



Standard Operating Procedure: SOP-Ball-20

SPOT CHECKING BOWLING BALLS

| <u>Rev</u> | <u>Date</u> | <u>Staff Member</u> | <u>Purpose</u> |
|------------------------------|-------------|-----------------------|--|
| 1 | 6/8/22 | D Speranza | Modified to match spec manual changes that defines "significantly different" now as meaning different plus closer to spec limit. |
| Origination date: 10/21/2020 | | Originator: T Frenzel | |



Purpose: To spot check approved bowling balls in the field to ensure all approved balls meet and continue to meet USBC equipment specifications.

Materials:

- Computer with access to the P: drive, and Minitab
- Bowling balls to spot check

Procedure:

1. Bowling ball spot checks are performed both quarterly, and as needed, for each ball brand represented at the local bowling ball distributors.
2. Ball models to spot check will be chosen at USBC’s discretion. Likely candidates for spot checking are:
 - a. Models within the 24-additional range for any specification
 - b. Models that are advertised as having any property within the 24-additional range for any specification.
 - c. Models with approval samples within 1.0 points of the hardness spec
3. Four balls from a model are acquired from local bowling ball distributors. Based on the specifications to be tested, the balls may need to be purchased.
4. All balls throughout this procedure will be tested in accordance with the respective SOP for testing the specification of which they are near a limit.
5. If any of the 4 balls test within the additional sample thresholds below, an additional 4 balls will be acquired. See table for additional sample thresholds. Significant differences will be determined with the relevant statistical methods or by observational means.

| Spec | Spec limit | Additional Sample Threshold |
|------------------------|------------|-----------------------------|
| Differential RG | 0.060 | 0.057 |
| Minimum RG | 2.447 | 2.460 |
| Maximum RG | 2.813 | 2.800 |
| Minimum COR | 0.650 | 0.660 |
| Maximum COR | 0.750 | 0.739 |
| COF | 0.320 | 0.290 |
| Surface Roughness (Ra) | 65 | 50 |
| Oil absorption | 2:15 | 4:00 |
| Hardness | 73 | 74 |

*Original approval testing models received before January 1, 2021 will be held to 72D hardness spec

6. If the 8-ball grouping indicates a DPMO greater than 6000 (0.6% defects) or a significant difference from the ball model at time of approval and closer to the spec limit, then up to 24 additional samples will be acquired and tested in increments of 8.



7. DPMO will be calculated after each group of 8 balls is acquired. If the DPMO falls below 6000 (0.6% defects), testing of the model will stop.
8. If a significant difference from the model at time of approval is found, but the model still meets all equipment specifications, USBC will notify the manufacturer that the model needs to be resubmitted for approval in its current state. Penalties for changing a ball model found within the equipment specifications manual may apply.
9. If the 32-ball group indicates a DPMO between 6000 and 50000 (0.6~5.0% defects), the ball model will be put on a probationary status where balls may remain in the field, but the manufacturer must make a change to the production of the model and submit data on 24 balls per production run for a minimum of 5 runs until they can show a Ppk of 0.83 or greater (a defect rate of less than 0.6%).
10. If the 32-ball group indicates a DPMO over 5.0% and there has not been a sample that measures outside of specifications, USBC will continue to acquire groups of balls up to 58 samples. Guidelines for collecting up to 58 samples includes:
 - a. 58 samples may apply to either to affected batches or all batches combined, depending on whether there is evidence only certain batches are affected
 - b. Collection of additional groups may be halted before 58 samples are collected if a sample is found outside of the specification
 - c. If an out of specification ball is found and the nonconformance remains above 5.0%, action will be taken to revoke the ball model's approval status
 - d. If the nonconformance remains greater than 5.0% and a ball outside of specification is not found, the ball model will be put on the probationary status described in step 9.
 - e. If the nonconformance falls below 5% in testing, the ball will be put on probationary status described in step 9.
11. If the 32-ball group indicates a DPMO over 5.0% and there has already been one or more bowling balls found outside of specification, action will be taken to revoke the bowling ball's approval status.