



# Laboratory Proficiency Quality Manual

Developed by



THE CARPET AND RUG INSTITUTE

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## **Introduction**

Proficiency testing involves interlaboratory comparisons to determine the relative performance of a laboratory. Regulators, laboratory accreditation bodies, and other organizations that specify compliance to ISO/IEC 17011 require participation in proficiency testing. The ISO/IEC 17043 provides a consistent basis to determine the competence of laboratories.

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## 1.0 Scope

The Carpet and Rug Institute's Laboratory Proficiency program shall provide enough randomized pre-cut samples to each participating laboratory. The samples shall be intentionally oversized to require the laboratory to cut and prepare the samples. The randomized samples shall come from a single production lot of carpet to reduce the variability. The laboratories shall use proper conditioning techniques for each test method. The program is intended for use by accredited laboratories; however, the program shall be open to non-accredited laboratories. The data from non-accredited laboratories shall not be used at any time in the calculation of the statistics of the accredited laboratories. The method ASTM E178 Standard Practice for Dealing with Outlying Observations shall be utilized.

## 2.0 References

### **AATCC Standards**

TM 16 Option 3 Colorfastness to Light

### **ASTM Standards**

D 1335 Standard Test Method for Tuft Bind of Pile Yarn Floor Covering

D 2646 Standard Test Methods for Backing Characteristics of Pile Floor Coverings

D 3676 Section 13 Total Thickness, Forced at Compressed Thickness, Compression Thickness

D 3676 Sections 19 Weight, Thickness

D 3574 Thickness after Contact, Specimen 50% Compression Deflection Value

D 3936 Standard Test Method for Resistance to Delamination of the Secondary of Pile Yarn Floor Covering

D 5252 Standard Practice for the Operation of the Hexapod Drum Tester

D 5823 Standard Test Method for Tuft Height of Pile Floor Coverings

D 5848 Standard Test Method for Mass Per Unit Area of Pile Yarn Floor Coverings

D 6859 Standard Test Method for Pile Thickness of Level Pile Yarn Floor Covering

D 7241 Standard Test Method for Pile Thickness of Multilevel Pile Yarn Floor Covering

D 7330 Standard Test Method for Assessment of Surface Appearance Change in Pile Yarn Floor Covering using Standard Reference Scales

E 178 Standard Practice for Dealing with Outlying Observations

E 648 Standard Test Method for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source

E 662 Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials

### **ISO Methods**

17011 Conformity Assessment - Requirements for Accreditation Bodies Accrediting Conformity Assessment Bodies

17043 Conformity Assessment - General Requirements for Proficiency Testing

### 3.0 Terms and Definition

Assigned Value – A value attributed to a test item.

Coordinator – The individuals with responsibility for organizing and managing all the activities involved in the operation of the testing scheme on the part of the participants.

Participant – The laboratory organization that receives proficiency test items and submits results for review by the proficiency testing provider.

Interlaboratory Comparison – Performance and evaluation of measurements or test on the same or similar items by two or more laboratories in accordance with predetermined conditions.

Outlier – The observation in a set of data that appears to be inconsistent with the remainder of the set.

Proficiency Testing – The evaluation of participant performance against pre-established criteria by or means of interlaboratory comparisons:

*Quantitative Scheme - The objective is to quantify one or more measurements of the proficiency test item.*

*Qualitative Scheme - The objective is to identify or describe one or more characteristics of the proficiency test item.*

*Sequential Scheme - One or more proficiency test items are distributed sequentially for testing or measurement and returned to the proficiency testing provider at intervals.*

*Simultaneous Scheme - Proficiency test items are distributed for concurrent testing or measurement within a defined period.*

*Sampling - Samples are taken for subsequent analysis.*

Proficiency Test Item – A sample, product, or reference material measurement standard, data set, or other information used for proficiency testing.

Proficiency Testing Provider – An organization which takes responsibility for all tasks in the development and operation of a proficiency testing scheme.

Proficiency Testing Round – A single complete sequence of distribution of proficiency test items and the evaluation and reporting of results to the participants.

Standard Deviation – A quality calculation to indicate the extent of deviation for a group.

SD Means – The average standard deviation among the testing results of the participant laboratories.

Laboratories in Mean – The number of laboratories included in the group mean.

Range – The difference between the highest and lowest reported means included in the group mean.

Coefficient of Variation – The percent coefficient of variation, defined as (SD means/group mean) multiplied by 100, a measure of the dispersion or scatter of the data.

Units – The unit of test in which the data is presented in the tables and graphs.



## 4.0 Technical Requirements

### 4.1 General

- 4.1.1 CRI shall operate the program and shall clearly identify the scheme to be used to all participants. CRI shall have the proper knowledge of the scheme. If subcontractors are used in the program, they must receive written approval by the Carpet and Rug Institute. Subcontractors shall not be utilized in the analysis of the data.

### 4.2 Personnel

- 4.2.1 The proficiency testing provider shall have managerial and technical personnel with the necessary authority, resources, and technical competence required to perform their duties.
- 4.2.2 The proficiency testing provider management shall define the experience necessary to the key positions within its organization.
- 4.2.3 CRI shall maintain records of the relevant authorization(s) competence, educational, or experience and professional qualifications, and training skills for all personnel. This information shall be readily available and shall include the date on which competence to perform their assigned duties was assessed and confirmed.

### 4.3 Accommodations

- 4.3.1 CRI shall have accommodations that provide storage, handling, preparation, and providing test items to all participants. CRI shall use the most current edition of Minitab statistical software for analysis of the data.

### 4.4 Design of Proficiency Scheme

- 4.4.1 The process in which a program operator distributes homogenous samples of a material for testing by participating testing laboratory for the process of comparison on an anonymous basis, the relative performance of the laboratories.

**Note:** Laboratories participating in an accreditation program, such as NVLAP, shall be included in the data analysis. Non-accredited laboratories may participate; however, their test data shall not be included in the group mean of the accredited laboratories.

## 4.5 Method/Procedure Choice

- 4.5.1 The test methods for analysis are listed in Annex A. The methods included can be revised in the event an accreditation body includes three or more labs for a specific test.

## 4.6 Operation of Proficiency Program

### 4.6.1 Instructions for Participant

- 4.6.1.1 The Proficiency Program shall give participants advanced written notice of the distribution of test samples.
- 4.6.1.2 A form shall be submitted from the participants selecting the desired test methods.
- 4.6.1.3 The details of factors which could influence the testing of the proficiency test items, such as conditioning or storage, shall be clearly identified.
- 4.6.1.4 The specific and detailed instructions on the manner of recording and reporting shall be clearly identified. The reporting of test results shall be supplied by CRI in a digital format.
- 4.6.1.5 The results must be received within 60 days after the receipt of the samples by the participating laboratory.

## 4.7 Data Analysis and Evaluation of Proficiency Testing Results

### 4.7.1 Data Analysis and Records

- 4.7.1.1 All data processing equipment and Minitab software shall be validated in accordance with procedures before being brought into use. All digital systems shall include a backup process and system recovery plan. The results of maintenance shall be recorded.
- 4.7.1.2 Results received from participants shall be recorded and analyzed by appropriate methods using Minitab software. Procedures shall be established and implemented to check the validity of data entry, data transfer, and statistical analysis. Unless otherwise noted the test results from participants shall be transferred from Excel into the Minitab software.
- 4.7.1.3 Data analysis shall generate a summary and performance statistics along with associated information consistent with the statistical design of the proficiency testing scheme.

- 4.7.1.4 The influence of outliers on summary statistics shall be minimalized using robust statistical methods or appropriate tests to detect statistical outliers in accordance with ASTM E 178.
- 4.7.1.5 CRI shall have documented criteria and procedures for dealing with test results that may be inappropriate for statistical evaluation (e.g. miscalculations, transpositions, and other errors).
- 4.7.1.6 CRI shall have documented criteria and procedures to identify and manage proficiency test samples that are subsequently found to be unsuitable for performance evaluation (e.g. inhomogeneity, instability, damage, or contamination).

#### 4.7.2 Evaluation and Performance

- 4.7.2.1 CRI shall use valid methods of evaluation which meets the purpose of the scheme. The methods shall be documented and include a description of the basis for the evaluation. CRI shall not subcontract the evaluation of test results.
- 4.7.2.2 Where appropriate for the purpose of the proficiency scheme, CRI shall provide expert commentary on the performance of participants regarding the following.
  - (a) Overall performance against prior expectations, taking measurement uncertainties into account;
  - (b) Variations within and between participants, and comparisons with any previous proficiency testing rounds;
  - (c) Variations between methods or procedures;
  - (d) Possible sources of error (with reference to outliers) and suggestions for improving performance;
  - (e) Advice and educational feedback to participants as part of the continual improvement procedures of participants;
  - (f) Situations where unusual factors make evaluation of results and commentary on performance impossible; and
  - (g) Conclusion of testing results

**Note:** Updated summaries of performance from historical rounds of testing shall be included in the test report.

## 4.8 Reports

- 4.8.1 The report shall be comprehensive and shall include the results of all participants. The report shall include the performance of individual laboratories. The final report shall be authorized by the Director of Technical Services.
- 4.8.2 Laboratories shall be identified to the accreditation body only and a laboratory can request the identity of their laboratory in the report. Under no circumstance will the identification of other laboratories be shared with other participants. Each round of testing shall be identified with a unique number.
- 4.8.3 The report shall include, at a minimum:
- CRI proficiency information;
  - Contact information for the proficiency coordinator;
  - Contact information for the Director of Technical Services;
  - Contact information for the Manager of Data Analytics;
  - Signature of person(s) authorizing the report;
  - Report number;
  - Clear description of testing material;
  - Statistical data and summaries;
  - Procedures used to perform statistical analysis;
  - Summaries of previous rounds; and
  - Any revisions to the analysis due to sample damage or improper sample preparation.

## 4.9 Communication with Participants

- 4.9.1 CRI shall provide the following:
- (a) Relevant details of the scope of the proficiency testing scheme
  - (b) Any fees for participation
  - (c) Documented eligibility criteria for participation
  - (d) Confidentiality arrangements
  - (e) Details of how to apply
- 4.9.2 Participants shall be informed of any changes in proficiency testing scheme, design, or operation.
- 4.9.3 There shall be documented procedures for enabling participants to appeal against the evaluation of their performance in the CRI Laboratory Proficiency program.

4.9.4 Relevant records of communications with participants shall be maintained and retained, as needed.

#### 4.10 Confidentiality and Impartiality

4.10.1 CRI ensures staff are free from commercial, financial, and other pressures which might influence the results of the certification process. All persons contracted by CRI to perform duties or services must commit and attest that they are free from commercial pressures by signing the CRI Conflict of Interest, Confidentiality, and Financial Disclosure Policy document.

4.10.2 Confidentiality is defined as information in written or oral form which is disclosed by the company as confidential information. Information in the public domain is not considered confidential.

4.10.3 Impartiality is defined as an agreement to act independent from commercial and other conflicts of interest. Declare any previous or current associations with suppliers of products.

### 5.0 Management Requirements

#### 5.1 Organization

##### 5.1.1 Legal Identity

The Carpet and Rug Institute, Inc. is a registered corporation in the State of Georgia. CRI is recognized by the Internal Revenue Service of the United States government as a 501(c)(6) entity. CRI is a national trade association with membership open to all corporations, persons, and partnerships engaged in the manufacture of carpet, rugs, cushions, adhesives, and floor covering products.

##### 5.1.2 Governance

CRI Policy is determined by a Board of Directors composed of leadership from member companies and is implemented by a full-time professional CRI staff. Additionally, member company personnel provide time and expertise to several CRI committees, subcommittees, panels, task groups, and teams. The wide range of assembled information provides a focal point for issue discussion and a voice for the industry.

### 5.1.3 Strategic Issues Leadership Council (SILC)

- Executing strategy established by the Policy Committee.
- Approving panel actions and recommendations.
- Approving impartiality policies.
- Prioritizing activities for CRI adherence to the approved budget.

### 5.1.4 Product Performance & Standards Panel (PP&S)

- Developing policies relating to the operation, modification to, and scope of the program.
- Developing program activities.
- Developing proficiency requirements.
- Developing impartiality policies.
- Counteracting any tendency of any parties to exert commercial pressure or undue influence and reporting any such activity.
- Assigning individuals or groups specific responsibilities or duties as members of the proficiency program task group.

## 5.2 Management System

5.2.1 The Laboratory Proficiency Quality Manual defines the management system of the program. The testing provider, and or the organization of which is part of shall be legally identifiable. See section 5.1.1.

5.2.2 It is the responsibility of CRI to meet the needs of the participants, regulatory authorities, and other entities providing recognition.

5.2.3 The responsibilities of key personnel are identified below:

The CRI President:

- Oversees the Laboratory Proficiency program team.
- Handles compliance of the proficiency programs.
- Supervises all financial, contractual, and administrative functions of the program.
- Ensures adequate resources are available for all certification activities.
- Manages implementation of policies and procedures.
- Delegates authority to appropriate personnel on the day-to-day operations of the proficiency program.
- Ensures timely response to complaints and appeals and acts as the chief executive.
- Exercises general supervision of all operations and personnel, including recruiting, hiring, and discharging employees of the institute.
- Evaluates and determines the CRI personnel competence.

The Director of Technical Services & Programs:

- Serves as the team leader and is responsible for the operation of the program.
- Ensures compliance of proficiency with ISO 17043.
- Supervises implementation of the policies and procedures associated with the program along with issuing the final report.
- Administrates functions of the program ensuring these responsibilities are accomplished correctly and in a timely manner.
- Approves all contractual agreements.
- Issues participant notifications.
- Reviews quality processes and manuals for continuous improvements.
- Covers preventive actions and corrective actions.
- Implements improvements to the quality system reviews final reports for accuracy and compliance for approval.

The Manager of Data Analytics:

- Coordinating proper communication with participants, scheduling, and distributing of test samples.
- Maintains program records and other administrative duties, including initiating the invoicing process for applicants, participants, and reconciles receipts of payment.
- Evaluates testing data for the proficiency of the participants.
- Corresponds with potential and participating clients, scheduling, preparation, and authorization for sample distributions.
- Drafts the final report and reviews with the Director of Technical Services and Programs. If no edits or revisions are required, the report shall be signed by both managers and submitted to the participants and the accreditation body.

### 5.3 Document Control

- 5.3.1 Changes to documents shall be reviewed by the Manager of Data Analytics and approved by the Director of Technical Services and Programs. The approved document shall be noted with a revision number and date.

### 5.4 Review of Requests and Contracts

- 5.4.1 CRI has a policy for the review of request for contracts. The review shall cover proficiency test items, adequate resources, and appropriate version of test methods.

### 5.5 Subcontracting of Services

- 5.5.1 CRI contracts services from external bodies in certain circumstances. All subcontracted services shall include confidentiality and conflict of interest. Copies of such agreements are available for inspection at the CRI offices.

- 5.5.2 The analysis of laboratory results shall not be subcontracted.

### 5.6 Purchasing Supplies and Services

- 5.6.1 CRI shall have a policy for the selection of supplies (e.g. test items, Minitab software version etc.) that could affect the quality of the proficiency program.

### 5.7 Customer Service

- 5.7.1 All feedback shall be utilized for improvement of the proficiency program.



## 5.8 Complaints

- 5.8.1 CRI shall evaluate all complaints or appeals received by participants relating to the Laboratory Proficiency program. An investigation shall be conducted, and a written response of the investigation shall be sent to the participant. In some instances, this may require providing new test material and retesting to validate the original data.

## 5.9 Control of Nonconforming Work

- 5.9.1 CRI shall have a policy that shall be implemented when any deviation from the program guidelines. The significance of the nonconforming work shall be identified. The required action shall be taken immediately and the participants shall be notified.

## 5.10 Improvement

- 5.10.1 CRI shall strive for continuous improvement. The quality management system, quality objectives, audit results, analysis of data, revision of test methods, and additional available information shall be utilized for the improvement of the program.

## 5.11 Corrective Action

- 5.11.1 CRI shall have a policy for the identification and implementation of corrective action. A cause analysis shall be conducted for the determination of the root cause. The actions identified shall be to eliminate the problem and to prevent recurrence shall be applied. The actions taken shall be documented and shall be appropriate to the risk.

## 5.12 Preventive Action

- 5.12.1 Any improvements to the management system, data analysis, nonconforming work, technical changes, or method changes shall be implemented and monitored for improvement to the program.

## 5.13 Control of Records

- 5.13.1 CRI shall maintain records for identification, collection, filing, storage, maintenance, and disposal. All records shall be readily available. CRI shall keep all records secure and confidential in accordance with all regulatory requirements. Records stored electronically shall be backed up and maintained. All technical records that include data, test methods, analysis, final report, and report summaries shall also be maintained confidentially.

#### 5.14 Internal Audits

- 5.14.1 CRI shall conduct internal audits on a predetermined schedule and procedure to verify the operations continue to comply with regulatory requirements. The internal audit shall include the quality management system, test item preparation, storage and distribution, reporting activities, and test methods.

#### 5.15 Management Reviews

- 5.15.1 CRI staff shall conduct regular management reviews to ensure continued compliance and identify any necessary changes for improvements. The review shall include policies, internal audits, volume of work, customer feedback, corrective actions, technical changes, test method revisions, additional test evaluations, and recommendations for improvements.

**Annex A - Carpet & Cushion Methods**

	<b>Method</b>	<b>Description</b>	
AATCC	TM 16-Option 3	Colorfastness to Light	Carpet
ASTM	D-1335	Standard Test Method for Tuft Bind of Pile Yarn Floor Covering	Carpet
ASTM	D-2646	Standard Test Methods for Backing Characteristics of Pile Yarn Floor Covering	Carpet
ASTM	D-3574 C	Thickness after Contact, Specimen 50% Compression Deflection Value	Cushion
ASTM	D-3676 Section 13	Total Thickness, Force at Compressed Thickness, Compression Thickness	Cushion
ASTM	D-3676 Section 19-12	Weight, Thickness	Cushion
ASTM	D-3936	Standard Test Method for Resistance to Delamination of the Secondary Backing of Pile Yarn Floor Covering	Carpet
ASTM	D-5252	Standard Practice for the Operation of the Hexapod Drum Tester	Carpet
ASTM	D-5823	Standard Test Method for Tuft Height of Pile Floor Coverings	Carpet
ASTM	D-5848	Standard Test Method for Mass Per Unit Area of Pile Yarn Floor Coverings	Carpet
ASTM	D-6859	Standard Test Method for Pile Thickness of Level Pile Yarn Floor Covering	Carpet
ASTM	D-7241	Standard Test Method for Pile Thickness of Finished Multilevel Pile Yarn Floor Covering	Carpet
ASTM	D-7330	Standard Test Method for Assessment of Surface Appearance Change Using Standard Reference Scales	Carpet
ASTM	E-648	Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source	Carpet
ASTM	E-662	Test Method for Specific Optical Density of Smoke Generated by Solid Materials	Carpet