Designation: D2915 – 17 (Reapproved 2022)

Standard Practice for Sampling and Data-Analysis for Structural Wood and Wood-Based Products[1]

This standard is issued under the fixed designation D2915; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

INTRODUCTION

Sampling and data analysis should be integrated in the design and evaluation of wood and wood-based structural products. This practice is useful in assessing the appropriateness of the assigned properties and for checking the effectiveness of grading procedures. Statistical methodologies are provided to serve as a basis for the empirical establishment and evaluation of mean and near minimum property estimates. These population estimates are then used by product standards to assign structural design values for use with an established design methodology (that is, allowable stress design, load and resistance factor design, limit states design, etc.). Near-minimum property estimates are typically used by the product standards to define the performance for a variety of structural properties where strength is a primary consideration (that is, extreme fiber stress in bending, axial tension, axial compression, shear, and elasticity for buckling concerns). Population mean estimates are often used to assess serviceability design criteria where strength is not the primary design concern (that is, elasticity estimates used for deformation calculations, permissible compression stress at a deformation, etc.).

For situations where a manufactured product is sampled repeatedly or lot sizes are small, alternative test methods as described in Ref (**1**)[2] may be more applicable.

1. Scope

1.1 This practice covers sampling and analysis procedures for the investigation of specified populations of wood and wood-based structural products referred to in this standard as products. Appropriate product standards should be referenced for presentation requirements for data. Depending on the interest of the user, the population from which samples are taken may range from the products produced at a specific manufacturing site to all the products produced in a particular grade from a particular geographic area, during some specified interval of time. This practice generally assumes that the population is sufficiently large so that, for sampling purposes, it may be considered infinite. Where this assumption is inadequate, that is, the population is assumed finite, many of the provisions of this practice may be employed but the sampling and analysis procedure must be designed to reflect a finite population. The statistical techniques embodied in this practice provide procedures to summarize data so that logical judgments can be made. This practice does not specify the action to be taken after the results have been analyzed. The action to be taken depends on the particular requirements of the user of the product.

1.2 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.3 This practice does not purport to address the adjustment factors needed to adjust test data to standardized mechanical and environmental conditions (that is, temperature, moisture, test span, or load duration). Additionally, it provides a basis for statistical estimates that will typically require further adjustment to determine design values for use with an accepted design methodology (that is, allowable stress, limit states, or

[1] This practice is under the jurisdiction of ASTM Committee D07 on Wood and is the direct responsibility of Subcommittee D07.02 on Lumber and Engineered Wood Products.

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[2] The boldface numbers in parentheses refer to the list of references at the end of this practice.

load and resistance factor design). It shall be the responsibility of the user to seek out the appropriate adjustments in specific product standards.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

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

2. Referenced Documents

2.1 *ASTM Standards:*[3]

D9 Terminology Relating to Wood and Wood-Based Products

D245 Practice for Establishing Structural Grades and Related Allowable Properties for Visually Graded Lumber

D1990 Practice for Establishing Allowable Properties for Visually-Graded Dimension Lumber from In-Grade Tests of Full-Size Specimens

D2555 Practice for Establishing Clear Wood Strength Values

D3737 Practice for Establishing Allowable Properties for Structural Glued Laminated Timber (Glulam)

D5055 Specification for Establishing and Monitoring Structural Capacities of Prefabricated Wood I-Joists

D5456 Specification for Evaluation of Structural Composite Lumber Products

D6570 Practice for Assigning Allowable Properties for Mechanically Graded Lumber

E29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications

E105 Guide for Probability Sampling of Materials

3. Terminology

3.1 *Definitions*—For definitions of terms related to wood, refer to Terminology D9.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *established design methodology, n*—methodology used to determine if a structure will perform adequately using structural design values.

3.2.1.1 *Discussion*—Established design methods currently used include allowable stress design, load and resistance factor design, limit states design.

3.2.2 *products, n*—wood and wood-based structural products.

3.2.3 *serviceability, n*—condition other than the building strength under which a building is still considered useful.

3.2.3.1 *Discussion*—Serviceability limit state design of structures includes factors such as durability, overall stability, fire resistance, deflection, cracking, and excessive vibration.

3.2.4 *strength, n*—level of stress expressed in terms of force per area being evaluated for design.

3.2.5 *structural design values, n*—unit stresses and stiffness values utilized in design.

3.2.5.1 *Discussion*—Structural design values are test results adjusted for duration of load, factor of safety, and expected service conditions.

3.2.6 *tolerance limit (TL), n*—tolerance limit with 95 % content and 75 % confidence.

4. Statistical Methodology

4.1 Two general analysis procedures are described under this practice: parametric and nonparametric. A nonparametric approach requires fewer assumptions and is generally more conservative than a parametric procedure. The parametric approach assumes a known distribution of the underlying population, an assumption which, if incorrect, may lead to inaccurate results. Some examples of parametric distributions are normal, lognormal and Weibull. Therefore, if a parametric approach is used, appropriate statistical tests shall be employed to substantiate this choice along with measures of test adequacy (**2**). For parametric approaches in this practice, the examples provided are based on assuming normality.

NOTE 1—The assumption of "normality" in the examples is not a given and should be verified before using in real cases. A nonparametric approach requires fewer assumptions and is generally more conservative than a parametric procedure.

4.2 *Population:*

4.2.1 It is imperative that the population to be evaluated be clearly defined, as inferences made pertain only to that population. In order to define the population, it may be necessary to specify (*1*) grade name and description, (*2*) geographical area over which sampling will take place (nation, state, manufacturing site, etc.), (*3*) species or species group, (*4*) time span for sampling (a day's production, a month, a year, etc.), (*5*) material dimensions, and (*6*) moisture content.

4.2.2 The sampling program should consider the population from which the test specimens originated, including types of processing methods or marketing practices with respect to any influence they may have on the representative nature of the sample. Test specimens may be collected from stock at manufacturing sites, centers of distribution, at points of end use or directly from current production. Sampling programs should consider potential effects of the sample source, timing, and location on the variability of specimen properties.

4.3 *Sampling Procedure:*

4.3.1 *Random Sampling*—The sampling unit is commonly the individual test specimen. When this is not the case, see 4.3.3. The sampling shall assure random selection of sampling units from the population described in 4.2 with all members of the population sharing equal probability of selection. The principles of Practice E105 shall be maintained. When sampling current production, refer to Practice E105 for a recommended sampling procedure (see Appendix X3 of this practice for an example of this procedure). If samples are selected from

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