NATIONAL STORM SHELTER ASSOCIATION
Storm Shelter Quality Verification

Available Guides and Standards

The highest level of shelter quality and resulting public safety will result when design, construction, and installation are in compliance with the most comprehensive and extensive standard available, currently the ICC 500, the International Code Council/National Storm Shelter Association (ICC/NSSA) Standard for Design and Construction of Storm Shelters. It may be purchased from the International Code Council(ICC - International Code Council Store) or from the NSSA (ICC-NSSA Standards). Without full compliance, vulnerabilities may exist and safety may be compromised.

While the Federal Emergency Management Agency (FEMA) does not approve, adopt, or endorse products or standards, the Agency acknowledges that shelters complying with the NSSA Standard meet all FEMA criteria as stated in FEMA 320, *Building a Safe Room For Your Home or Small Business.*

The need for quality control in the relatively new, rapidly expanding shelter industry is discussed below. Also discussed are quality control mechanisms being implemented by NSSA for the emerging shelter industry.

Fundamental Performance Criteria

The most fundamental shelter performance criteria include the ability to prevent perforation by wind-borne debris and the ability to withstand the pressures imposed by extreme winds. Verification that shelters meet these criteria requires testing of aboveground shelters for debris impact resistance and analysis of the shelter for structural integrity (including doors with special attention to latching devices). Venting is also important. Deviations from FEMA 320 designs should be checked for adequacy by a qualified design professional.

None of the FEMA publications mentioned above provides extensive guidance on design of underground shelters. Critical considerations for underground shelters include debris impact resistance of doors and exposed portions of the shelter, capacity of doors and latching mechanisms to withstand wind-induced pressures, resistance to soil and hydrostatic pressures, resistance to flotation, venting and safe access/egress facilities.

The ICC 500 Standard is comprehensive, covering all types and sizes of shelters. It is incumbent upon professionals who design shelters or approve shelter designs to be thoroughly familiar with the ICC 500 Standard and to apply appropriate wind loads to the shelter. Both FEMA 320 and FEMA 361 give design guidance. Because of a very limited science base, compliance verification of debris impact resistance requires testing or judgments by experienced test engineers. Hence design engineers should not be expected to verify compliance with debris impact criteria. Such verifications can be made only by qualified testing laboratories.

Highest Known Quality Assurance Level

The highest quality assurance level is afforded by Producer Members of the National Storm Shelter Association. The application process for shelter producers requires that applicants:

1. Pledge to produce only those shelters that meet or exceed the ICC 500 standard
2. Abide by the Bylaws and Code of Ethics of NSSA which includes business practices
3. Subject their shelter designs and design changes to the scrutiny of an independent third party approved by NSSA
4. Have their shelters tested for debris impact resistance
5. File a Certificate of Installation with NSSA for each shelter installed

Shelter Producer Members are required to affix a seal to each shelter produced, certifying that it was designed, constructed, and installed to meet current standards. Each seal bears a serial number that is registered with NSSA when the Certificate of Installation is filed with NSSA headquarters..

This process emphasizes the professional conduct of shelter producers and their meeting or exceeding the most comprehensive performance standard available. Hence code officials or approval agencies achieve the highest level of quality assurance by recognizing shelter producers who are Producer Members of NSSA.

Minimum Quality Assurance Level

Approval agencies for shelter installation or incentive grants can feel confident that shelters produced and installed by NSSA members meet or exceed the NSSA Standard. For shelters produced by others, approval agencies should, at a minimum, require the following of shelter producers:

Site-built residential shelters should be checked for compliance with FEMA 320 by a qualified code official, building inspector, or by a registered design professional. Deviations from 320 designs should be evaluated by a registered professional engineer whose approval is given in a document bearing a professional seal.

Producers of manufactured shelters or site-built shelters not shown in FEMA 320 should be required to present: (1) a report or letter from an NSSA-approved test laboratory indicating that the shelter meets the FEMA criteria for debris impact resistance, and (2) a letter bearing the seal of a registered professional engineer indicating that the shelter meets all aspects of the NSSA standard (exclusive of debris impact resistance requirements). Agencies approved by NSSA to make such evaluations are listed on the NSSA web site http://www.nssa.cc/ProducerMembership.php

List of Shelter Producers

A list of shelter manufacturers who have had shelters or shelter components tested at Texas Tech University for debris impact resistance can be viewed on the web at the *Shelters Tested* section of www.wind.ttu.edu A list of companies that have met NSSA Producer Member requirements may be found on the web at www.NSSA.cc This list is short because few producers have invested the time and money for quality verification. The NSSA Seal program, open only to members of NSSA, is described in the NSSA Bylaws.