Georgia State
International Building Code

Appendix N
Disaster Resilient Construction

(2012 Edition)

PROPOSED

Georgia Department of Community Affairs
Local Government Assistance Division
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GEORGIA STATE INTERNATIONAL BUILDING CODE
APPENDIX N
DISASTER RESILIENT CONSTRUCTION

The INTERNATIONAL BUILDING CODE, 2012 Edition, published by the International Code Council, when used in conjunction with the Georgia State Amendments to the INTERNATIONAL BUILDING CODE, 2012 Edition and Appendix N Disaster Resilient Construction, shall constitute the official *Georgia State Minimum Standard Building Code.*

FORWARD

Introduction

The Department of Community Affairs (DCA) was awarded a grant through the U.S. Department of Housing and Urban Development (HUD) to develop Disaster Resilient Building Code (DRBC) Appendices for the International Building Code (IBC) and the International Residential Code (IRC). The DRBC Appendices are optional regulations that local jurisdictions may adopt, in whole or in part, through local ordinance. A task force of stakeholders was appointed to look for opportunities to improve any code provisions relating to damage from hurricane, flood, and tornado disasters. In addition to the approved recommendations from the task force, the state has developed and will conduct a comprehensive training program for code enforcement officials on the importance, implementation and enforcement of the Disaster Resilient Construction Appendices.

The meetings for the Disaster Resilient Building Code Appendices Task Force were open to the public, interested individuals and organizations that desired participation. The technical content of currently published documents on flooding, high-wind construction, and storm shelters, were used and referenced. Those publications included documents of the International Code Council (ICC), American Society of Civil Engineers (ASCE), the Federal Emergency Management Agency (FEMA), Mitigation Assessment Team (MAT) Program, Georgia Emergency Management Agency/Homeland Security (GEMA), APA – The Engineered Wood Association, National Institute of Standards and Technology (NIST), National Oceanic and Atmospheric Administration (NOAA), National Science Foundation (NSF), The State of Florida, American Forest & Paper Association's American Wood Council, Southern Forest Products Association, NAHB Research Center, Insurance Institute for Business & Home Safety, and the Federal Alliance for Safe Homes.

Adoption

Local jurisdictions may adopt this entire appendix with chosen options or specific sections that apply to their communities through a local ordinance. The adopting ordinance must also be filed on record with DCA. A sample ordinance has been included in this document to assist the local jurisdictions with the adoption process. Recommended training is being offered to assist code enforcement officials in the implementation and enforcement of the appendices documents. Contact DCA at (404) 679-3118 or www.dca.ga.gov for more information.

Neither The Disaster Resilient Building Code Appendices Task Force, its members nor those participating in the development of Appendix N Disaster Resilient Construction accept any liability resulting from compliance or noncompliance with the provisions of Appendix N Disaster Resilient Construction.

The 2012 Disaster Resilient Building Code (DRBC) Appendices Task Force was charged with the development of two appendices. One appendix is for the International Residential Code and the other appendix is for the International Building Code. These two appendices look for opportunities to improve any provisions relating to hurricane, flood, and tornado disasters. In addition to improving existing provisions in the codes, the task force also developed new provisions to be included in the appendices that address these issues. These appendices contain increased construction requirements for disaster resilience and are intended to be made available for adoption by local jurisdictions in the State of Georgia.

These appendices have reasonable and substantial connection with the public health, safety, and general welfare. In addition, the financial impact and costs associated with these appendices have been taken into consideration.

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Mr. Bill Abballe, AIA, American Institute of Architects (AIA) – Georgia Chapter
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Mr. Alan Giles, , CFM, Georgia Department of Natural Resources (EPD / Floodplain Management Unit)
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Mr. Calvin Jordan, 2012 International Building Code Task Force Liaison, Code Consultant

How to Use *Appendix N Disaster Resilient Construction*

The appendix may be adopted in whole or in part by Local Jurisdictions to fit the needs of their community. The following sample ordinance has been provided to aid in the process of indentifying Chapters and Sections of the appendix that may be adopted. The format easily allows for choosing to adopt, revise or delete individual Chapters and Sections. Download the MS Word (.doc) version from the DCA website to take advantage of the dropdown menu choices and edit ability features of the document. Note that in Chapter 3, choose one of three options for flood elevation. Only one option may be chosen and that option must be higher than what has been previously adopted and enforced by the jurisdiction. Also note that in Chapter 4, choose one of three options for increased wind load. Only one option may be chosen and that option must be higher than what has been previously adopted and enforced by the jurisdiction. The Sample Ordinance document takes into account the flood elevation option in Chapter 3 and the wind load option in Chapter 4 of this appendix.

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SAMPLE ORDINANCE FOR ADOPTION OF

GEORGIA STATE INTERNATIONAL BUILDING CODE

APPENDIX N
DISASTER RESILIENT CONSTRUCTION

ORDINANCE NO._____

An ordinance of the **[JURISDICTION]** adopting the latest edition as adopted and amended by the Georgia Department of Community Affairs of *Appendix N Disaster Resilient Construction* regulating and governing the mitigation of hazard to life and property from natural weather related disasters, high-wind damages, flooding, and establishing construction standards for storm shelters in the **[JURISDICTION]**; providing for the issuance of permits and collection of fees therefore; repealing Ordinance No. ____ of the **[JURISDICTION]** and all other ordinances or parts of the laws in conflict therewith.

The **[GOVERNING BODY]** of the **[JURISDICTION]** does ordain as follows:

Section 1. That a certain document, three (3) copies of which are on file in the office of the **[TITLE OF JURISDICTION'S KEEPER OF RECORDS]** of **[NAME OF JURISDICTION]**, being marked and designated as *Appendix N Disaster Resilient Construction* to the International Building Code, the latest edition as adopted and amended by the Georgia Department of Community Affairs, be and is adopted as the *Appendix N Disaster Resilient Construction* of the **[JURISDICTION]**, in the State of Georgia for regulating and governing the mitigation of hazard to life and property from natural weather related disasters, high-wind damages, flooding, and establishing construction standards for storm shelters; providing for the issuance of permits and collection of fees therefore; and each and all of the regulations, provisions, penalties, conditions and terms of said *Appendix N Disaster Resilient Construction* on file in the office of the **[JURISDICTION]** are hereby referred to, adopted, and made a part hereof, as if fully set out in this ordinance, with the additions, insertions, deletions and changes, if any prescribed in Section 2 of this ordinance.

Section 2. [NAME Of JURISDICTION] hereby:

Choose an item. CHAPTER AN1 SCOPE AND ADMINISTRATION Choose an item.

Choose an item. SECTION AN101 ADMINISTRATION Choose an item.

Choose an item. AN101.1 Purpose Choose an item.

Choose an item. AN101.2 Objectives Choose an item.

Choose an item. AN101.3 Scope Choose an item.

AN101.3.1 Insert [Name Of Jurisdiction] for [NAME OF JURISDICTION].

Choose an item. AN101.4 Violations Choose an item.

Insert [Name Of Jurisdiction] for [NAME OF JURISDICTION].

Choose an item. SECTION AN102 APPLICABILITY Choose an item.

Choose an item. AN102.1 General Choose an item.

Choose an item. AN102.2 Other laws Choose an item.

Choose an item. AN102.3 Referenced codes and standards Choose an item.

Choose an item. SECTION AN103 POST DISASTER EVENT INSPECTIONS GUIDLINES Choose an item.

Choose an item. AN103.1 Inspections Choose an item.

Choose an item. AN103.1.1 Right of entry Choose an item.

Choose an item. AN103.2 Types of inspections Choose an item.

Choose an item. AN103.3 Post disaster building safety evaluation chart Choose an item.

Choose an item. Figure AN103.3 Post Disaster Building Safety Evaluation Chart Choose an item.

Choose an item. AN103.4 Evaluation Forms Choose an item.

Insert [Name Of Jurisdiction] for [NAME OF JURISDICTION].

Choose an item. AN103.5 Placement and remove of placards Choose an item.

Choose an item. CHAPTER AN2 DEFINITIONS Choose an item.

Choose an item. SECTION AN201 GENERAL Choose an item.

Choose an item. AN201.1 Scope Choose an item.

Choose an item. AN201.2 Terms defined in other codes Choose an item.

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Choose an item. AN201.3 Terms not defined Choose an item.
Choose an item. SECTION AN202 DEFINITIONS Choose an item.
Choose an item. CHAPTER AN3 FLOOD-RESISTANT CONSTRUCTION Choose an item.
Choose an item. SECTION AN301 HAZARD IDENTIFICATION Choose an item.
Choose an item. AN301.1 Identification of flood hazard areas Choose an item.
Insert [Name Of Jurisdiction] for [NAME OF JURISDICTION].
Insert [Date of Issuance] for [DATE OF ISSUANCE].
Choose an item. SECTION AN302 SCOPE Choose an item.
Choose an item. AN301.1 Flood Loads Choose an item.
Choose an item. FLOOD ELEVATION OPTION Choose an item. Choose an item.
Choose an item. SECTION AN303 FLOOD DAMAGE-RESISTANT MATERIALS Choose an item.
Choose an item. AN303.1 Flood damage-resistant materials Choose an item.
Choose an item. AN303.2 Location of flood damage-resistant materials Choose an item.
Choose an item. AN303.3 Fasteners and connectors used for flood-resistant materials Choose an item.
Choose an item. CHAPTER AN4 HIGH-WIND RESISTIVE CONSTRUCTION Choose an item.
Choose an item. SECTION AN401 GENERAL Choose an item.
Choose an item. AN401.1 Applications Choose an item.
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Choose an item. AN403.4 Continuous operation of Risk Category IV buildings Choose an item.
Choose an item. SECTION Choose an item. Choose an item.
Choose an item. CHAPTER AN5 STORM SHELTERS, SAFE ROOMS AND BEST AVAILABLE REFUGE AREAS Choose an item.
Choose an item. SECTION AN501 GENERAL Choose an item.
Choose an item. AN501.1 General Choose an item.
Choose an item. AN501.2 Occupant load Choose an item.
Choose an item. AN501.3 Construction documents Choose an item.
Choose an item. AN501.4 Signage Choose an item.
Choose an item. SECTION AN502 DEFINITIONS AND NOTATIONS Choose an item.
Choose an item. AN502.1 Definitions Choose an item.
Choose an item. AN502.2 Additional definitions Choose an item.
Choose an item. SECTION AN503 BEST AVAILABLE REFUGE AREAS Choose an item.
Choose an item. AN503.1 General Choose an item.
Choose an item. AN503.2 Occupant Density Choose an item.
Choose an item. AN503.3 Identification of best available refuge areas Choose an item.
Choose an item. SECTION AN504 APPLICABILITY Choose an item.
Choose an item. AN504.1 Required storm shelters or safe rooms Choose an item.

Section 3. That Ordinance No. ____ of **[JURISDICTION]** entitled **[FILL IN HERE THE COMPLETE TITLE OF THE LEGISLATION OR LAWS IN EFFECT AT THE PRESENT TIME SO THAT THEY WILL BE REPEALED BY DEFINITE MENTION]** and all other ordinances or parts of laws in conflict herewith are hereby repealed.

Section 4. That if any section, subsection, sentence, clause or phrase of this ordinance is, for any reason, held to be unconstitutional, such decision shall not affect the validity of the remaining portions of this ordinance. The **[GOVERNING BODY]** hereby declares that it would have passed this law, and each section, subsection, clause or phrase thereof, irrespective of the fact that any one or more sections, subsections, sentences, clauses and phrases be declared unconstitutional.

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Section 5. That nothing in this ordinance or in *Appendix N Disaster Resilient Construction* hereby adopted shall be construed to affect any suit or proceeding impending in any court, or any rights acquired, or liability incurred, or any cause or causes of action acquired or existing under any act or ordinance hereby repealed as cited in Section 3 of this ordinance; nor shall any just or legal right or remedy of any character be lost, impaired or affected by this ordinance.

Section 6. That the **[JURISDICTION'S KEEPER OF RECORDS]** is hereby ordered and directed to cause this ordinance to be published. (An additional provision may be required to direct the number of times the ordinance is to be published and to specify that it is to be in a newspaper in general circulation. Posting may also be required.)

Section 7. That this ordinance and the rules, regulations, provisions, requirements, orders and matters established and adopted hereby shall take effect and be in full force and effect **[TIME PERIOD]** from and after the date of its final passage and adoption.

Section 8. Chapter AN6 Resources, of this document is intended to be used by the building officials as a resource guide.

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APPENDIX N
DISASTER RESILIENT CONSTRUCTION

CHAPTER AN1
SCOPE AND ADMINISTRATION

SECTION AN101
ADMINISTRATION

AN101.1 Purpose. The scope of this appendix is to promote enhanced public health, safety and general welfare and to reduce public and private property losses due to hazards and natural disasters associated with flooding, high-winds, and windborne debris above that which is provided in the general provisions of this appendix.

AN101.2 Objectives. The objectives of this appendix are to:

1. Protect human life, to minimize property loss and to minimize the expenditures of public money associated with natural weather related disasters, including flooding, tornadoes and other high-wind events.
2. Establish enhanced design and construction regulations consistent with nationally recognized good practices for the safeguarding of life and property.

AN101.3 Scope.

AN101.3.1 The provisions of this appendix are not mandatory unless specifically referenced in an adopting ordinance of **[NAME OF JURISDICTION]**. If adopted, the provisions shall apply to all new development and to substantial improvements to existing development.

AN101.3.2 The provisions of this appendix supplement the jurisdiction's building and fire codes to provide for enhanced provisions to mitigate the hazard to life and property from natural weather related disasters, including flooding, tornadoes and other high-wind events.

AN101.3.3 The provisions of this appendix establish design and construction standards for storm shelters.

AN101.4 Violations. Any violation of a provision of this appendix or failure to comply with a permit of variance issued pursuant to this appendix or any requirement of this appendix shall be handled in accordance with the ordinances of **[NAME OF JURISDICTION]**.

SECTION AN102
APPLICABILITY

AN102.1 General. This appendix provides enhanced minimum requirements for development of new construction and substantial improvement of existing development above that contained in the *International Building Code (IBC)*.

AN102.1.1 The provisions of this appendix shall apply to all new construction and additions, and shall apply to substantial alterations in flood hazard areas unless it is technically infeasible or otherwise exempted in Section 3403.2 of the *International Building Code*.

AN102.1.2 Regardless of the category of work being performed, the work shall not cause the structure to become unsafe or adversely affect the performance of the building; shall not cause an existing mechanical or plumbing system to become unsafe, hazardous, insanitary or overloaded; and unless expressly permitted by these provisions, shall not make the building any less compliant with this appendix or to any previously approved alternative arrangements than it was before the work was undertaken.

AN102.1.3 Where there is a conflict between a requirement of the *International Building Code* and a requirement of this appendix, the requirement of this appendix shall govern. Where there is a conflict between a general requirement of this appendix and a specific requirement of this appendix, the specific requirement shall govern. Where, in any specific case, different sections of this appendix specify different materials, methods of construction or other requirements, the most restrictive shall govern.

AN102.2 Other laws. The provisions of this appendix shall not be deemed to nullify any provisions of local, state or federal law.

AN102.3 Referenced codes and standards. The codes and standards referenced in this appendix shall be those that are listed in Chapter AN7 and such codes and standards shall be considered as part of the requirements of this appendix to the prescribed extent of each such reference. Where differences occur between provisions

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this appendix and referenced codes and standards, the provisions of this appendix shall apply.

SECTION AN103
POST DISASTER EVENT INSPECTIONS GUIDELINES

AN103.1 Inspections. The building official or agents shall inspect buildings and structures to determine the habitability of each with the goal of getting the community back into their residences quickly and safely. Inspections shall always be performed by teams of at least two individuals, also known as disaster assessment teams.

AN103.1.1 Right of entry. Unless permitted under the exigent circumstances provisions or from an order from State or Federal Authorities, disaster assessment teams shall confirm the right of entry requirements with the incident commander. Upon approval, the assessment teams shall be authorized to enter the structure or premises at reasonable times to inspect or perform duties as provided by this code, provided that the structure or premises be occupied, that credentials are presented, that entry is requested, and that entry is granted by the owner or person having charge over the structure or premises.

AN103.2 Types of inspections.

AN103.2.1 Rapid evaluation. Rapid evaluation is performed after a disaster event to determine if a building is apparently safe or obviously unsafe. The evaluation should last 10 to 30 minutes per building and shall be performed by the building official and/or their designated responders. Evaluation shall determine if a detailed evaluation is necessary. Placards are posted on buildings indicating status as one of the following:

1. INSPECTED
2. RESTRICTED USE
3. UNSAFE

See Section AN605 for Placards that may be reproduced for use in the field during evaluations. The jurisdiction shall alter placards to meet the jurisdiction and building department's requirements.

AN103.2.2 Detailed evaluation. Detailed evaluation is a thorough visual examination of a damaged building performed by a team of two, including an inspector and a design professional. Evaluation should last 30 minutes to 4 hours per building. Evaluation shall determine necessary restrictions on a damaged building's use, the need for an engineering evaluation or to evaluate postings.

AN103.2.3 Engineering evaluation. When indicated by the building official as necessary, engineering evaluations shall be completed by a registered design professional hired by the building owner.

AN103.3 Post disaster building safety evaluation chart. See Figure AN103.3 for Post Disaster Building Safety Evaluation Chart.

AN103.4 Evaluation Forms. *ATC-45 Rapid Evaluation Safety Assessment Form* and *ATC-45 Detailed Evaluation Safety Assessment Form* shall be used by **[Name of Jurisdiction]'s** Building Official for post disaster inspections. See Section AN605 for copies of the Safety Assessment Forms.

AN103.5 Placement and removal of placards.

AN103.5.1 Placement. Placards are to be posted in a clearly visible location near the main entrance and shall be visible from the public right-of-way. RESTRICTED USE or UNSAFE placards shall be placed at all entrances.

AN103.5.2 Removal. Placards shall not be removed or replaced, except by the authorized representatives of the local jurisdiction.

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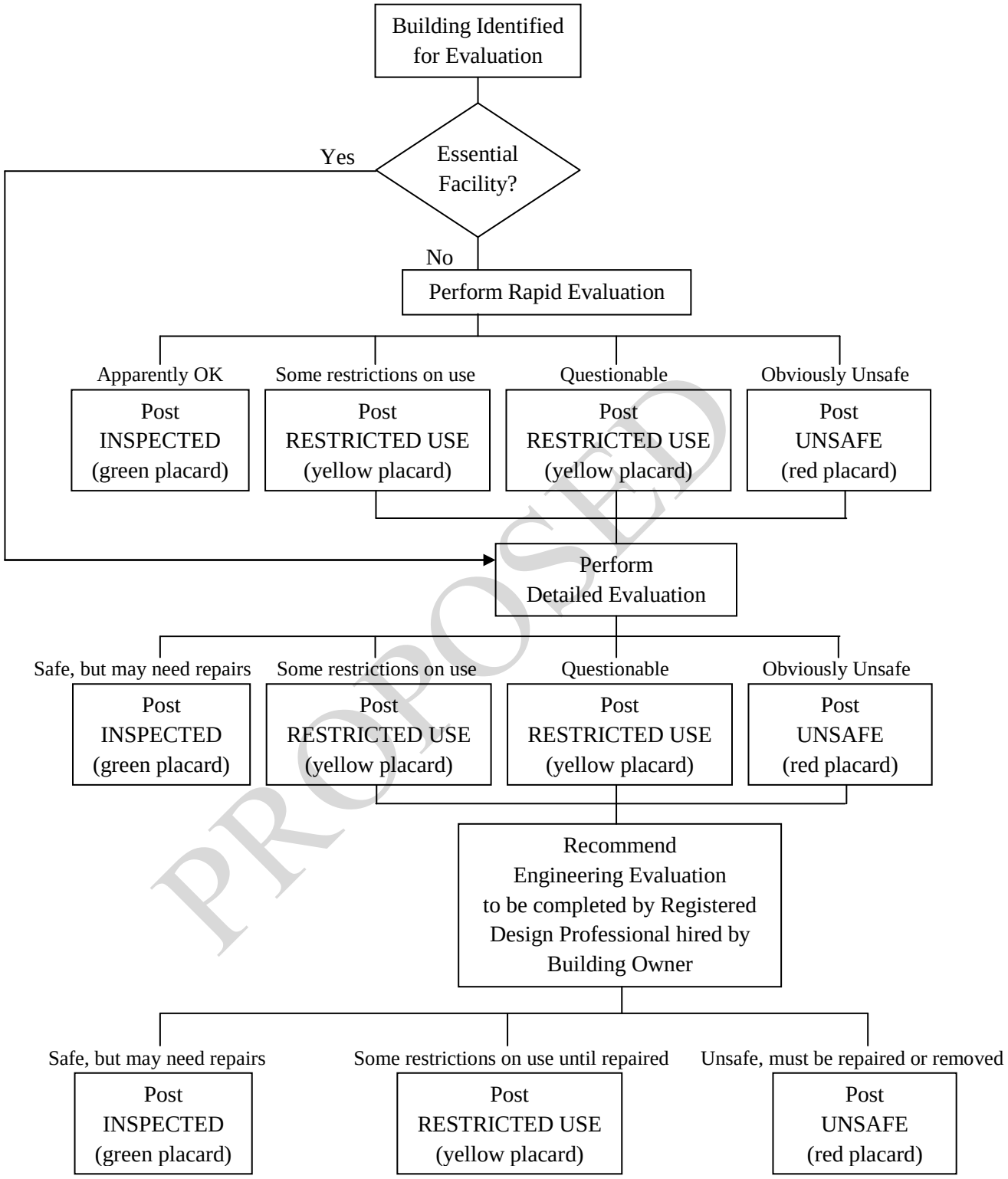
Figure AN103.3 Post Disaster Building Safety Evaluation Chart [a]



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[a] *When Disaster Strikes* by the International Code Council, Inc., Seventh Printing: November 2011, copyright 2007

CHAPTER AN2
DEFINITIONS

SECTION AN201
GENERAL

AN201.1 Scope. Unless otherwise expressly stated the following words and terms shall, for the purposes of this appendix, have the meanings shown in this chapter.

AN201.2 Terms defined in other codes. Where terms are not defined in this appendix and are defined in other *International Codes*, such terms shall have the meanings ascribed to them as in those codes.

AN201.3 Terms not defined. Where terms are not defined through the methods authorized by this section, such terms shall have their ordinarily accepted meanings such as the context implies.

SECTION AN202
DEFINITIONS

500-YEAR FLOOD. Flood having a 0.2% annual probability of being equaled or exceeded.

ADVISORY BASE FLOOD ELEVATION (ABFE). An advisory base flood elevation (BFE) issued by the Federal Emergency Management Agency (FEMA) that reflects post-storm conditions and vulnerability to damages from future flooding.

BASE FLOOD. Flood having a 1% chance of being equaled or exceeded in any given year, also referred to as the 100-year flood.

BASE FLOOD ELEVATION (BFE). The elevation of flooding, including wave height, having a 1% chance of being equaled or exceeded in any given year established relative to the National Geodetic Vertical Datum (NGVD), North American Vertical Datum (NAVD) or other datum specified on the *Flood Insurance Rate Map* (FIRM).

BUILDING OFFICIAL. The officer or other designated authority charged with the administration and enforcement of the *International Building Code*, or the building official's duly authorized representative.

DESIGN FLOOD. The greater of the following two flood events:

(1) The *base flood*, affecting those areas identified as *special flood hazard areas* on the community's FIRM;

(2) The flood corresponding to the area designated as a *flood hazard area* on a community's *flood hazard map* or otherwise legally designated.

DESIGN FLOOD ELEVATION (DFE). The elevation of the *design flood*, including wave height, relative to the datum specified on the community's legally designated flood hazard map. In areas designated as Zone AO, the *design flood elevation* shall be the elevation of the highest existing grade of the building's perimeter plus the depth number (in feet) specified on the flood hazard map.

FLOOD [DAMAGE]-RESISTANT MATERIAL. Any building product [material, component or system] capable of withstanding direct and prolonged contact with floodwaters without sustaining significant damage.

FLOOD HAZARD AREA. The area subject to flooding during the *design flood*.

FLOOD HAZARD MAP. Map delineating *flood hazard areas* adopted by the authority having jurisdiction.

FLOOD INSURANCE RATE MAP (FIRM). An official map of a community on which the Federal Emergency Management Agency (FEMA) has delineated both the *special flood hazard areas* and the risk premium zones applicable to the community.

FREEBOARD. A factor of safety expressed in feet above a flood level for purposes of floodplain management.

FUTURE-CONDITIONS FLOOD. The flood having a 1% chance of being equaled or exceeded in any given year based on future-conditions hydrology. Also known as the 100-year future-conditions flood.

FUTURE-CONDITIONS FLOOD ELEVATION. The flood standard equal to or higher than the Base Flood Elevation. The future-conditions flood elevation is defined as the highest water surface anticipated at any given point during the future-conditions flood.

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CHAPTER AN3
FLOOD-RESISTANT CONSTRUCTION

Forward: This appendix provides three different options for increased freeboard. The jurisdiction may pick only one option that is higher than previously adopted and enforced by the jurisdiction. The National Flood Insurance Program (NFIP) minimum standards reference Base Flood Elevation without any freeboard in high risk flood hazard areas. Due to the flood damage prevention updates performed during the Map Modernization initiative that led to flood risks being digitally identified in all 159 Georgia counties, all Georgia NFIP participating communities have freeboard standards that meet or exceed the 1 foot standard used in the State model ordinances for areas where BFEs have been established.

SECTION AN301
HAZARD IDENTIFICATION

AN301.1 Identification of flood hazard areas. To establish flood hazard areas:

(a) flood hazard map adopted by jurisdiction based on areas of special flood hazard as identified by the Federal Emergency Management Agency in an engineering report entitled "The Flood Insurance Study of **[INSERT NAME OF JURISDICTION]**," dated **[INSERT DATE ISSUANCE]**, and amended or revised with the accompanying Flood Insurance Rate Map (FIRM) and Flood Boundary and Floodway Map (FBFM) and related supporting data along with any revisions thereto.

(b) FIRM maps provided by the Federal Emergency Management Agency.

SECTION AN302
SCOPE

AN302.1 Flood loads. Buildings designed and constructed in flood hazard areas defined in IBC Section 1612.2 shall comply with the following:

AN302.1.1 Flood hazard areas without base flood elevations. In flood hazard areas without base flood or future-conditions flood elevation data, new construction and substantial improvements of existing structures shall have the lowest floor of the lowest enclosed area (including basement) elevated no less than three (3) feet above the highest adjacent grade to the building foundation.

OPTION A – FLOOD ELEVATION

AN302.1.2 Increase to base flood elevation requirements. Floors required by ASCE 24 to be built above base flood elevations as follows:

The higher of:

(a) Design flood elevation plus one (1) foot, or
(b) Base flood elevation plus one (1) foot, or
(c) Advisory base flood elevation, or
(d) Future-conditions plus one (1) foot, if known or
(e) 500-year flood, if known

OPTION B– FLOOD ELEVATION

AN302.1.3 Increase to base flood elevation requirements. Floors required by ASCE 24 to be built above base flood elevations as follows:

The higher of:

(a) Design flood elevation plus two (2) feet, or
(b) Base flood elevation plus two (2) feet, or
(c) Advisory base flood elevation, or
(d) Future-conditions plus one (1) foot, if known or
(e) 500-year flood, if known

OPTION C – FLOOD ELEVATION

AN302.1.4 Increase to base flood elevation requirements. Floors required by ASCE 24 to be built above base flood elevations as follows:

The higher of:

(a) Design flood elevation plus three (3) feet, or
(b) Base flood elevation plus three (3) feet, or
(c) Advisory base flood elevation, or
(d) Future-conditions plus one (1) foot, if known or
(e) 500-year flood, if known

SECTION AN303
FLOOD DAMAGE-RESISTANT MATERIALS

AN303.1 Flood damage-resistant materials. Flood damage-resistant materials comply with FEMA Technical Bulletin 2, Table 2. Types, Uses, and Classifications of Materials.

AN303.2 Location of flood damage-resistant materials. Building components and materials located below the increase to base flood elevation as determined by the local jurisdiction in accordance with AN302.1 shall be flood damage-resistant as defined by Section AN303.1.

AN303.3 Fasteners and connectors used for flood damage-resistant materials. Fasteners and connectors used for flood damage-resistant materials to be made of stainless steel, hot-dipped zinc-coated galvanized steel, mechanically deposited-zinc coated, silicon bronze or copper. Copper fasteners shall not be permitted for use in conjunction with steel.

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CHAPTER AN4
HIGH-WIND RESISTIVE CONSTRUCTION

SECTION AN401
GENERAL

AN401.1 Applications. Buildings, and parts thereof shall be designed to withstand the minimum wind loads and meet the opening protection requirements of IBC Section 1609 as modified in this chapter. **Wind Load Option A, B or C shall be selected. Table AN401.1 may be used to assist in the selection of an appropriate Wind Load Option.**

AN401.2 Limitations. The following limitations shall apply to the design and construction of buildings with respect to winds.

AN401.2.1 Empirical masonry. The empirical masonry provisions in IBC Section 2109 or Chapter 5 of TMS 402/ACI 530/ASCE 5 shall not be permitted to be used for the wind load resisting elements of buildings, or parts of buildings or other structures.

AN401.2.2 Unreinforced (plain) masonry. The unreinforced masonry provisions in IBC Section 2109 or sections 2.2, 3.2 or 8.2 of TMS 402/ACI 530/ASCE 5 shall not be permitted to be used for the wind load resisting elements of buildings, or parts of buildings or other structures.

AN401.2.3 Conventional light-frame construction. The *conventional light-frame constriction* provisions in IBC Section 2308 shall not be permitted to be used for the wind load resisting elements of buildings, or parts of buildings or other structures.

Exception: Compliance with AF&PA WFCM shall be permitted subject to the limitations therein and the limitations of this appendix.

SECTION AN402
DEFINITIONS AND NOTATIONS

AN402.1 General. The following terms are defined in Chapter 2 of the International Building Code:

CONVENTIONAL LIGHT-FRAME CONSTRUCTION.

MASONRY.

Unreinforced (plain) masonry.

WIND-BORNE DEBRIS REGION.

WIND SPEED, V_{ult}.

SECTION AN403
WIND LOADS

AN403.1 Wind Directionality Factor. The directionality factor for Wind Option B and C shall be taken as 1.0.

AN403.2 Exposure. Wind pressures for Wind Option B and C shall be based on exposure category C or D in accordance with IBC Section1609.4 or ASCE 7.

AN403.3 Enclosure classification. The enclosure classification shall be determined in accordance with ASCE 7 with the largest door or window on a wall that receives positive external pressure considered as an opening.

AN403.4 Continuous operation of Risk Category IV buildings. When a building or an internal area within a building in Risk Category IV is required to remain operational during a design wind event (target performance level OB), that building or that internal area shall be designed in accordance with ICC-500 or FEMA-361.

SECTION AN404
WIND LOAD OPTION A

AN404.1 Basic wind speed. The ultimate design wind speed, V_{ult}, for use in the design of buildings and structures shall be obtained from IBC Section 1609.3.

AN404.2 Debris Hazard and Protection of Openings. Buildings shall be designed for impact resistance in accordance with IBC Section 1609.1.2 or ASCE 7.

Exception:

1. For Risk Category III buildings with a Life Safety target performance level for the entire building, the exterior glazing shall be impact resistant or be protected with an impact resistant covering meeting the requirements of ASTM E1996.
2. For Risk Category IV buildings with an Immediate Occupancy target performance level for the entire building, the exterior glazing shall be impact resistant or be protected with an impact resistant covering meeting the requirements of ASTM E1996 for *Enhanced Protection*.

PROPOSED

SECTION AN405
WIND LOAD OPTION B

AN405.1 Basic wind speed. The ultimate design wind speed, V_{ult}, for use in the design of Risk Category I buildings and structures shall be obtained from IBC Section 1609.3. The ultimate design wind speed, V_{ult}, for use in the design of Risk Category II buildings and structures shall be obtained from IBC Figure 1609B. The ultimate design wind speed, V_{ult}, for use in the design of Risk Category III and IV buildings and structures shall be obtained from IBC Figure 1609B or 135 mph, whichever is greater.

AN405.2 Debris Hazard and Protection of Openings. Buildings shall be designed for impact resistance in accordance with this Section in addition to IBC Section 1609.1.2 or ASCE 7.

Exception:

1. For Risk Category IV buildings, all components of the exterior envelope shall be impact resistant or be protected with an impact resistant covering meeting the requirements of ASTM E1996 for *Enhanced Protection*.

SECTION AN406
WIND LOAD OPTION C

AN406.1 Basic wind speed. The ultimate design wind speed, V_{ult}, for use in the design of Risk Category I buildings and structures shall be obtained from IBC Section 1609.3. The ultimate design wind speed, V_{ult}, for use in the design of Risk Category II buildings and structures shall be obtained from IBC Figure 1609B. The ultimate design wind speed, V_{ult}, for use in the design of Risk Category III and IV buildings and structures shall be obtained from IBC Figure 1609B or 170 mph, whichever is greater.

AN406.2 Debris Hazard and Protection of Openings. Buildings shall be designed for impact resistance in accordance with this Section in addition to IBC Section 1609.1.2 or ASCE 7.

Exception:

1. For Risk Category IV buildings, all components of the exterior envelope shall be impact resistant or be protected with an impact resistant covering meeting the requirements of ASTM E1996 for *Enhanced Protection*.

PROPOSED

Table AN401.1
WIND LOAD OPTIONS:
TARGET PERFORMANCE LEVELS AND DESIGN CRITERIA[4]

OPTION	DESIGN WIND EVENT	Risk Category II[1]			Risk Category III[1]			Risk Category IV[1]		
		Target Performance Level[2]	Min Wind Speed V_{ult}	Wind-Borne Debris	Target Perfor-mance Level[2]	Min Wind Speed V_{ult}	Wind-Borne Debris	Target Perfor-mance Level[2]	Min Wind Speed V_{ult}	Wind-Borne Debris
A	EF0 & 1 Tornado – IBC level Hurricane	CP[3]	IBC 1609.3	IBC 1609.1.2 or ASCE 7	CP[3]	IBC 1609.3	IBC 1609.1.2 or ASCE 7	CP[3]	IBC 1609.3	IBC 1609.1.2 or ASCE 7
					LS		Glazing	IO[5]		Glazing
B	EF2 Tornado – Cat 3 Hurricane	CP[3] for EF0-EF1-IBC Hurricane for Risk Cat. III/IV	IBC 1609.3 for Risk Cat. III/IV	IBC 1609.1.2 or ASCE 7	LS	145 mph	Req'd for glazing per IBC 1609.1.2 and ASCE 7	IO[5]	145 mph	Exterior Envelope
C	EF3 Tornado – Cat 4 Hurricane	CP[3] for EF0-EF1-IBC Hurricane for Risk Cat. III/IV	IBC 1609.3 for Risk Cat. III/IV	IBC 1609.1.2 or ASCE 7	LS	170 mph	Req'd for glazing per IBC 1609.1.2 and ASCE 7	IO[5]	170 mph	Exterior Envelope

Notes:

1. Risk Category per IBC Section 1604.5
2. Performance Levels:
   - CP: Collapse Prevention
   - LS: Life Safety
   - IO: Immediate Occupancy
   - OB: Operational Building
3. LS for occupants away from exterior envelope. IO for storm shelters or safe rooms.
4. See Section AN401 and Section AN403 for additional limitations and criteria.
5. OB for building or an internal area within a building designed to ICC-500 or FEMA 361.

CHAPTER AN5
STORM SHELTERS, SAFE ROOMS AND BEST AVAILABLE REFUGE AREAS

SECTION AN501
GENERAL

AN501.1 General. This section applies to the location and construction of storm shelters and safe rooms when constructed as separate detached buildings or as internal areas within buildings for the purpose of providing safe refuge for storms that produce high winds, such as tornados and hurricanes, and to the selection of best available refuge areas. Storm shelters shall be designed and constructed in accordance with IBC Section 423. Safe rooms shall be designed and constructed in accordance with FEMA 361. Storm shelters, safe rooms, and best available refuge areas shall be located on an accessible route.

Exception: *Residential Safe Rooms* and safe rooms serving a Business Group B Occupancy and having an *occupant load* not exceeding 16 persons may be constructed in accordance with FEMA 320.

AN501.2 Occupant load. The occupant load for storm shelters and safe rooms shall be determined by ICC 500 and FEMA 361 respectively.

AN501.3 Construction documents. Construction documents for buildings containing a storm shelter or safe room shall include the information required in ICC 500 or FEMA 361 respectively. Construction documents for buildings with access to a remote community storm shelter or safe room shall indicate the location of and access to the community storm shelter or safe room. Construction documents for buildings not containing or without access to a remote storm shelter or safe room, shall indicate the best available refuge area.

AN501.4 Signage. The location(s) of storm shelters, safe rooms or the best available refuge area(s) shall be clearly marked with a permanent sign.

SECTION AN502
DEFINITIONS AND NOTATIONS

AN502.1 Definitions. The following terms are defined in Chapter 2 of the International Building Code:

DWELLING UNITS.
OCCUPANT LOAD.
STORM SHELTER.
Community Storm Shelter.
Residential Storm Shelter.

AN502.2 Additional definitions.

BEST AVAILABLE REFUGE AREAS. Areas in a building that have been deemed by a registered design professional to likely offer the greatest safety for building occupants during a tornado or hurricane. Because these areas were not specifically designed as storm shelters or safe rooms, their occupants may be injured or killed during a tornado or hurricane. However, people in the best available refuge areas are less likely to be injured or killed than people in other areas of a building.

SAFE ROOM. A building, structure or portions thereof, constructed in accordance with FEMA 361 and designed for use during a severe wind storm event, such as a hurricane or tornado.

Community Safe Room. A safe room not defined as a "Residential Safe Room"

Residential Safe Room. A safe room serving occupants of *dwelling units* and having an *occupant load* not exceeding 16 persons.

SECTION AN503
BEST AVAILABLE REFUGE AREAS

AN503.1 General. Best available refuge area occupants may be injured or killed during a tornado or hurricane. However, people in the best available refuge areas are less likely to be injured or killed than people in other areas of a building.

AN503.2 Occupant Density. The minimum required floor area per occupant for best available refuge area(s) shall be determined in accordance with ICC 500 Table 501.1.1.

AN503.3 Identification of best available refuge areas. Best available refuge areas shall be identified by a registered design professional in accordance with the Wind Hazard Checklist of FEMA 361, Appendix B and FEMA P-431.

SECTION AN504
APPLICABILITY

AN504.1 Required storm shelters or safe rooms.

1. All new kindergarten through 12th grade schools with 50 or more occupants in total, per school, shall have a storm shelter or safe room.
2. All new 911 call stations, emergency operation centers, and fire, rescue, ambulance, and police stations shall have a storm shelter or safe room.

PROPOSED

CHAPTER AN6
RESOURCES

SECTION AN601
CONTACTS

Georgia Department of Community Affairs (DCA)
Construction Codes
Georgia State Amendments to the State Minimum Standard Codes
http://www.dca.ga.gov/development/constructioncodes/programs/codeAmendments.asp
Phone: 404-679-3118

Georgia Department of Natural Resources (DNR)
Floodplain Management
4220 International Parkway, Ste. 101
Atlanta, GA 30354-3902
www.georgiadfirm.com
Phone: 404-675-1757

Federal Emergency Management Agency (FEMA)
www.fema.gov; www.floodsmart.gov
www.fema.gov/rebuild/buildingscience/
FEMA Publications and Technical Bulletins:
www.fema.gov/library/index.jsp
www.fema.gov/plan/prevent/floodplain/techbul.shtm

Georgia Emergency Management Agency (GEMA)
Georgia Office of Homeland Security
P.O. Box 18055
Atlanta, GA 30316-0055
www.gema.ga.gov
www.ready.ga.gov
Phone: 404-635-7000

Georgia Association of Regional Commissions (GARC)
www.garc.ga.gov
http://garc.ga.gov/main.php?Regional-Commissions-2
(for assistance in identifying Flood Hazard Areas)

International Code Council (ICC)
www.iccsafe.org

National Weather Service
www.srh.weather.gov

State Fire Marshal's Office
2 Martin Luther King Jr. Drive
Suite 920 / West Tower
Atlanta, Georgia 30334
www.oci.ga.gov
Phone: 404-656-7087

PROPOSED

SECTION AN602
EMERGENCY INSPECTION KIT [b]

- ☐ **Staff's disaster response management plan**
- ☐ **Team contact list**
- ☐ **Area maps**
- ☐ **Official identification**
- ☐ **Personal identification**
- ☐ **Inspection forms and placards**
- ☐ **Communication equipment**
- ☐ **Clipboard**
- ☐ **Hard hat**
- ☐ **Orange safety vest**
- ☐ **Dust mask**
- ☐ **Work gloves**
- ☐ **Steel toe and waterproof boots**
- ☐ **Whistle**
- ☐ **First aid kit**
- ☐ **Latex gloves**
- ☐ **Safety glasses**
- ☐ **Sunglasses**
- ☐ **Pocket knife**
- ☐ **Matches**
- ☐ **Antibacterial hand wipes or alcohol-based hand sanitizer**
- ☐ **Insect repellant (w/ Deet or Picaridin)**
- ☐ **Sunscreen (SPF 15 or greater)**
- ☐ **Camera**
- ☐ **Black markers**
- ☐ **Pens & pencils**
- ☐ **Envelope for expense receipts**
- ☐ **Compass, GPS unit**
- ☐ **Backpack, waistpack**
- ☐ **Flashlight and extra batteries**
- ☐ **Battery-operated radio**
- ☐ **Duct tape**
- ☐ **Staples & stapler**
- ☐ **Staple gun**
- ☐ **Calculator**
- ☐ **Tire repair kit**

Remember to grab:

- ☐ **Personal identification**
- ☐ **Rain gear, extra clothing**
- ☐ **Water bottle**
- ☐ **Prescription medication**
- ☐ **Cell phone and charger**
- ☐ **Cash for personal expenses**
- ☐ **Toiletries**

(b) *Disaster Mitigation: A Guide for Building Departments* by the International Code Council, Inc., copyright 2009

SECTION AN603
SAFETY TIPS [a]

1. **Always travel in teams of at least two people.**
2. **Always wear a hard hat, gloves, goggles, safety vest, and dust masks.**
3. **Always wear safety shoes capable of protecting the toes and bottom of the foot.**
4. **Survey the building exterior completely before entering.**
5. **Enter building only if authorized and if deemed safe to do so.**
6. **Be alert for falling objects.**
7. **In case of fire, injuries or victims, evacuate the area and alert the fire department immediately.**
8. **Avoid downed power lines and buildings under them or water surrounding them.**
9. **In case of gas leaks, shut off the gas (if possible) and report the leak.**
10. **In a flood situation, have a "walking stick."**

(a)*When Disaster Strikes* by the International Code Council, Inc., Seventh Printing: November 2011, copyright 2007

SECTION AN604
MAJOR DISASTER PROCESS

(from link http://www.fema.gov/hazard/dproc.shtm)

A Major Disaster Declaration usually follows these steps:

- **Incident occurs and local government responds,** supplemented by neighboring communities and volunteer agencies. If overwhelmed, turn to the state for assistance;

Generally the local government will issue a local state of emergency

- **The State responds** with state resources, such as the National Guard and state agencies;

Prior to committing state resources, the Governor will declare a state of emergency in the counties impacted by the event for which assistance is needed.

- **Damage assessment** by local, state, federal, and volunteer organizations determine losses and recovery needs;

Generally the locals will submit a preliminary damage assessment to the state and the state will review and determine if state and/or federal assistance is needed. If federal assistance is needed, the state will request FEMA perform a preliminary joint damage assessment. If the Governor determines that the incident is of such severity and magnitude that effective response is beyond the capabilities of the state and the affected local governments then supplementary Federal assistance is requested (next step).

- **A Major Disaster Declaration** is requested by the Governor, based on the damage assessment, and agreement to commit state funds and resources to the long-term recovery;
- **FEMA evaluates** the request and recommends action to the White House based on the disaster, the local community and the state's ability to recover;
- **The President approves** the request or FEMA informs the Governor it has been denied. This decision process could take a few hours or several weeks depending on the nature of the disaster.

SECTION AN605
SAMPLE EVALUATION FORMS AND INSPECTION PLACARDS [b] (following pages)

PROPOSED

Figure AN605.1 [b]

ATC-45 Rapid Evaluation Safety Assessment Form

Inspection

Inspector ID: _____ Inspection date: _____

Affiliation: _____ Inspection time: _____ ☐ AM ☐ PM

Areas inspected: ☐ Exterior only ☐ Exterior and interior

Building Description

Building name: _____

Address: _____

_____

Building contact/phone: _____

Number of stories: _____

"Footprint area" (square feet): _____

Number of residential units: _____

Type of Building

☐ Mid-rise or high-rise ☐ Pre-fabricated

☐ Low-rise multi-family ☐ One- or two-family dwelling

☐ Low-rise commercial

Primary Occupancy

☐ Dwelling ☐ Commercial ☐ Government

☐ Other residential ☐ Offices ☐ Historic

☐ Public assembly ☐ Industrial ☐ School

☐ Emergency services ☐ Other: _____

Evaluation

Investigate the building for the conditions below and check the appropriate column.

Observed Conditions:	Minor/None	Moderate	Severe
Collapse, partial collapse, or building off foundation	☐	☐	☐
Building significantly out of plumb or in danger	☐	☐	☐
Damage to primary structural members, racking of walls	☐	☐	☐
Falling hazard due to nonstructural damage	☐	☐	☐
Geotechnical hazard, scour, erosion, slope failure, etc.	☐	☐	☐
Electrical lines / fixtures submerged / leaning trees	☐	☐	☐
Other (specify) _____	☐	☐	☐

Estimated Building Damage (excluding contents)

☐ None

☐ >0 to <1%

☐ 1 to <10%

☐ 10 to <30%

☐ 30 to <70%

☐ 70 to <100%

☐ 100%

☐ See back of form for further comments.

Posting

Choose a posting based on the evaluation and team judgment. Severe conditions endangering the overall building are grounds for an Unsafe posting. Localized Severe and overall Moderate conditions may allow a Restricted Use posting.

☐ **INSPECTED** (Green placard) ☐ **RESTRICTED USE** (Yellow placard) ☐ **UNSAFE** (Red placard)

Record any use and entry restrictions exactly as written on placard: _____

_____

_____

Number of residential units vacated: _____

Further Actions

Check the boxes below only if further actions are needed.

☐ Barricades needed in the following areas: _____

_____

☐ Detailed Evaluation recommended: ☐ Structural ☐ Geotechnical ☐ Other: _____

☐ Substantial Damage determination recommended

☐ Other recommendations: _____

_____

☐ See back of form for further comments.

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PROPOSED

Figure AN605.2 [b]

ATC-45 Detailed Evaluation Safety Assessment Form

Inspection

Inspector ID: _____ Inspection date: _____

Affiliation: _____ Inspection time: _____ ☐ AM ☐ PM

Final Posting
from page 2

☐ Inspected
☐ Restricted Use
☐ Unsafe

Building Description

Building name: _____

Address: _____

_____

Building contact/phone: _____

Number of stories: _____

"Footprint area" (square feet): _____

Number of residential units: _____

Type of Building

☐ Mid-rise or High-rise
☐ Low-rise multi-family
☐ Low-rise commercial
☐ Pre-fabricated
☐ One- or two-family dwelling
☐ Other: _____

Primary Occupancy

☐ Dwelling
☐ Other residential
☐ Public assembly
☐ Emergency services
☐ Commercial
☐ Offices
☐ Industrial
☐ Other: _____
☐ Government
☐ Historic
☐ School

Evaluation

Investigate the building for the conditions below and check the appropriate column. There is room on the second page for a sketch.

	Minor/None	Moderate	Severe	Comments
Overall hazards:				
Collapse or partial collapse	☐	☐	☐	
Building or story lean or drift	☐	☐	☐	
Fractured or displaced foundation	☐	☐	☐	
Structural hazards:				
Failure of significant element/connection	☐	☐	☐	
Column, pier, or bearing wall	☐	☐	☐	
Roof/floor framing or connection	☐	☐	☐	
Superstructure/foundation connection	☐	☐	☐	
Moment frame	☐	☐	☐	
Diaphragm/horizontal bracing	☐	☐	☐	
Vertical bracing	☐	☐	☐	
Shear wall	☐	☐	☐	
Nonstructural hazards:				
Parapets, ornamentation	☐	☐	☐	
Canopy	☐	☐	☐	
Cladding, glazing	☐	☐	☐	
Ceilings, light fixtures	☐	☐	☐	
Stairs, exits, access walkways, gratings	☐	☐	☐	
Interior walls, partitions	☐	☐	☐	
Mechanical & electrical equipment	☐	☐	☐	
Elevators	☐	☐	☐	
Building contents, other _____	☐	☐	☐	
Geotechnical hazards:				
Slope failure, debris impact	☐	☐	☐	
Ground movement, erosion, sedimentation	☐	☐	☐	
Differential settlement	☐	☐	☐	

Continue on page 2

PROPOSED

Figure AN605.2 [b] **(**Continued)

ATC-45 Detailed Evaluation Safety Assessment Form — Page 2

Building name: _____ Inspector ID: _____

Sketch
Make a sketch of the damaged building in the space provided. Indicate damage points.

Estimated Building Damage
(excluding contents)

- ☐ None
- ☐ >0 to <1%
- ☐ 1 to <10%
- ☐ 10 to <30%
- ☐ 30 to <70%
- ☐ 70 to <100%
- ☐ 100%

Posting
If there is an existing posting from a previous evaluation, check the appropriate box.

Previous posting: ☐ INSPECTED ☐ RESTRICTED USE ☐ UNSAFE Inspector ID: _____ Date: _____

If necessary, revise the posting based on the new evaluation and team judgment. *Severe* conditions endangering the overall building are grounds for an Unsafe posting. Local *Severe* and overall *Moderate* conditions may allow a Restricted Use posting. Indicate the current posting below and at the top of page one, whether the posting has been revised or not.

☐ **INSPECTED** (Green placard) ☐ **RESTRICTED USE** (Yellow placard) ☐ **UNSAFE** (Red placard)

Record any use and entry restrictions exactly as written on placard: _____

Number of residential units vacated: _____

Further Actions Check the boxes below only if further actions are needed.

☐ Barricades needed in the following areas: _____

☐ Engineering Evaluation recommended: ☐ Structural ☐ Geotechnical ☐ Other _____

☐ Substantial Damage determination recommended

☐ Other recommendations: _____

PROPOSED

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Figure AN605.3 [b]

INSPECTED

LAWFUL OCCUPANCY PERMITTED

This structure has been inspected (as indicated below) and no apparent structural hazard has been found.

Date _____

Time _____

☐ **Inspected Exterior Only**

☐ **Inspected Exterior and Interior**

Report any unsafe condition to local authorities; reinspection may be required.

Inspector Comments:

_____

_____

_____

Facility Name and Address:

_____

_____

_____

This facility was inspected under emergency conditions for:

_____ (Jurisdiction)

Inspector ID / Agency

_____

_____

_____

Do Not Remove, Alter, or Cover this Placard until Authorized by Governing Authority

PROPOSED

Figure AN605.4 [b]

RESTRICTED USE

Caution: This structure has been inspected and found to be damaged as described below:

_____

_____

_____

Entry, occupancy, and lawful use are restricted as indicated below:

☐ Do not enter the following areas: _____

☐ Brief entry allowed for access to contents: _____

☐ Other restrictions: _____

Facility name and address:

_____

_____

_____

Date _____

Time _____

This facility was inspected under emergency conditions for:

_____ (Jurisdiction)

Inspector ID / Agency

_____

_____

_____

Do Not Remove, Alter, or Cover this Placard until Authorized by Governing Authority

PROPOSED

Figure AN605.5 [b]

UNSAFE

DO NOT ENTER OR OCCUPY
(THIS PLACARD IS NOT A DEMOLITION ORDER)

This structure has been inspected, found to be seriously damaged and is unsafe to occupy, as described below:

_____

_____

_____

_____

Do not enter, except as specifically authorized in writing by jurisdiction. Entry may result in death or injury.

Facility Name and Address:

_____

_____

_____

Date _____

Time _____

This facility was inspected under emergency conditions for:

_____
(Jurisdiction)

Inspector ID / Agency

_____

_____

_____

Do Not Remove, Alter, or Cover this Placard until Authorized by Governing Authority

PROPOSED

CHAPTER AN7
REFERENCES

REFERENCED STANDARDS

ASCE Standards ASCE/SEI 24-05 Flood Resistant Design and Construction
FEMA P-320, Third Edition / August 2008 Taking Shelter From the Storm: Building a Safe Room For Your Home or Small Business, Includes Construction Plans and Cost Estimates
FEMA 361, Second Edition / August 2008 Design and Construction Guidance for Community Safe Rooms
FEMA P-431, Second Edition/October 2009 Tornado Protection: Selecting Refuge Areas in Buildings
FEMA Technical Bulletin 2, Table 2. Types, Uses, and Classifications of Materials

REFERENCED RESOURCES

(a) *When Disaster Strikes* by the International Code Council, Inc., Seventh Printing: November 2011, copyright 2007
(b) *Disaster Mitigation: A Guide for Building Departments* by the International Code Council, Inc., copyright 2009

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