

# BALL TECHNOLOGY STUDY

## GLOSSARY

### **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.

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### **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.

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### **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.

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### **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  $1 \times 10^{-9}$  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".

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### **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.

### **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.

### **Revolutions Per Minute (RPM)**

A measure of the frequency of rotation, specifically the number of rotations around a fixed axis in 1 minute.

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### **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.

### **Surface Roughness – Sa**

The arithmetic mean height of the surface of the evaluation area.

### **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.

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### **Synthetic**

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

### **Tail Plank**

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 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.