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.

Designation: E329 – 18

An American National Standard

Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection[1]

This standard is issued under the fixed designation E329; 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.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope*

1.1 This specification defines the minimum requirements for agencies engaged in any of the following:

(a) Inspection of specified methods and materials used in construction,

(b) Special Inspection, and

(c) Testing of materials used in construction.

1.2 Criteria are provided for assessing the competence of an agency to properly perform designated inspections, tests, or Special Inspection services. This specification establishes essential characteristics pertaining to the organization, management, personnel, facilities, quality systems, responsibilities, duties, inspection and testing methods, records, and reports of the agency. This specification may be supplemented by more specific criteria and requirements, if required.

1.2.1 This specification specifically addresses factors relevant to an agency's ability to produce precise, accurate test data or determine the conformity of construction activities and materials used in construction with regulations, codes, standards, and approved project plans and specifications containing the requirements against which the inspection or test, or both, will be performed. Specific or general requirements include:

1.2.1.1 Facilities and management of the agency,

1.2.1.2 Sufficiency and technical competency of personnel,

1.2.1.3 Suitability, calibration, and maintenance of equipment,

1.2.1.4 Quality system, audit, and review,

1.2.1.5 Responsibilities, duties, and authority of agencies,

1.2.1.6 Validity and appropriateness of sampling, testing, and inspection methods and procedures,

1.2.1.7 Management of records,

1.2.1.8 Reporting, review, and transmission of test and inspection data or findings, and

1.2.1.9 Specific requirements for identified fields (concrete, soil, etc.).

1.3 This specification can be used as a basis to assess an agency and is intended for use in accrediting agencies, public or private, engaged in inspection, testing, and Special Inspection of construction activities and materials used in construction. These services include but are not limited to reinforced concrete, precast concrete, structural steel erection, welding, bolting, soil and rock, foundations, masonry, sprayed fire-resistive materials, fire stops, exterior insulation and finish system (EIFS), and Special Cases. Building officials can use Specification E329 to assess the competency of agencies in the fields covered by Specification E329.

1.4 A certificate of accreditation, including the scope of accreditation, is required to comply with this specification.

1.5 The users of an accredited agency must review the agency's scope of accreditation to ensure the agency has been accredited for its technical competence to perform the specific inspections or tests requested by the user.

1.6 This specification is not intended to:

(a) circumvent or replace the agreement between the agency and the owner that should clearly define the responsibilities and authorities of the agency;

(b) address design requirements that supersede applicable codes, laws, and regulations; or

(c) address construction means, methods, techniques, or sequences.

1.7 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the*

[1] This specification is under the jurisdiction of ASTM Committee E36 on Accreditation & Certification and is the direct responsibility of Subcommittee E36.70 on Agencies Performing Construction Inspection, Testing and Special Inspection.

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***A Summary of Changes section appears at the end of this standard**

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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:*[2]

C1077 Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation

C1093 Practice for Accreditation of Testing Agencies for Masonry

D3666 Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials

D3740 Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction

E4 Practices for Force Verification of Testing Machines

E543 Specification for Agencies Performing Nondestructive Testing

E605 Test Methods for Thickness and Density of Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members

E736 Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members

E1513 Practice for Application of Sprayed Fire-Resistive Materials (SFRMs)

E2174 Practice for On-Site Inspection of Installed Firestops

E2393 Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers

2.2 *AASHTO Standard:*

R18 Standard Recommended Practice for Establishing and Implementing a Quality System for Construction Materials Testing Laboratories[3]

2.3 *ANSI/ISO/IEC Standard:*[4]

17011 General Requirements for Accrediation Bodies Accrediting Conformity Assessment Bodies

17020 General Criteria for the Operation of Various Types of Bodies Performing Inspection

17025 General Requirements for the Competence of Calibration and Testing Laboratories

2.4 *AWS Documents:*[5]

B1.11 Guide for the Visual Inspection of Welds

D1.1 Structural Welding Code, Steel

D1.4 Structural Welding Code—Reinforcing

D1.5 Bridge Welding Code

2.5 *SJI Documents:*[6]

Recommended Code of Standard Practice for Steel Joists and Joist Girders

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *accreditation, n*—the third-party attestation of an agency's competence to perform inspection, or testing services, or both.

3.1.1.1 *accreditation body, n*—the body that administers the accreditation program and issues the certificate of accreditation.

3.1.1.2 *accreditation scope, n*—the formal statement issued by the accreditation body to the agency that describes the specific inspections, tests, or both, for which the agency has demonstrated a competency in performing and is accredited.

3.1.1.3 *Discussion*—A certificate of accreditation shall identify the agency and its location along with the accreditation body, the accreditation standard, the general field(s) of inspection or testing, effective dates, conditions and authorized signatures, seals, or combinations thereof, of the accreditation body. The certificate must be accompanied by an accreditation scope to fully describe the technical competence of the agency.

3.1.2 *agency, n*—the organization, or part thereof, authorized by the client or client's duly authorized representative to inspect, test, or both, construction activities and materials used in construction as required by the approved project plans and specifications.

3.1.2.1 *inspection agency, n*—an agency that uses technical procedures and individuals with special expertise to perform inspection activities.

3.1.2.2 *Discussion*—Agency personnel may collect and submit samples, identified with respective portions of the construction, for laboratory evaluation. The inspection agency and testing agency may be one organization or separate organizations.

3.1.2.3 *Special Inspection agency, n*—an accredited third-party inspection agency approved by the applicable building official to perform Special Inspections.

3.1.2.4 *Special Inspector, n*—a person employed by a Special Inspection agency and approved by the applicable building official, certified by a third party to perform certain types of inspection as required by the applicable building code.

3.1.2.5 *testing agency, n*—an agency that uses technical procedures, individuals with special expertise, and specified equipment to measure, sample, examine, test, or otherwise produce data unique to the construction activities or materials used in construction. The inspection agency and testing agency may be one or separate organizations.

3.1.3 *bituminous material and mixtures, n*—as used in construction, all types of asphalts and tars for pavements.

3.1.3.1 *Discussion*—Bituminous mixtures include bituminous stabilized soil, base course, binder, leveling, surface

[2] 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.

[3] Available from American Association of State Highway and Transportation Officials (AASHTO), 444 N. Capitol St., NW, Suite 249, Washington, DC 20001, http://www.transportation.org.

[4] Available from International Organization for Standardization (ISO), 1, ch. de la Voie-Creuse, Case postale 56, CH-1211, Geneva 20, Switzerland, http://www.iso.ch.

[5] Available from American Welding Society (AWS), 550 NW LeJeune Rd., Miami, FL 33126, http://www.aws.org.

[6] Available from Steel Joist Institute (SJI), 3127 Mr. Joe White Ave., Myrtle Beach, SC 29577-6760, http://www.steeljoist.org.

course, and mastic mixtures. Bituminous mixtures may contain asphalt binder material which, in some cases, may be further modified with other additive materials to produce special properties.

3.1.4 *client, n*—the party that contracts with the agency to perform its services.

3.1.5 *concrete, n*—as used in construction, a mixture of hydraulic cement, aggregates, and water, with or without admixtures, fibers, or other cementitious materials.

3.1.6 *contractual agreement*—the legally-binding service contract between the agency and the agency's client.

3.1.6.1 *Discussion*—The *contractual agreement* referred to throughout this document may include *testing, inspection,* or *Special Inspection services contracts*.

3.1.7 *engineer, professional, n*—an individual who is registered or licensed to engage in the practice of engineering as defined by the statutory requirements of the professional registration or licensing laws of the state or jurisdiction in which the project is to be constructed.

3.1.8 *inspection, n*—a technical procedure based on visual observation or field measurement of construction activities or materials used in construction employed to evaluate activities or materials and determine general compliance with approved project plans and specifications.

3.1.8.1 *Special Inspection, n*—the unique term applied to the process of inspection or monitoring of specific materials, equipment, installation, fabrication, erection or placement of components and connections by individuals with special expertise as approved by the applicable building official to ensure compliance with the approved project plans and specifications.

3.1.9 *inspector/technician, n*—a person employed by the agency assigned to perform the inspection or testing of construction activities or materials used in construction or both.

3.1.10 *facility, main, n*—a structure with a permanent address, which provides testing or inspection services, or both, for multiple projects for a period expected to be greater than three years.

3.1.10.1 *facility, site, n*—a structure, or a mobile, fully-equipped, self-contained unit, capable of conducting specific tests or inspections or both, established in a dedicated area on-site for the duration of a specific project, but not for projects expected to exceed three years.

3.1.10.2 *facility, sub-, n*—a structure with a permanent address, that is physically separate from, but considered an extension of the main facility, which generally provides testing or inspection services or both for multiple projects.

3.1.10.3 *facility, permanent, adj*—as used to describe testing or inspection facilities, or both, expected to function for a period exceeding three years.

3.1.10.4 *facility, temporary, adj*—as used to describe testing or inspection facilities or both, expected to function for a period not to exceed three years.

3.1.11 *masonry, n*—as used in construction, masonry units, brick, mortar and grout.

3.1.11.1 *Discussion*—The masonry construction may be load bearing or non-load bearing.

3.1.12 *nondestructive testing, n*—procedures for testing construction activities or materials used in construction, or both, that does not impair the serviceability of the materials or assemblies under test.

3.1.12.1 *Discussion*—Nondestructive testing includes all test methods that do not impair the serviceability of the material, part, or assembly under test. Nondestructive tests are specific. They usually reveal only the specific kinds of defects and conditions for whose detection they were designed. Consequently, they must be selected in accordance with the specific materials, the specific conditions to be detected, and the specific job to be done.

3.1.13 *registered design professional, n*—an individual who is registered or licensed to practice their respective design profession as defined by the statutory requirements of the professional registration laws of the state or jurisdiction in which the project is to be constructed.

3.1.14 *soil, n*—as used in construction, subgrade, subbase, base, select fill and other similar types of granular and non-granular soils regardless of whether it is considered as a structural element in the project or general fill not supporting structural elements.

3.1.15 *steel, n*—as used in construction, structural steel plates and shapes used wholly or in part for structures including reinforcing steel used in concrete.

3.1.15.1 *Discussion*—It is not intended to include steels used in conjunction with mechanical, electrical, heating or air-conditioning equipment except for the supporting structures.

3.1.16 *testing*—a technical procedure performed on construction activities or materials used in construction with specified equipment that produces data unique to the construction activities or materials; the data are used to evaluate or determine selected properties or characteristics of the activities or materials.

4. Significance and Use

4.1 The inspection and testing of construction activities and the materials used in construction are important elements in obtaining quality construction in general compliance with the contract documents. An agency providing construction inspection, testing, or Special Inspection, must be selected with care after a comprehensive evaluation of their competency to perform the services properly and in compliance with the approved project plans and specifications.

4.2 This specification provides minimum criteria for use in assessing the qualifications of construction inspection, testing, and Special Inspection agencies. The criteria may be supplemented by more specific criteria and requirements for particular classes of testing or types of inspection agencies. An individual user can also use it to judge the competency of an agency.

4.3 The intent of this specification is to provide a standardized basis for requirements for a technically oriented construction inspection, testing, or Special Inspection agency, with

respect to the agency's capability to objectively and competently provide the specific services without prejudice.

4.4 Typically, assessing an agency involves the following three essential sequential phases:

4.4.1 Submittal of basic information in accordance with the criteria of this specification to the accreditation body by an agency desiring to be accredited to this specification,

4.4.2 Assessment of the agency-submitted information by the accreditation body, and

4.4.3 On-site assessment of the agency by the accreditation body.

5. Organization and Management

5.1 The agency shall be legally identifiable. It shall be organized and shall operate in such a way that its facilities meet the requirements of this specification.

5.1.1 Main facilities, sub-facilities, and permanent site facilities shall maintain personnel, equipment, procedures, and documentation as required in this specification. The manager for the main facility may also be responsible for a sub-facility or permanent site facility (see 6.2.2 and 6.3.2). Main facilities, sub-facilities, and permanent site facilities shall be accredited in accordance with 9.4.1 to perform the functions described in 3.1.2.1 or 3.1.2.3 or 3.1.2.5 of this specification.

5.1.2 Temporary site facilities offering a defined scope of services for a specific project, which are demonstrably under the main facility's or sub-facility's technical direction and quality program, do not require separate accreditation. Agencies that use temporary site facilities for their projects shall describe the operation of these facilities in their quality manual.

5.1.3 An endorsement for the operation of temporary site facilities shall also be listed on the agency's accreditation certificate.

5.2 The agency shall:

5.2.1 Have managerial personnel with the authority and resources needed to discharge their duties.

5.2.2 Have arrangements to ensure that its personnel are free from any commercial, financial, and other pressures including trade organization rules that might adversely affect their independence, their judgment, and the integrity of their services. A Special Inspection agency or its personnel shall not be directly involved in the manufacture, supply, installation, use, or maintenance of the inspected items.

5.2.3 Be organized in such a way that confidence in its independence of judgment and integrity is maintained at all times.

5.2.4 Specify and document the responsibility, authority, qualifications, and interrelation of all personnel who manage, perform, or verify services affecting the quality of inspections or tests, or both.

5.2.5 Provide supervision by persons qualified to perform the inspections and tests and to implement relevant procedures. They shall be qualified to evaluate the objective of the inspections or tests and the results. The ratio of supervisory to non-supervisory personnel shall be such as to ensure adequate supervision.

5.2.6 Have a technical manager (however named) who has overall responsibility for the technical operations.

5.2.7 Have a quality manager (however named) who has the responsibility for the quality system and its implementation. The quality manager shall have direct access to the highest level of management at which decisions are made on agency policy or resources, and to the technical manager. In some agencies, the quality manager may also be the technical manager or deputy technical manager.

5.2.8 Nominate deputies in case of absence of the technical or quality manager.

5.2.9 Where relevant, have documented policy and procedures to ensure the protection of clients' confidential information and proprietary rights.

5.2.10 Where appropriate, as determined by the agency's quality manual, participate in interlaboratory comparisons and proficiency testing programs.

6. Personnel

6.1 *General:*

6.1.1 The agency shall have sufficient personnel having the necessary education, training, technical knowledge, certification as appropriate, and experience for their assigned functions.

6.1.2 The agency shall ensure that the training of its personnel is kept up-to-date.

6.1.3 Records of relevant certification, qualifications, training, skills, and experience of the technical personnel shall be maintained by the agency.

6.2 *Construction Inspection and Testing Agency:*

6.2.1 The following personnel requirements must be satisfied by the agency when inspection or testing services, or both, are being provided:

6.2.2 The inspection and testing services of the agency that provides the quality control or quality assurance program, or both, as related to construction activities or materials used in construction, shall be under the direction of a person charged with engineering managerial responsibility. The person shall be a professional engineer and a full-time employee of that agency. The person shall have at least five years experience in inspection and testing of construction activities and materials used in construction. The organization may consist of one or more separate facilities providing inspection or testing services or both. A professional engineer may have engineering managerial responsibility for one or more facilities within the organization.

6.2.3 When a producer's or manufacturer's laboratory only serves as a quality control laboratory and does not produce tests for acceptance, payment, or the official record, the requirement for a professional engineer is waived. However, the laboratory function of the organization shall be supervised by a quality control manager. The quality control manager shall have at least five years experience in testing of that particular construction material, and be a full time employee of the organization. The quality control manager will have the authority to make changes in production to ensure that quality material is produced. He may serve as the quality control manager for several materials production facilities. The quality

control manager shall have the certifications appropriate to the testing of the materials supervised.

6.2.4 A laboratory supervisor shall have at least three years experience performing tests in relevant construction activities and materials used in construction. This person shall be able to demonstrate either by oral or written examination, or both, their ability to perform the tests normally required in the manner stipulated under ASTM or other governing test procedures and shall be capable of evaluating the test results in terms of specification compliance. Certification by qualified national, regional, or state authorities as appropriate to the services is required.

6.2.5 A field supervisor shall have at least three years inspection experience in the type of services being supervised. This person shall be able to demonstrate, either by oral or written examination, or both, their ability to perform correctly the required duties and shall be capable of evaluating the inspection or test results in terms of specification compliance. Certification by qualified national, regional, or state authorities as appropriate to the services is required.

6.2.6 *Inspector or Technician*—This person shall have sufficient education and on-the-job training or trade school training to properly perform the inspection or test to which the person is assigned. This person must be able to demonstrate competence for the test or inspection that is being conducted either by oral or written examination, or both. Certification as appropriate for the services being performed, or certification by other qualified national authorities as appropriate to the service, shall be considered as one means of documenting competency. The inspector or technician shall work under the direct supervision of personnel meeting the requirements of 6.2.4 or 6.2.5.

6.2.7 It is satisfactory for a person to fill one or more of the levels of management, supervision, inspector, or technician positions in accordance with 6.2.2, 6.2.3, 6.2.4, and 6.2.5, provided the person qualifies for the highest level worked. It is also recognized that frequently some tests and inspections are conducted at small field or peripheral locations; it is not the intent of this specification that the supervisory personnel be directly present at such locations at all times. If the qualified person in 6.2.2 performs as a supervisor, they do not have to comply with the certification requirements.

6.3 *Special Inspection Agency:*

6.3.1 The following personnel requirements must be satisfied by an agency that provides Special Inspection services:

6.3.2 The Special Inspection services of the agency shall be under the direction of a registered design professional and a full-time employee of that agency. The person shall have at least two years experience in Special Inspections. The organization can consist of one or more separate facilities providing Special Inspection. A registered design professional can have managerial responsibility for one or more facilities within the organization as defined by Section 5.

6.3.3 The qualifications of the field supervisor shall be determined by the applicable building official. If no requirements have been set forth, the field supervisor of Special Inspection shall have at least two years Special Inspection experience in the type of work being supervised. This person shall be certified in the areas he or she is supervising.

6.3.4 The qualifications of the Special Inspector shall be determined by the applicable building official. If no requirements have been set forth, the Special Inspector shall be certified by a third party. This certification exam shall include; a written examination that shall include; reading plans as a performance element. The examination shall demonstrate the candidate's ability to correctly perform the required duties and evaluate the inspection results for specification and code compliance.

6.3.5 The registered design professional according to 6.3.2, in addition to the requirements of 6.3.4 shall document the experience and job training of each Special Inspector being supervised. The Special Inspection agency shall maintain such documentation for a minimum of three years after the individual(s) have left their employment.

6.3.6 A person can fill one or more of the levels of management, supervision, inspector, or technician positions in accordance with 6.3.2 – 6.3.4, provided the person qualifies for the highest level worked.

7. Equipment

7.1 The agency shall furnish all items of equipment, including reference materials, required for the correct performance of inspections and tests. In those cases where the agency needs to use equipment outside its permanent control, it shall ensure that the relevant requirements of this specification are met.

7.2 All equipment shall be properly maintained. Maintenance procedures shall be documented and shall include a schedule for future maintenance.

7.2.1 Any equipment that has been subjected to overloading or mishandling, or that gives suspect results, or has been shown by verification or otherwise to be defective, shall be taken out of service, clearly identified, and wherever possible, stored at a specified place until it has been repaired and shown by calibration, verification, or test to perform satisfactorily.

7.2.1.1 The agency shall examine the effect of this defect on previous inspections or tests.

7.3 Each item of equipment including reference materials shall, when appropriate, be labeled, marked or otherwise identified to indicate its calibration status.

7.4 Records shall be maintained for each item of equipment and all reference materials significant to the inspections or tests performed. The records shall include:

7.4.1 The name of the item of equipment,

7.4.2 The manufacturer's name, type identification, and serial number or other unique identification,

7.4.3 Date received and date placed in service,

7.4.4 Condition when received (for example, new, used, reconditioned, and so forth),

7.4.5 Copy of the manufacturer's instructions, where available, condition when received (for example, new, used, reconditioned, and so forth),

7.4.6 Details of maintenance carried out to date,

7.4.7 Dates and results of calibrations or verifications, or both, and date of next calibration or verification, or both,

7.4.8 History of any damage, malfunction, or repair, and
7.4.9 Current location.

8. Quality System, Audit and Review

8.1 The agency shall establish and maintain a quality system appropriate to the type, range, and volume of inspections and testing activities it undertakes. The elements of this system shall be documented. The quality documentation shall be available for use by the agency's personnel.

8.1.1 The agency shall define and document its policies and objectives for, and its commitment to good practice and quality of, inspection or testing services.

8.1.2 The agency management shall ensure that these policies and objectives are documented in a quality manual and communicated to, and understood and implemented by, all personnel concerned. The quality manual shall be maintained current under the responsibility of the quality manager.

8.2 The quality manual and related quality documentation shall state the agency's policies and operational procedures established in order to meet the requirements of this specification. The quality manual and related quality documentation shall also contain:

8.2.1 A quality policy statement, including objectives and commitments, by top management;

8.2.2 The organization and management structure of the agency, its place in any parent organization and relevant organizational charts;

8.2.3 The relations between management, technical operations, support services, and the quality system;

8.2.4 Procedures for control and maintenance of documentation;

8.2.5 Job descriptions of key personnel and reference to the job descriptions of other personnel;

8.2.6 Identification of the agency's approved signatories (where this concept is appropriate);

8.2.7 The agency's procedures for achieving traceability of measurements;

8.2.8 The agency's scope of inspections or tests, or both;

8.2.9 Arrangements for the agency to review all new services to ensure that it has the appropriate facilities and resources before commencing such services;

8.2.10 Reference to the test procedures used;

8.2.11 Procedures for handling inspection and test items;

8.2.12 Reference to the equipment and reference measurement standards used;

8.2.13 Reference to procedures for calibration, verification and maintenance of equipment;

8.2.14 Procedures to be followed for feedback and corrective action whenever testing discrepancies are detected, or departures from documented policies and procedures occur;

8.2.15 The agency's arrangements for permitting departures from documented policies, procedures, or standards;

8.2.16 Procedures for dealing with complaints;

8.2.17 Procedures for protecting confidentiality and proprietary rights; and

8.2.18 Procedures for audit and review.

8.3 The agency shall arrange for audits or inspections of its activities at appropriate intervals to verify that its operations continue to comply with the requirements of the quality system. Such audits shall be carried out by qualified personnel who are independent of the activity to be audited.

8.3.1 If the audit findings cast doubt on the correctness or validity of the agency's inspections or test results, the agency shall investigate the findings and circumstances to determine if the agency's inspection or test results reported to the client and other parties were affected. If the agency's investigation determines that the agency's inspection or test results were affected, the agency shall take immediate corrective action and shall immediately notify, in writing, the client and any other party as required by the contractual agreement.

8.4 The quality system adopted to satisfy the requirements of this specification shall be reviewed at least once a year by the management to ensure its continuing suitability and effectiveness and to introduce any necessary changes or improvements.

8.5 All audit and review findings, external and internal, and any corrective actions that arise from them shall be documented. The person responsible for quality shall ensure that these actions are discharged within the agreed timescale.

8.6 In addition to periodic audits, the agency shall ensure the quality of results provided to clients by implementing checks. These checks shall be reviewed and shall include, as appropriate, but are not limited to:

8.6.1 Internal quality control schemes using, whenever possible, statistical techniques,

8.6.2 Participation in proficiency testing or peer reviews,

8.6.3 Regular use of certified reference materials or in-house quality control using secondary reference materials, or both,

8.6.4 Replicate inspections or testing using the same or different methods,

8.6.5 Re-inspection or re-testing of retained items, and

8.6.6 Correlation of results for different characteristics of an item.

9. Responsibilities and Duties

9.1 It shall be the responsibility of the agency to ensure that it performs only inspections or tests for which it is adequately equipped and staffed, and that its personnel perform only inspections or tests for which they are adequately trained.

9.2 The following duties are those usually performed by the agency:

9.2.1 Obtain representative samples of those materials required by the approved project plans and specifications, and authorized by the contractual agreement to be tested and evaluated.

9.2.2 When samples are collected by the agency, the agency must ensure that there is proper protection, handling, and storing of the samples to ensure that they remain representative of the material being used at the time of sampling.

9.2.3 When the agency is responsible for collecting samples, the samples must be identified with the respective portions of the work in which the material represented was or will be used.

9.2.4 Perform all testing and inspection operations in accordance with appropriate standards as referenced in the contractual agreement.

9.2.5 Call to the attention of the client any irregularities or deficiencies in the construction materials or processes, or both, as related to construction materials, that the contractual agreement specifically states the agency is responsible for testing or inspecting.

9.2.6 Submit promptly to the client and distribute as specified in the contractual agreement formal reports of all tests and inspections which indicate compliance or noncompliance with the approved project plans and specifications. The reports shall be complete and factual, citing the methods used in obtaining samples, the tests performed, the specified values for the measured characteristics, the values obtained, the parts of the structure involved, and similar pertinent data. The agency shall be prepared to substantiate its reports to the extent necessary.

9.3 Unless specifically authorized, the agency does not have the right of rejection.

9.4 The agency shall have its laboratory procedures and equipment inspected at intervals of not more than three years by a qualified national authority as evidence of its competence to perform the required tests.

9.4.1 The agency shall demonstrate evidence of meeting the requirements of Specification E329 through accreditation in the field of its operations by a recognized accreditation authority. ANSI/ISO/IEC Standards 17011 can be used to evaluate the credentials, qualifications, and operation of the accreditation body.

9.5 The agency shall supply the qualified accreditation authority with the qualification of its Personnel as listed in Section 6. At a minimum each person shall be re-evaluated internally or externally, at least every three years for each test or inspection or both the person is authorized to perform.

10. Inspections and Test Methods

10.1 The agency shall have documented instructions on the use and operations of all relevant equipment, on the handling and preparation of items, and for inspection, calibration, or testing, or a combination thereof, where the absence of such instructions could jeopardize the inspections or tests. All instruction, standards, manuals and reference data relevant to the services of the agency shall be maintained up-to-date and be readily available to the personnel and external auditors.

10.2 The agency shall use appropriate test methods and procedures for all inspections and tests and related activities within its responsibility (including sampling, handling, transport and storage, and preparation of items, estimation of uncertainty of measurement, and analysis of inspection data or test data, or both). They shall be consistent with the accuracy required, and with any standard specifications relevant to the inspections, or tests concerned.

10.3 Where test methods are not specified, the agency shall, whenever possible, select test methods that have been published as international or national standards, those published by reputable technical organizations or in relevant scientific texts or journals.

10.4 Where it is necessary to employ test methods that have not been established as standards, these shall be subject to agreement with the client, be fully documented and validated, and be available to the client and other recipients of the relevant reports.

10.5 Where sampling is carried out as part of the test method, the agency shall use documented procedures and appropriate statistical techniques to select samples.

10.6 Calculations and data transfers shall be subject to appropriate checks.

10.7 Where computers or automated equipment are used for the capture, processing, manipulation, recording, reporting, storage, or retrieval of inspection or test data, the agency shall ensure that:

10.7.1 All requirements of this specification are complied with,

10.7.2 Computer software is documented and adequate for use,

10.7.3 Procedures are established and implemented for protecting the integrity of data; such procedures shall include, but are not limited to: the integrity of data entry or capture, data storage, data transmission and data processing,

10.7.4 Computer and automated equipment is maintained to ensure proper functioning and provided with the environmental and operating conditions necessary to maintain the integrity of inspection and test data, and

10.7.5 Appropriate procedures for the maintenance of security of data including the prevention of unauthorized access to, and unauthorized amendment of, computer records are established and implemented.

10.8 Documented procedures shall exist for the purchase, reception and storage of consumable materials used for the technical operations of the agency.

11. Records

11.1 The agency shall establish and maintain a documented system to identify, collect, index, access, file, store, maintain, and dispose of management and technical records to suit its particular circumstances and to comply with applicable regulations.

11.2 A record retention period shall be established but shall be no less than 3 years.

11.3 Records shall be legible and include sufficient information to permit satisfactory recapitulation of the inspection.

11.4 Records shall be safely stored and retained to prevent damage, deterioration or loss.

11.5 Records shall be held secure and in confidence to the client, unless otherwise authorized by the client or required by law, regulation, or valid court order.

12. Report

12.1 The services performed by the agency shall be documented by a retrievable report that accurately, clearly, objectively, and unambiguously presents measurements, observations, examinations, and test results in accordance with the reporting requirements of the inspection or test method(s).

Each test or inspection report also shall include the following unless the contractual agreement specifies otherwise:

12.1.1 A title, for example, "Report of Reinforced Concrete Inspection," "Report of Field Moisture and Density Tests;"

12.1.2 The name, address, and contact information of the agency;

12.1.3 A unique identification of the report (such as report number), the date of issued, a sequential number for each page, and the total number of pages;

12.1.4 The name and address of client (physical or electronic) where appropriate;

12.1.5 Description of, condition of, and clear identification of the item or area (location) inspected or tested;

12.1.6 Date of performance of inspection or test;

12.1.7 Identification of inspection and test methods used or clear description of any non-standard method used;

12.1.8 Any deviations from, additions to, or exclusions from, the inspection or test method and any other information relevant to a specific inspection, or test, such as environmental conditions;

12.1.9 Measurements, observations, examinations, and test results, supported by tables, graphs, sketches, and photographs, as appropriate;

12.1.10 A statement to the effect that the results relate only to the items inspected or tested;

12.1.11 A statement that the report shall not be reproduced, except in full, without the prior written approval of the agency; and

12.1.12 Name(s) of individual(s) performing the inspections or tests;

12.1.13 A signature and title, or an equivalent identification, of the person(s) accepting responsibility for the content of the report (however produced) on behalf of the agency; and

12.1.14 Identification of results obtained from inspections or tests subcontracted by the agency to others. The agency shall not represent the services of others as its own.

12.2 In addition to the requirements of 12.1, each inspection or test report, where necessary for the proper interpretation or understanding of the report, shall include the following:

12.2.1 Project title and reference designation;

12.2.2 Reference to relevant specification(s) or requirement(s);

12.2.3 A statement indicating compliance with approved project plans and specifications; and

12.2.4 Other reporting requirements of the client, the building official, or relevant authority.

12.3 In addition to the requirements of 12.1 and 12.2, test reports presenting results where information on sampling is necessary for the interpretation of the test results shall include the following:

12.3.1 Date of sampling or date sample received, as appropriate;

12.3.2 Clear identification of the material sampled including manufacturer, brand name, lot number, source, or similar unique information, as applicable;

12.3.3 Sampling location, where relevant, using an explicit description, diagram, sketch, or photograph, as applicable;

12.3.4 Identification of sampling methods used, or sampling plan or procedure if a non-standard method was used;

12.3.5 Deviations from, additions to, or exclusions from standard sampling methods or predetermined sampling plans or procedures; and

12.3.6 Details of environmental conditions present during the sampling such as rain or freezing weather that may have affected the testing of the sample or the interpretation of the test results.

12.4 When interpretations of tests, inspections, or samplings are included in the report, the basis for the interpretations shall be clearly explained.

NOTE 1—Interpretations commonly include determination of compliance/noncompliance of the results with requirements or fulfillment of contractual requirements.

12.5 Material revisions or additions to a report after issue shall be made in the form of a further document clearly indicating the revised information and clearly referencing the original report identification. Such revisions or additions shall meet the relevant requirements of 12.2.

12.6 Transmission of inspection or test reports by electronic means shall follow documented procedures to ensure that the requirements of this standard are met and that confidentiality is preserved.

13. Concrete Inspection and Testing

13.1 *General:*

13.1.1 Concrete inspection and testing services will normally include some or all of the following: sampling and testing of ingredients, mixture design, checking of production equipment and procedures, inspection of placement and curing, and laboratory testing of hardened specimens.

13.1.2 The agency shall comply with the most recent edition of Practice C1077 for tests of concrete and aggregate.

14. Soil and Rock Inspection and Testing

14.1 *General:*

14.1.1 Soil and rock inspection and testing services will normally include some or all of the following: sampling and testing of in-situ materials, sampling and testing of materials being processed, sampling and testing of processed materials, inspection and testing of soil and rock placement procedures, and sampling and testing of in-place constructed components.

14.1.2 The agency shall comply with the most recent edition of Practice D3740.

15. Steel Inspection and Testing

15.1 *General:*

15.1.1 Steel inspection and testing services will normally include one or more of the following general functions: inspection at source of base material (the steel mill), inspection at fabrication shop, inspection at erection site, laboratory testing to determine physical and chemical properties of steel, laboratory tests of paints for use on steel structures, qualification of welding procedures and personnel, nondestructive testing (radiographic, magnetic particle, liquid penetrant, ultrasonic, etc.), and inspection of cutting and bending of reinforcing bars and testing of same.

15.1.2 Personnel performing visual inspection of structural steel or piping shall be familiar with the quality requirements of the particular project and the governing codes or standards. Visual weld inspection shall be performed by an AWS Certified Welding Inspector (AWS-QC-1) except as otherwise allowed by contractual agreement. The inspection of welds shall be supervised or overseen by an AWS Certified Welding Inspector or by a Professional Engineer.

15.2 The agency shall be equipped to meet the needs of the procedures required to fulfill the contractual agreement. If the agency subcontracts services to other agencies, these agencies shall be properly equipped.

15.3 *Reference Material*

15.3.1 Appropriate references, relevant to the construction being inspected, including the approved project plans and specifications, shall be readily available to the technicians or inspectors at all times. The following are particularly essential:

15.3.1.1 Applicable parts of *Annual Book of ASTM Standards*,

15.3.1.2 Applicable parts of *AISC Manual of Steel Construction,*

15.3.1.3 Applicable parts of *ASME Boiler and Pressure Vessel Code*

15.3.1.4 Applicable building codes,

15.3.1.5 AWS D1.1,

15.3.1.6 AWS B1.11,

15.3.1.7 AWS D1.5,

15.3.1.8 AWS D1.4, and

15.3.1.9 Steel Joist Institute (SJI) Recommended Code of Standard Practice for Steel Joists and Joist Girders.

15.4 *Laboratory Equipment*—The testing agency responsible for testing steel shall be equipped with at least the following:

15.4.1 Suitable facilities for preparing test specimens.

15.4.2 A screw or hydraulic type of testing machine of sufficient capacity to test the specimen. The machine shall be equipped with suitable gripping and bending tools and with variable speed control. It shall be verified annually in accordance with a procedure specified by Practices E4 and shall meet the accuracy requirement of these procedures. A report giving detail of the verification shall be readily available.

15.4.3 Hardness measuring device (Rockwell or Brinell).

15.4.4 Appropriate measuring equipment such as micrometers, rules, dividers.

15.4.5 Access to a chemical laboratory suitably equipped for the analysis of constituents and alloying elements of structural steels, and for analysis of paints to applicable specification.

15.4.6 AWS standard guided-bend test jig.

15.4.7 Bend test jig for reinforcing steel.

15.5 *Field Equipment (Mill, Fabrication, and Erection)*—The agency should be equipped with the following items of equipment appropriate to the service to be rendered:

15.5.1 Steel tape, rule, calipers, and other appropriate measuring equipment.

15.5.2 Weld dimension gage.

15.5.3 Weld viewing shield.

15.5.4 Hammer for weld testing.

15.5.5 Battery operated hand light.

15.5.6 Paint thickness gage.

15.5.7 Thermometer (or temperature-measuring crayons).

15.5.8 Inspector's identification stamp or tags.

15.5.9 Inspection wrench (a torque wrench used per AISC requirements) for high strength bolts.

15.5.10 *Tension Calibrator (Tension Measuring Device)*—The accuracy of a tension calibrator shall be confirmed through calibration at least annually. Three of the AISC approved methods for installing pretension bolts in slip critical connections do not rely on any torque measurements at all. The turn-of-nut method (favored by AISC), the alternate design fastener method, and direct tension indicator method do not rely on torque measurements, but rather on observing nut rotation, the snap off of a mandrel, or deformation of tension indicators; these methods require initial verification using a tension measuring device.

15.6 *Qualifications for Nondestructive Testing Agencies*—When nondestructive testing is required, the agency performing the testing shall meet in their entirety the requirements of Practice E543.

16. Nondestructive Testing Agencies

16.1 Nondestructive Testing will usually include tests performed by the following methods: Radiographic Testing (RT), Ultrasonic Testing (UT), Liquid Penetrant Testing (PT) and Magnetic Particle Testing (MT).

16.2 The agency shall comply with the most recent edition of Practice E543 and to the other requirements specified in Sections 5 – 12 of this specification.

17. Sprayed Fire Resistive Inspection and Testing

17.1 *General:*

17.1.1 Spray-applied fire-resistive material inspection and testing will normally include some or all of the following services:

17.1.1.1 Inspection of application, in accordance with the "Inspection Procedures" Section of Practice E1513.

17.1.1.2 Testing of thickness and density in accordance with Test Methods E605.

17.1.1.3 Testing of cohesion/adhesion in accordance with Test Method E736.

17.2 The agency shall comply with the requirements specified in Sections 5 – 12 of this specification.

18. On-Site Inspection of Installed Firestops

18.1 *General:*

18.1.1 On-site inspection of installed firestops will normally address all types of firestops installed through or onto fire resistive assemblies.

18.1.2 A standard practice is provided in Practice E2174 and Practice E2393.

18.2 The agency shall comply with the requirements in Sections 5 – 12 of this specification.

19. Bituminous Inspection and Testing

19.1 *General:*

19.1.1 Bituminous inspection and testing services will normally include some or all of the following services:

19.1.1.1 Sampling of the bituminous material at the refinery, terminal, mix plant, or project site,

19.1.1.2 Testing of bituminous materials and mixtures in the laboratory,

19.1.1.3 Investigation of aggregate at source for compliance with the specification requirements,

19.1.1.4 Preparation of mix design with or without stability determinations such as Marshall, Hubbard-Field, Hveem, or others,

19.1.1.5 Inspection of proportioning and mixing at the plant or project site,

19.1.1.6 Determination of percent bitumen and grading of aggregates in mix,

19.1.1.7 Determination of stability in mix,

19.1.1.8 Inspection of spreading and rolling,

19.1.1.9 Determination of thickness of compacted mix, and

19.1.1.10 Determination of density of samples from compacted surface.

19.1.2 The agency shall comply with the most recent edition of Specification D3666.

20. Masonry Inspection and Testing

20.1 *General:*

20.1.1 Masonry inspection and testing services will normally include some or all of the following services:

20.1.1.1 Sampling and inspecting the raw materials used in the manufacture of masonry units,

20.1.1.2 Inspecting the manufacture of masonry units,

20.1.1.3 Sampling and testing masonry units,

20.1.1.4 Preparing grout and mortar mixture design,

20.1.1.5 Inspecting and testing the production and placement of grout and mortar, and

20.1.1.6 Inspecting and testing the reinforcing steel used in masonry construction.

20.1.2 The agency shall comply with the most recent edition of Practice C1093 for tests of masonry, grout, and mortar.

21. Keywords

21.1 accreditations; competencies; construction materials; evaluating; inspection agencies; personnel qualifications; Special Inspections; testing agencies; verifications

SUMMARY OF CHANGES

Committee E36 has identified the location of selected changes to this standard since the last issue (E329 – 14a) that may impact the use of this standard. (Approved Jan. 1, 2018)

(1) Deleted Note 1.

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