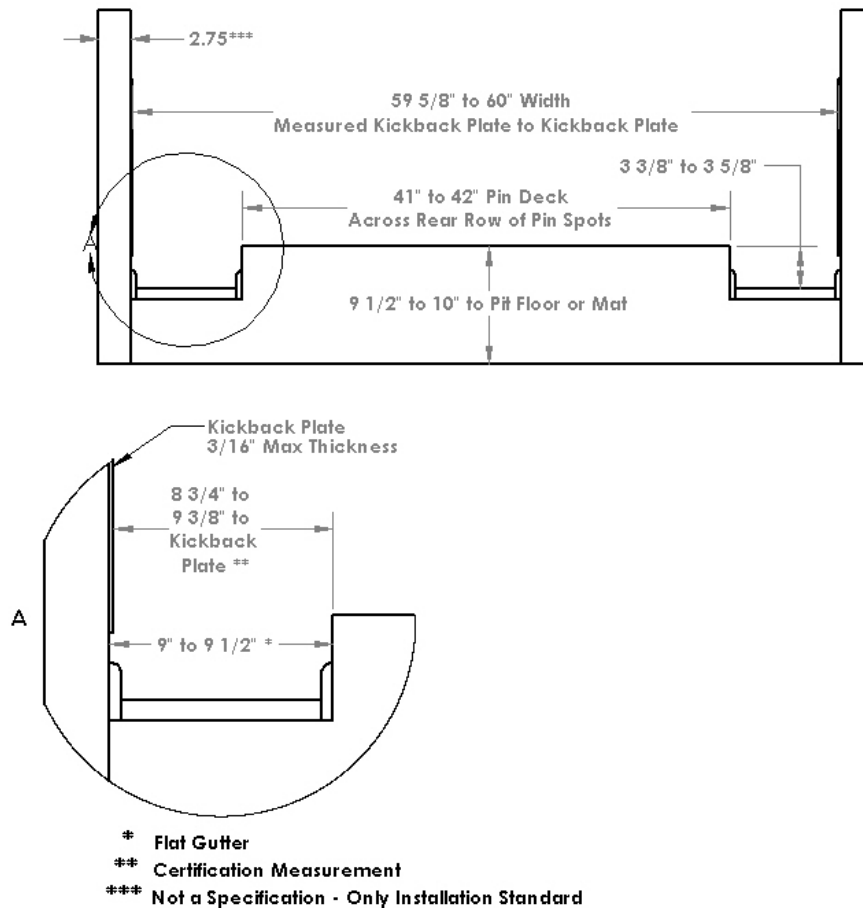
Rear Cushion

The rear cushion shall in all cases be covered with material of a dark color and shall be so constructed as to prevent the pins from rebounding onto the lane. (For pit and rear cushion measurements on automatic pinsetting devices, see section on Automatic Pinsetting devices in this manual.)



Pit

1. For lanes without automatic pinsetting devices, there shall not be less than 10 inches from the pit floor to the top of the lane and it shall not be less than 9 1/2 inches from the top of the pit mat to the top of the lane. The pit shall not be less than 30 inches in depth from the rear edge of the lane (including the width of the tail plank as a portion of the measurement) to the face of the rear cushion.
2. For lanes with automatic pinsetting devices, see the section on Automatic Pinsetting Devices.



Regulation Bowling Lane Dimensions

Side View — Pit End

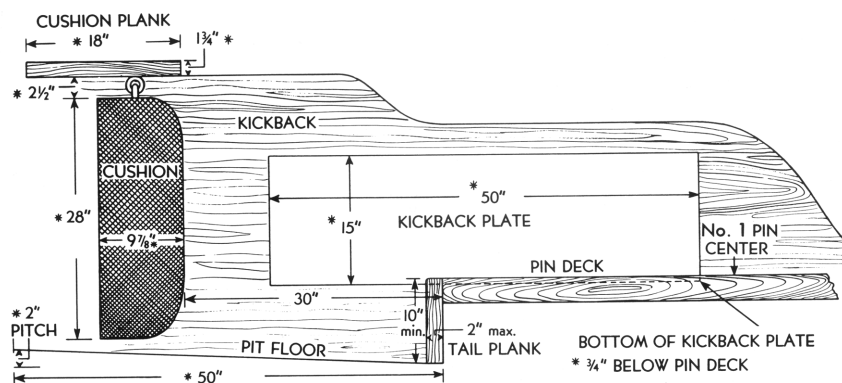


Figure 48

* Note: These are not specifications but accepted standards for installing bowling Lanes.

Technical Specifications for Fully-Automatic Pinsetting Devices

All automatic pinsetting devices must be USBC approved and meet the following specifications:

1. Be designed to operate under all situations normally arising in a certified league or tournament.
2. Be constructed so it can be installed on any USBC regulation lane except where approval has been obtained to modify or alter one or more of the specifications in the pit area.
3. Such device must perform entirely automatic. A push button may be installed to operate the device in the event of certain emergencies. Such push button to be installed where it is easily accessible to the bowler or scorer. An emergency shall be considered when the machine is unable to pick up a pin which has moved more than $1\frac{3}{4}$ inches off the pin spot (measured from center of spot to center of moved pin); or when pins are left standing at the conclusion of the third delivery in the 10th frame plus an occasional machine malfunction.
4. It must conform with all provisions of USBC rules and regulations pertaining to pin fall. The device must be able to return any pin to the same position to which it has been moved by a previous delivery, except when an emergency shall have been considered, as described in requirement three.
5. The machine must be able to operate under permissible voltage fluctuations existing in the community where it is installed and in use.
6. The completed installation must comply with the requirements of the state or local inspection authorities.
7. There shall be a minimum of three seconds between the time the ball reaches the pit and activates the cushion or back stop and the pin table descends and contacts the standing pins.
8. The pit floor at the tail plank shall measure not less than $4\frac{3}{4}$ inches below the pin deck surface.
9. The minimum distance from the end of the lane to the nearest point of the cushion shall be 25 inches. The measurement includes the width of the tail plank.
10. Each automatic pinsetting device shall be equipped with a curtain or other pin-arresting device. The curtain and the cushion shall be so located and constructed that no pins may rebound from the curtain or cushion onto the pin deck. (See Figures 49-54, page 45)
11. Each automatic pinsetting device shall, on the first ball cycle, place the bowling pin completely on the pinspot of the pindeck.
12. In establishments using pinsetting devices, such devices must be checked annually, by the local association manager or authorized representative, at the time lanes are being checked for certification to determine if pins are spotted correctly.

Pit Measurements — Automatic Pinsetting Device

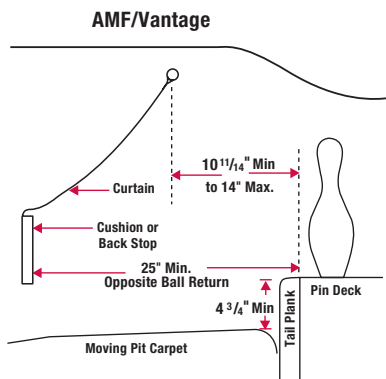


Figure 49

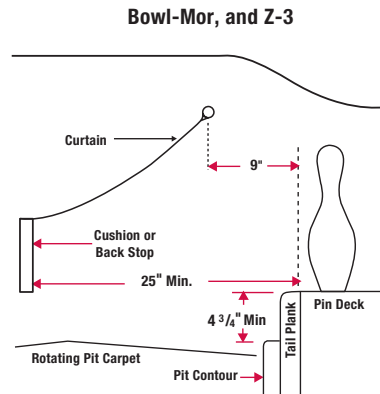


Figure 50

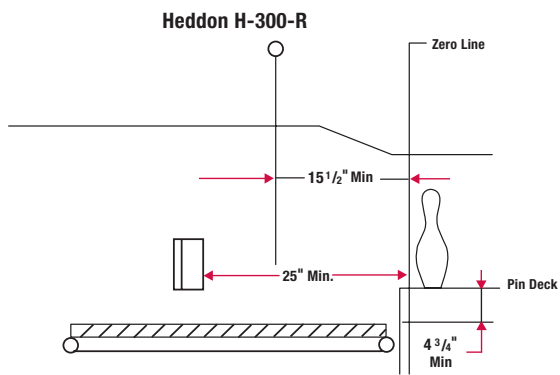


Figure 51

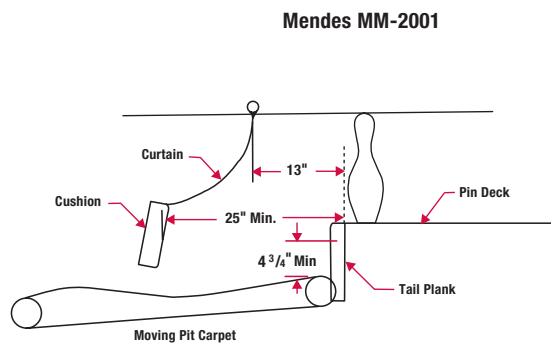


Figure 52

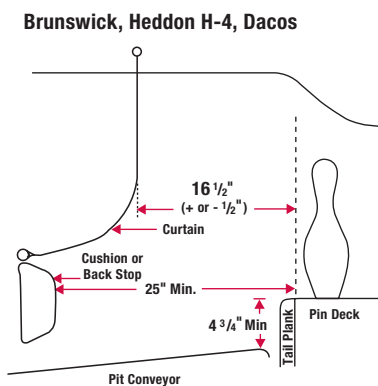


Figure 53

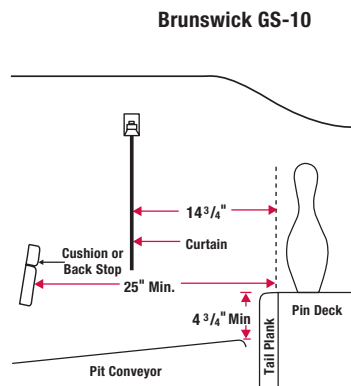


Figure 54

Technical Specifications for Automatic Scoring Device

An automatic scoring device which meets the following specifications may be used during USBC certified competition.

1. This device must record scores in accordance with USBC General Playing Rules and must accommodate the existing patterns of bowling (Cross lane alternation per frame, and single lane only).
2. Any such device attached to approved equipment for automatically setting pins shall not affect their operational aspects to the point of altering scoreability.
3. Such device must properly detect and score off-spot pins. An off-spot pin shall be defined as a standing pin that has been moved from its original position, but the pinsetter is still able to pick up and re-spot.
4. This device must provide easy access and operation for the bowler/official scorer to make corrections for incidents such as bowling out of turn, illegal or improper pin fall, provisional balls, late starts, dead balls, blinds, handicaps, out-of-range pins (a pin which has moved and cannot be picked up by an approved pinsetting device), malfunction of the device, etc.
5. The device must provide a printed record which can be audited frame by frame.
 - a. This shall include the exact pin fall on each delivery.
6. Safeguards must be provided which prohibit the inadvertent loss of scores from the device by human error, power failure, or other equipment failure.
7. This device must allow for connectivity to and operation of an approved automatic foul detector.

Technical Specifications for Automatic Foul Detecting Device

Each certified bowling center must have an approved automatic foul detecting device or provision to station a judge at the foul lines during USBC certified competition. If an automatic foul detecting device is used, it must be USBC approved and meet the following specifications:

1. The foul detecting device must be entirely automatic. No manually operated push buttons, switches, levers, or other devices will be accepted.
2. Any equipment necessary to the operation of an automatic foul detection device must be flush with the division board if mounted therein.
3. The automatic foul detecting device must be able to operate under permissible voltage fluctuations existing in the community where the device is installed and in use.
4. The automatic foul detecting device must be equipped with a visible signal. Such light signal shall be visible to the scorekeeper and bowler and shall remain visible for not more than 15 seconds or less than 10 seconds. It is also recommended that a sound signal be provided. Such signal should be of sufficient intensity to be heard at the bowler settee area.
5. The beam of the foul detecting device shall not be set more than ¼ inch beyond the approach side of the foul line.
6. The completed installation must comply with the requirements of the state or local inspection authorities.

Lane Certification/Inspection

All lanes in certified centers must be inspected for compliance with existing specifications.

Certification Specifications

The following specs must always be maintained and are checked at time of a new installations:

Basic Center Specification	Minimum	Maximum
Approach Depression: Measured 5" from foul line	-.250"	.250"
Approach Length: Not including foul line	15'	No Max
Foul Line Width	3/8"	1"
Lane Length: Foul line to center of head pin spot	59'- 11 1/2"	60'- 1/2"
Lane Panel Gaps	0	.050"
Pit Length (end of lane to nearest point on cushion)	25"	No Max
Pit Depth (pin deck surface to pit floor)	4 3/4"	No Max
Pin Spots: Center to Center Spacing	11 15/16"	12 1/16"
Lane Width: (applied to entire lane but measured at rear row of pins)	41"	42"
Gutter Width	8 3/4"	9 3/8"
Center of Corner Pin to Gutter Edge	2 1/2"	3"
Lane Panel Drop Offs	0	.040"

For new center installations, the inspection must be within 14 days of completion of the installation or within 14 days of USBC being notified.

The following are requirements for new installations and overlay installations. These specs are part of the tiered certification requirements.

Tier Specification - new center	Minimum	Maximum
Lengthwise Tilt of Lanes*	-.040"	.040"
Crosswise Tilt of Lanes**	-.030"	.030"
Crowns/Depressions**	-.030"	.030"

*Lengthwise tilt only applies to new centers and not to overlay installations

** New centers or overlays have tighter specifications only at the time of initial installation

The following make up the tiered certification specifications:

Tier Specification - existing center	Minimum	Maximum
Crosswise Tilt of the Lane	-.040"	.040"
Crowns/Depressions	-.040"	.040"
Kickback Plate to Kickback Plate Distance	59 5/8"	60"
Gutter depth (7 and 10 pin sides)	3 3/8"	3 5/8"
Lengthwise tilt of pin deck (between 4-7 and 6-10 pins)	-.187"	.187"
Crosswise Tilt of Pin Deck	-.040"	.040"

Inspection Process for Active Centers

Lanes are expected to meet specifications and, as such, can be inspected for compliance anywhere on the playing surface.

For the normal inspection process, all centers will be inspected following the same procedure, regardless of lane surface or type.

The following will be inspected:

- Crosswise tilt at five distances that will be moved over time to cover the entire lane surface.
- Crown/Depression of the lane surface at five locations on the following boards
 - Left 10 board
 - Left 15 board
 - Center 20 board
 - Right 15 board
 - Right 10 board
- Kickback plate to kickback plate distance at the rear row of pins
- Crosswise tilt of the pin deck at the rear row of pins
- Lengthwise tilt of the pin deck in two locations
 - Between the 4-7 pin spots
 - Between the 6-10 pin spots
- Flat gutter depths at the rear row of pins
 - 7 pin side of lane
 - 10 pin side of lane

Other items being observed are:

- Foul Lights
- Edge Strips
- Lane Panel Drop Offs
- Pin Spots
- Kickback Conditions

NOTE: The observed items are for information purposes and will not be used in the center's tier rating.

Application/Inspection – New or Reopening Centers

Centers that have never been certified or have opted out of certification and wish to re-enter the program, may request an inspection for certification. The center must meet all Basic Center Specifications in above chart.

Once verified that the Basic Center Specifications have been met, the center will be inspected for the Tier Specifications. For the initial certification, the center must meet the Silver level of compliance within the Tiered Specifications.

NOTE: Until the Silver Tier is established, centers must pass 95% compliance.

Application/Inspection – Existing Centers

1. All existing certified centers will be certified for the 2020, 2021 and 2022 seasons as details are being finalized for the future tiered certification process.

In January 2023, centers will start to be inspected for compliance with the physical lane and pit specifications. All centers will get inspected once during the three-year period between January 2023 and December 2025. At some point during this initial three-year inspection period as center data is received and analyzed, tier levels will be established to determine gold, silver, bronze and certified compliance criteria.

Tier	Compliance Criteria
Gold	Range TBD (example 99% to 100%)
Silver	Range TBD (example 95% to 99%)
Bronze	Range TBD (example 90% to 95%)
Pending Below ___%	Range TBD (example less than 90%)

2. Inspections will be conducted year-round by USBC national employees. Upon completion of an inspection, the inspection report will be sent to the bowling center detailing the findings. Overseas military centers will be required to self-inspect and report their certification results.
3. Tiering levels, will be good for a total of three seasons after an inspection with proper payment of certification fees. Should the center wish to be inspected ahead of schedule to improve their tier level, additional inspections may be requested pending inspector availability. An additional fee might be required for this reinspection.
4. The inspection fees for a three-year center certification will be \$30 per lane inspected payable to Certification Department at USBC. The inspection fee will be waived for overseas military centers who use local inspectors and turn in a properly filled out certification application to USBC Certification Department.

Certified Centers Responsibilities

A tiered certificate issued to a bowling center shall be displayed in the center. By doing so, the owner and all operational personnel acknowledge that to their best effort the lanes and all bowling equipment continue to comply with the respective standards of that tier or better if improvements are made.

Lane Dressing/ Lane Surface Requirements

In addition to compliance with all other terms and conditions of the certification requirements, retention of a certificate shall be subject to the following:

1. If dressing is used, it shall meet specifications and must comply with the following:
 - a. Dressing must be distributed from edge board to edge board for the entire distance that dressing is applied. (In the application of this rule, buffing the lane is considered applying dressing.)
 - b. Following any application of dressing, the dressed portion of the lane shall have a minimum of three units of dressing at all points on the lane surface.
 - c. Any stripping (cleaning) of dressing from the lanes must be uniform from edge board to edge board and at least from the headpin to the distance to which dressing has been applied

NOTE: As of August 1, 2019, item 1 is indefinitely suspended.

2. The lane surfaces shall not be altered to attempt to steer the ball path or alter pin fall by any means or methods. For example, and without intending any limitation of the rule, the lane installers, resurfacers, center proprietors, center managers and center maintenance personnel are specifically prohibited from creating grooves, tilts, or depressions in the lane to guide the ball path to a desired location even if the measurements fall within allowable tolerances or from altering pit area specifications to attempt to alter the pinfall.
3. Any authorized representative of USBC, shall be permitted at any time to inspect a certified center for compliance with bowling equipment specifications and to inspect all equipment the center uses to maintain its lanes.

NOTE: Although there is a minimum requirement, additional inspections can be performed at the discretion of the USBC. Should a re-inspection indicate compliance changes, the tier level will be adjusted accordingly.

NOTE: Inspection information obtained shall be recorded on Certified Bowling Center Certificate provided by USBC and found on BOWL.com.

4. A minimum of one inspection every three bowling seasons shall be required from each center for center certification.

Failure to comply with any of the foregoing shall constitute grounds for score denials and suspension or withholding of membership of all persons involved, including owners, managers, and maintenance personnel, and shall also constitute grounds for the action set forth in the noncompliance procedures of this chapter.

Penalty for Noncompliance

Anyone who attempts or directs another to alter lanes to create a ball path or otherwise affect the course of the ball or pin fall, or permits any of the foregoing to occur, is liable for suspension of membership. A nonmember found to have taken or permitted such actions may be denied USBC membership until his/her application is approved by USBC Rules Department.

Lapse of Certification

A center certification may be withdrawn for the following:

- Not paying the certification fee
- Not allowing an inspection

Noncompliance Procedures

1. When surface requirements or bowling equipment specifications do not meet the minimum tier level, centers have until their next inspection cycle to make repairs to meet at least the minimum tier level before yearly inspections are required. Centers will be charged the full inspection fee.
2. When a center refuses an inspection during their normal required bowling season or refuses to pay the certification fee:
 - a. The centers certification will be withdrawn. The local association and the bowling center will be notified of the decision to withdraw the certification.
 - b. The center may appeal the decision which must occur within 30 days of the notification.
 - If there is no appeal, the decision will be final.
 - If there is an appeal, the case will be handled by the Equipment Specification Committee.

If there is a certificate withdrawal, the bowling center and each league/tournament will be notified that following completion of the current schedule, any future leagues/tournaments will not be certified until the center is inspected.

When a bowling center wishes to improve or dispute the results from an inspection report and the associated tier level, a bowling center can request that their lanes be re-inspected at any time to improve their tier level classification. The center is required to pay the normal reinspection fee and possibly travel expenses.

NOTE: References to bowling center notices in this section shall mean notice to the owner and/or any other representative designated by the owner. References to leagues/tournaments shall mean those bowling or scheduled to bowl in the center which have applied for certification or are certified.

Miscellaneous

1. In the event a certificate is temporarily suspended or withdrawn, any bowler who withdraws from a league in the bowling center shall be deemed to have done so for satisfactory reason for the purposes of Rule 114a.
2. None of the provisions of the certification requirements shall be interpreted to limit any action that may be taken when it is deemed necessary to protect the integrity of bowling. In such cases, USBC may conduct a hearing in the matter. The Board of Directors may authorize issuance of membership to members of leagues desiring to be certified and committed to bowl in a bowling center in which a bowling center certificate is not in effect. All members of such leagues must apply for membership.
 - a. Privileges and services will be provided to members of such leagues, but shall not include recognition of averages, all pins-over-average awards, all national recognition awards, 11-in-a-row (youth only), 300 games and 800 series or better. Such privileges and services may not be extended for more than one season, or longer than one year.

Lane Dressings and Lane Dressing Measuring Equipment

Technical Specifications for Lane Dressing

Only lane dressings containing a USBC approved additive added by the dressing manufacturer, and meeting the following requirements, shall be approved for use on lanes where certified competition is conducted:

1. The specification for UV content shall be 300-367 ppm by weight.
2. The dressing-additive mixture shall be so homogenized as to assure a storage life of not less than six months without noticeable separation of the additive.
3. The dressing-additive mixture shall comply with safety standards and shall not be harmful to health.
4. All dressing containers shall bear the USBC approved logo.
5. A one-liter sample of oil shall be supplied to USBC upon request for evaluation of UV additive content and homogenous characteristics. The purpose of the additive is to provide a bowling surface condition enabling accurate measurement and recording of the relative amount of dressing across the width of the lane. There shall be no deviation from an approved additive/dressing without prior written approval from the USBC.
6. All lane conditions must have a viscosity between 12 cP (centipoises) and 81 cP @ 21.1° C (70° F) when using a Brookfield LVDV +II Pro Viscometer equipped with an LV1 spindle using the guard leg at all times in order to maintain the % torque at the recommended value in the 10-100 range while set at 60 RPM.

7. All lane conditioner manufacturers are required to include in the Regulatory Section of their product's MSDS that the lane conditioner meets all United States Federal Government CFR (Code of Federal Regulations) Title 21 requirements for GRAS (Generally Regarded as Safe) relating to product human contact and possible human ingestion. For more information on these statutes, please contact USBC Equipment Specifications Department or consult CFR title 21.

Technical Specifications for Lane Dressing Tape Take-Up Device

These specifications establish the requirements for the lane dressing take-up device to be employed to apply the tape described in USBC specifications for lane dressing pick-up tapes to, and remove it from, the surface of a bowling lane.

1. By mechanical action, the device shall apply one layer of tape to and across the width of a lane, with the adhesive side on the lane surface. A second mechanical action shall pick up the original tape and simultaneously affix a second like tape to the first tape, adhesive sides together, so as to encapsulate the lane dressing picked up by the first tape between the two layers of tape.
2. The device shall accept two rolls of the tape on separate spools. The free ends of the tapes, affixed together, shall be held firmly in place while the tape from one spool is applied to and rolled across the lane by means of a flexible wheel, guided by a channel provided by the device running across the width of the lane. Then, as the first tape is removed from the lane surface and picked up by the device, the second tape shall be dispensed from its spool and affixed, adhesive sides together, to the first tape. The combined sample can then be removed from the device.
3. The part of the device holding the free end of the tapes during dispensing shall have a holding force of not less than five pounds to assure that the tapes will not pull free while being applied and picked up.
4. The device shall be capable of superimposing the second tape on the first with no more than 1/16 inch misalignment.
5. The device shall be capable of performing 10,000 operations as specified without failure or excessive wear. Lubrication, if required, at 100-hour usage intervals, shall suffice to assure effective operation of the device.
6. The device shall be capable of being cleaned by wiping with a cloth.
7. The device shall be designed and manufactured to "best commercial practice" and shall be operational without damage after being subject to the following tests:
 - a. Vibration: 0.01" displacement, 1 Hertz per second to 400 Hertz per second applied to any of four sides. At least two vibration tests, each of one minute duration, must be satisfactorily met.
 - b. Shock: 4 Gs when applied to any of six sides.
8. Unless otherwise specified by USBC, all examinations and tests shall be made at the following environmental conditions:
 - a. Operating: +30 to +100 degrees Fahrenheit
 - b. Storage: -30 to +165 degrees Fahrenheit

Only a device approved by USBC as meeting these requirements shall be employed for application of the tape on lanes where certified competition is conducted.

The manufacturer of an approved device shall be responsible for continuing compliance with

these requirements and USBC reserves the right to perform any inspection and/or test which it deems appropriate to assure that the device does comply.

To that end, unless waived by USBC, the manufacturer shall supply one device out of each 500 units manufactured for visual and mechanical inspection by USBC, at the manufacturer's site or as directed by USBC. Such device may be selected at random by USBC from the production line.

At USBC's discretion, the device may be subject to the environmental extremes and/or vibration and/or shock requirements of these specifications. Failure of the device to pass all requirements of these specifications shall constitute a basis for withdrawal of approval.

The manufacturer may recommend improved design changes. However, once approval has been given by USBC, no modification may be made to the device without prior written USBC approval.

Technical Specifications for Ultraviolet-Sensitive Tape Reader

These specifications establish the requirements for an instrument (the reader) capable of measuring the amount of ultraviolet-sensitive additive in lane dressing which has been encapsulated as described in USBC specifications for lane dressing pick-up tape.

1. The reader shall accept a one-inch wide, two-layer tape which has encapsulated the lane dressing and shall provide reading of the ultraviolet-sensitive additive in the lane dressing within the accuracies herein specified.
2. The ultraviolet sensing device within the reader shall be sensitive to 435 nanometer light and shall operate in the linear portion of the curve to provide a linear output of the read-out over its projected range. Detection shall be linear from 0.005 to 5 cc of percent nonvolatile material per square foot with a concentration of 0.033 percent ultraviolet tracer in the dressing. The reader's sensitivity shall be capable of differentiating between 0.00835 cc per square foot.
3. The output reading shall be displayed to provide a comparison of the relative amount of additive encapsulated along the length of the tape.
4. The reader shall include a drive tape advancement mechanism that shall advance the tape in 1 1/16 inch increments with cumulative error of not more than 0.5 inch in 42 inches. The manual mechanism shall have detents at 1 1/16 inch increments.
5. The tape path shall be constructed to minimize any sideward tape movement, while permitting hand feed of the tape until engaged by the drive mechanism, at which time the drive will advance the tape as specified in Item 4.
6. The tape path shall be readily cleaned and constructed to prevent an accumulation of fluorescent debris.
7. Stray light shall not present interference in a brightly lit room or in direct sunlight.
8. The control for driving the tape shall be easily accessible to the operator and the reader shall otherwise be constructed to assure operator convenience, including the position of switches, lamps, controls, and overall size of the reader.
9. The light source shall be a 375 nanometer ultraviolet light.
 - a. On the front panel, an indicator will show the primary power is on and another shall indicate when the ultraviolet light is functioning.*
10. With the unit at ambient temperature the stabilization time, from the time the unit is turned on until the unit can make accurate readings, shall be approximately 45 minutes. Verification shall be conducted by repeatable tests using the same tape and obtain readings produced previously plus/minus 2.
 - a. The readout indications for a test tape shall be repeatable after the unit has been

operational for one hour without readjustment of the "null" control. Output shall be plus/minus 0.1 of the original reading.*

- b. There shall be no noticeable change in the output reading when the AC input is varied between 105 and 125 VAC.
11. The reader shall be capable of 500 hours operation with no adjustment of internal controls, during which time the output shall remain linear with no distortion over the required range of the reader.
12. There shall be one external "null" adjustment allowing for setting the readout device to zero.*
13. Unless otherwise specified by USBC, all examinations and tests shall be made at the following environmental conditions:
 - a. Operating: +30 to +100 degrees F
 - b. Storage: -30 to +165 degrees F
 - c. Relative humidity: 90 percent maximum; no minimum
 - d. Altitude: Sea level to 8,000 feet
14. The units shall be designed and manufactured to "best commercial practice" and shall be operational, without internal adjustments, and shall have no mechanical failures (damage) after being subjected to the following tests:
 - a. Vibrations: 0.01" of displacement from, 1 to 400 Hertz/second when applied to any of six sides.
 - b. Shock: 2 Gs when applied to any of six sides.

**Applies to Original Black Box Reader.*

Only a USBC approved device meeting the foregoing requirements shall be employed for evaluation of sample tapes taken from lanes on which certified competition is conducted.

The manufacturer of an approved device shall be responsible for continuing compliance with the foregoing requirements and USBC reserves the right to perform any inspection and/or test which it deems appropriate to assure that the device does so comply.

To that end, unless waived by USBC, the manufacturer shall supply one device out of each 250 units manufactured for visual, electrical and mechanical inspection by USBC, at the manufacturer's site or as directed by USBC. Such device may be selected at random by USBC from the production line.

At USBC's discretion, the device may be subjected to the environmental extremes and/or vibration and/or shock requirements of these specifications. Failure of the device to pass all requirements of these specifications shall constitute a basis for withdrawal of approval.

The manufacturer may recommend improved design changes. However, once approval has been given by USBC no modification may be made to the device without prior written USBC approval.

Technical Specifications for Lane Dressing Pick-up Tape

These specifications establish the requirements for the lane dressing pick-up tape to be employed with the take-up device described in USBC specifications for lane dressing take-up device.

1. The tape shall be one-inch wide, substantially transparent when applied to a surface, having an adhesive side which, when rolled (with the take-up device) on and across

a bowling lane, shall have the property of picking up all lane dressing from the lane surface. When a second like tape is affixed to the first tape, adhesive sides together, it shall effectively encapsulate the picked-up dressing. The combined tapes must permit comparative measurement of the ultraviolet-sensitive additive encapsulated along the tapes length by use of the reader device. (See specifications for ultraviolet-sensitive reader.)

2. The tape shall have a usable life of not less than 18 months, including at least six years subsequent to its application to a lane surface as described.
3. Unless otherwise specified by USBC, the tape shall perform as above after being subjected to the following environmental conditions:
 - a. Operating: +40 to +100 degrees F
 - b. Storage: -30 to +165 degrees F

Manufacturers Field Test Program for Products

This program is for the purpose of evaluating test products (excluding automatic scoring devices and automatic pin spotters) in the field for durability and scoring by the USBC. To conduct a manufacturer's field test, the following guidelines must be met:

1. Proposer shall notify the USBC Equipment Specifications Department not less than 30 days prior to the proposed installation date. The proposed location, with address, telephone number and a contact person at the center, date of installation, number of lanes and a full description of the test product must accompany the request.
2. USBC has the right to have their personnel present during the installation or at any time thereafter. The product must meet all USBC installation certification specifications for the duration of the installation. USBC representatives will inspect the installation for verification of acceptable tolerances before allowing any certified competition to be conducted on the test product. They will inspect the installation at a minimum of every four months.
3. The proposer may have a maximum of 16 lanes per test. These test lanes may be divided between two bowling centers, but may include no more than half the lanes per center. Testing must be done on pairs of lanes (two lanes, four lanes, six lanes, etc.).
4. Each proposer may have a maximum of five field tests underway at one time. A field test may last a maximum of 1½ years before its termination or entering into an official USBC test. If the official USBC test is not started in that time period, the product must be removed or USBC certification will be withdrawn. If the official USBC test is started in that time period, the product can remain in use until the conclusion of the test and the USBC Equipment Specifications and Certification Committee's decision.
5. The Equipment Specifications Department has the right to refuse a field test if they feel the concept is inappropriate or compromises the integrity of the game. The proposer may provide supporting laboratory data as an appeal to the USBC Equipment Specifications and Certification Committee.
6. USBC can require the field test to be terminated at any time and have the test product removed from certified competition and an approved product reinstalled. All cost of the installation or removal of the test product will be the proposer's responsibility. Possible termination reasons could be, but are not limited to, product failure which could affect scoreability, product effects on scoreability compared to approved products, product creates a hazard to bowlers or bowlers' equipment, or at the request of the center ownership.
7. Before installation of the test product, a field test agreement must be completed in full and returned to the USBC Equipment Specifications Department.

Manufacturers Field Test Program for Pins

1. Only pins that have passed the threshold stage and official ramp scoring test may be eligible for a field test.
2. Proposer shall notify the USBC Equipment Specifications Department not less than 60 days prior to placing the pins into the field test. The proposed location, with address, telephone number and a contact person at the center, starting date and number of lanes and pins used, must accompany the request. A field test agreement form must be completed in full and returned to the USBC Equipment Specifications Department before starting the test.
3. ALL pins to be used in the field test must be submitted to the USBC Equipment Specifications Department not less than 60 days prior to the proposed start of the test. These pins will be tested by staff to ensure they meet all specifications and within the same parameters (i.e., scoring, center of gravity, weight) of those pins that passed the official ramp test. These pins must have permanent test pin labels when received by staff. Once tested and approved for the field test, staff will then permanent mark identification numbers on each pin.
4. Staff reserves the right to inspect the pins at any time during the test.
5. The test must be conducted in an area of the country acceptable to the USBC Equipment Specifications Department.
6. Length of test is limited to one year.
7. The USBC Equipment Specifications Department has the right to refuse a field test if they feel the concept is inappropriate or compromises the integrity of the game. The proposer may provide supporting data as an appeal to the USBC Equipment Specifications and Certification Committee.
8. USBC may terminate the field test at any time and have the pins removed from certified competition. All costs of placing the pins in play or removal of the test pins will be the proposer's responsibility. Possible reasons for termination could be, but are not limited to: pin failure, scoreability, poor pin performance in pinsetters, unacceptable to bowlers or at the request of the center ownership.

Technical Terms

Ambient Temperature

Temperature of the surrounding area; same as room temperature.

Acceptable Product

Any product that is not currently governed by set specifications and lacks standard testing procedures, yet has been reviewed by USBC Equipment Specifications and Certifications personnel and deemed not to impact the integrity of the sport. Acceptable products are allowed to be used during USBC certified competition.

Approach

The area immediately in front of the lane before the foul line measuring at least 15 feet in length and not less than the width of the lane.

Approved

Used to describe equipment that has been sent in, reviewed, tested and found to meet all current specifications at the time of approval.

ASQ

American Society for Quality.

ASTM

American Society of Testing Materials.

Asymmetrical Core (undrilled)

A ball where the RG (radius of gyration) values of the Y (high RG) and Z (intermediate RG) axes of the ball differ by more than 5% of the total differential of the ball.

Axis Migration

Path of which the axis point travels across the surface of a ball as the ball travels down the lane; this path will always have the approximate same RG measurement as the ball travels.

Axis Rotation

The measurement of horizontal angle through which a ball rotates; rotation is synonymous with the amount of "side roll" a bowler applies to the ball.

Axis Tilt

The measurement of the vertical angle through which a ball rotates; tilt is synonymous with the amount of "spin" a bowler applies to the ball.

Backend

Portion of the lane after the lane conditioner ends up until the pins.

Ball Track

The area on which a ball makes contact with a lane.

Bifilar

The use of two cords or wires to support the test cradle in testing the radius of gyration of a bowling pin.

Breakpoint

The apex (peak) of the hook phase curve.

Center of Gravity, CG

The imaginary point inside a body of matter where the total weight of the body is thought to be concentrated.

Certified

Any competition, bowler, league, center or coach that is registered with USBC.

Coefficient of Friction, COF

The ratio of the force opposing the relative motion of two surfaces and the normal force acting perpendicular opposing force. In bowling, this term usually defines the interaction between the coverstock, lane conditioner and lane.

Coefficient of Restitution, COR

The ratio of the energy of two objects after impact to the energy before impact. In the case of a ball striking a pin, this is the percentage of energy transfer from the ball to the pin.

Conventional Grip

The method of drilling in which the fingers are inserted to the second knuckle.

Core

The interior of the bowling ball; depending upon the construction of the ball, the core may consist of the inner core (weight block) and/or the outer core (light filler material).

Crack

A partial break or split that appears on the surface of the ball, which is no more than 3" long and no more than 1/8" wide. This includes what is referred to as "stress fractures" which often occur around thumb or finger inserts or through the bridge area between the finger holes. If a crack is located within the bowler's track area, the ball is not permitted for use during USBC certified competition. See Fissure.

Coverstock

The exterior or outer shell of the bowling ball.

Drift

The different in location between a bowlers starting position and ending position at the foul line.

Durometer

A device to check hardness of bowling balls and bowling pins.

Edge Board

The last board on each side of a pin deck or lane.

Entry Angle

This is the angle at which the bowling ball enters the pins relative to the longitude of the lane.

Equator

The High RG plane of a bowling ball in symmetrical balls.

Fingertip Grip

Method of drilling where only the tips of the fingers are inserted into the ball

Fissure

A break or split 3" long or greater and/or 1/8" wide or greater, usually occurring from some breaking or parting. If a fissure is present anywhere on the ball, the ball is not permitted for use in USBC certified competition as it may damage the lane surface. Fissures may not be repaired as the roundness and diameter of the ball are compromised which can impact scoring and cause issues with ball return equipment. See Crack.

Flare

The ball track progression due to axis migration.

Friction

The force which opposes the relative motion of two surfaces which are in contact with each other.

Hardness

Resistance to plastic (permanent) deformation due to a constant load from a sharp object.

Heads

This is in reference to the area from the foul line to 20 feet.

Hook Phase

Described as a curve, this is the second phase of ball motion where the ball has encountered enough friction to change direction.

Initial Installation

The first installation of a surface in a brand new center.

Intermediate Differential

The difference in radius of gyration between the Y (high RG) and Z (intermediate RG) axes on the bowling ball.

Kickback

The partitions that enclose the pin deck area located on the outside of the flat gutters which are also used to support the pin setting device.

Kickback Plate

A plate (3/16" max. thickness) made of USBC approved materials that is used to protect the wood kickback.

Lane and Approach Markings

Symmetrical graphics on the playing surface as well as any targets meeting USBC specifications.

Launch Angle

The angle in which the ball exits your hand initially at the point of release.

Mass Bias

Y axis or high RG spot on the ball. See *PSA*.

Midlane

Area past the heads to the end of applied lane conditioner.

Modulus of Compression

Ratio of the unit stress to unit strain within the proportioned limit of material in compression.

Mohs' Hardness

A scale for classifying a material based on relative hardness determined by the ability of a harder material to scratch a softer one.

Moment of Inertia

Resistance to change in rotation.

Nanometer

A unit of measure used for measuring the wavelength of light. One nanometer equals 1×10^{-9} meters or 10 angstroms.

Natural Pair of Lanes

This refers to a pair of lanes used in certified competition. Usually natural pairs of lanes have a common ball return and are numbered 1 and 2, 3 and 4, etc.

Non-Approved/Non-Conforming

This term is used to describe equipment that has been sent in, reviewed, tested and found to not meet one or more of the current specifications.

Particle

Any additive mixed into the coverstock to change the interaction between the bowling ball, lane conditioner and the lane.

Phenolic

A plastic-like material derived from the chemical "phenol".

Pin (in reference to a bowling ball)

This is used to indicate where the top of the weight block is located in the ball.

Pin Base Flat Diameter

The diameter of the base of the pin which will contact a surface when a pin is stood upright.

Pin Deck

The area of the lane on which the pins are spotted.

Pitch

Angle at which holes in the bowling ball are drilled.

Positive Axis Point, PAP

This is the point on a ball which the ball rotates initially upon release. A bowler's Axis Point is unique to them and has the potential to change depending on how that bowler releases the bowling ball. The Axis Point includes both a horizontal and vertical measurement from the center of grip.

Preferred Spin Axis, PSA

The axis around which a ball will migrate to and spin around when energy is added to the bowling ball; this will always be the high RG axis of the ball. This term applies to all asymmetrical and drilled symmetrical balls.

Ra – see Surface Roughness – Ra.**Radius of Gyration, RG**

Measured in inches, radius of gyration is the distance from the axis of rotation at which the total mass of a body might be concentrated without changing its moment of inertia.

Refinish

To put a new protective coating on lanes or pins.

Refurbish

To renew the life of an approved bowling pin by the use of plastic coatings and Nylon reinforcing over the entire pin.

Re-release

A reproduction and subsequent release of an existing (previously approved) product. Re-released products must meet all current specifications and are no longer considered grand-fathered beyond their original approval under previous specifications.

Roll Phase

The third phase of ball motion where the ball is traveling on a linear path towards the pins.

Roundness

Being such that every part of the surface or the circumference is equidistant from the center.

Rs – see Surface Roughness – Rs.**Runout**

States how far the actual surface is permitted to vary from the dimensions implied.

Scleroscope

An instrument which measures the hardness of work in terms of elasticity.

Serial Number

An identifying series of numbers and/or letters in order to identify a specific ball; if a serial number is no longer identifiable then a new one can be engraved in order to give it a unique identifying series.

Skid Phase

The first phase of ball motion; the ball path is in a straight line and has not encountered enough friction to begin its hook phase.

Slabbing

The separation of glue joints in a wood core pin or separation of materials in a synthetic lane.

Span

The distance between the thumb and finger holes on a bowling ball.

Surface Roughness – Ra

The arithmetic mean of the peak to valley distances over an evaluation distance.

Surface Roughness – Rs

The arithmetic mean of peak to peak distances of the local peaks in the evaluation distance.

Sward Hardness

A measurement of surface hardness.

Symmetrical Core (undrilled)

A ball where the RG (radius of gyration) values of the Y (high RG) and Z (intermediate RG) axes of the ball do not differ by more than 5% of the total differential of the ball.

Synthetic

In bowling terms, any pin or lane product not made of wood.

Tailplank

The board on the rear edge of the pin deck to protect and prolong the life of a pin deck. Technically, this is not part of the lane

Thermoplastic

A plastic material which when heated will melt but after cooling will return to a solid shape.

Total Differential

The difference between the X (low RG) and Y (high RG) axes values of any bowling ball.

Traction

The friction between an object and the surface on which it moves.

Two-Handed Approach

Both hands are placed on the ball and are left on the ball throughout the swing until release. At the point of release, a dominant hand releases the ball thereby being a one-handed delivery. Additionally, the dominant hand is determined by the side of the body about which the ball swings.

Two-Handed Delivery

Both hands impart force on the ball to get it down the lane. Normally done by swinging the ball between one's legs and is more commonly used when youth start to learn how to bowl. Individuals who deliver the ball from the chest using both hands would be considered to be using a two-handed delivery and therefore must remain with this style throughout competition.

Ultraviolet

The region of the electromagnetic spectrum just below that of visible light generally ranging from 10-400 nanometers.

Void

A manufactured cavity with purposeful size, dimension and/or location within an object.

Vulcanized

Rubber that has been treated with sulfur to make it harder and stronger.



**621 Six Flags Drive
Arlington, TX 76011
800.514.2695**