Designation: C1487 – 19

Standard Guide for Remedying Structural Silicone Glazing[1]

This standard is issued under the fixed designation C1487; 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.

1. Scope

1.1 This guide provides recommendations for remedying existing structural sealant glazing (hereinafter called SSG) installations in situ. Remedial work may be necessary when a lite of glass is replaced, for routine maintenance, or after distress is discovered. This guide focuses on large-scale remedies, not isolated repairs or maintenance.

1.2 Committee C24 is not aware of any comparable standards published by other organizations.

1.3 *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:*[2]

C717 Terminology of Building Seals and Sealants

C1392 Guide for Evaluating Failure of Structural Sealant Glazing

C1394 Guide for In-Situ Structural Silicone Glazing Evaluation

C1401 Guide for Structural Sealant Glazing

E330 Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference

E997 Test Method for Evaluating Glass Breakage Probability Under the Influence of Uniform Static Loads by Proof Load Testing

E1233 Test Method for Structural Performance of Exterior Windows, Doors, Skylights, and Curtain Walls by Cyclic Air Pressure Differential

3. Terminology

3.1 *Definitions*—Definitions of the terms used in this guide are found in Terminology C717.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *distress, n*—the individual or collective physical manifestations of a failure as perceivable problems. For SSG, such distress may include sealant adhesive failure, sealant cohesive failure, shifting of a lite, loss of a lite, or water infiltration (see Guide C1394).

3.2.2 *qualified person, n*—one with a recognized degree or professional registration and extensive knowledge and experience in the field of SSG, and who is capable of design, analysis, and evaluation in the subject.

4. Significance and Use

4.1 Guidelines are provided for remedying existing SSG installations. Refer to Guide C1401 for a complete discussion of proper SSG design, installation, and materials.

4.2 Due to the unlimited range of materials that may be used in a particular building, and because each design is unique, the information contained in this guide is general in nature.

4.3 This guide should not be the only reference consulted when designing remedies for SSG. For example, the local building code and the manufacturers' product literature for the actual materials used, if known, also should be considered. The sealant manufacturer(s) should be involved fully with the remedial design.

4.4 This guide is intended to be a resource, but it is not a substitute for experience and judgement in designing remedies for the specialized types of construction discussed. It is intended to be used in conjunction with other resources as an aid in remedying problems with existing SSG.

5. Introduction

5.1 There are numerous reasons that a building owner or manager, hereinafter referred to as owner, may choose to remedy an SSG system, including routine maintenance or to correct discovered deficiencies. Regardless of the reason that such a remedy is undertaken, it is recommended that the remedial design and construction be performed under the supervision of a qualified person.

[1] This guide is under the jurisdiction of ASTM Committee C24 on Building Seals and Sealants and is the direct responsibility of Subcommittee C24.10 on Specifications, Guides and Practices.

Current edition approved Oct. 15, 2019. Published October 2019. Originally approved in 2000. Last previous edition approved in 2012 as C1487–02(2012). DOI: 10.1520/C1487-19.

[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.

5.2 It is essential to begin the remedial process with a comprehensive evaluation, in accordance with the guidelines established in Guide C1394. The underlying cause of failure must be understood fully prior to implementing a remedy; otherwise, the failure may be repeated.

5.3 Based on the outcome of the evaluation, various remedies may be indicated. The potential remedies include, depending on the pervasiveness and the nature of the problem, the following:

5.3.1 Isolated repairs (such as the replacement of an individual lite of glass) can be performed by a competent glazier trained in the proper installation of SSG. If the original SSG was properly performed, then such minor repairs can be effected by careful duplication of the original procedures.

5.3.2 In-situ remedial work is necessary where pervasive problems exist in an SSG application, such as due to poor design or workmanship during original construction.

5.3.3 Complete reglazing may be necessary in extreme cases or at the end of the useful service life, in accordance with the principles for new SSG. For example, if the existing joint configuration does not allow adequate cleaning to replace a structural joint, it may be necessary to reglaze, because adhesion is critical to the performance of SSG and cleaning is critical to adhesion.

5.4 The remainder of this guide particularly addresses the type of in-situ remedial SSG projects as described in 5.3.2, to correct a pervasive problem without comprehensive reglazing.

6. Remedial Design

6.1 If it is determined that a large-scale remedial program is necessary, then a remedial design should be developed by a qualified person.

6.2 Depending on the cause of the problem(s) with the existing installation, it may not be prudent to rely on the original SSG design.

6.3 The remedial design should include the following:

6.3.1 Calculations of the structural sealant stress so that the final installation will comply with the SSG industry guidelines (see Guide C1401) and applicable codes. In some jurisdictions, glass replacement triggers the requirement to comply with the current building code for glass strength and structural sealant joint capacity, rather than the code under which the building was originally constructed.

6.3.2 Sealant product selection to be compatible with all existing materials that it will contact.

6.3.3 Accessory product selection, if any are replaced or added by the remedy, to be compatible with all existing materials that they will contact.

7. Field Testing

7.1 Prior to implementing the proposed remedial work, field testing should be performed under the direction of a qualified person. Whereas in new SSG installations it is possible to perform laboratory testing to verify the adhesion characteristics of the products and substrates, remedial SSG usually requires field testing. In-situ adhesion testing is strongly recommended for the selected product combination, including cleaner, primer, sealant, and the actual adhesion surface of the substrate.

7.2 Field testing of the actual adhesion surface of the substrate is recommended, rather than another face of the same component, because the adhesion characteristics may vary with exposure. It may be necessary to deglaze a lite to access the actual adhesion surface. It is not recommended to test faces of components other than those actually scheduled for permanent adhesion because the adhesion characteristics can vary with exposure and manufacturing processes.

7.3 Because the field test procedure may be cumbersome and expensive to perform, it is recommended to perform pretesting to screen possible combinations of products. These preliminary tests may be performed in the laboratory or in the field on convenient surfaces of the components, rather than the actual adhesion surfaces.

7.4 To verify adhesion with the final product combination, one field test procedure is as follows:

7.4.1 Perform a minimum of three tests in selected mock-up areas. More tests should be performed depending on the reasons for repair, or if the existing conditions vary with exposure or other variables.

7.4.2 Apply structural sealant and accessories to actual adhesion surfaces exactly as they are intended to be installed during full-scale production work.

7.4.3 Adjust the installation so that the structural sealant is exposed, for example, a weatherseal joint may have to be omitted during testing.

7.4.4 After the cure time recommended by the sealant manufacturer, install chambers over the test joints and adjacent substrates. Bed chambers in sealant and adhere to the face of the metal and glass, leaving the top open for filling. See Fig. 1.

7.4.5 Fill the chambers with distilled water, causing the face of the test joints to be completely immersed in water. Seal the top edge of the chambers after filling, to prevent evaporation. In cold climates, consideration should be given to protecting the chamber from freezing.

7.4.6 After seven days water immersion, remove chambers and perform adhesion tests as prescribed by the sealant manufacturer. Acceptance criteria should be determined by the sealant manufacturer.

7.5 Finally, prior to proceeding with implementation of the remedial work, consideration should be given to performing a full-scale load test on representative mock-ups. These tests can be performed using suction cups on the exterior or interior of the glass (Guide C1392) or pressurized chambers on the interior or exterior (Test Methods E330, E997, or E1233). Such tests are often conducted at 1.5 times the design wind service load. Depending on the specific causes of failure identified by evaluation (Guide C1394), it may be appropriate to test individual components at different test loads.

8. Remedial Work

8.1 Once a remedial program has been developed and tested, it is essential that the production work be implemented exactly like the approved mock-ups.