PREPARED BY:

ARA

Report #: 005480

2024 Residential Wind-Loss Mitigation Study

June 28, 2024

Prepared for:

Florida Office of Insurance Regulation
200 East Gaines Street, Larson Bldg.
Tallahassee, Florida 32399

Prepared by:

Applied Research Associates, Inc.
8537 Six Forks Road, Suite 600
Raleigh, NC, 27615

Table of Contents

1. Introduction

Applied Research Associates, Inc. (ARA) has performed the 2024 Residential Wind-Loss Mitigation Study (LMS) and prepared this report for the Florida Office of Insurance Regulation (OIR) under contract number 2324-06 RFP OIR.

1.1. Objective

The objective of this project is to evaluate windstorm loss relativities for construction features including, but not limited to, those which enhance wind uplift, methods to prevent water intrusion through the tracks of sliding glass doors, roof strength, roof covering performance, roof-to-wall strength, wall-to-floor-to-foundation strength, opening protections, and window, door, and skylight strength.

Previous studies were performed in 2002 and 2008 to quantify wind loss reduction for wind mitigation construction features including:

- *Development of Loss Relativities for Wind Resistive Features of Residential Structures* (ARA, 2002a), focusing on single-family homes,
- *Development of Loss Relativities for Wind Resistive Features for Residential Buildings with Five or More Units* (ARA, 2002b) focusing on condominium and renter occupancies in buildings with five or more units, and
- *2008 Florida Residential Wind Loss Mitigation Study* (ARA, 2008), which addressed additional wind mitigation features for both single- and multi-family residences.

The 2024 Residential Loss Mitigation Study draws heavily on the work that was completed in the 2002 and 2008 studies. It addresses single-family, multi-family, and manufactured housing/mobile home residences. It provides data and information on the estimated reduction in loss for wind-resistive building features for residential property insurance. It provides a technical basis for actuarially reasonable discounts, credits, or other rate differentials, for construction techniques demonstrated to reduce the amount of loss in a windstorm.

Similar to the 2002 and 2008 loss mitigation studies, this study focuses on average Florida homes. It does not address potential mitigation effects of larger, more expensive homes that are more structurally complex and tend to proportionally have more value in the home interior and finishes.

1.2. Scope

The scope of this study intends to quantify the benefits of the wind resistive features called out in 627.0629, Florida Statutes, namely fixtures or construction techniques that enhance:

1. Wind uplift prevention
2. Roof Strength (including roof deck material type and connection to roof framing)
3. Roof Covering Performance

4. Roof-to-Wall Strength
5. Wall-to-Floor-to-Foundation Strength
6. Opening Protection
7. Window, Door, and Skylight Strength

Additional features are examined in this study. These additional features include features that influence wind losses and/or mitigate wind losses. These features have been identified from hurricane damage surveys, insurance loss data, and engineering data.

A major element of the scope of this study is the requirement to consider and analyze the loss data from the hurricanes making landfall in Florida between 2018 and 2023. These data include both damage survey data and insurance company loss data. The insurance loss data consist of policy level loss amounts ($) by coverage type. This study uses available insurance loss data to validate updates to the loss modeling approach to account for effects of water intrusion through the tracks of sliding glass doors and roof cover aging.

This study uses hurricanes as the windstorm to quantify the loss relativities. Hurricanes dominate the severe wind climate in Florida and, hence, are the primary contributors to windstorm loss costs.[1] This approach is consistent with the FBC design windspeed map (as adapted from ASCE 7), which is based on hurricane winds.

The scope of this project includes single- and multi-family residential buildings built prior to the statewide adoption of the Florida Building Code (FBC) in March 2002 (the 2001 FBC edition) and residential buildings built after the statewide adoption of the FBC. These eras are referred to as "pre-FBC" and "post-FBC," respectively. The post-FBC era is further subdivided based on FBC revisions that led to significant changes in structural requirements for the locations considered in this study.

Manufactured housing and mobile homes are also included in this study. However, construction of these buildings is governed by the US Department of Housing and Urban Development (HUD) manufactured housing code instead of the FBC. As such, construction eras for these buildings are based on changes in the HUD code. These eras are pre-1976 (also considered "mobile homes"), 1976-1993, and 1994 or later.

The mitigation features must be practically verifiable so insurers can be reasonably confident a particular residential building qualifies for the rate differentials. Hence, the scope of consideration for wind loss mitigation construction features must be limited by the capability to inexpensively verify.

The scope of work also implies that the measures of construction feature effectiveness in reducing windstorm loss (i.e., "the loss relativities") are to be converted to "insurance rate differentials". Hence, this study also outlines the simple conversion step from "wind mitigation loss relativities" into "insurance rate differentials."

[1] Thunderstorm winds, tornadoes, and the occasional extra-tropical cyclone can also produce high winds in the state. However, hurricanes have the greatest potential for widespread catastrophic damage and are therefore used herein as the wind hazard for the development of the wind loss mitigation relativities. In general, wind mitigation against hurricane winds is also effective in reducing losses for these other windstorms.

This study is intended to provide a complete update to the wind loss relativity study published in ARA (2002a and 2002b), and 2008 (ARA, 2008). The work is based on new and standalone analyses, new data, and improved technical modeling capabilities. The results herein are therefore not constrained to "match or replicate" those from the 2002 and 2008 loss relativity results.

1.3. Review of Previous Florida Loss Mitigation Studies

The 2002 Loss Relativity Studies (ARA, 2002a and 2002b) were the first-ever comprehensive approach to develop a modern wind loss classification system and systematically quantify wind mitigation loss relativities for single- and multi-family residences. The basic approach used in the 2002 studies was to estimate how loss costs change with wind resistive fixtures and construction techniques by using engineering analysis and repair/replacement cost methods for individually modeled buildings. Three-dimensional models of buildings were developed with and without specific wind-resistive fixtures. These buildings were then analyzed for hurricane damage and loss using load and resistance modeling techniques, consistent with modern engineering design methods. Monte Carlo Simulation was used to analyze thousands of hurricanes striking each modeled building at specific locations in Florida. Analysis of this simulation data provided the statistics to quantify losses and the effectiveness of specific combinations of wind mitigation features.

The 2008 Loss Mitigation Study (ARA, 2008) expanded the number building features addressed for both single- and multi-family residence and considered new (at the time) wind loading research. For single-family homes, this included considerations for two story buildings, variations in roof slope, tile roof coverings (in addition to asphalt shingles), and soffit construction type. For multi-family residences, rooftop equipment and parapet height on flat roof structures were introduced as new factors.

1.4. Mitigation Features Considered in 2024 LMS

Historically, engineers focused on the structural frame and load-path issues in designing buildings for wind loads. However, beginning in the 1970's, engineers began to document the importance of the building envelope (roof deck and covering, roof-to-wall connection, windows, doors, etc.) performance in influencing the resulting financial loss experienced by buildings in windstorms. In many storms, the building frame performed adequately, but the windows and/or doors failed, often due to impact by wind-borne debris. Roof covering was almost always damaged, resulting in water penetration into the building, particularly for hurricanes.

Damage and the ensuing losses to residential buildings were found to be governed by the performance of the building envelope, including many non-engineered components, such as roof covering, windows and doors, roof sheathing, garage doors, etc. The failure of soffits (usually vinyl or aluminum) can lead to water entering the attic space as well as internal pressurization of the attic space. The key structural frame connection for most failures was the roof-to-wall connection. Foundation failures and frame failures, other than the roof-to-wall frame connection, were found to be extremely rare for site-built houses, except in intense tornadoes.

In most cases, if damage to the frame or foundation did occur, it was preceded by the failure of other components.

Figure 1-1 illustrates the key building envelope features for site-built, single-family homes that affect hurricane damage and loss. Detailed discussion of these features is provided in Section 1.4.1 of the 2008 study (ARA, 2008) and is not repeated here. Figure 1-2 illustrates how the loads increase dramatically once the building envelope fails. Failure of a small opening can lead to large internal pressures. These pressures act outward on the walls and roof on the leeward and back side of the building and can result in a doubling of the loads on the building envelope. This phenomenon is why the failure of a window often produces a progression of failures in the roof deck, whole roof, or other openings that quickly lead to large insurance losses.

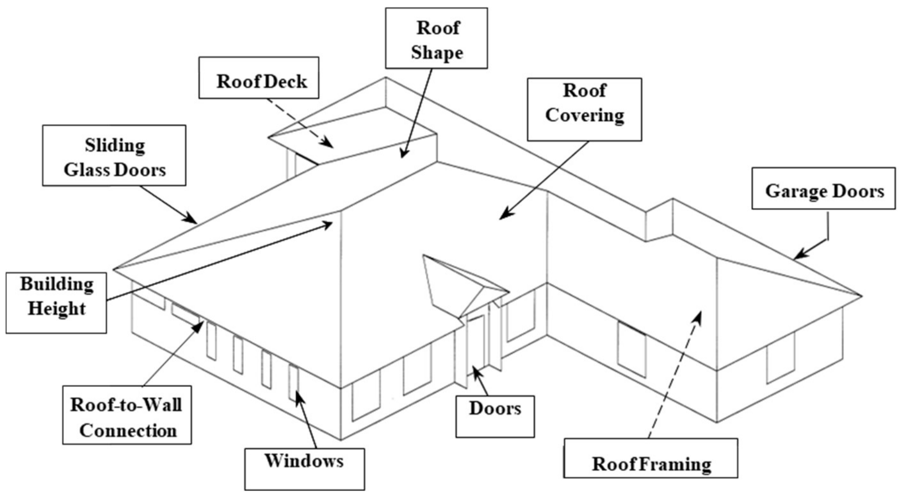


Figure 1-1. Building Envelope Features the Control Wind Damage and Loss.

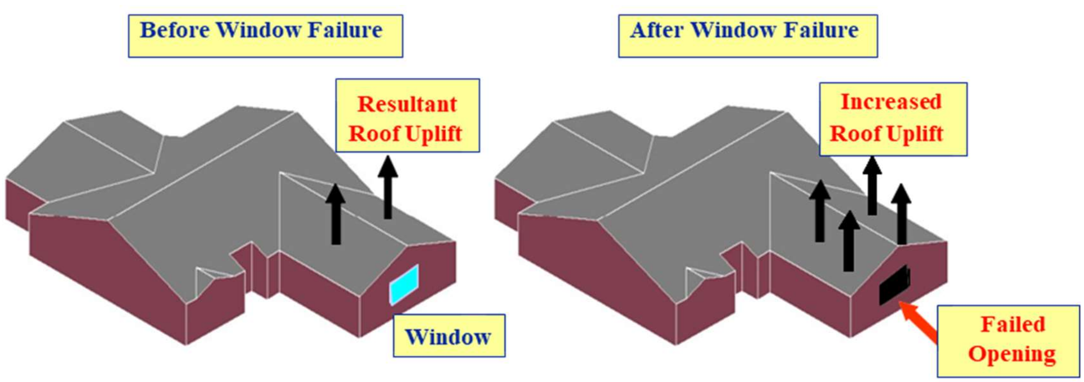


Figure 1-2. Protection of Wall Envelope Reduces Likelihood of Internal Pressurization.

The performance of multi-family residential buildings in hurricanes is also governed by the performance of the building envelope. Most of the potential failure models that are observed in single-family residences are also observed in the multi-family residences, particularly in the case of the smaller wood frame and masonry multi-unit residential buildings. Flat roof buildings are more common in multi-family construction, and thus additional modes of failure unique to flat roofs play a more important role in multi-family construction as compared to single-family construction. The ability to place HVAC units on the roofs of flat roof buildings adds a frequently observed failure mode that is not seen in the case of sloped roof buildings. Figure 1-3 shows some of the key building components responsible for producing loss in hurricanes in a typical multi-family building. Detailed discussion of these features is provided in Section 1.4.2 of the 2008 study (ARA, 2008) and is not repeated here.

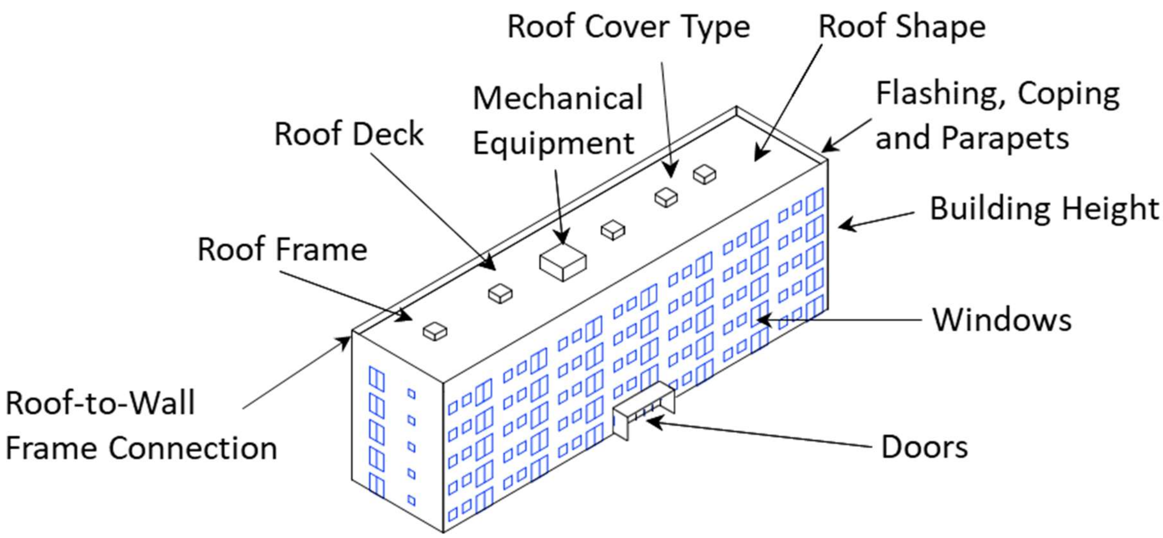


Figure 1-3. Features that Affect Hurricane Damage and Loss for Buildings with 5 or More Units

In addition to the features considered in the 2002 and 2008 loss mitigation studies, this study addresses the mitigation benefits of the following:

- Florida Building Code Changes since 2008,
- Prevention of water Intrusion through sliding glass doors, and
- Asphalt shingle roof cover aging
- Performance of metal panel roof covering.

Details on updated treatment existing, and consideration of new, mitigation features are provided in Section 2.2.

1.5. Technical Approach

This study uses ARA's HurLoss load and resistance modeling approach to quantify the impact of individual building parameters (e.g., roof slope or roof shape) on loss costs. The HurLoss methodology has been extensively validated through comparisons of modeled and observed physical damage to buildings and associated insured loss data.

The HurLoss modeling approach for damage and loss employs two separate models. A building performance model, using engineering-based load and resistance models, quantifies physical damage. The building physical damage model considers the effects of wind direction changes, progressive damage, and storm duration. Economic loss given physical damage, is estimated using repair and reconstruction cost estimation methods. This process is consistent with how insurance adjusters estimate claims, given observed building damage. Through direct simulations of thousands of storms with representative buildings, the building performance model produces outputs that are post-processed into loss functions for building, contents, and loss of use. Figure 1-4 shows a schematic of the HurLoss damage and loss modeling methodology.

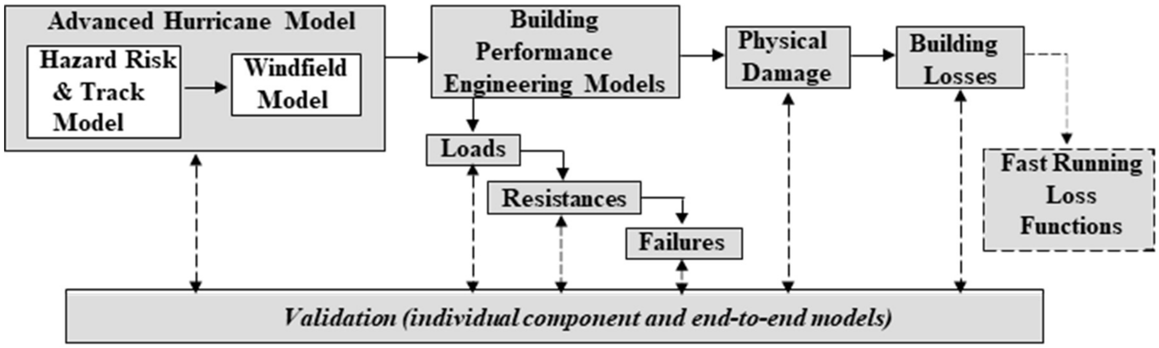


Figure 1-4. HurLoss Hurricane Damage and Loss Modeling Approach

Wind resistive features of each building modeled are established for each simulation run of 500,000 years of hurricanes. Component and building specifications for each key feature are defined in the input files. For example, the roof deck may be specified as ½" plywood with 8d (2½") nails at 12" spacing in the field and 6" spacing on the plywood edge. HurLoss lays out the roof deck as shown in Figure 1-5 and computes the resistances based on the nail size and spacing. For this example, the resistances are computed using probabilistic models developed from nail pull-out tests. Similarly, if the roof-to-wall connection is 3-16d (3½") toe-nails, HurLoss models the uplift resistance of that connection. Hence, each house is modeled with strengths that reflect the specified ultimate wind resistance features for that building.

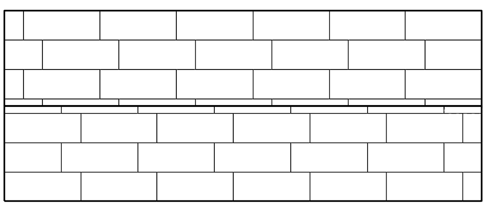


Figure 1-5. Roof Deck Sheathing Layout for House Model 1304G

At each time step during a simulated storm, the computed wind loads acting on the building and its components are compared to the modeled resistances of the various components. If the computed wind load exceeds the resistance of the component, the component fails. When a component such as a window or a door fails, the wind-induced pressure acting on the exterior of the component is transmitted to the interior of the building. This internal pressure is then added (or subtracted) from the wind loads acting on the exterior of the building to determine if any additional components have been overloaded because of the additional loads produced by the internal pressurization of the building.

The progressive failure damage modeling approach is summarized in Figure 1-6. Estimates of wind loads as a function of wind direction are produced for building components, including roof cover, roof sheathing, windows, and doors, as well as for larger components including the entire roof, walls and overturning or sliding of the entire building in cases where a positive attachment to the ground does not exist. The statistical properties of the resistances of the building components are obtained from laboratory tests and/or engineering calculations. In the simulation process, the resistances of the individual building components that will be loaded are sampled prior to the simulation of a hurricane and are held constant throughout the hurricane simulation.

The model computes a complete history of the failure of the building, which can be used to make a "movie" of the building performance. Figure 1-7 presents six frames from such a movie. The movie in this case represents one realization of a simulation of the expected performance of a house built with hurricane straps, but otherwise satisfying only the minimum criteria of the building code requirements required prior to introduction of the FBC. The frames show the progressive damage to the building during the passage of the storm caused by changes in wind loads resulting from wind direction and windspeed changes, and effects of internal pressurization, which begins with the first window failure that occurs just after the windspeed reaches 138 mph (peak gust windspeed).

Once the building damage has been computed for a given storm and the losses for all coverages computed, the process is repeated for a new set of sampled building component resistances. Once simulations have been performed for the completed 500,000-year storm set, we derive the data necessary to develop a statistical model for the expected performance of the building given the occurrence of a storm.

With this explicit modeling approach, it is possible to assess the impact of the Florida Building Code on the reduction in physical damage and insured loss. For example, the analysis of enclosed designs (protected openings) can be explicitly modeled in the same manner an engineer designs the truss package or the builder selects the windows to comply with the required dynamic pressure rating.

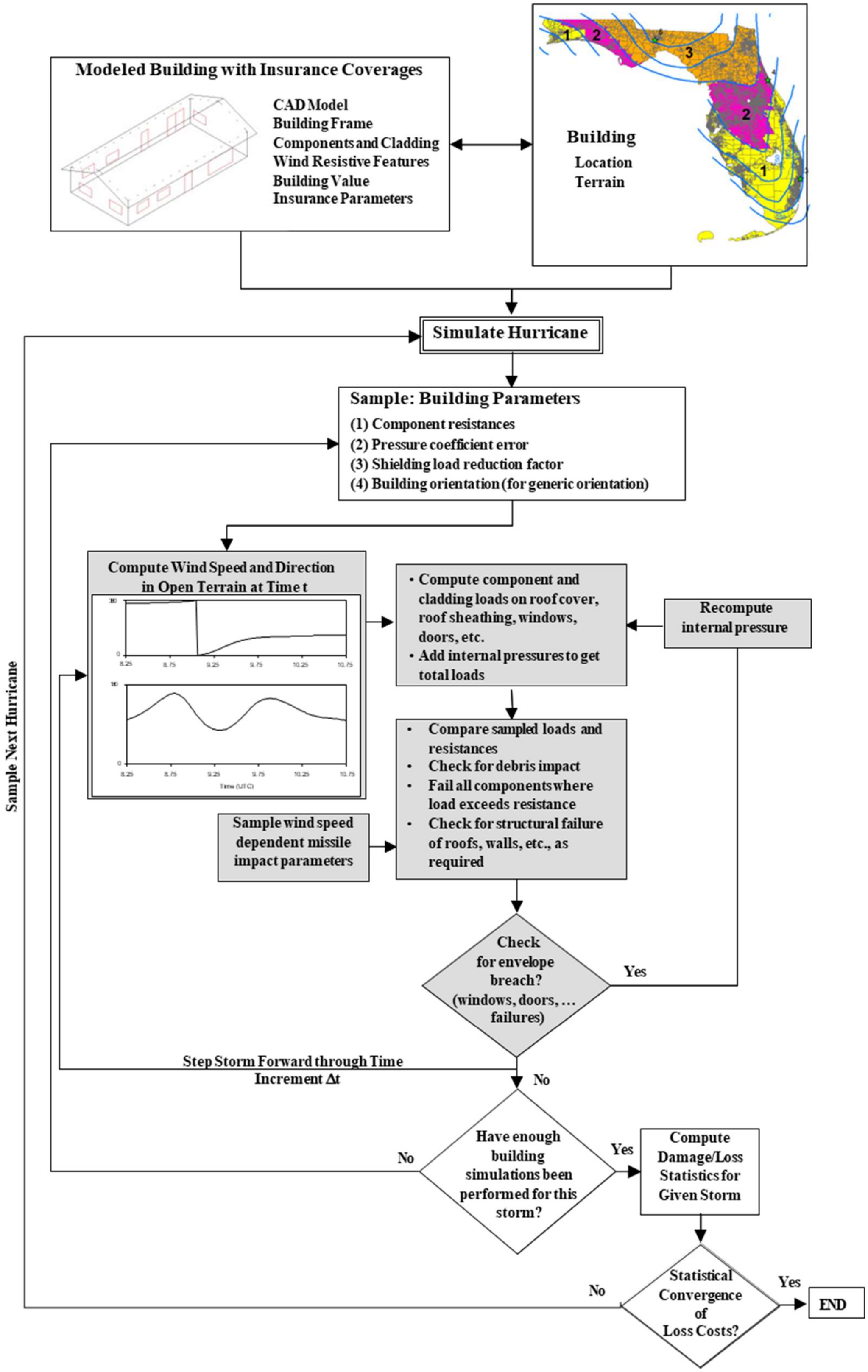


Figure 1-6. HurLoss Building Damage Simulation Methodology

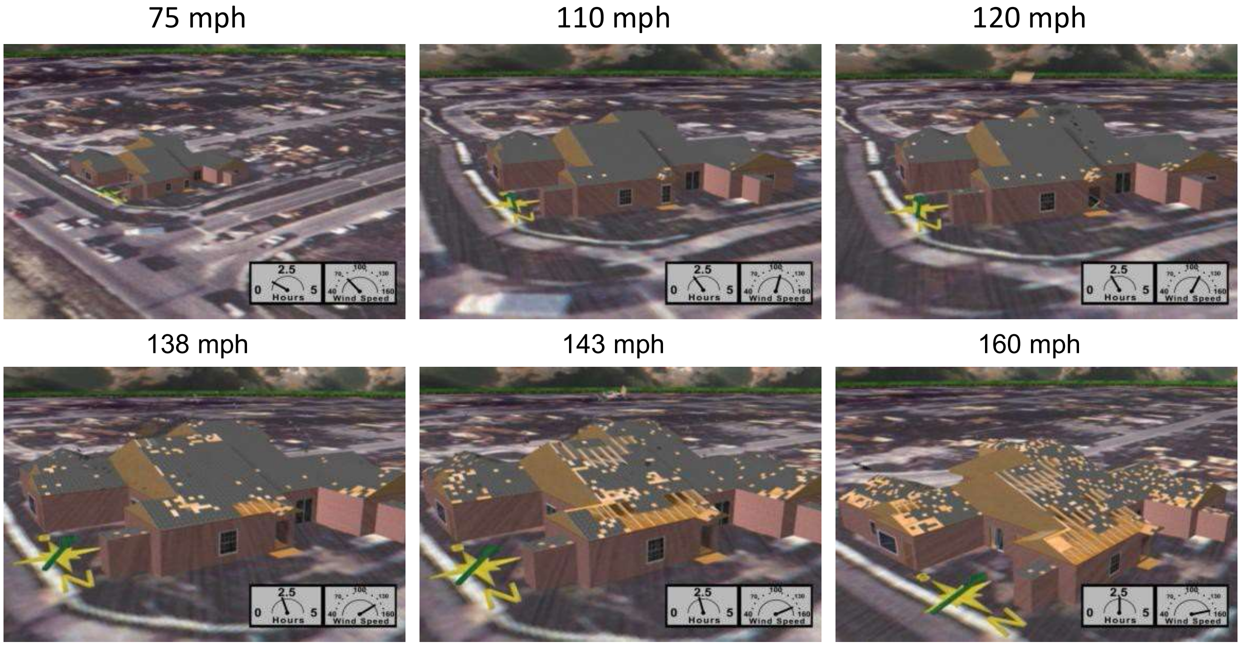


Figure 1-7. Visualization of HurLoss Modeled Progressive Building Damage

1.6. Background on Loss Relativities

The loss relativities presented in this study reflect the variation of loss cost for a given building with different combinations of wind-resistive features. The term "loss cost" is an insurance term that measures the long-term statistical average of loss for a particular building and a particular hazard over a one-year period. The hurricane loss cost for a single building is the long-term statistical average of annual covered hurricane losses divided by the building replacement value. Loss costs are the mathematical expected value of losses (normalized by building value) over many years at a particular location. For a particular building type, the loss costs will vary from location to location because of variations in both the hurricane hazard risk and terrain (aerodynamic roughness). Loss costs are a fundamental measure used by insurance companies to establish insurance rates.

Hurricane loss costs are dependent on the building's location, basic construction features, and wind mitigation construction features. Weak buildings have high losses relative to building value (high loss costs) and strong buildings have low losses relative to building value (low loss costs).

Loss relativities are produced by normalizing loss costs for each building type by the loss costs of an arbitrarily selected reference building. Figure 1-8 illustrates how loss relativities can be produced for three different buildings. The average annual losses for hurricane wind hazards are first estimated for each building, considering the location, terrain, basic construction features and wind mitigation features. The average annual losses are normalized to produce loss costs (i.e., loss in dollars per thousand dollars of building value). Normalizing the loss costs by the weakest building produces a relativity of one for the weakest building (i.e., building with the highest loss cost) and relativities less than one for the stronger buildings. In this example, House 2 has a loss relativity that is 58% of House 1 and is therefore more resistant to wind damage than

House 1. In summary, loss relativities provide a single non-dimensional measure of a building's ability to withstand damage/economic loss from hurricane wind effects relative to some reference building at the same location.

	Value	Average Annual Loss (AAL, $)	AAL/Value	Loss Cost ($/$1000)	Loss Relativity
	$600,000	$3,600	0.006	$6.00	1.00
	$400,000	$1,400	0.0035	$3.50	0.58
	$200,000	$800	0.040	$4.00	0.67

Figure 1-8. Example Loss Cost Relativities for Three Different Houses

1.6.1. Interpretation of Loss Relativities

Loss costs represent long-term statistical averages, based on mathematical expectation. As such long-term simulations are required to achieve statistically stable means of expected annual loss. The use of single or small groups of insured loss events requires significant analysis to extract useful validation data. The analysis approach of analyzing the data in strata by peak gust windspeeds provides a useful approach to understanding insurance loss data. For such analyses, windspeed zones are developed from windfield models calibrated to land and marine anemometer measurements and dropsondes for that hurricane. Insurance data are then analyzed by these strata and losses are assessed. The differences in building construction features are more meaningful for the high wind zones that are near or exceed the design windspeeds for that location.

Most hurricanes do not stress the building envelope of even old code buildings. Since building envelope failures control the largest portion of hurricane loss costs, losses from modest hurricanes across building features will not, in general, match the loss cost relativities developed in this study. In high wind events (generally with gust windspeeds greater than about 120 mph), the dramatic effects of mitigation can be seen as large differences in insured loss for different buildings. Many old code structures will begin to come apart as winds exceed 120 and 130 mph.

Another confounding factor is that in a single event, the strong winds for a location generally occur over an azimuth range of about 90 to 120 degrees. The orientation of the building, particularly its roof shape and orientation relative to the strong winds will have an enormous influence on the loads on the building in that event. For example, quartering winds on a gable roof will produce loads that are 2-3 times higher than winds normal to the gable roof. Hence, for identical houses in the same neighborhood (but facing different directions), one could have its roof deck fail while its neighbor only loses a few roof shingles or tiles. Both buildings experienced essentially the same peak gust windspeeds; but the actual loads are determined by the roof pressures, which are highly wind-direction dependent.

Considering many modeled storms over thousands of simulated years tends to average out the effect of wind direction and hence loss relativities are essentially the same regardless of building orientation. For example, in Miami the effect of house orientation on loss costs is less than about 5% from worst facing direction to best facing direction.

1.7. Organization of the Report

Section 2 discusses updates to technical methodology made for the 2024 study. It summarizes updates to modeling of hurricane wind hazards, engineering models (including evaluation of Florida Building Code changes, damage-to-loss modeling, regions and locations considered, building models and groups, and insurance assumptions.

Section 3 summarizes new analysis of insurance company loss data from recent hurricanes. A significant amount of insurance data has been analyzed to demonstrate the effect of model updates to better predict insured loss.

Sections 4, 0, and 5.3.4 present the loss relativities for single-family, multi-family, and manufactured home/mobile home residences. Separate loss relativity tables for pre-FBC and post-FBC construction are presented for single-family, multi-family Group I, and manufactured residences. Loss relativity tables for multi-family Group II and III residences include both pre- and post-FBC results in the same tables.

Section 7 discusses the significant role that inspections play in the develop effective implementation of wind loss mitigation programs and provides recommendations for process improvements.

The summary and recommendations are presented in Section 8. Section 9 includes a reference bibliography.

Appendix A discusses wind mitigation features and summarizes the definitions of the features considered in this study. Appendix B illustrates the hurricane modeling data used in the insurance loss data analysis in Section 3. Wireframe CAD views of the modeled buildings are included in Appendix C. Example FBC design calculations are given in Appendix D and example results from modeling enhancements for water intrusion through sliding glass doors are presented in Appendix E.

2. Methodology Updates

2.1. Hurricane Wind Hazard Modeling

The hurricane simulation model described in Vickery et al. (2009a, 2009b) is used in this study. This model is the basis of the national hurricane windspeeds given in ASCE 7 since 1998. This model is the basis for the wind model in HURLOSS and was used in the 2008 Loss Relativity Study.

The simulation approach consists of two components, a hurricane windfield model described in Vickery et al. (2009a) and a hurricane track model described in Vickery et al. (2009b). Given key hurricane parameters at any point in time from the track model, the windfield model is used to develop estimates of windspeed and direction at any arbitrary position. Inputs to the windfield model include the central pressure difference, radius to maximum winds, the Holland pressure profile parameter, storm position, translation speed and heading. The hurricane track methodology, developed using historical hurricanes and environmental reanalysis data, reproduces the frequency and spatial characteristics of hurricane tracks as well as the variation of storm size and intensity along the tracks. Environmental parameters used directly in the hurricane track simulation include sea surface temperature, tropopause temperature, and vertical wind shear.

Since 2008, the track model methodology has been updated to 1) combine models for the Caribbean, Central America, the United States, and Canada into a full North Atlantic basin model, and 2) develop a view of hurricane risk reflective of the current state of the climate. The latter update was performed by replacing the historical re-analysis environmental parameters used in the hurricane track simulation with environmental parameters sourced from General Circulation Models (GCMs). An overview of the model basis used in 2008 is presented in Section 2.1.1 and updates since 2008 are presented in Section 2.1.2, including developing a view of hurricane risk reflective of the current state of the climate in Section 2.1.2.2.

2.1.1. Basis from Model Used in 2008

The development and validation of the track model is provided in Vickery et al. (2009b). The models for both the radius to maximum winds (RMW) and the Holland B parameter are described in Vickery and Wadhera (2008), and the intensity filling model is described in Vickery (2005). The windfield model has been extensively validated for surface level winds at both coastal and inland stations as described in Vickery et al. (2009a). An overview of the track and windfield models is provided in the following sections.

2.1.1.1. Hurricane Track Model

A negative binomial distribution is sampled to determine the number of storms to be simulated in a single year. The initial parameters (e.g., position, date, time, heading, translation speed, central pressure) are randomly sampled from all tropical storms in the HURDAT2 database. Using historical starting parameters to initiate the simulated tracks ensures that the climatology associated with seasonal preferences for storm genesis are retained but does not provide any insight as to how storm genesis might be affected by a changing climate. After a storm is initialized, given a storm location at time i, values of sea surface temperature, tropopause temperature and wind shear are sampled within the hurricane simulation from the RCP 8.5 output.

The relative intensity, defined as the ratio of the actual central pressure difference to the greatest possible central pressure difference, is modeled through statistical regression models dependent upon vertical wind shear and previous values of relative intensity as in Equation 1.

$$\ln(I_{i+1}) = c_1\ln(I_i) + c_2\ln(I_{i-1}) + c_3\ln(I_{i-2}) + c_4\ln\left(V_{S_i}\right) + \varepsilon \qquad \textbf{1}$$

where I is the relative intensity, c_1, c_2, etc. are constants that vary with region in the Atlantic Basin, V_{S_i} is the vertical wind shear, i denotes a six-hourly position, and ε is a random error term. Increasing wind shear acts to reduce the relative intensity.

Central pressure is modeled as a function of the relative intensity and thermodynamic and environmental variables including vertical wind shear and the difference between the tropopause and sea surface temperatures as described in Vickery et al. (2000a). A simple one-dimensional ocean mixing model, described in Emanuel et al. (2006), is used to simulate the effect of ocean feedback on the relative intensity calculations. The ocean mixing model returns an estimate of a mixed layer depth which is used to compute the reduction in sea surface temperature caused by the passage of a hurricane. Increasing temperature differentials leads to more intense events while increasing wind shear reduces both intensity and frequency.

Once a simulated storm makes landfall, the central pressure difference, Δp , is decreased as the storm fills (or weakens). The filling of the storm is modeled using the approach described in Vickery (2005), where the central pressure difference at any time after landfall, $\Delta p(t)$, is given as:

$$\Delta p(t) = \Delta p_0 exp(-at) \qquad \textbf{2}$$

where Δp_0 is the central pressure difference at the time of landfall; a is a filling parameter, which is a function of the storm intensity, translation speed and size at the time of landfall as well as the location (or region) of landfall; and t is the time in hours since the center of the storm crossed land. Large storms tend to fill slowly compared to small storms, weak storms fill more slowly than strong storms and slowly moving storms fill slower than fast moving storms. Four different representations of the filling parameter, a, are used – one for the Gulf of Mexico, one for the Florida Peninsula, and two for the Atlantic Coast. In performing studies for locations in Florida, only the first two filling model regions (different representations of the filling parameter, a) are applicable. Additional changes in the characteristics of the hurricane following landfall include a decrease in the value of the Holland profile parameter, B, modeled using an exponential decay function. An increase in the radius to maximum winds, *Rmax*, is brought about because *Rmax* is correlated with central pressure and/or latitude, both of which continue to change after landfall.

The radius of maximum winds (*RMW*) and Holland *B* pressure profile parameter are modeled through regional statistical models as functions of central pressure, latitude, and sea surface temperature (Vickery and Wadhera, 2008). Two models are given for the *RMW*, one for the Atlantic basin and one for the Gulf of Mexico as shown in Equations 3 and 4, respectively.

$$\ln(RMW_{Atlantic}) = 3.015 - 6.291 \times 10^{-5}\Delta p^2 + 0.0337\psi + \varepsilon_{Atlantic} \qquad \sigma_{lnRMW} = 0.441 \quad (3)$$

$$\ln\left(RMW_{Gulf}\right) = 3.859 - 7.700 \times 10^{-5}\Delta p^2 + \varepsilon_{Gulf} \qquad \sigma_{lnRMW} = 0.390 \quad (4)$$

where Δp is the central pressure difference, ψ is the storm latitude, and ε is a random error term. The two regional models for *RMW* are combined using the central pressure difference over the life of the storm to yield a single *RMW* model for each simulated storm. Increasing sea surface temperatures act to reduce the *RMW* due to the increase in storm intensity (central pressure difference).

The Holland *B* parameter, used to define the overall shape of the hurricane and to describe the pressure-wind relationship, over open water is modeled as in Equations 5 and 6.

$$B = 1.76 - 1.21\sqrt{A} + \varepsilon \qquad \sigma_B = 0.226 \quad (5)$$

$$A = \frac{RMW \cdot f}{\sqrt{2R_dT_s\left(1 + \frac{\Delta p}{p_c e}\right)}} \quad (6)$$

where f is the Coriolis parameter, R_d is the gas constant for dry air, T_s is the sea surface temperature, p_c is the central pressure, Δp is the central pressure difference, e is the base of natural logarithms, and ε is a random error term. Increasing sea surface temperature reduces the A term in Equation 6, resulting in a larger *B* value. Holding central pressure and *RMW* constant, a larger value of *B* would result in a pressure profile with a steeper gradient from the *RMW* to the far field of the storm.

The position and speed of the storm are estimated based on changes in the translation speed and storm heading over the current six-hour period. The changes in the translation speed c and the storm heading θ between time steps i and $i + 1$ are obtained from Equations 7 and 8, respectively.

$$\Delta \ln c_{i+1} = a_1 + a_2\psi_i + a_3\gamma_i + a_4\ln c_i + a_5\theta_i + \varepsilon \quad (7)$$

$$\Delta\theta_{i+1} = b_1 + b_2\psi_i + b_3\gamma_i + b_4c_i + b_5\theta_i + b_6\theta_{i-1} + \varepsilon \quad (8)$$

where a_1, a_2, b_1, b_2, etc. are constants that vary with region in the Atlantic basin, ψ_i, γ_i are the storm latitude and longitude, respectively, c is the translation speed, θ is the storm heading, i denotes a six-hourly position, and ε is a random error term. The coefficients a_1, a_2, b_1, b_2 etc. were previously developed using 5°×5° grids over the Atlantic basin. A different set of coefficients for easterly and westerly headed storms is used. Currently, there is no steering dependency on any environmental parameters within the model.

2.1.1.2. Hurricane WindField Model

The hurricane windfield model used here is described in detail in Vickery et al. (2009a). A brief overview of the hurricane windfield model is given here. The windfield model consists of two basic components, a 2-D slab model used to describe the horizontal structure of the hurricane, and a 1-D boundary layer model used to describe the variation of the horizontal windspeed with height.

The 2D-slab model was created using a finite difference scheme to solve the nonlinear equation of horizontal motion, vertically averaged through the height of the boundary layer, to obtain the steady-state windfield over a set of nested rectangular grids. Inputs to the slab model include the central pressure difference, the Holland *B* parameter, *RMW* and translation speed. Steady state windfield solutions were generated for a range of input parameters, yielding 14,040 unique windfields. The *u* and *v* components of the windfield were then transformed to a Fourier series, whose coefficients can be called efficiently within a large-scale hurricane simulation. The main reason for using a 2-D numerical model is that it provides a means to consider the effect of surface friction on windfield asymmetries and to model the enhanced inflow caused by surface friction, particularly at the sea-land interface.

The results from the 2-D slab model are coupled with a boundary layer model that reproduces the variation of the horizontal wind with height. This model has been developed using a combination of experimental and theoretical analyses. The experimental data consists of the analysis of dropsonde data collected in hurricanes during the period from 1997 through 2003. The variation of the mean horizontal windspeed, $U(z)$ with height z, in the hurricane boundary layer can be modeled using Equation 9.

$$U(z) = \frac{u_*}{k}\left[\ln\left(\frac{z}{z_o}\right) - 0.4\left(\frac{z}{H}\right)^2\right] \qquad \textbf{9}$$

where u_* is the friction velocity, z is the height above ground, z_o is the surface roughness length, k is the von Karman constant, and H is the height of the boundary layer. The boundary layer for winds over water is computed using Equation 10.

$$H = 385 + 0.291/I \qquad \textbf{10}$$

where the inertial stability parameter, I, is defined as in Equation 11.

$$I = \sqrt{\left(f + \frac{2V}{r}\right)\left(f + \frac{V}{r} + \frac{\partial V}{\partial r}\right)} \qquad \textbf{11}$$

where V is the azimuthally averaged tangential gradient windspeed, f is the Coriolis parameter, and r is the radial distance from the center of the storm. Since H is a function of $1/I$, the boundary layer height decreases with increasing windspeed and decreasing distance from the center of the storm. The ratio of the mean over water surface level windspeed to the mean windspeed at the top of the boundary layer obtained from the model varies between about 0.67 and 0.74, with 0.71 being a representative value. Figure 2-1 shows comparisons of the variation of the modeled and observed windspeed with height produced by the hurricane boundary layer model.

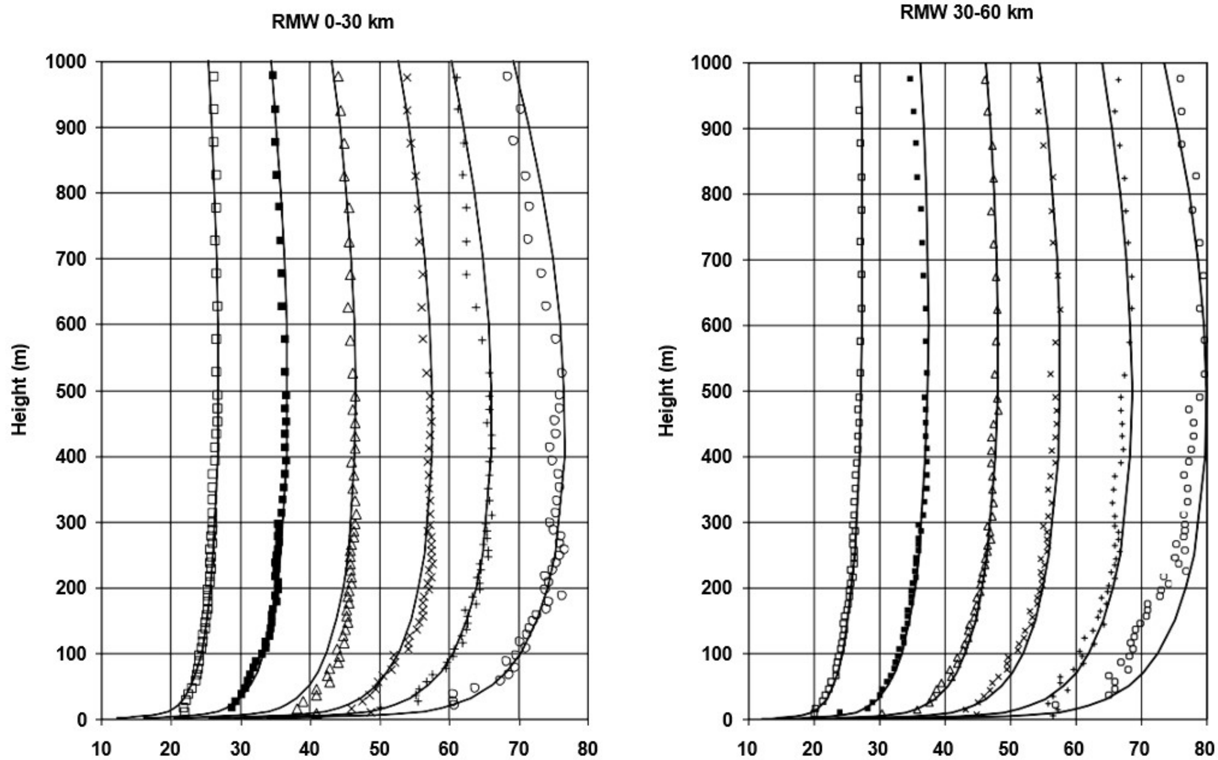


Figure 2-1. Comparisons of modeled and observed hurricane mean velocity profiles over the open ocean for a range of windspeeds.

Surface roughness is a critical component in the modeling of winds, notably during the transition of wind speed profiles from marine to over land terrain. As the ground surface becomes rougher, the wind speeds near the ground decrease although the upper-level wind speed remains the same. Figure 2-2 shows the rapid transition of surface level gusts from a marine environment to smooth open terrain. More than half of the reduction occurs within 100 meters of the coast, and approximately 80% of the reduction occurs within 1 km of the coast. Mean wind speeds transition more slowly.

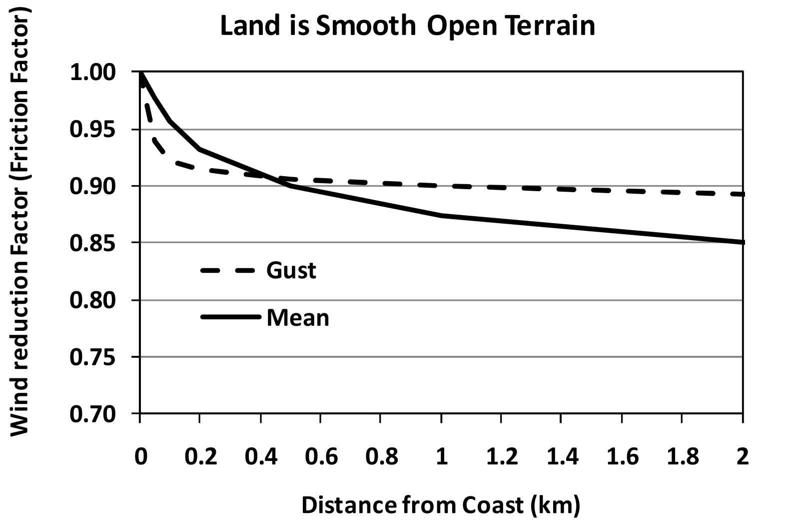


Figure 2-2. Wind speed transition at the coast from a marine environment (z_0≈0.003 m) to open terrain (z_0=0.03 m).

As the hurricane moves over land, the value of the maximum windspeed at a given height transitions asymptotically from marine terrain to some rougher terrain over a fetch distance F. For modeling the transition, the ESDU (1982) boundary layer transition model is used, but the limiting fetch distance of about 100 km used in ESDU (1982) is reduced to 20 km. This smaller fetch distance is consistent with the lower boundary layer heights associated with tropical cyclones compared to the larger values used in ESDU for winds not produced by tropical cyclones. The full transition from a marine terrain to an open terrain results in an 18% to 20% reduction of the mean windspeed at a height of 10 m.

Figure 2-3 presents the gust windspeed ratios derived from the Vickery, et al. (2009a) model (near the RMW), the ratios derived from the Vickery, et al. (2000a) model (also near the RMW) and those derived from ASCE 7. The windspeed ratio is defined as the open terrain gust windspeed (defined here as z_o = 0.03m) divided by the marine gust windspeed. Thus, for Exposure D, the ratio is equal to $1/K_z$ where K_z is the exposure height factor used in ASCE-7. As indicated in Figure 2-8, the windspeed ratios produced by the new windfield model are similar to the ratios associated with Exposure D for all windspeeds, whereas for large windspeeds, the windspeed ratio associated with the older model, using a drag coefficient that does not have an upper limit, approaches that of Exposure C in ASCE 7.

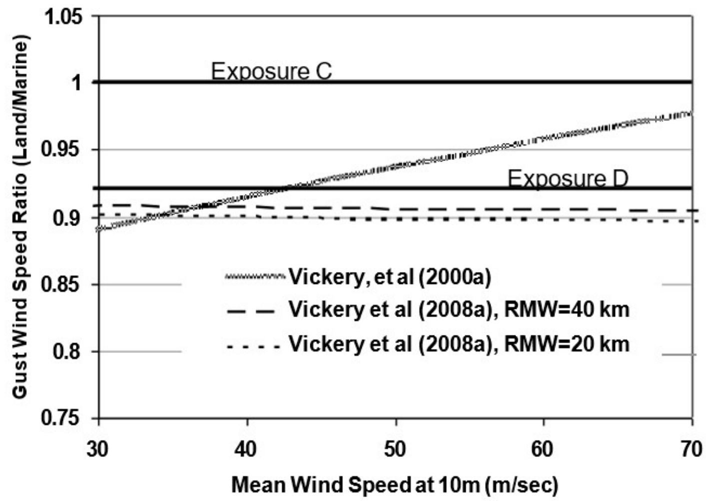


Figure 2-3. Gust windspeed ratio (gust windspeed on land divided by gust windspeed over water). A gust windspeed ratio of 1 indicates no reduction in windspeed as wind moves from sea to land (i.e., marine roughness is the same as open terrain).

2.1.2. Model Changes Since 2008

2.1.2.1. North Atlantic Basin Model

In updating the United States specific hurricane track model to a full North Atlantic Basin model, the modeling methodology remains unchanged from that discussed in Vickery et al., (2009a) but the historical and environmental data serving as the basis of model development and validation were extended through 2019. Figure 2-4 presents coastal segments along the Gulf of Mexico and Florida used to compare modeled and historical hurricane parameters from the full North Atlantic Basin model. Figure 2-5 through Figure 2-9 present comparisons of modeled and historical translation speeds, headings, occurrence rates, and central pressures along the Florida coastal segments. P-values associated with statistical tests for equivalence of distributions (e.g., Kolmorogov-Smirnov, Chi-Square), means (e.g., t-test), and variances (F-test) are also presented in the figures.

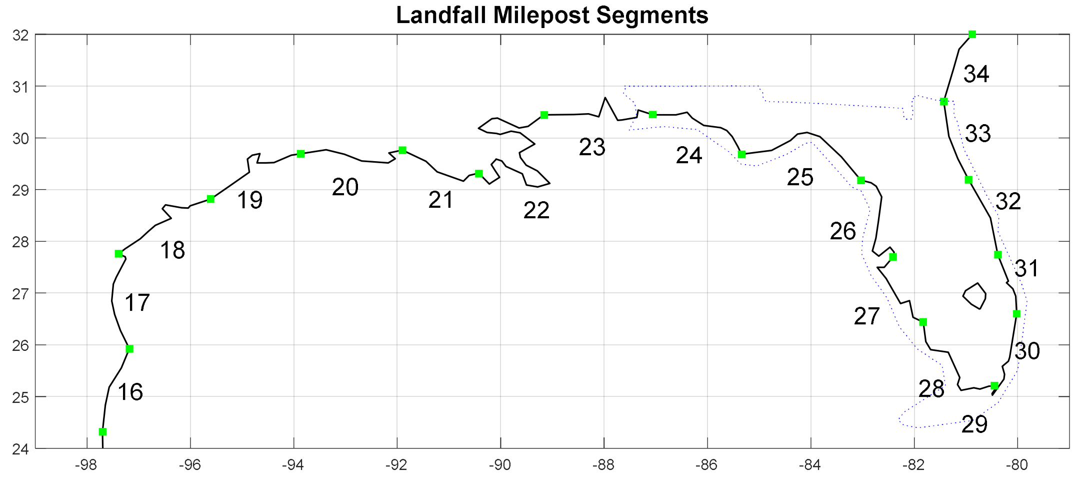


Figure 2-4. Locations of coastal segments used to compare modeled and historical properties of hurricanes at landfall.

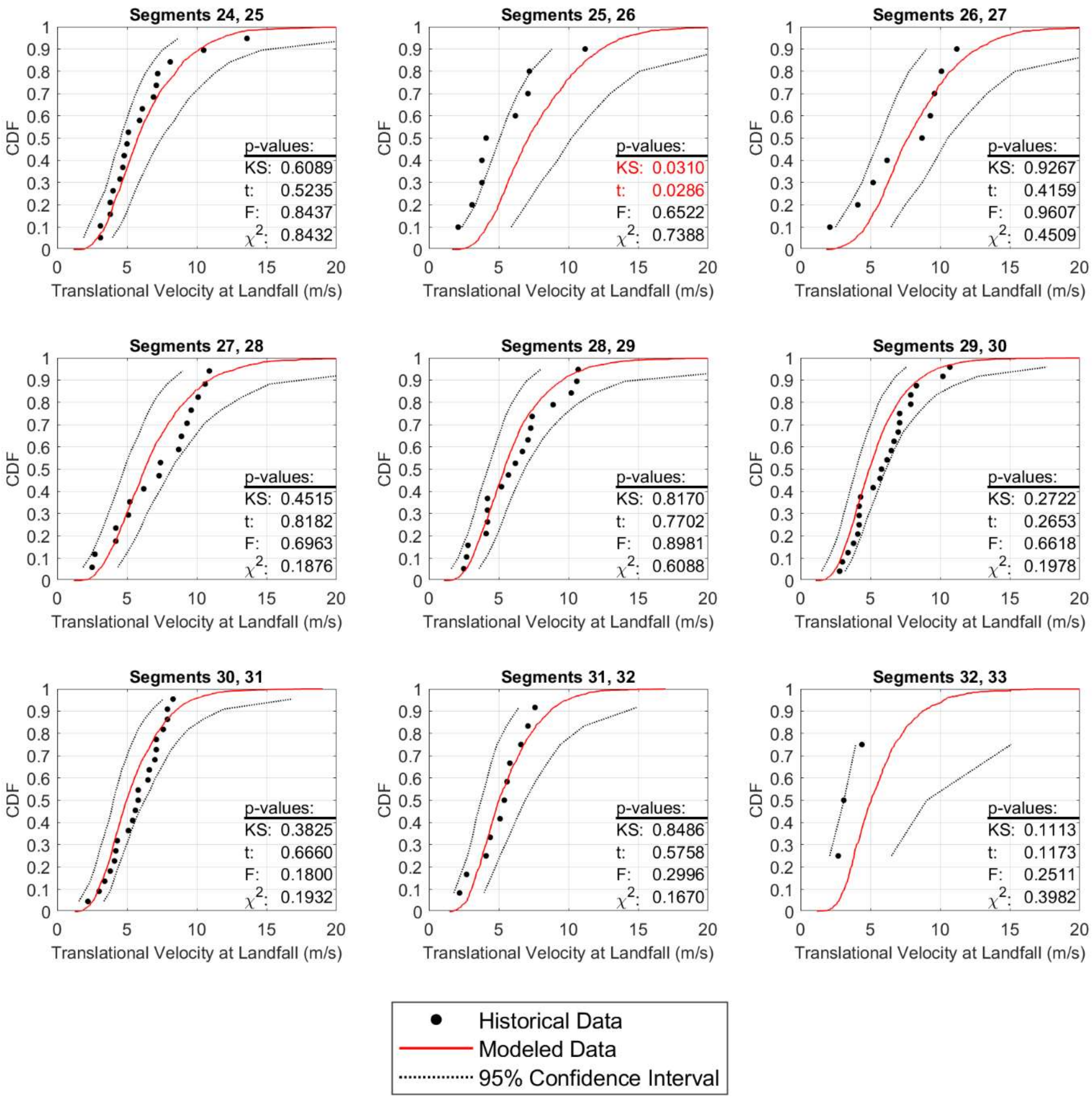


Figure 2-5. Comparisons of modeled and observed translation speed at landfall for segments along the Florida coastline.

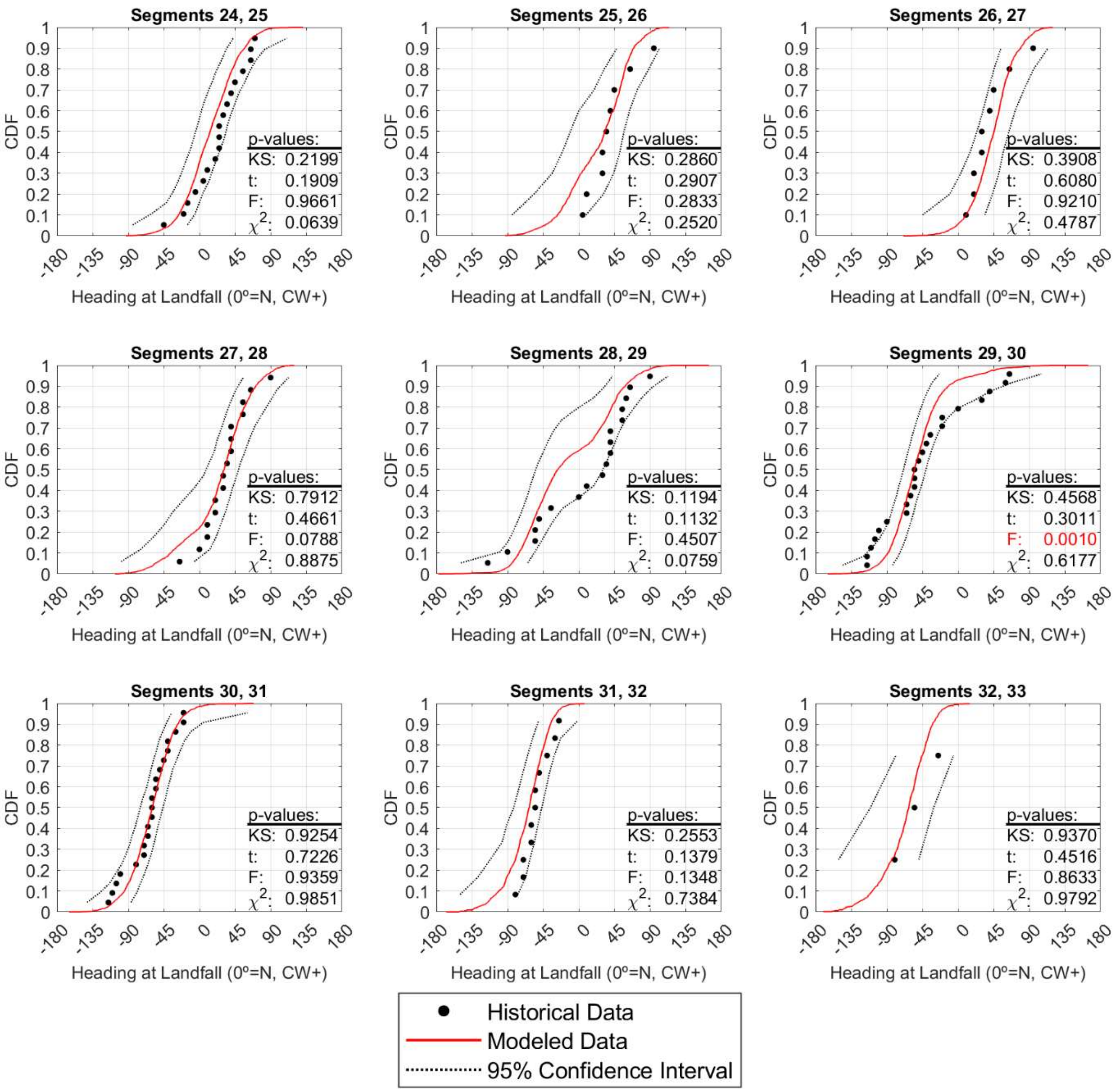


Figure 2-6. Comparisons of modeled and observed storm headings at landfall for segments along the Florida coastline.

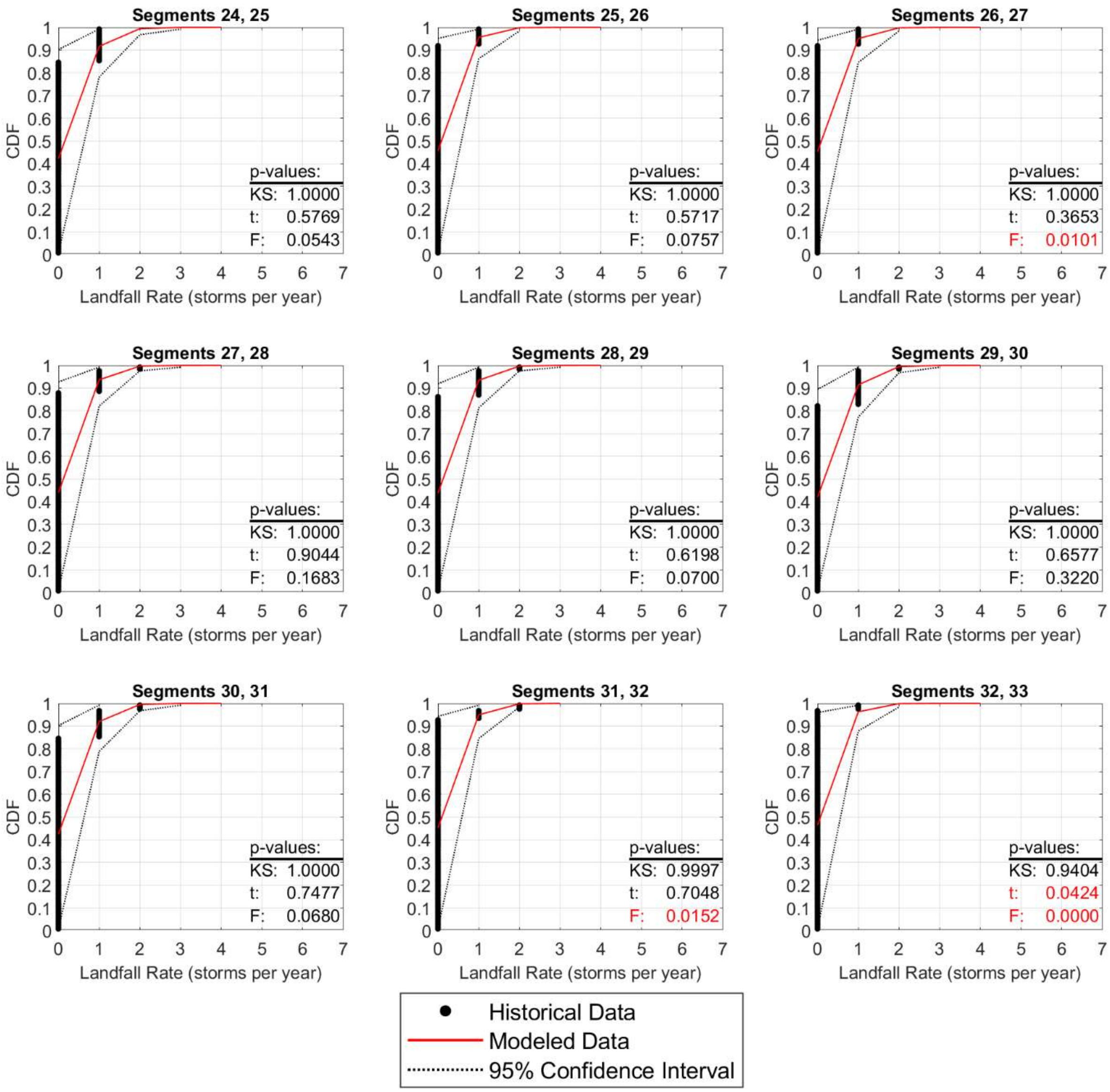


Figure 2-7. Comparisons of modeled and observed landfall rate for segments along the Florida coastline.

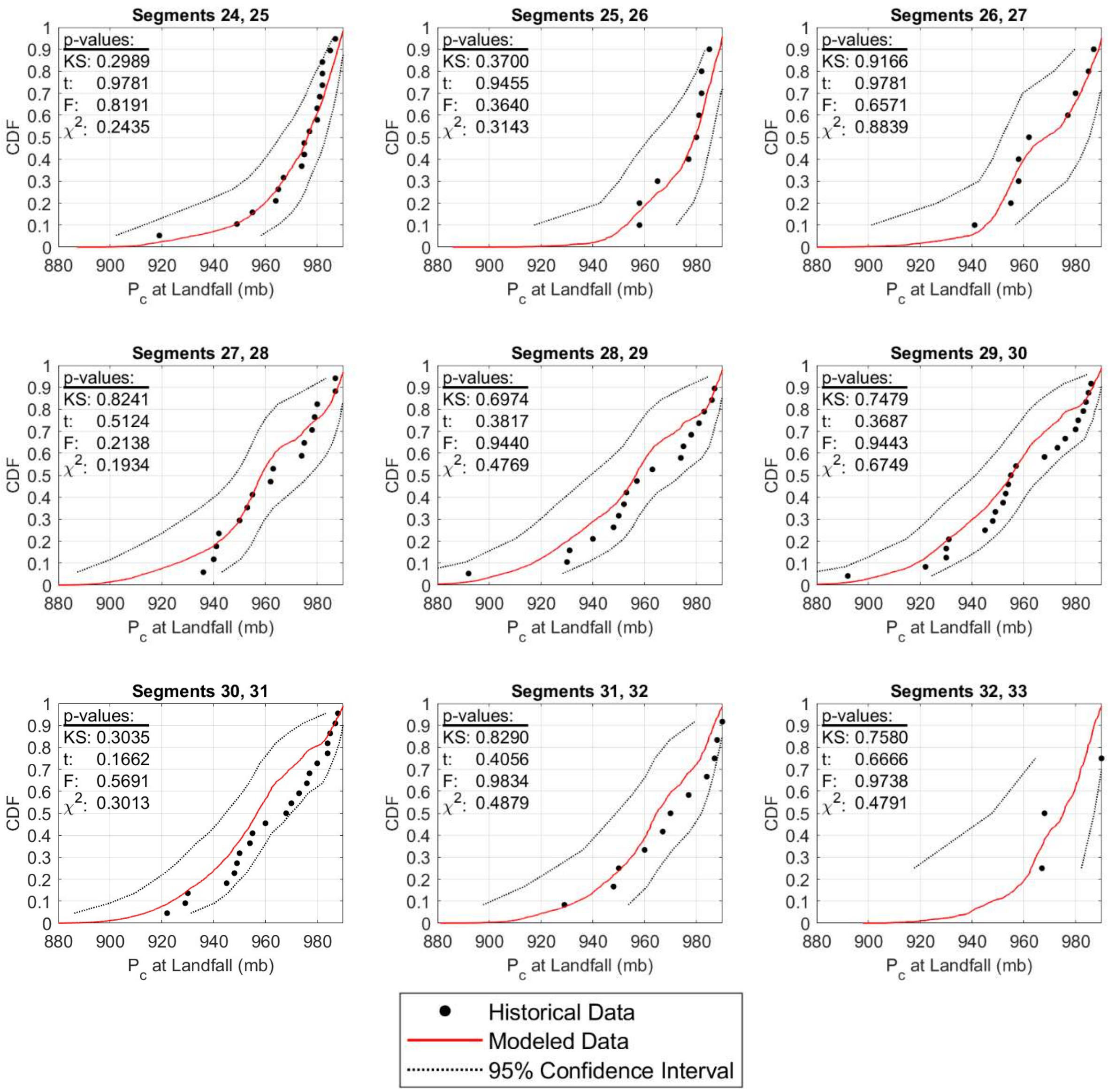


Figure 2-8. Comparisons of modeled and observed landfall central pressures for segments along the Florida coastline.

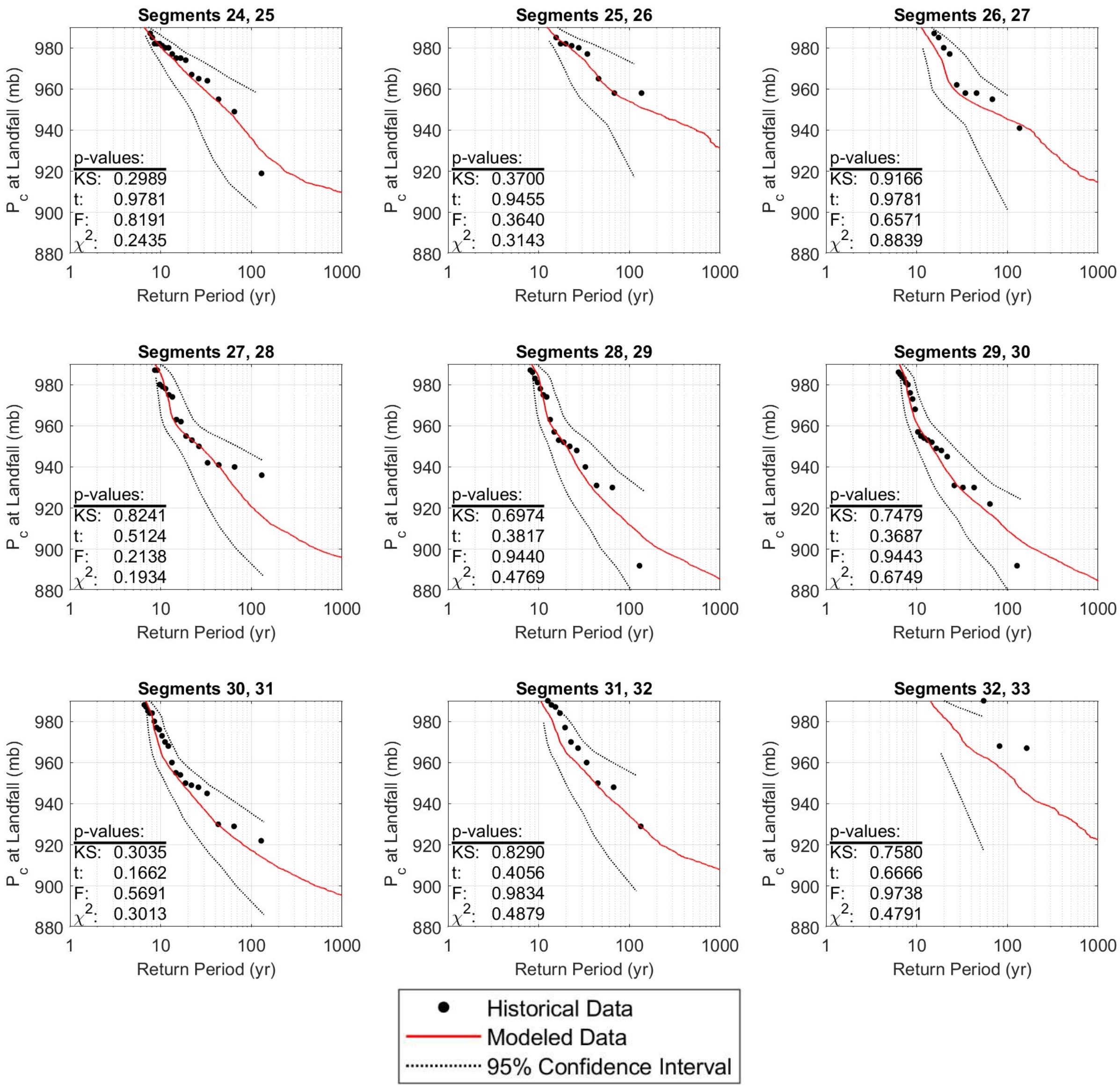


Figure 2-9. Comparisons of modeled and observed landfall central pressures for segments along the Florida coastline plotted as a function of return period.

2.1.2.2. Current View of Climate

Until recently, hurricane risk in the United States has been characterized simulating tracks and windfields in a stationary climate equivalent to the average climate state from 1949 to the present. However, significant research has taken place since the 2008 loss relativities study to indicate climate change as already begun to impact the hurricane hazard. The Intergovernmental Panel on Climate Change (IPCC) reports with high confidence in their Sixth Assessment Report that both the proportion of intense hurricanes (category 3-5) and the peak windspeeds of the most intense events will increase on the global scale with increasing global warming. Considering such research, we have developed a view of hurricane risk under the current climate, which has gone through the rigorous auditing process of the Florida Commission on Hurricane Loss

Projection Methodology (FCHLPM) and has been approved for ratemaking in the state of Florida. The submission to the FCHLPM can be accessed here https://fchlpm.sbafla.com/media/r42ngc14/ara21_fchlpm_submission_2023-04-18.pdf.

Environmental parameters used directly in the hurricane track simulation include sea surface temperature, tropopause temperature, and vertical wind shear. When characterizing the long-term hurricane hazard, historical environmental data from 1949 to the present is sourced from the National Center for Environmental Prediction (NCEP)/National Center for Atmospheric Research (NCAR) Reanalysis 1 dataset. To characterize the hurricane hazard in the current climate, the historical climate data used in the hurricane track model is replaced with environmental output associated with the IPCC Representative Concentration Pathway (RCP) 6.0 scenario in the year 2021. This methodology allows for the consideration of changes in, and interactions of, multiple environmental parameters as opposed to only a single parameter (e.g., sea surface temperature). Figure 2-10 shows the 100-year return period sustained windspeeds in open terrain obtained using the current climate view of hurricane risk in Florida.

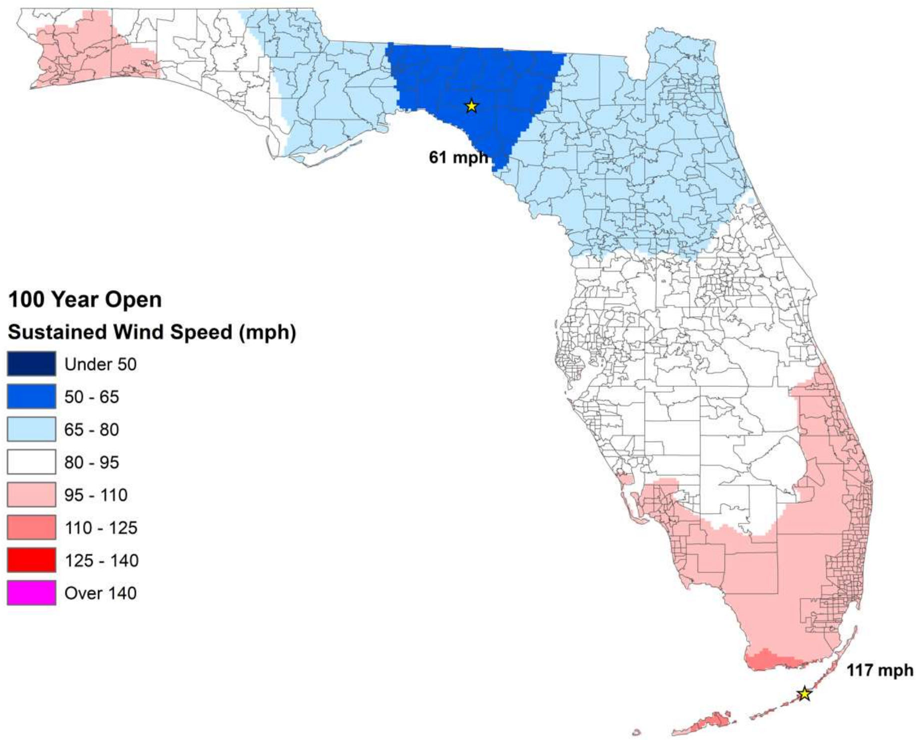


Figure 2-10. 100-year return period sustained windspeeds at a height of 33 ft (10 m) above ground in open terrain.

Figure 2-11 shows the change in the 2017 Florida Hurricane Catastrophe Fund (FHCF) zero deductible average annual losses using the current climate view of hurricane risk in Florida compared to the long-term view. On a statewide basis, the current climate view of hurricane risk in Florida results in a small upward effect on the statewide modeled hurricane loss costs of about 4.9%.

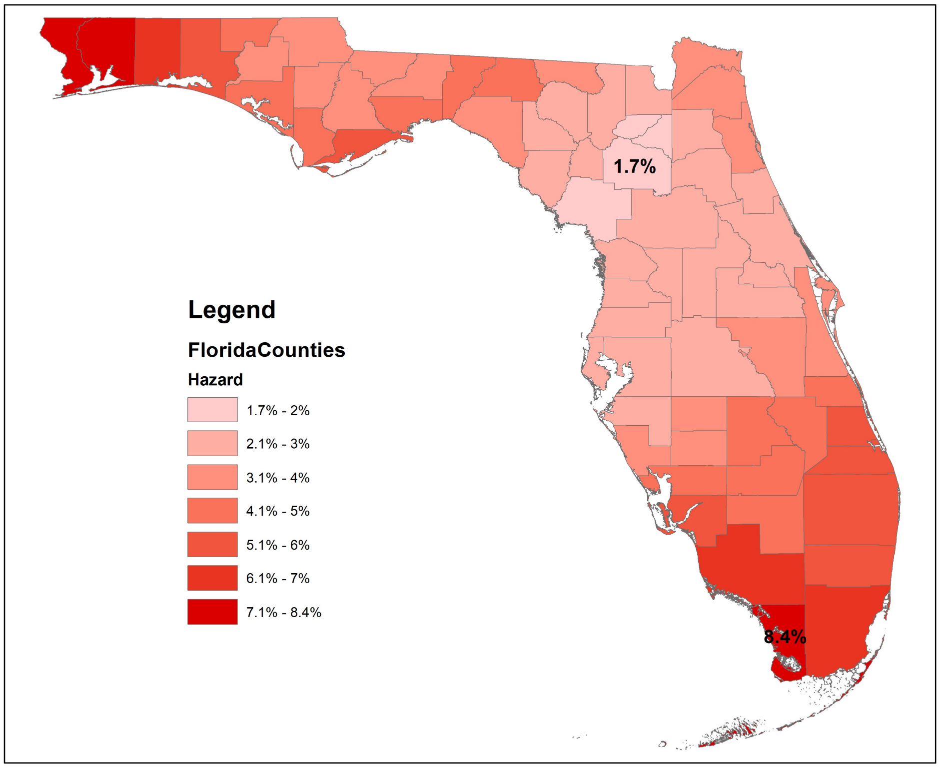


Figure 2-11. Percentage Change in 2017 FHCF zero deductible average annual losses by county between climate change view and long-term view.

2.2. Engineering Models of Building Performance

2.2.1. Florida Building Code Changes Since 2008

The Florida Building Code (FBC) has undergone a number of updates since 2008. The following subsections discuss the code changes address the impact of these changes on the wind resistive features, such as design windspeeds, roof deck attachment, and secondary water resistance.

2.2.1.1. Design Windspeeds and Opening Protection

The most notable change since the 2008 wind loss mitigation study is in the design windspeed contours. FBC 2001, 2004, and 2007 used the ASCE 7-98 design windspeed map (red contours in Figure 2-12). These windspeed contours were used for allowable stress design along with a load factor of 1.6 to compute a design wind pressure for a given location. FBC 2010 and onward used ASCE 7-10 (and later) windspeed contours. The ASCE 7-22 contours are shown as the blue contours in Figure 2-12. The windspeed contours for the majority of the state are essentially unchanged throughout the majority of Florida between the ASCE 7-10 and 7-22 with the only slight differences in the panhandle where Hurricane Michael (2018) made landfall in Florida. The ASCE 7-10 (and later) windspeed contours are used with the ultimate strength design method and include a load factor of 1.0 (instead of 1.6). The outcome of these changes is that the windspeeds shown on the design wind maps are much higher now than they were previously. However, the resulting design pressures for buildings are similar. This also results in changes to the wind-borne debris region (WBDR) definitions as shown in Table 2-1. Changes in Design Wind Maps. Opening protection is required for all buildings in the WBDR as the option to use partially enclosed design instead was eliminated in 2007. Prior to FBC 2010, the WBDR region was defined for all category II buildings (including single-family homes) as design windspeeds of 120 mph or greater, or for design windspeeds of 110 mph or greater and within 1 mile of the coast for allowable stress design. Since FBC 2010, the WBDR has been defined as category II buildings with design windspeeds for 140 mph or greater, or for design windspeeds of 130 mph or greater and within 1 mile of the coast for ultimate strength design.

FBC 2023 includes a slight change to the WBDR that were updated in ASCE 7-22. All category II buildings with design windspeeds of 140 mph or greater remain in the WBDR. However, the WBDR was expanded to include category II buildings with design windspeeds of 130 mph and within 1 mile of the mean line where exposure D exists. This could most notably impact areas such as Orlando where opening protection may be now required for some buildings.

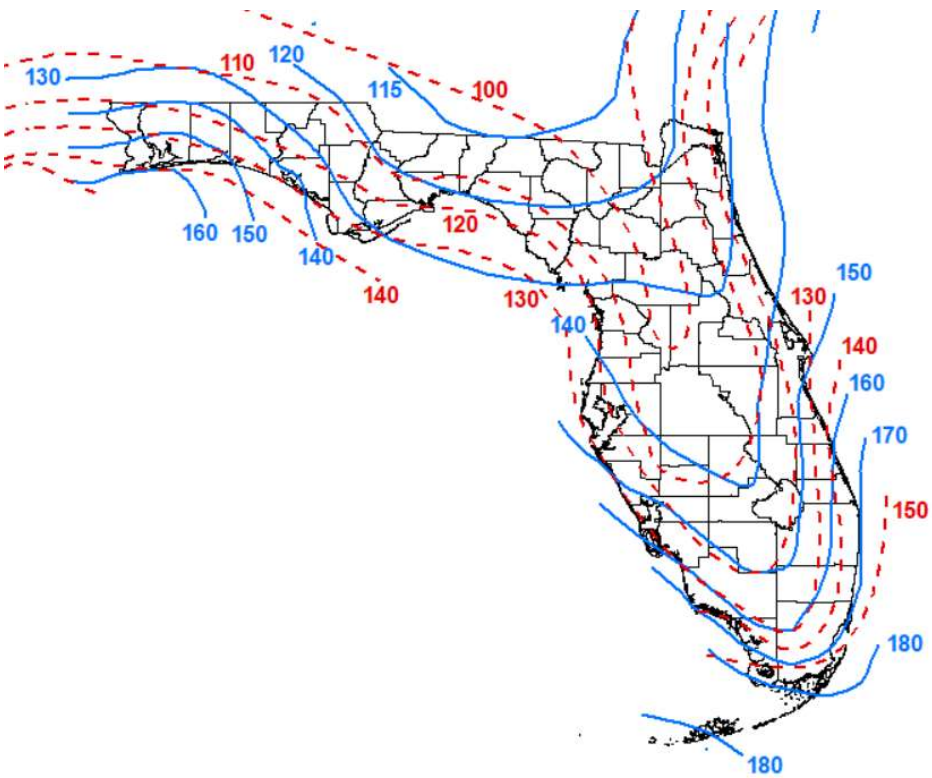


Figure 2-12. Windspeed contours for FBC 2001-2007 (red), and FBC 2010 & onward (blue).

Table 2-1. Changes in Design Wind Maps

Building Code(s)	ASCE Map	Windspeed Range	Load Factor	WBDR Definitions
FBC 2001, 2004, 2007	7-98/02/05	100 - 150	1.6	≥120 mph or ≥110 mph within 1 mile of coast
FBC 2010, 2014, 2017, 2020	7-10/16	115-180	1.0	≥140 mph or ≥130 mph within 1 mile of coast
FBC 2023	7-22	115-180	1.0	≥140 mph or ≥130 mph within 1 mile of mean water line where exposure D exists

2.2.1.2. Roof Deck Attachment

Another notable change to the FBC is the change in component and cladding loads on the roof of building less than 60 feet tall. FBC 2020 adopted the updated roof loads and zones from ASCE 7-16. For sloped roofs, the zone configuration did not change, but the pressure coefficients increased based on new wind tunnel test data. For low-sloped roofs (i.e., 2:12 slope or less), the roof zones changed to better reflect the distribution of load.

For single-family homes in Florida, the increase in design roof pressures has limited impact because 8d ring shank nails have been required for roof deck attachment since the 2006 FBC Supplement (effective December 2006) to the FBCR 2004 across the entire state of Florida. This change resulted in an approximate doubling of the uplift capacity of roof sheathing compared to the uplift resistance provided by 8d common nails at the same spacing. FBCR 2020 has defined closer spacing of 8d ring shank nails for higher windspeeds and eliminated exception to use weaker roof deck attachments.

However, for multi-family homes (e.g., Group I homes) 8d ring shank nails have been required only in the HVHZ since FBC 2004. Therefore, this increase in roof pressures has a larger impact on the design loads for roof deck attachment for these buildings.

2.2.1.3. Secondary Water Resistance

Secondary Water Resistance (SWR), also known as sealed roof deck, is a layer of protection that seals the roof deck and protects the building if the roof cover and underlayment fail. The goal of applying SWR is to keep rainwater out of the building if the roof cover fails. Further details on SWR are provided in Appendix A.

At the time of the 2002 and 2008 wind mitigation studies, SWR was not required by the FBC. FBCR 2014 was the first edition of the FBC that included requirements for SWR (or secondary water barrier). However, the requirement for SWR only applied to single-family homes where the roof covering was being replaced (i.e., existing construction). For new construction, an alternative was introduced to FBCR 2014 that was intended to provide SWR. However, the other options included do not provide SWR. Similarly, FBCR 2017 provides multiple options for underlayment of new construction, one of which produces SWR. The underlayment section of FBCR 2020 (Section 905.1.1) was updated to be consistent with the recommendations from Insurance Institute for Business & Home Safety (IBHS) to create SWR (or a “sealed roof deck”). Although this is now required by the FBC, it is difficult for homeowners to prove that SWR was installed.

From conversations with inspectors in Florida, we have learned that SWR is not always being installed as permits are not acquired by all roofing contractors on every house. Because it is difficult to prove and their still seems to be some confusion over SWR requirements, we treated the base case as "no SWR" for this study as we did for previous wind mitigation studies.

2.2.1.4. FBC Construction Eras

The changes discussed above are summarized in Table 2-2.

Table 2-2. Summary of notable changes to FBC since 2008 wind loss mitigation study

Building Code	Effective Date	ASCE 7	Notable Changes
FBC 2010	3/15/2012	7-10	• Change of windspeed contours to use ultimate design with load factor of 1. Results in changes to design windspeeds and WBDR definitions
FBC 2014	6/30/2015	7-10	• SWR first required for site-built single-family homes being re-roofed. • SWR included in alternative underlayment option for new construction
FBC 2017	12/31/2017	7-10	• Multiple options of underlayment for new construction, one of which produces SWR
FBC 2020	12/31/2020	7-16	• Updated roof pressure zones and pressure coefficients for buildings less than 60 feet tall. • Slight changes to windspeed contours that increase design windspeeds in the Panhandle • Underlayment section updated to be consistent with IBHS recommendations for SWR (or "sealed roof deck")
FBC 2023	12/31/2023	7-22	• Updated definition of WBDR to include inland areas within 1 mile of the mean water line where exposure D exists rather than within 1 mile of the coast. More inland areas with design windspeeds from 130-139 mph will require opening protection.

Although the changes listed in Table 2-2 are notable, we recommend continuing to use the same three eras that were used for the 2008 wind mitigation study. The eras are shown in Table 2-3. The first era, pre-FBC, includes all buildings that were constructed prior to the development of the FBC. The second era, FBC 2001 & 2004, includes buildings that were built to the FBC 2001 and 2004 codes. Single-family homes in Miami-Dade, Broward, and Palm Beach counties should also be included in this era. Following Hurricane Andrew in 1992, Miami-Dade and Broward Counties adopted significantly improved design requirements to the South Florida Building Code (SFBC), and the neighboring county of Palm Beach amended the SBC to require missile impact protection of glazed openings for many buildings. Because the SFBC improvements formed the basis for the HVHZ in the future FBC, and the Palm Beach County amendments were similar in scope to future WBDR requirements, these changes are considered FBC provisions for the purposes of this study and therefore were not considered as being in effect for the pre-FBC era.

The third era is FBC 2006 & onward. FBC 2006 is an unofficial designation used in this study for the FBC(R) 2004 with the following amendments:

- Ring shank nails are required for all roof deck attachments for prescriptive designs (12/8/2006)

- Soffits required to be designed to resist wall pressures (12/8/2006)
- Option for ASTM D-7158 Class H (150 mph [asd]; 190 mph [ultimate]) shingles for design windspeeds of at least 130 mph for allowable stress design (or 170 mph for ultimate design) (12/28/2006)
- Elimination of the Panhandle Exception for the WBDR (2/1/2007)
- Elimination of the partially enclosed design option (7/1/2007)

Table 2-3. Construction eras for loss relativity analysis

Loss Relativity Era	Permit Application Dates	Approximate Year Built
Pre-FBC	Prior to March 1, 2002	2002 and earlier
FBC 2001 & 2004[1]	From March 1, 2002 to December 7, 2006	2003-2007
FBC 2006 & onward	From December 8, 2006 to current	2008-current

[1] Single-family homes in Miami-Dade and Broward counties built to SFBC 1994 should be treated as the FBC 2001 & 2004 era because the SFBC 1994 has similar requirements to the HVHZ in FBC 2001.

Although the changes described since the 2008 loss mitigation study are notable, we believe that they do not rise to the level of needing an additional era because:

- Despite the changes to the design windspeeds beginning in FBC 2010 (ultimate strength design instead of allowable stress design), the resulting design pressures are similar, and WBDR where opening protection is required are similar for the purposes of producing relativities.
- The changes in roof pressures with FBC 2020 (via ASCE 7-16) resulted in some changes to the prescriptive spacing of ring shank nails. However, this significant increase in load was already largely addressed by the FBCR 2006 prescriptive requirement for 8d ring shank nails at 6-inch spacing across the state.
- Whether the underlayment requirements for new construction would produce SWR was not clear prior to FBCR 2020. Although the FBCR 2020 and 2023 requirements are significant improvements, our understanding from discussions with inspectors is that proper SWR installations are not consistently being enforced as some roofing contractors are not acquiring permits.

2.2.1.4.1. Determination of FBC Era

There are several approaches for determining FBC era for insurance rating purposes. The first and foremost approach is to find out what code the building was built to. That is, the question should be "To what building code (and amendments) was the building built?" and not "What year was the building built?" The FBC requires that the structural drawings indicate building design information. For example, Figure 2-13 shows a drawing stamp that indicates the house was designed to FBC 2001 as a fully enclosed building with 120 mph basic windspeed. The second approach is to verify the permit application date and use that to classify the building into the appropriate era. Permit application dates are generally available from the local Florida building

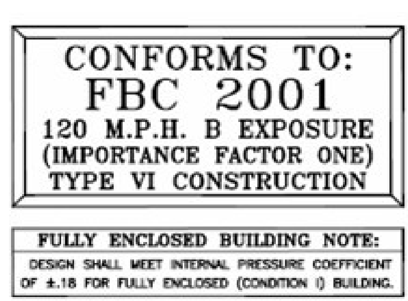


Figure 2-13. Example drawing stamp that shows FBC construction

department. For example, an insurer could ask the homeowner to provide that information if there was a question as to whether the home qualified as FBC 2001 or 2006.

A third, less accurate, approach would be to use the year built as a surrogate to determine the appropriate FBC era. As shown in Table 2-3, homes built from 2003-2007 would most likely fall into FBC 2001 & 2004 Era, while homes built in 2008 and later would fall into FBC 2006 & onward Era. A year-built of 2002 or 2007 is more uncertain. This is because effective date for significant changes falls within these years. We placed a year built of 2002 in the pre-FBC era and a year built of 2007 in the FBC 2001 & 2004 era as shown in Table 2-3. These years-built recognize that there is a lag time between initial permitting and completion of construction, which often includes delays. Generally, we have taken the approach that the year built will be the code adoption date plus one year.

It is clear that any year-built approach is simply an approximate surrogate for FBC Era and would miss some homes that are actually FBC built homes. For example, a home whose permit application occurred after March 1, 2002, and was also completed in the same year would be missed by the surrogate years in Table 2-3. Similarly, a home with permit application in 2007 and completed in 2007 would be missed as FBC 2006 using the surrogate year built in Table 2-3.

The homeowner should always have the option of confirming whether the home is FBC (and which FBC Era) by providing construction permit application dates and or design drawing information. Since the rate differentials are significant for FBC construction, the homeowner has an economic interest in making sure the home receives the appropriate credit. From the insurer viewpoint, they have a clear economic interest in making sure that homes were built to the FBC. For example, an insurer that uses year built of 2001 or 2002 as automatic qualification for FBC 2001 Era would be granting rate differentials to many homes that were permitted before the FBC became effective. Since homes built prior to the FBC require an inspection to determine what rate differentials apply, the differences are significant in terms of both inspection cost and rate differentials.

2.2.2. Water Intrusion though Tracks of Sliding Glass Doors

Water infiltration through the tracks of sliding glass doors can lead to costly damage to the interior, contents and furnishings of residential buildings, particularly for multi-family structures (Prevatt et al., 2019). This vulnerability is especially apparent during severe weather events such as hurricanes. Post-hurricane damage assessments have revealed that wind-driven rainwater intrusion through intact windows and doors, can cause significant damage to buildings even in the absence of structural damage (Gurley and Masters, 2011). Despite sliding glass doors being subjected to water intrusion resistance testing according to TAS 202 standards, particularly in Florida's High-Velocity Hurricane Zone (HVHZ), the testing pressures typically represent only 15% of the design pressure, often below 6 pounds per square foot (psf). Consequently, the testing conditions likely underestimate the impact of heavy wind-driven rainfall during hurricanes on sliding glass doors.

A few recent studies have focused specifically on water intrusion through the tracks of sliding glass doors. For instance, Parackal et al. (2023) investigated water intrusion through a C2 sliding glass door under various static pressures and wetting rates. Their experiments also included dynamic pressure testing. The results illustrated in Figure 2-14 depict the average water ingress for each pressure increment and wetting rate. These curves exhibit a range of pressures where no water ingress occurs, followed by water intrusion where small pressure changes cause significant increases in water ingress. Subsequently, the slope of the curve decreases towards an asymptote, indicating diminishing increase in water ingress with higher wind pressure. In addition, dynamic pressure testing yielded lower water ingress compared to static pressure testing. The researchers suggested that the observed water intrusion behavior is influenced by the track depth of the sliding door assembly. The track depth for Parackal et al. (2023) study was about 1.15 in.

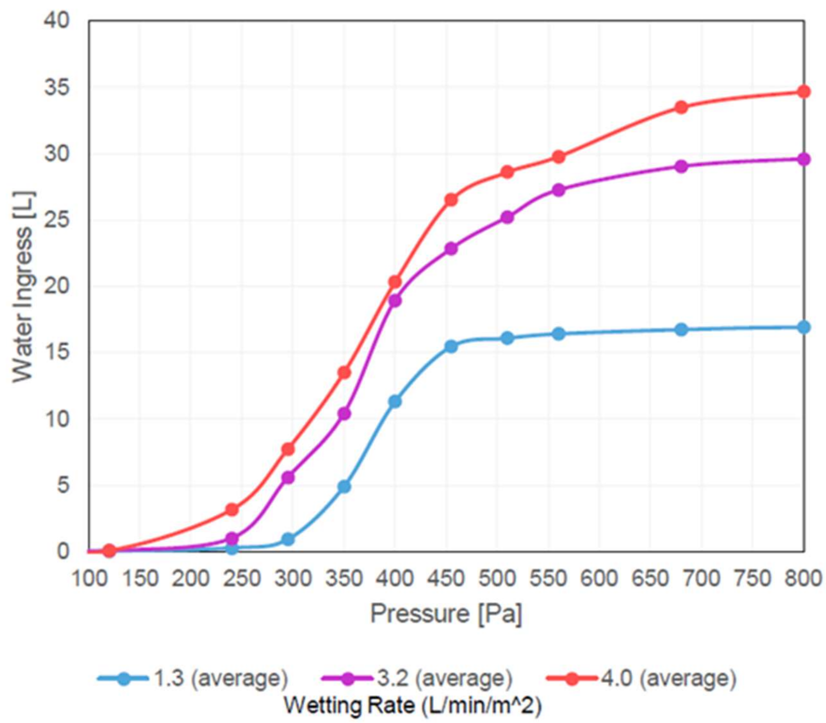


Figure 2-14. Average Water Ingress by Pressure Increment and Wetting Rate through Sliding Glass Door (Parackal et al. 2023).

In a study by Vutukuru et al. (2024), sliding glass doors with and without shutters were tested at the Florida International University (FIU) Wall of Wind (WOW) facility under various wind directions, wetting rates, and simulated windspeeds. Minimal to no water intrusion was observed at a windspeed of 65 mph for the tested sliding door model. However, significant water intrusion occurred at windspeeds of 110 mph or higher, particularly in the absence of shutters.

In this study, we have developed a simplified empirical model based on the findings of Parackal et al. (2023). We utilized power law and logarithmic fits to describe the steep and plateau portions of the observed curves, respectively. This model is applicable within wetting rates ranging from 1.3L/min/m^2 to 4L/min/m^2. For wetting rates beyond these bounds, water intrusion estimates are extrapolated from the modeled curves. The modeled curves align well with the data points from Parackal et al.'s study, as shown in Figure 2-15. The modeled curve with dynamic wind effects was compared with the data obtained from experiments carried out at FIU (NCE,

2023) for two types of sliding glass doors. The wetting rate used in those experiments was about 1.7L/min/m^2. The comparison of test results with the modeled water intrusion is shown in Figure 2-16. This figure shows that the modeled water intrusion does not significantly differ from those measured in the experiments.

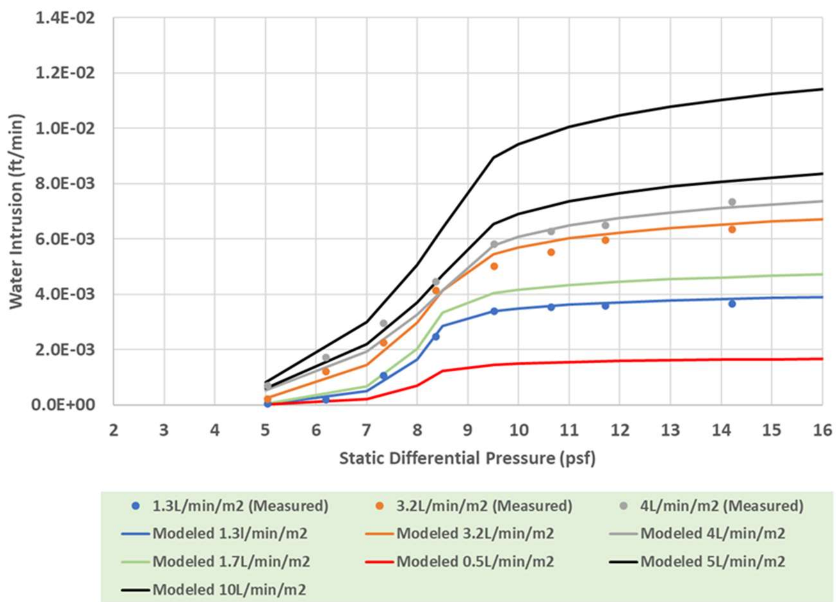


Figure 2-15. Comparison of Modeled Water Intrusion with those Measured in Parackal et al. (2023).

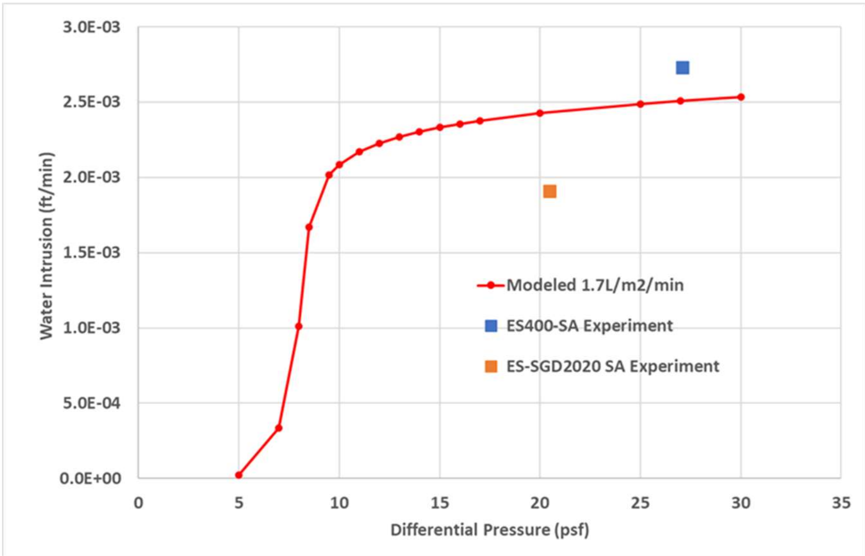


Figure 2-16. Comparison of Modeled Water Intrusion with those Measured in FIU Experiments.

2.2.3. Asphalt Shingle Roof Cover Aging

Observations of damage resulting from recent hurricanes in Florida, including Hurricanes Ian, Michael, and Irma, reveal a notable trend: older asphalt shingles exhibit poorer performance compared to relatively newer ones. The IBHS report on building performance in southwest Florida during Hurricane Ian (Giammanco, 2023) underscores this, indicating that asphalt shingles are more vulnerable among all roof cover types and their performance generally degrades over time. Notably, half of all shingle roofs exhibited detectable damage (see Figure 2-17), suggesting minimal advancement in wind resistance since Hurricane Charley in 2004. Age emerges as the primary predictor of asphalt shingle damage, with roofs aged over 10 years old having approximately a 50% probability of damage during high wind gusts (see Figure 2-18).

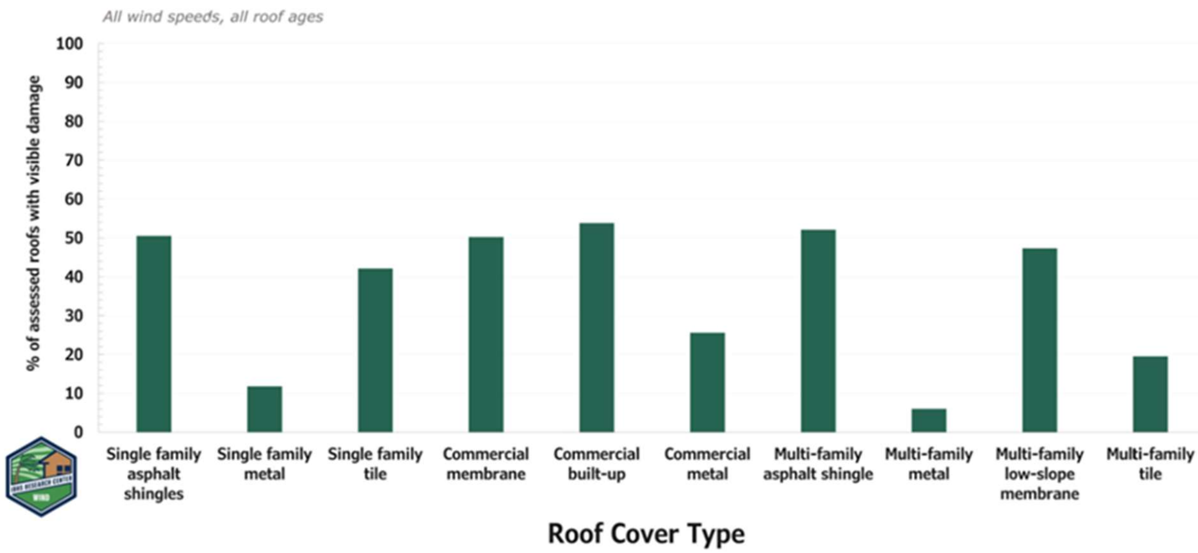


Figure 2-17. Percent of Damaged Roof Cover Type from Hurricane Ian Damage Survey (Giammanco, 2023).

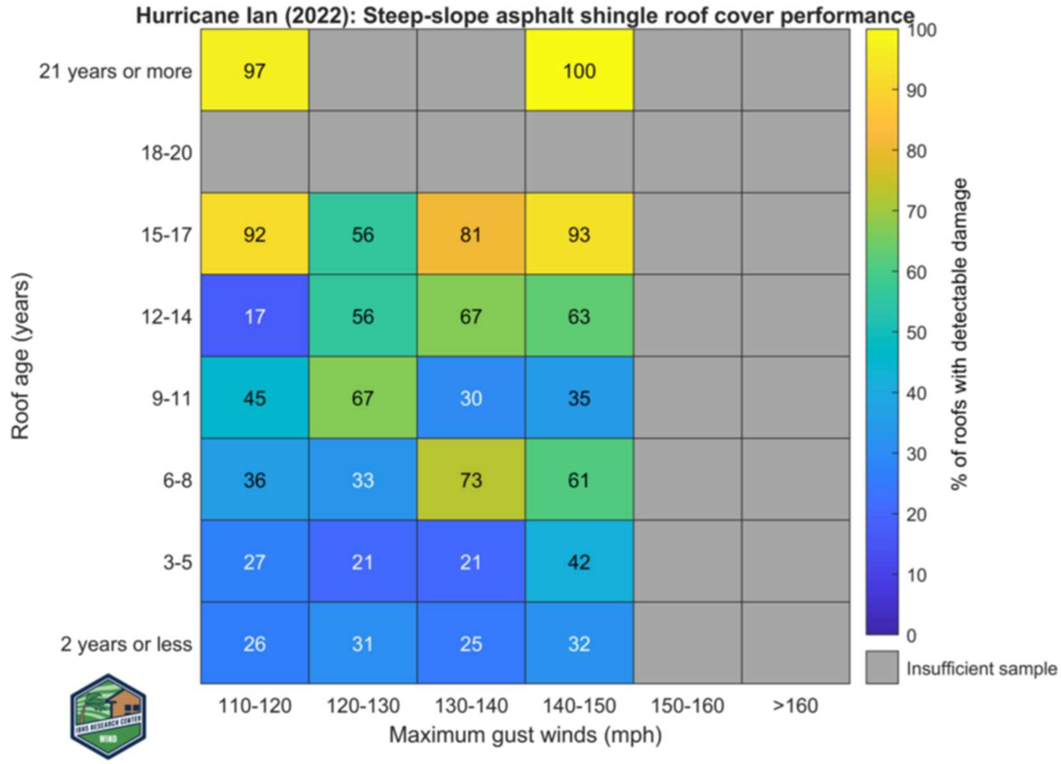


Figure 2-18. Steep Slope Asphalt Shingle Roof Cover Performance in Hurricane Ian with respect to Roofing Age (Giammanco, 2023).

A study by Dixon et al. (2012) sheds light on this phenomenon, revealing that partial unsealing of aged roofs is a prevalent issue. Their investigation, which encompassed 27 naturally aged asphalt shingle roofs in Florida spanning from one month to over twenty-five years old, identified significant, non-random patterns of partial unsealing in both field and hip/ridge cap shingles. Partial unsealing was found to increase statistically with roof age, with observations of partial unsealing near end joints in field shingles, indicating cohesive failure in the sealant and potentially contributing to wind damage. Hip and ridge cap shingles exhibited partial unsealing regardless of roof age, underscoring the importance of adhesion at the ridge line for long-term wind performance. Figure 2-19 shows the percent of unsealed field shingles with respect to the age of the roof from Dixon et al. (2013) study. Peterka et al. (1997) noted that wind uplift forces can escalate with the loss of sealant strip adhesion, as wind forced through gaps in the unsealed strip increases underside pressure on the shingle, increasing vulnerability to blow off.

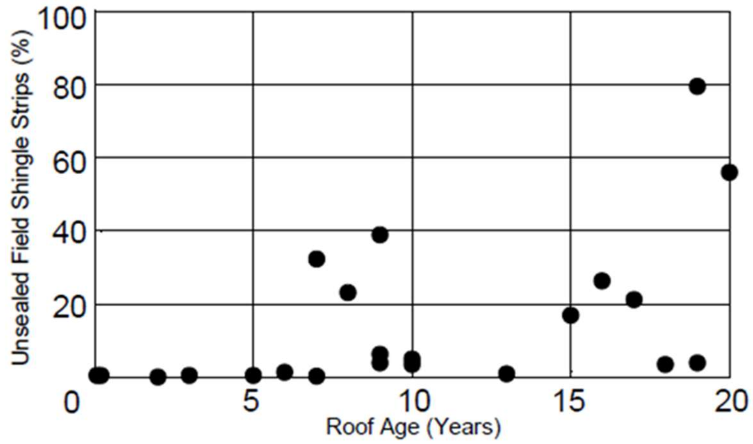


Figure 2-19. Percent of unsealed shingle strips located in the field of the roof verses roof age (Dixon et al., 2013).

Masters et al. (2013) conducted comprehensive wind load tests on three-tab and laminate asphalt shingles. Their findings revealed that the uplift load on partially unsealed three-tab shingles generally exceeded that of fully sealed shingles, whereas this increase was not observed for laminate shingles (see Figure 2-20). However, both three-tab and laminate shingles exhibited higher total loads when partially unsealed (see Figure 2-21). Other studies, such as Dixon et al. (2014), have sought to characterize the wind uplift resistance of both naturally and artificially aged shingles. Their findings indicate that aging does diminish the wind uplift resistance of shingles to some extent, yet fully sealed shingles still offer excellent long-term resistance to uplift loads.

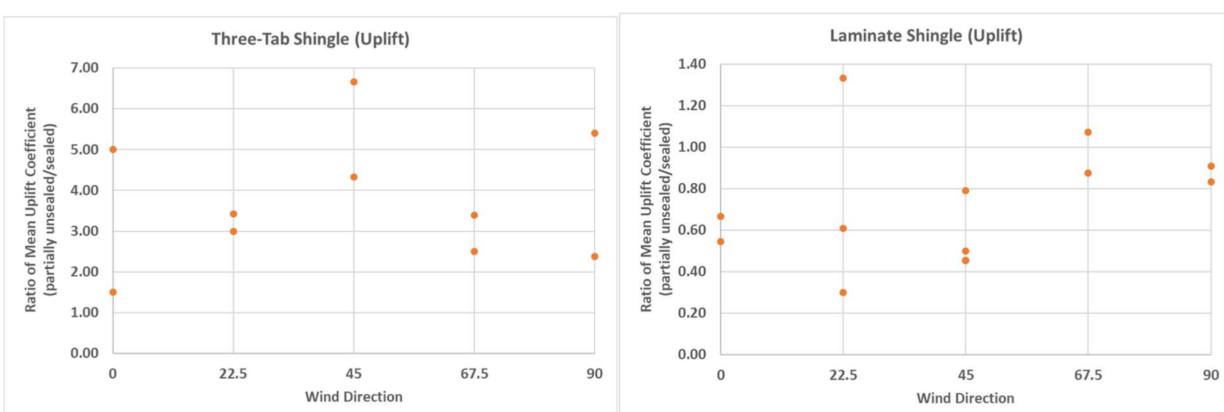


Figure 2-20. Ratio of Mean Uplift Coefficients for Partially Unsealed and Fully Sealed Shingles from Masters et al. (2013) study.

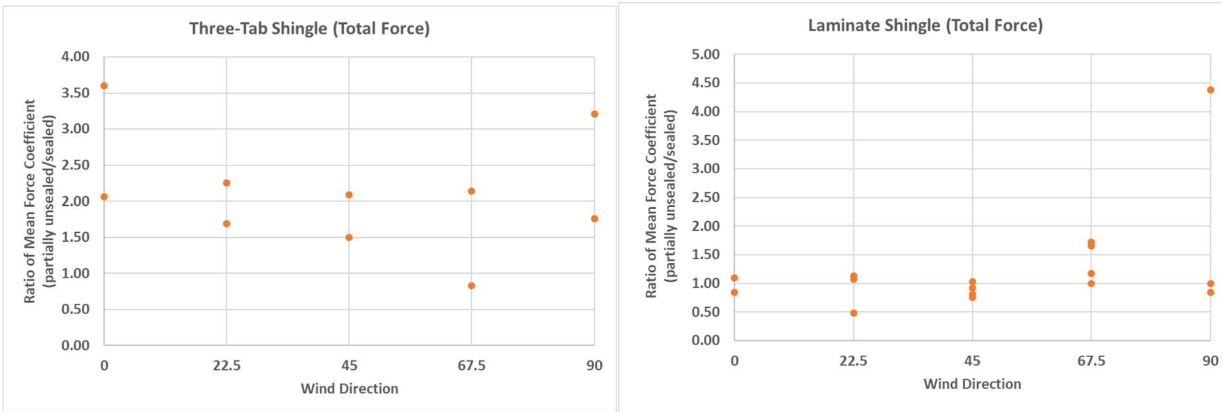


Figure 2-21. Ratio of Mean Total Force Coefficients for Partially Unsealed and Fully Sealed Shingles from Masters et al. (2013) study.

Based on the studies discussed above, a model has been developed to account for the influence of age on roof cover performance. In a building damage simulation due to hurricane, as per the findings of Dixon et al. (2012), the proportion of partially unsealed shingles is determined based on the age of the roofing material. Subsequently, the uplift loads acting on these shingles are adjusted according to the research conducted by Masters et al. (2013). Figure 2-22 and Figure 2-23 compare fragilities of average condition non-FBC asphalt roof coverings, with and without considering the effect of roof age, for gable and hip roofs respectively. The house model employed in this analysis is a single-story structure with a simple rectangular floor plan enclosing an area of 1800 square feet. Fragilities pertaining to the deteriorated condition of the roof are also integrated into the figures. The comparison reveals elevated failure probabilities for shingles relative to their age. Particularly, shingles aged over 6 years exhibit higher failure probabilities compared to those without the roof aging effect.

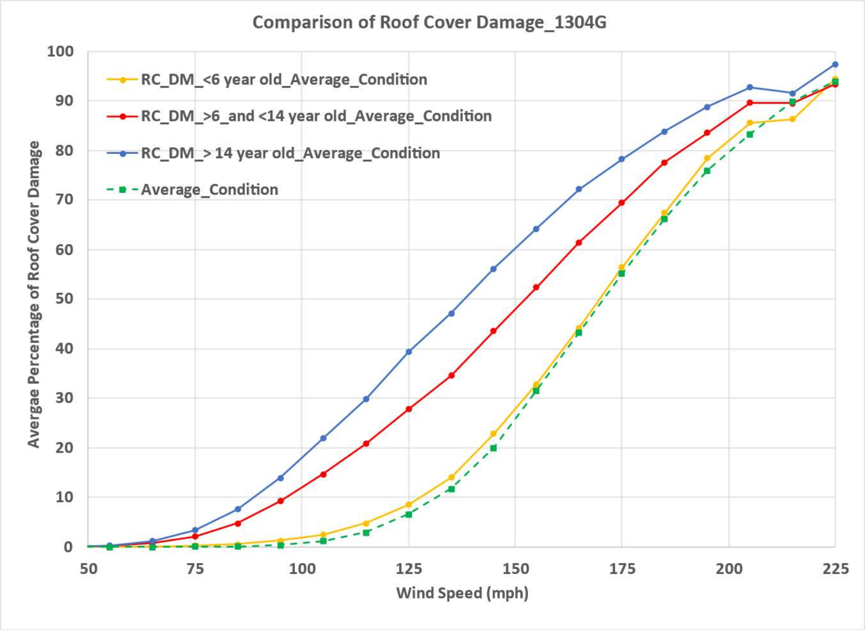


Figure 2-22. Comparison of Effect of Roof Age on the Roof Cover Damage Probabilities for Gable Roof House.

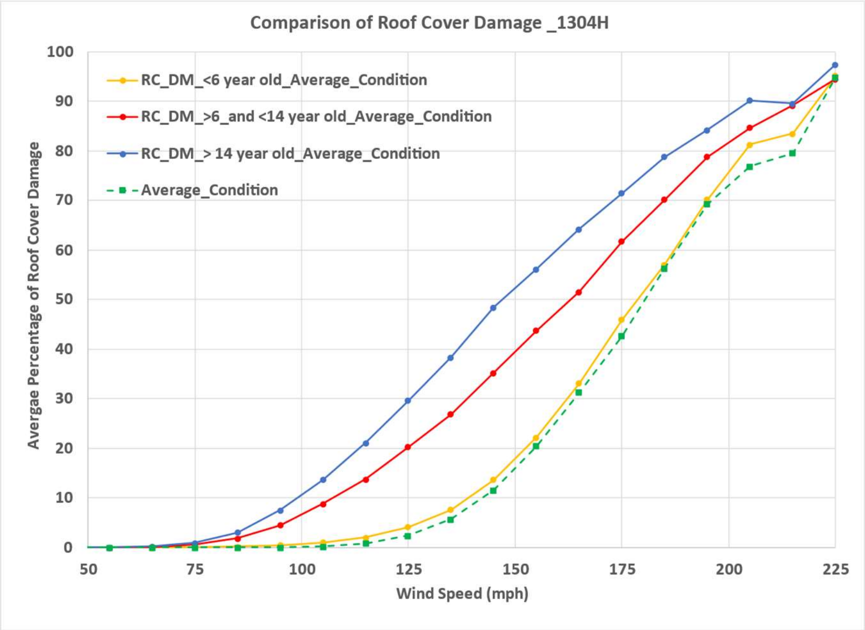


Figure 2-23. Comparison of Effect of Roof Age on the Roof Cover Damage Probabilities for Hip Roof House.

Figure 2-24 illustrates a case study featuring a single-story house with a gable roof with a 15-year-old non-Florida Building Code (FBC) shingle, situated in Terrain B. The figure demonstrates the impact of roof aging on the loss ratio by wind speed, considering the presence or absence of Secondary Water Resistance (SWR). In this case, the Roof Age Model (RAM) increases the loss ratio by about an order of magnitude for wind speeds below 90 mph.

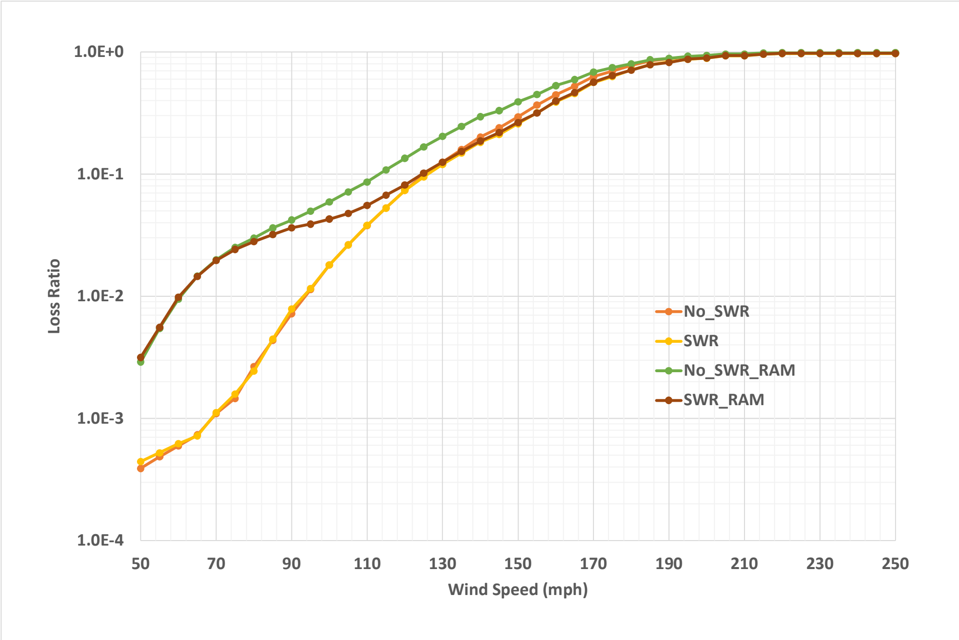


Figure 2-24. Comparison of Loss Ratio with and without the Roof Age Model

2.2.4. Metal Roof Panels

2.2.4.1. Metal Roof Performance in Hurricanes

Metal roofs generally performed well in past hurricanes, such as Hurricane Michael and Ian, as documented in FEMA (2020, 2023) and Giammanco et al. (2023), especially when compared to other roofing materials such as asphalt shingles and tiles. Key observations from these studies include:

- **Damage Rates:** Metal roofs had significantly lower overall damage rates compared to asphalt shingle and tile roof coverings. The IBHS report on Hurricane Ian damage observations (Giammanco et al. 2023) found that single-family metal roofs had only an 11.4% damage rate, while the damage rates for asphalt shingles and tile were 52% and 42% respectively.
- **Wind Speed:** Metal roofs performed well at lower wind speeds. Giammanco et al. (2023) indicated a damage rate below 5% for metal roofs when wind speeds stayed under 130 mph.
- **Severity of Damage:** When metal roofs did get damaged, the damage tended to be more extensive compared to other roofing materials. Giammanco et al. (2023) found a 20% chance that over 25% of the metal roof cover would be damaged compared to 10% for asphalt shingles. This is because metal roofs are made of large individual panels, and if one panel fails, it can lead to the failure of other panels which are attached to the panel being ripped off.
- **Failure Points:** Damage to metal roofs often started at edges like hips, ridges, and eaves, as observed in FEMA (2023) and Giammanco et al. (2023).

- **Impact on Underlying Structure:** In cases where a large portion of a metal roof was damaged, the underlayment and wood decking below the roof were also more likely to be compromised compared to asphalt or tile roofs (Giammanco et al. 2023).
- **Building Code Compliance:** Newer houses built to stricter building codes (post-2010 Florida Building Code) fared better than older ones with metal roof replacements. This suggests that code-compliant installation methods significantly improve wind resistance.
- **Metal Roof Type:** No clear difference in performance between standing seam (with concealed clips) and through-fastened metal roofs was observed based on the limited data available.
- **Other Components:** Damage to surrounding structures like carports could cause secondary damage to metal roofs.

Overall, metal roofs provide good protection against hurricanes, especially when installed according to modern building codes. However, they are still susceptible to damage, particularly at high wind speeds and at roof edges.

2.2.4.2. Wind Loads and Resistance Modeling of Metal Panel Roofing

The metal roofing considered in this study is architectural metal roofing which typically uses standing seam metal roofing (SSMR) panels. The wind load resistance of SSMR secured to plywood roof decks with sheet metal screws has been modeled using parametric equations derived from detailed finite element models (FEM) provided in Vickery et al. (2023). The FEM models in Vickery et al. (2023) evaluated the impact of various design variables on the uplift resistance of the metal panels, including seam height, metal thickness, fastener spacing, and panel width. The FEM studies revealed that uplift resistance increases non-linearly with greater panel thickness and seam height while it decreases non-linearly with increased fastener spacing and panel width. Since the parametric model given in Vickery et al. (2023) was based on static uniform loads, further modifications were made to address dynamic wind loads and variations in resistance observed in experimental studies and industry test data.

Baskaran et al. (2006) conducted experimental studies on wind uplift resistance of SSMR using a dynamic wind test protocol. They investigated the effect of air leakage through the structural wooden deck beneath the roofing on wind resistance, conducting 20 experiments with varying panel width, fastener spacing, seam height, and air leakage. To compare their test results with the Vickery et al. (2023) model, wind uplift resistances were calculated using the FEM-derived parametric equation, and the ratios of tested to predicted uplift resistance were plotted against air leakage ratios and shown in Figure 2-25. The results showed significant variation even with low air leakage percentages, generally indicating that the tested capacities were lower than the predicted capacities. Based on this comparison, a reduction factor ranging from 0.45 to 0.75 is used in the updated ARA metal panel damage model to adjust the resistance obtained using the Vickery et al. (2023) parametric equation.

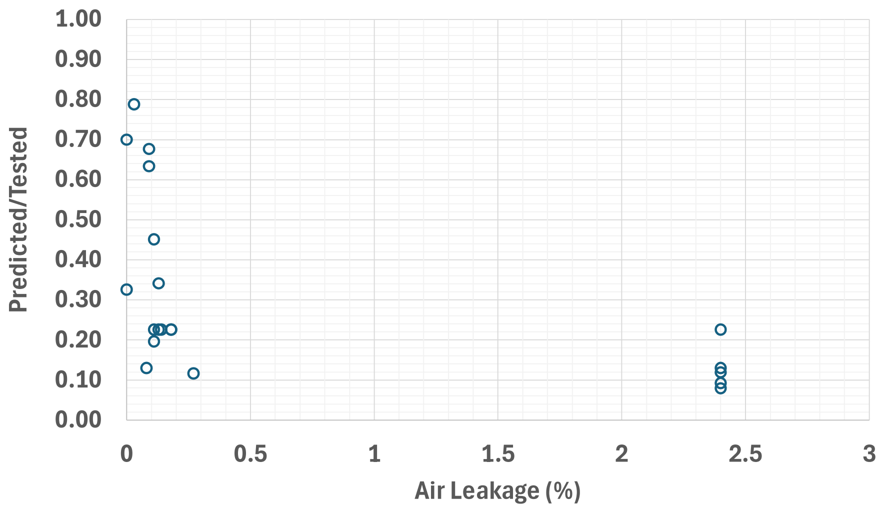


Figure 2-25 Ratio of Predicted SSMR Capacity to Tested Capacity with respect to Air Leakage in the Roof Deck

A review by Sivapathasundaram and Mahendran (2017) on the pull-out capacities of screw fastener connections in steel cladding systems revealed significant discrepancies between predicted and tested capacities. The mean ratio of failure load to pull-out capacity was 0.77, with a coefficient of variation (COV) of 0.24. In addition, uniform static load test data from Sheffield Metals (2023) for various SSMR systems approved for FBC-Non HVHZ and FBC-HVHZ were reviewed. Wind uplift resistances obtained using the Vickery et al. (2023) model are compared with test data from Sheffield Metals (2023) a in Table 2-4, showing a mean ratio of 1.2 and a COV of 0.29. Based on these reviews, a COV of 0.24 was adopted in the damage model.

Table 2-4 Comparison of Predicted Capacities of SSMR using Vickery et al. (2023) with Tested Capacities from Sheffield Metals (2023)

Sample	Type	Panel width (mm)	Fastener spacing (mm)	Panel thickness (mm)	Seam height (mm)	Predicted Uplift capacity using Vickery et al. (2023) (Kpa)	Tested Uplift Capacity (Kpa)	Tested / Predicted
1	Sheffield Metals 1.5" Mechanical Seam	406.4	609.6	0.511	38	8.21	6.80	0.83
2	Sheffield Metals 1.5" Mechanical Seam	406.4	609.6	0.511	38	8.21	10.22	1.24
3	Sheffield Metals 1.5" Mechanical Seam	406.4	609.6	0.511	38	8.21	11.20	1.36
4	Sheffield Metals 1.75" SnapLock	457	609.6	0.511	44.45	7.35	8.23	1.12
5	Sheffield Metals 1.75" SnapLock	457	609.6	0.511	44.45	7.35	10.94	1.49
6	Sheffield Metals 1.75" SnapLock	457	609.6	0.511	44.45	7.35	12.54	1.71
7	Sheffield Metals 1.5" SnapLock 550	482.6	609.6	0.511	38	6.92	13.06	1.89
8	Sheffield Metals 2.0" Mechanical Seam	457	609.6	0.511	50.8	7.36	7.51	1.02
9	Sheffield Metals 2.0" Mechanical Seam	457	609.6	0.511	50.8	7.36	8.06	1.09
10	Sheffield Metals 2.0" Mechanical Seam	457	609.6	0.511	50.8	7.36	9.66	1.31
11	Sheffield Metals 2.0" SCH Mechanical Seam	476	609.6	0.511	50.8	7.07	6.79	0.96
12	Sheffield Metals 1.0" Mechanical Seam	432	457	0.511	25.4	8.86	7.75	0.87
13	Sheffield Metals 1.5" SnapLock 450	406.4	457	0.511	38	10.67	7.51	0.70
Mean								**1.20**
Standard Deviation								**0.35**
COV								**0.29**

Xia (2022) conducted full-scale experiments and FEM modeling to examine the performance of SSMR under dynamic wind loading. The results indicated a linear relationship between wind pressure and clip reaction under low wind pressure (less than 0.5 kPa or 10 psf). At higher pressures (above 3 kPa or about 60 psf), significant deformation of the roof panel altered load sharing among clips, resulting in more loads being transferred to clips and fasteners at the roof edges. To account for uneven load redistribution in the damage model, the loads on the fasteners are increased by 30% to 50% when wind pressure exceeds 60 psf in the panel.

The wind load and resistance model for SSMR has been implemented in our wind damage model for residential structures based on the above discussion. Figure 2-26 shows a comparison of the fragilities of different FBC era SSMR obtained from the damage simulation. The comparison also includes fragilities for FBC and FBCplus asphalt shingles with different roof ages. The "New shingles" correspond to a roof age of 0 to 6 years, "Mid Shingles" to a roof age of 7 to 13 years, and "Old Shingles" to a roof age older than 13 years. The pre-FBC metal roofing is 26 GA panel with 30-inch fastener spacing, the FBC metal roofing is 26 GA panel with 24-inch fastener spacing, and FBCplus metal roofing is 24 GA with 24-inch fastener spacing. All the metal panels are 16 inches wide and have a 1-inch seam height. The house model employed in this analysis is a one-story gable roof house with an 1800 sq. ft. plan area. The house has a strong roof deck and roof-to-wall connection and is in a suburban terrain (i.e., Terrain B). It is observed from the figure that SSMR is stronger than respective FBC shingles for low wind speeds, but more fragile at higher wind speeds.

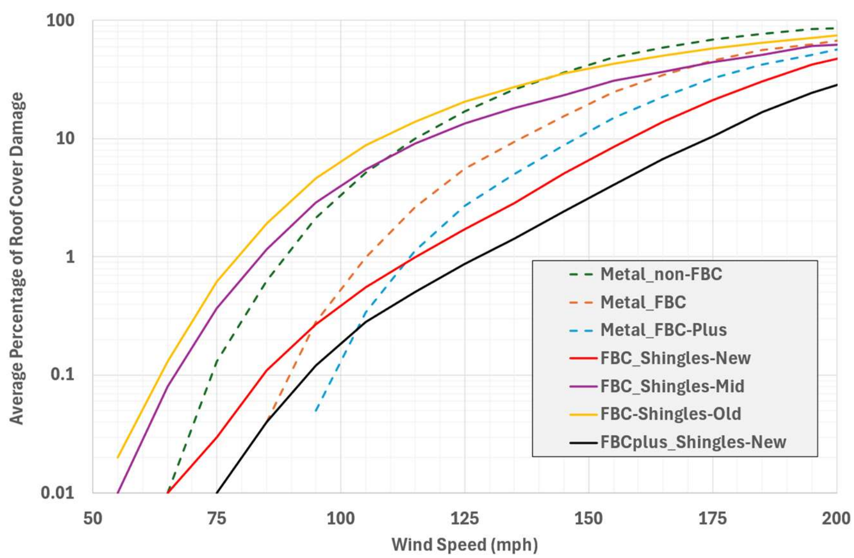


Figure 2-26 Comparison of Fragilities of SSMR with Asphalt Shingle Roofing.

Figure 2-27 illustrates a case study featuring the same house described in the previous section. The figure compares the loss ratios of the standing seam metal roofing (SSMR) with different types of asphalt shingles. It is noted from the figure that SSMR provides lower loss ratios compared to similar Florida Building Code (FBC) level asphalt shingles for wind speeds less than 100 mph. However, the losses are higher once the wind speeds exceed 110 mph. This behavior is consistent with the comparison we made from insurance claim data discussed in Section 3.2.

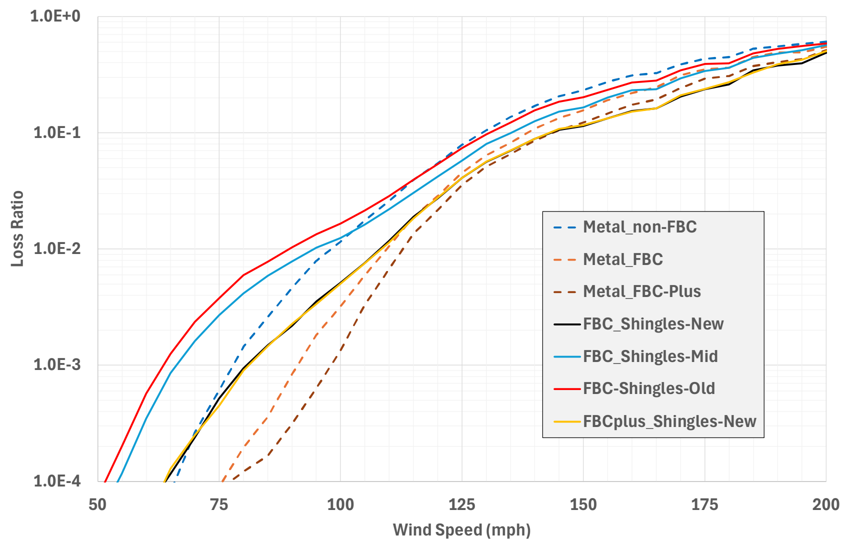


Figure 2-27 Comparison of Loss Ratio of SSMR with Asphalt Shingle.

2.2.5. Internal Pressure

The internal pressure model in the ARA damage models has been updated since completion of the 2008 Loss Mitigation Study. The model now incorporates flow continuity equations, leveraging the availability of faster computational resources for probabilistic analysis as computational power has become more affordable. This updated model was instrumental in the development of the ASCE 7-22 tornado hazard maps (Twisdale et al., 2023). Below is a brief discussion on the internal pressure model.

The internal pressure experienced by the building components is estimated by solving the continuity equation using a quasi-static model (Cook, 1990). The following equations, derived from those given in Cook (1990), are used to estimate the internal pressure

$$\sum_{j=1}^{N} Q_j + Q_B = 0 \qquad \mathbf{12}$$

where Q_j is the flow through j^{th} opening and Q_B is the total background flow through leakages assumed to be distributed uniformly over the building envelope. Equation 12 is the continuity equation. Q_B is modeled using Equation 13

$$Q_B = 3.4 * 10^{-4} * C_{D_B} \iint_{A_s} \left[\frac{2 * (P_e(x,y,z) - P_{int})}{\rho}\right]^{0.6} dA \qquad \mathbf{13}$$

where A_s is the total exposed surface area of the building, C_{D_B} is the drag coefficient for the background flow, $P_e(x,y,z)$ is the external pressure at an arbitrary location on the exterior of the building, P_{int} is the internal pressure and ρ is the density of air. The constant $3.4 * 10^{-4}$ is the assumed building porosity (e.g., Cook, 1990). Building porosity varies with building type, year of construction, and region of the country, being lower in both colder climates and recent construction. These variations in building porosity are not considered herein. Q_j is modeled by

$$Q_j = C_{D_j} A_j \sqrt{\frac{2 * (P_{e_j} - P_{int})}{\rho}} \qquad \textbf{14}$$

where C_{D_j} is the drag coefficient for flow through the jth opening, A_j is the area of the jth opening and P_{e_j} is the external pressure at the jth opening. Equation 14 is the orifice-plate meter equation (Cook, 1990). Prior to failure of a building envelope component Q_j is zero and the internal pressure is controlled by the background leakage alone. Both C_{D_j} and C_{D_B} are taken as 0.61 (Cook, 1990). Equations 13 through 14 are solved iteratively until the continuity equation is satisfied. Note that the internal pressures are computed for each compartment within a building using the method described above.

2.3. Regions and Locations for Loss Relativity Study

For the 2002 and 2008 wind loss mitigation studies, relativities were developed to be applied for residential buildings in the state, regardless of location. Although that was an acceptable approach at the time, especially given the large proportion of residential buildings that would have been constructed to pre-FBC building codes, that is no longer the case. Therefore, this study has been updated such that regions are developed to consider the variation in wind hazard as well as building code requirements across the state.

The regions were developed using the 700-year return period windspeed maps in the FBC and ASCE 7, which are used for design of category II buildings (including single-family homes). The windspeed contours range from 115 mph to 180 mph in open terrain. In addition, the HVHZ includes design windspeeds for two counties: 175 mph in Miami-Dade; 170 mph in Broward. Using the 700-year return period windspeed contours and the HVHZ, the state can be divided into the following wind zones:

1. 115 mph
2. 120 mph
3. 130 mph
4. 140 mph
5. 150 mph
6. 160 mph
7. 170 mph
8. 180 mph
9. HVHZ Broward County: 170 mph
10. HVHZ Miami-Dade County: 175 mph

2.3.1. Location Points

For single-family homes, we developed three regions and selected one representative location in each of those regions to model buildings. Since Group I multi-family buildings have similar construction features overall to single-family homes, the same three regions and representative locations are used. Group II and III multi-family buildings were modeled using a different approach because these are engineered buildings using different materials (i.e., concrete and steel instead of wood and masonry). For Group II and III buildings, locations were selected on current design contours so that designs for specific building codes representing general construction eras could be modeled and compared. The following subsections describe the locations selected for modeling single-family and Group I buildings, and Group II and III buildings.

2.3.1.1. Single-Family Homes and Group I Buildings

Using all ten of the regions described above is not necessary since the wind hazard is similar for some contours and the building code requirements will not vary dramatically from one windspeed contour to the next. Using the approach described in Section 2.1, wind hazard curves were developed for the points listed in Table 2-5 and shown in Figure 2-28. These points were selected to capture differences in wind hazard for different design windspeeds, coastal vs. inland, and geographic coverage across the state.

Table 2-5. Location of Points for 2024 Florida Loss Relativity Wind Mitigation Study

#	Location	County	Lat	Long	Design Windspeed (mph)	Coastal vs. Inland
1	Miami Beach	Miami-Dade	25.78040	-80.13610	175	Coastal
2	Orlando	Orange	28.4246	-81.3105	~ 135	Inland
3	Boca Raton	Palm Beach	26.3292	-80.0937	~170	Coastal
4	Daytona Beach	Volusia	29.2198	-81.0493	~ 135	Coastal
5	Pensacola	Escambia	30.4762	-87.1950	150	Coastal
6	Tallahassee	Leon	30.3954	-84.3451	115	Inland
7	Jacksonville	Duval	30.4914	-81.6836	125	Coastal
8	Tampa	Hillsborough	27.9792	-82.5393	~145	Coastal
9	Gainesville	Alachua	29.6865	-82.2767	125	Inland

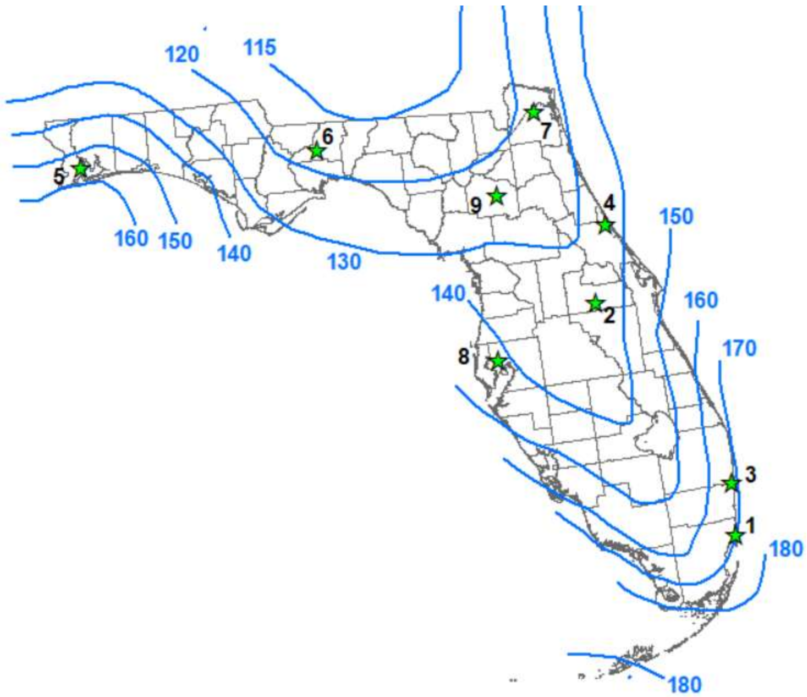


Figure 2-28. Location of points (green stars) where wind hazard curves were generated.

The wind hazard curves for each location were compared and are shown in Figure 2-29 through Figure 2-31. Figure 2-29 shows that the wind hazard curves for Miami Beach (location 1), Boca Raton (location 3), and Pensacola (location 5) are similar. Figure 2-30 shows that Orlando (location 2), Daytona Beach (location 4), and Tampa (location 8) have similar wind hazard curves, with Tampa being slightly higher. Figure 2-31 shows that the wind hazard curves for Tallahassee (location 6), Jacksonville (location 7), and Gainesville (location 8) are similar.

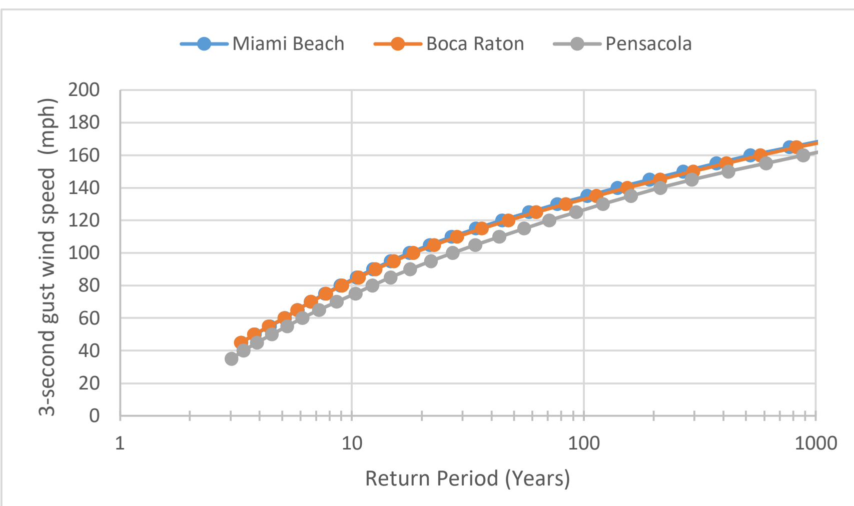


Figure 2-29. Wind hazard curves for Miami Beach, Boca Raton, and Pensacola.

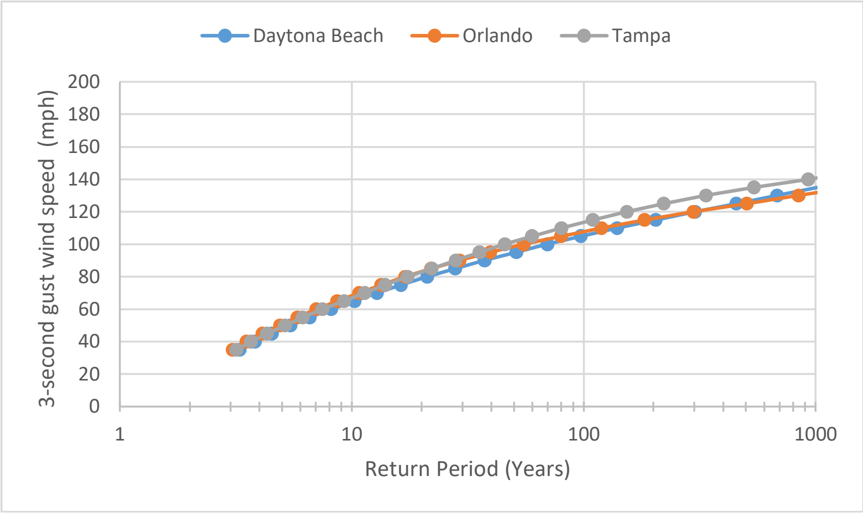


Figure 2-30. Wind hazard curves for Daytona Beach, Tampa, and Orlando.

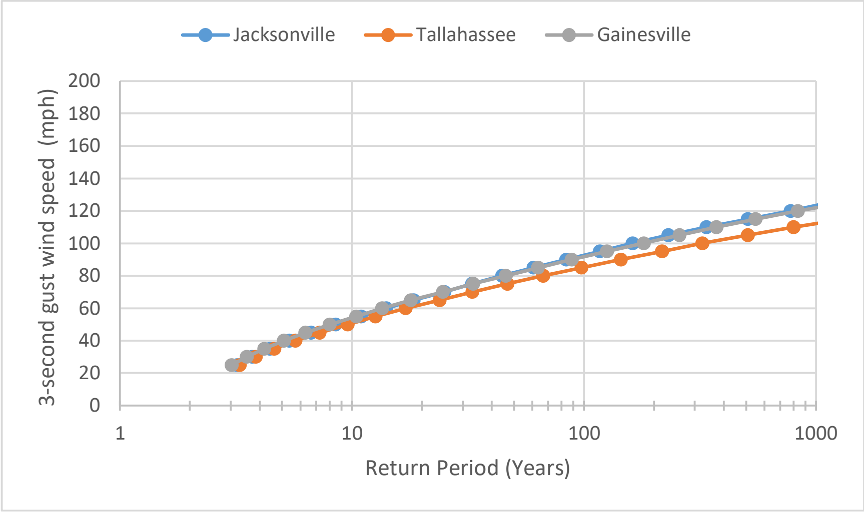


Figure 2-31. Wind hazard curves for Gainesville, Jacksonville, and Tallahassee.

We also compared the base single-family home for design windspeed contours 115 through 140 mph using suburban terrain (see terrain B Section 2.3.3). That is, the minimal requirements for the FBC for a given design windspeed are shown in Table 2-6. Terrain B was used because most single-family homes and other residential buildings are located in suburban areas rather than having large open areas immediately around them.

As shown in Table 2-6, the design requirements at the 115 and 120 mph contours are the same. For a design windspeed of 130 mph, the requirements change with an improved roof cover requirement for asphalt shingles (class G instead of class D shingles) and stronger roof-to-wall connection. At 140 mph, opening protection is required. Opening protection is also required within 1 mile of the coast for windspeeds of 130 mph or greater, but most buildings are not within 1 mile of the coast. Although there are several higher design windspeeds that require stronger roof covering and roof-to-wall connections, opening protection provides the largest savings as was found in the FEMA Building Codes Save report (FEMA 2020).

Table 2-6. Base single-family homes wind building characteristics in Terrain B for FBC 2006 and onward

Windspeed (Ultimate)	Terrain	Stories	Roof Cover	Roof Deck Attach.	Roof-to-Wall Conn	Opening Protection	SWR
115	B	2	D	Ringshank nails	Toenail	No	No
120	B	2	D	Ringshank nails	Toenail	No	No
130	B	2	G	Ringshank nails	Clips	No	No
≥140	B	2	G	Ringshank nails	Clips	Yes	No

Based on the wind hazard curves, base single-family houses in suburban terrain, and wind-borne debris regions, we selected three regions for this study as shown in Figure 2-32. The regions are defined by census block group. Region 1 includes all census block groups that with design windspeeds of 140 mph or higher. This region is intended to include all buildings that require opening protection, except for those with a windspeed of 130-139 mph that are within 1 mile of the coast. Region 2 includes census block groups with design windspeeds from 130-139 mph. This region is partially inside the WBDR. Region 3 includes all design windspeeds less than 130 mph, which is fully outside the WBDR. Figure 2-32 shows the three regions that were selected as well as the representative points. We use Boca Raton (location 3) for Region 1, Daytona Beach (location 4) for Region 2, and Tallahassee (location 6) for Region 3 for the computation of the loss relativities presented in Sections 4 through 5.3.4.

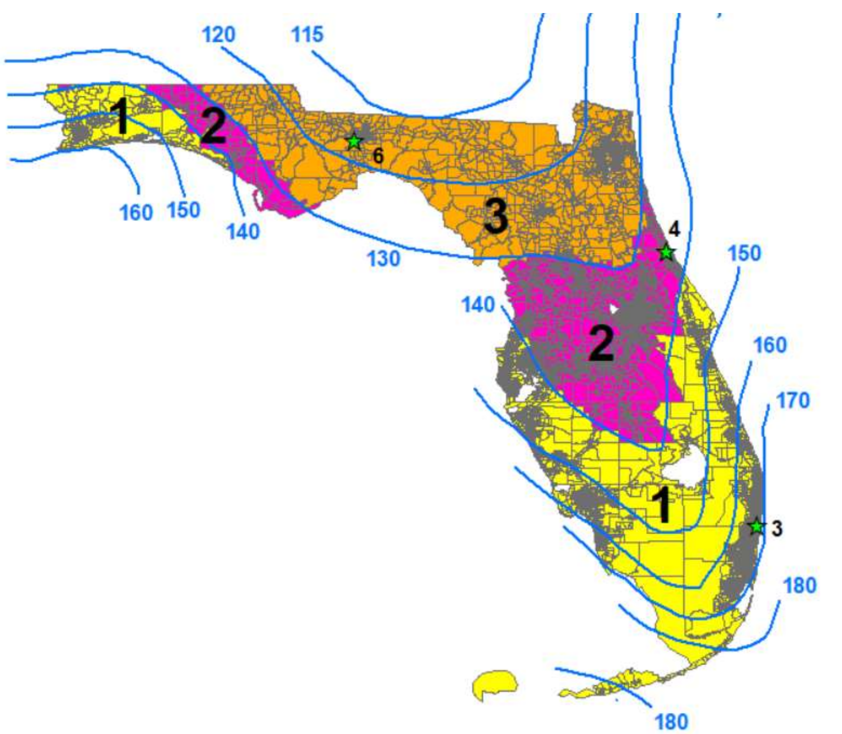


Figure 2-32. Three mitigation regions and representative points (green stars).

2.3.1.2. Group II and III Buildings

Group II and III multi-family buildings were modeled using a different approach because these are engineered buildings using different materials (i.e., concrete and steel instead of wood and masonry). This approach considers three eras and corresponding representative building codes as shown in Table 2-7.

Table 2-7. Group II and III Era and Representative Building Codes

Group II and III Era	Representative Building Code
1982 and earlier	SBC 1976
1983 – February 28, 2002	SBC 1991
March 1, 2002 - Present	FBC 2023

Within the current era (FBC era), the most notable change to the design wind speed maps was in FBC 2010 when the wind speed maps changed from allowable stress design to ultimate wind speeds. As previously discussed, the allowable stress design wind speeds are used with a load factor of 1.6 to compute design wind pressures whereas ultimate design wind speeds are used with a load factor of 1.0 to compute design wind pressures.

Since these buildings are modeled as engineered concrete or steel buildings, we chose locations where the allowable stress design and ultimate design wind speed contours intersect (i.e., ASCE 7-98 vs. ASCE 7-22). These locations are listed in Table 2-8 and shown on the map in Figure 2-33.

Table 2-8. Locations of Points for 2024 Florida Group II and III Buildings

No.*	Latitude	Longitude	Contour (ASCE 7-22)	Intersecting Contour (ASCE 7-98)
10	30.217	-84.463	120	110
11	30.296	-85.365	130	120
12	28.745	-80.935	140	120
13	30.49	-86.456	150	130
14	27.162	-80.312	160	140
15	24.56286	-81.77521	180	150
1	25.78040	-80.13610	170	150

**Numbering starts at 10 since 1-9 correspond to locations used for single-family and Group I buildings. Region 1 was used for both cases.*

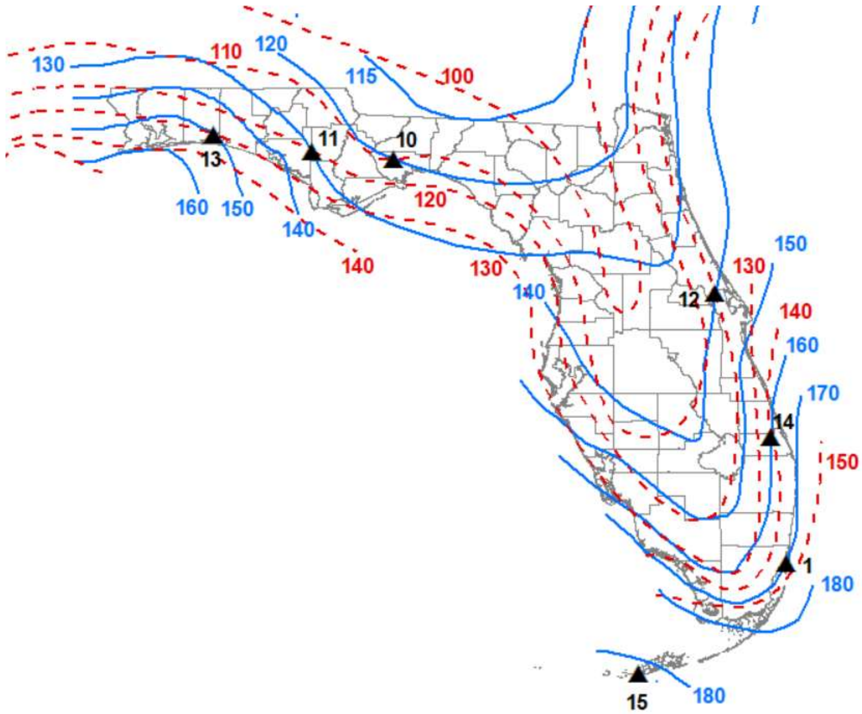


Figure 2-33. Points used to model Group II and III buildings (black triangles) were located at intersection of ASCE 7-98 (FBC 2001-2007, red) and ASCE 7-22 (FBC 2010-present, blue) wind contours.

For each of the locations in Figure 2-33, buildings representing each building code era (SBC 1976, SBC 1991, and FBC 2023) were modeled. Figure 2-34 shows the design wind speed maps for SBC 1976 and SBC 1991. As previously discussed, FBC 2023 uses ultimate strength 3-second gust wind speeds. However, SBC 1976 and 1991 use fastest mile wind speeds. Table 2-9 shows the design wind speed used for each building code as well as the equivalent ultimate 3-second gust wind speed to allow for direct comparison between the codes. As shown in this table, the 100 mph fastest mile design wind speed was used for most of Florida in SBC 1991, which is equivalent to a 149 mph ultimate 3-second gust wind speed. Therefore, the SBC 1991 design wind speeds are higher than those in FBC 2023 for much of the state. Similarly, the ultimate 3-second gust equivalent wind speeds of SBC 1976 are higher than those used in FBC 2023. However, this does not necessarily result in higher design wind pressures because FBC 2023 contains additional design parameters such as terrain, and increased pressure coefficients.

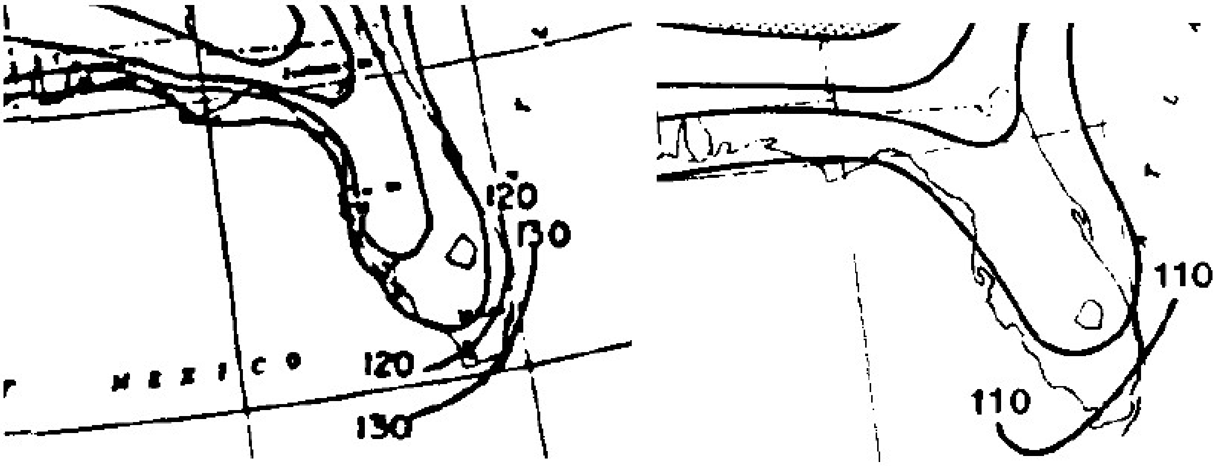


Figure 2-34. Fastest mile wind speed maps for SBC 1976 (left) and SBC 1991 (right).

Table 2-9. Design wind speeds for each building code era at selected locations for Groups II and III

#	Latitude	Longitude	FBC 2023 Windspeed	SBC 1991 Wind Speeds		SBC 1976 Wind Speeds	
				Fastest Mile	3-Second Gust (Ult) Equivalent	Fastest Mile	3-Second Gust (Ult) Equivalent
10	30.217	-84.463	120	100	149	90	136
11	30.296	-85.365	130	100	149	100	149
12	28.745	-80.935	140	100	149	110	163
13	30.49	-86.456	150	100	149	110	163
14	27.162	-80.312	160	100	149	110	163
15	24.56286	-81.77521	180	110	163	130	190
1	25.78040	-80.13610	170	110	163	120	176

2.3.2. Frequencies of Hurricane Winds by Location

The following paragraphs summarize the analysis of hurricane wind risk frequency and intensity by location. For simplicity, the discussion focuses on the nine locations used to model single-family homes and Group I buildings. However, the same approach was used for the locations at which we modeled Group II and III buildings. We have analyzed the simulated hurricane data by location point to illustrate the differences in the hurricane wind risk characteristics. Figure 2-35 shows the average number of hurricanes per 100 years according to 4 windspeed intervals: < 100 mph, 100-120 mph, 120-150 mph, and > 150 mph. We see that the average number of hurricanes varies significantly across the state, ranging from about 11 to about 30 events per 100 years.

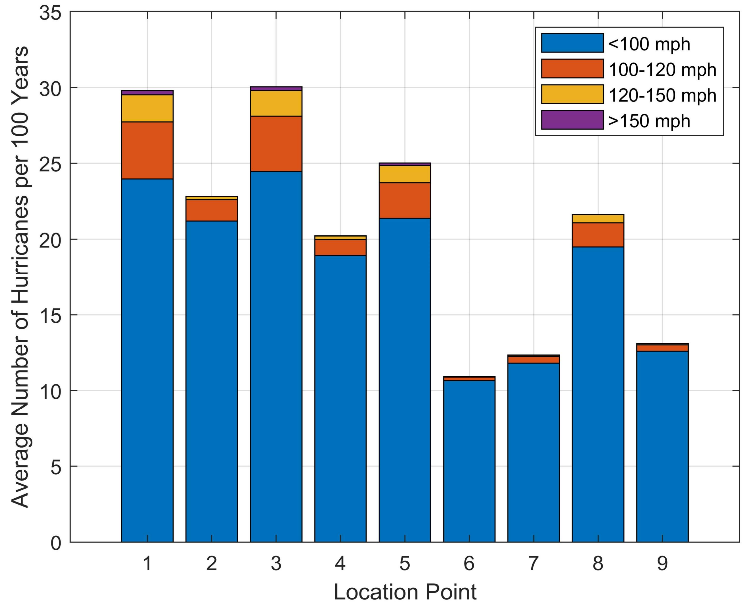


Figure 2-35. Average number of hurricanes by location and peak gust windspeed.

Greater than 120 mph. There is also a significant difference in the number of events that are greater than 120 mph, as illustrated in Figure 2-36. Points in SE Florida average more than 2 per 100 years while some locations in North Florida away from the coast average less than 0.1 per 100 years. The ratio of the number of events greater than 120 mph for each location-to-Location Point 6 (the minimum) is illustrated in Figure 2-37. There are more than 80 times as many > 120 mph events for South Florida than Point 6. This ratio illustrates the dramatic differences in the frequency and intensity of events by location within the State. Events greater than 120 mph are of particular interest because at those windspeeds one begins to see some notable building envelope failures in weaker construction.

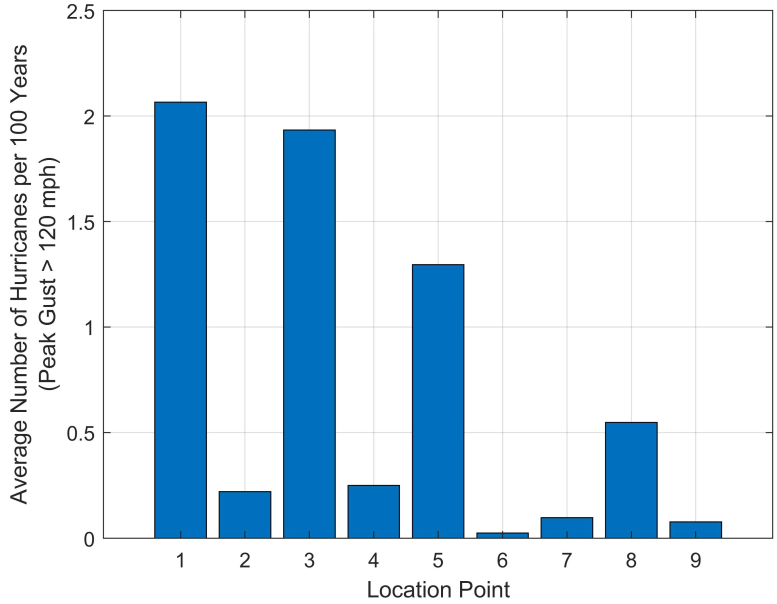


Figure 2-36. Average number of hurricanes with winds > 120 mph.

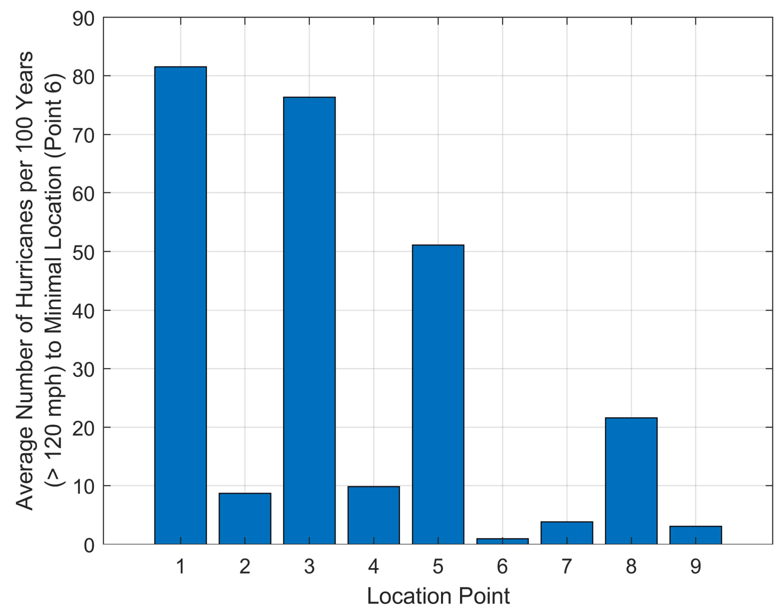


Figure 2-37. Ratio of number of hurricanes per 100 years wind winds > 120 mph to Point 6.

Greater than 150 mph. Figure 2-38 compares the average number of hurricane events producing greater than 150 mph windspeeds by location. More locations drop out of this plot, and we see that Points 1, 3, and 5 stand out. Point 1 (Miami) leads this group.

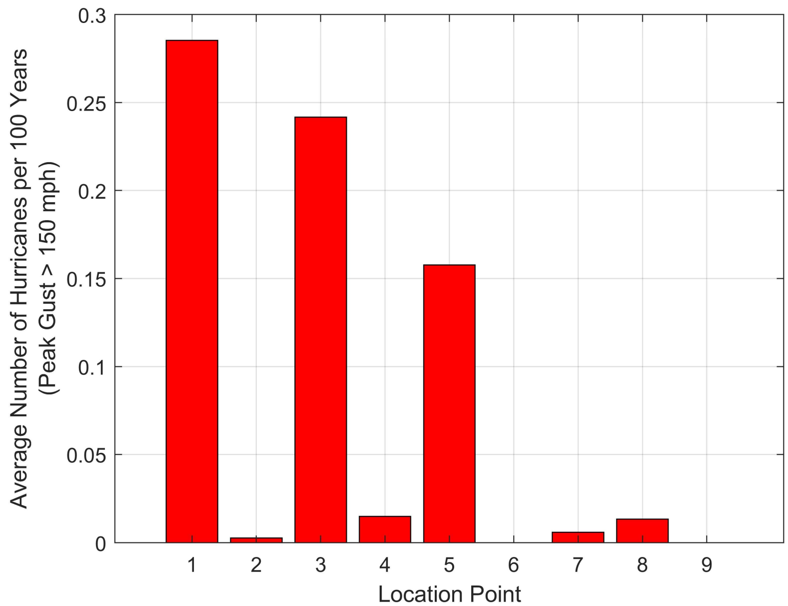


Figure 2-38. Average number of hurricanes per 100 years with winds greater than 150 mph.

Frequencies Relative to Design Winds. Figure 2-39 compares the average number of events that are less than and greater than the 700-year return period FBC design windspeed at each location per 100 years. The number of events that are less than the 700-year design windspeeds ranges from about 10 to almost 30 per 100 years. The numbers of events that exceed the 700-year design windspeed per 100 years averages less than one. Clearly, all locations in Florida will see many more hurricane wind events below their design windspeeds than those that are greater than their design windspeed (given in Figure 2-39).

The effects of the many lesser events in Figure 2-39 may be significant in terms of losses, particularly for structural assets covered by homeowners policies but not designed to the same wind loads for dwellings (such as attached and detached structures). The effect of tree fall from these lesser events may be important contributors to loss costs in parts of Florida.

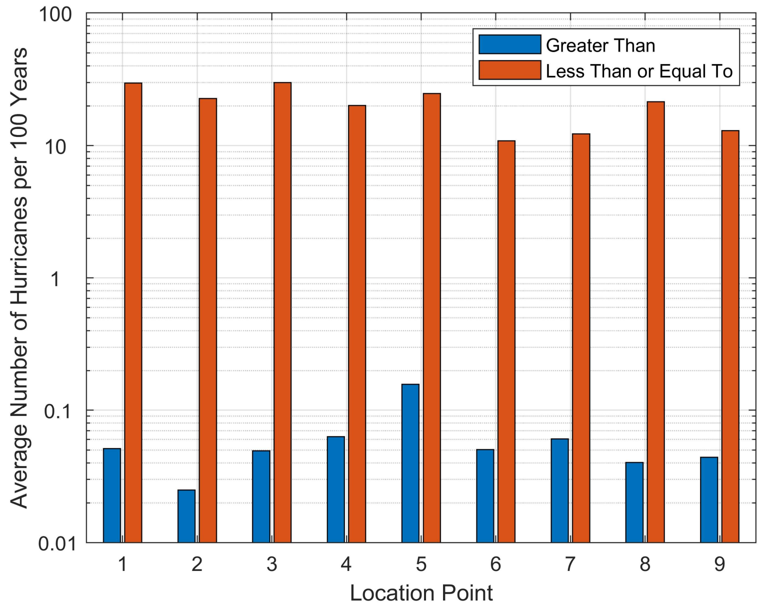


Figure 2-39. Average number of hurricanes per 100 years with winds greater than and less than the 700-year return period design windspeeds.

Non-Hurricane Winds. The wind mitigation insurance rate differentials apply to all windstorms and not just hurricanes. In certain areas in North Florida, non-hurricane winds may contribute significantly to the wind risk. Non-hurricane winds in Florida are dominated by thunderstorm winds and the occasional extra-tropical cyclone. Figure 2-39 also indicates that the frequency of hurricane winds more intense than the design event (i.e., 700-year return period) is relatively small for some locations (Points 6, 7 and 9) in the north central part of the State.

Resource and schedule constraints do not permit consideration of non-hurricane winds, even for locations where hurricanes do not dominate, such as Tallahassee. In this case, we will simply use the hurricane results for those locations with no corrections for non-hurricane winds. Since loss relativities are normalized by location, the fact that non-hurricane winds may be important for a few locations in Florida will not be significant for the remainder of the state. A further issue is that insurance companies often have different deductibles for hurricanes and non-hurricane wind events. These differences could be important for the low-hazard locations where non-hurricane winds dominate the wind hazard.

2.3.3. Terrain Exposure

The effect of terrain (i.e., the reduction in windspeed near the ground produced by the frictional effects of buildings and vegetation) has a significant impact on windspeeds and, hence, wind-induced damage and loss. The magnitude of the reduction of the windspeed at any height is a function of the size and density of the obstructions (buildings, trees, etc.) on the ground, as well as the fetch (distance) the wind has blown over a given terrain. Terrain also affects the turbulence intensity, velocity profiles, and wind-borne debris environment that act on the building.

Terrain is a fundamental parameter in the design of structures for wind loads. Terrain is recognized in most national and international model building codes using simplified terrain categories defined, for example, as open terrain, suburban terrain, urban terrain, etc. When designing a building, a design engineer must first determine what terrain a building is going to be built in and design the building to resist the associated wind loads. In ASCE-7, the U.S. national wind loading standard, there is a significant increase in the design loads associated with designing a building located in open terrain (Exposure C) compared to the case of a building designed for suburban terrain conditions (Exposure B). For example, the design loads for the cladding (windows, doors, roof sheathing, etc.) of a 15 ft tall building located in Exposure C are 21% more than those for a building located in Exposure B, and for a 25-foot-tall building the difference in the design loads is 34%. The true effect of terrain is in most cases greater than that indicated in the building codes which tend to conservatively underestimate the reduction in wind load that is experienced for most buildings located in suburban terrain.

Terrain is one of the more difficult parameters to specify for an individual building because it involves assessments of the site well beyond the buildings and land immediately surrounding the structure. Terrain is a difficult issue for engineers, designers, and building code practitioners to interpret and use for the Florida Building Commission to codify. Determining the terrain for a building requires knowledge of the site and surroundings for the full 360 degrees of azimuth outward for distances up to one mile, in some cases. Further, the definitions of exposure are subject to different interpretations by knowledgeable practitioners.

2.3.4. Building Codes and Terrain

The effect of terrain has a dramatic effect on wind loads on a building. As noted above, terrain is generally referred to as exposure category in building codes and standards. The upwind exposure category is based on ground surface roughness that is determined from vegetation and constructed facilities. Surface roughness or aerodynamic roughness produces a reduction in windspeed near the ground from the frictional effects of buildings and vegetation. ASCE 7-22 defines three surface roughness or terrain exposure categories:

Surface Roughness B. Urban and suburban areas, wooded areas, or other terrain with numerous, closely spaced obstructions that have the size of single-family dwellings or larger.

Surface Roughness C. Open terrain with scattered obstructions that have heights generally less than 30 ft (9.1 m). This category includes flat, open country and grasslands.

Surface Roughness D. Flat, unobstructed areas and water surfaces. This category includes smooth mud flats, salt flats, and unbroken ice.

There is also a surface roughness A, which represents urban areas with mid- and high-rise buildings. Surface roughness A also represents houses in tall-treed rural and suburban settings. These conditions are common throughout northern and western areas in Florida and can have a dramatic effect on wind loads on structures. A rate filing study completed by ARA for Security First Insurance Company showed that the reduced wind loads were significant to loss relativities as well. As such, we have included loss relativities for surface roughness A in this study to better reflect hurricane risk in heavily treed portions of the state.

The terrain exposure category is defined according to the distances over which various surface roughness conditions prevail for each wind direction considered. The ground surface roughness is generally measured in terms of roughness length, z_o. Each surface roughness category corresponds to a range of z_o. ASCE 7 also allows interpolation between terrain exposure categories.

The terrain definitions in the FBC used the exposure category (terrain) definitions of ASCE- 7 with a few important exceptions (see FBC Sections 1606.1.8 and 1620.3):

1. Exposure C (open terrain with scattered obstructions) applies to:
   a. All locations in HVHZ (Miami-Dade and Broward Counties), unless exposure D applies.
   b. Barrier islands as defined per s.161.55(5), Florida Statues, as the land area from the seasonal high-water line to a line 5000 ft landward from the coastal construction control line
   c. All other areas within 1,500 ft of the coastal construction control line, or within 1,500 ft of the mean high tide line, whichever is less.
2. Exposure B (urban, suburban, and wooded areas) practically applied to all other locations in Florida by virtue of the current definitions for Exposures A and D.

Figure 2-40 illustrates terrain transition from the ocean inland, using the ASCE 7 definitions of surface roughness. These terrain transitions reflect the fact that the wind flow is moving from a large open body of water onto land and the transition, in terms of effect on small buildings, takes place over relatively short distances. Buildings that face the open body of water or are within a few hundred feet of the water experience a more severe wind loading environment compared to those that are located further inland.

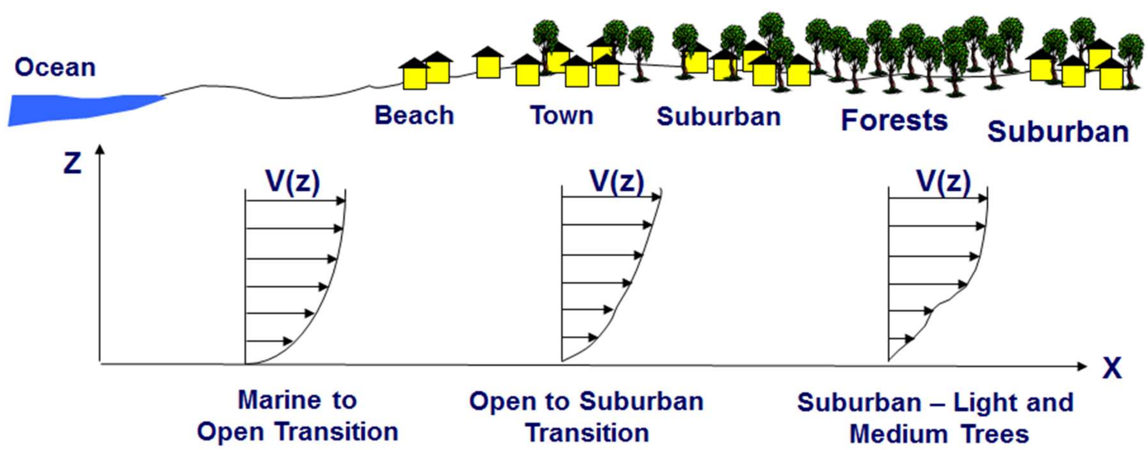


Figure 2-40. Illustrative terrain transition and resulting change in wind profile.

There are also potential differences in building code terrain, building design terrain, and actual terrain. As noted above, the definitions of building code terrain have changed over time and hence building code terrain may be dependent on building code eras. In some of the old building codes, different terrains were not recognized for single-family residences. Also, there may be differences in the building code terrain and the terrain used by the designer of the building. Finally, actual terrain is what is important in assessing wind loss mitigation. If a building has been designed for a more severe terrain than it is actually in (for example, inland HVHZ locations in actual Terrain B designed for Terrain C), then the building's wind mitigation is, of course, greater than that of a building designed for Terrain C that is actually in Terrain C. These factors further complicate the treatment of terrain in wind loss mitigation analysis.

As discussed above, we have also included loss relativities for terrain A in this study to represent houses in tall-treed rural and suburban settings. This terrain category is not currently included with the FBC or ACSCE-7 as a design consideration and is included herein as an actual terrain. Terrain A is intended to be used for multi-family buildings that are in Urban areas surrounded by mid-rise and high-rise buildings, whereas for single-family homes, terrain A is more representative of houses in tall treed suburban settings. Note that the FEMA Hazus Hurricane model defines tall trees as those with a height greater than 60 feet.

Role of Terrain in Assessing Wind Loss Mitigation Effectiveness. In the 2002 and 2008 loss relativity studies, we used separate loss relativity tables for terrain and each terrain table was self-normalized. The difficulty of dealing with terrain in determining wind loss mitigation relativities centers on how to define terrain for loss mitigation implementation. While insurance company windstorm rates are generally thought of as being location-dependent and not terrain-dependent, in most locations the effect of terrain may be inherently reflected into the rates. With this line of thinking, the insurance application of wind loss mitigation relativities could be based on the predominate terrain for each rating territory. On the other hand, if an insurance company treats location and terrain separately in their rates, then that insurance company would use the appropriate loss relativity table for the terrain representative of the building location. This approach recognizes that within a rating territory, such as a county, there are almost always multiple terrain categories, and these different terrains will have a dramatic influence on the risk of loss for individual buildings in that territory.

2.4. Building Models and Groups

Three-dimensional models of buildings are required for the hurricane damage and loss simulations. A computer-aided design (CAD) model is developed that provides a close representation of a real building, including roof geometry, height, plan dimensions, windows, doors, garage doors, and skylights. The resistances of the building components are key inputs to the engineering model of the building. By varying the strength and/or presence of certain components, a measure of the effectiveness of wind mitigation can be quantified for all possible combinations of features on the same building. This approach is then repeated by modeling and analyzing multiple building models to ensure that the results are not just based on one building model or plan geometry. We use the same building models for analyzing existing construction (built prior to FBC 2001) as we do for analyzing FBC construction.

In the 2002 studies, we used straightforward and generally simplified geometries of buildings. Most of the building models had rectangular plans. The simplified geometries provided ease of CAD change-out for roof shape for the same building model and facilitated computer runs in a reasonable amount of time. For this study, we use both a mixture of simplified geometries of idealized buildings and models of actual buildings. The “real” building models are based on Florida site visits, coupled with drawings and photographs.

The construction requirements for residential buildings are governed by the *FBC*. Residential buildings are classified as Occupancy Category II in the ASCE 7 standard and are designed with in

Importance Factor of 1.0. This means that the loads are multiplied by the Importance Factor of 1.0 in the determination of the strength factors needed to resist the loads. For structures such as attached screen enclosures, they are currently classified as Occupancy Category I (low hazard to human life in the event of failure) in ASCE 7. These types of structures have an Importance Factor of 0.77 and hence have an inherent failure rate much higher than the dwelling. As discussed later in this report, such attached and detached structures and any other "non-dwelling" structures have not been considered in this study. Hence the wind mitigation rate differentials developed in this study do not apply to non-dwelling structures that are not treated by the FBC and ASCE 7 as an Occupancy Category II building. For more discussion on losses associated with non-dwelling type structures, Twisdale et. al. (2007) evaluates issues of insurability of attached and detached structures for single-family and mobile homes.

The residential building groups used herein follow the requirement of the FBC for SF and MF buildings. Beyond SF and MF groups, we consider differences in the construction characteristics to further subdivide the MF group. Insurance policies generally have a distinction for the buildings with 4 or less families. Hence, the 2002 loss relativity studies included a study for single-family houses (ARA, 2002a) and a second study for multi-family residences that have 5 or more units (ARA, 2002b). Both occupancies were treated within the single 2008 Loss Mitigation Study (ARA, 2008). We understood that insurance companies would generally use the SF report for 1-4 family dwellings and the MF report for 5 or more family dwellings. Insurance companies should apply the SF and MF model building studies herein consistent with their policy language. We note that the construction features of SF and MF buildings three stories and less are very similar.

Table 2-10 provides a summary of the building models used in this study. These distinct models correspond to different buildings, as well as possible combinations of mitigation features that involve changes in geometry to the building envelope of the same building. For example, number of stories, roof shape, roof slope, garage, and skylights are the envelope parameters that require a modification to a building CAD model. These variations for the same basic building are given in the table. We note that many mitigation features, such as roof deck strength, do not require a separate CAD model since the strength of the roof deck is not a geometry related model change. The strength of the roof deck is changed by modifying specific inputs for a model building and does not require a change to the CAD model.

Hence, the mitigation effectiveness of most mitigation features can be evaluated using a single CAD model of the building. By varying mitigation features on the same building model coupled with using multiple building models, we can evaluate mitigation effectiveness "within and across" building models.

The data in Table 2-10 are grouped by building type, according to:

1. Single-Family (SF)
2. Multi-Family (MF)
    a. Group I (MF-I)
    b. Group II (MF-II)
    c. Group III (MF-III)
3. Manufactured/Mobile Homes (MH)

Due to considerations of computer run time, we have simplified the number of different buildings within the SF, MF, and MH groups for this study. Each group has two basic building plans with geometrical CAD variations as needed. The estimated building values for these modeled buildings are summarized in Section 2.5.

Table 2-10. Summary Data for Modeled Buildings

Builiding Group	Building Model	Roof Geometry	Roof Slope	No. of Stories	SF Garage	SF Porch	SF Skylight	Wall Area % Fens	Wall Area % Glazing	Fenstration Count							Total Sq Ft	Livable Sq Ft	Notes
										Window	Door	Slider	Garage Door	Skylight	Total	Leak Potential Count			
SF	1304g	Gable	4:12	1	Yes	No	No	26	14	10	2	1	1	0	14	17	1,800	1,316	Simple model. This is model 0013 used in the 2002 studies
SF	1304h	Hip	4:12	1	Yes	No	No	26	15	10	2	1	1	0	14	17	1,800	1,316	Simple model. This is model 0013 used in the 2002 studies
SF	1307g	Gable	7:12	1	Yes	No	No	22	13	10	2	1	1	0	14	17	1,800	1,316	Simple model. This is model 0013 used in the 2002 studies
SF	1307h	Hip	7:12	1	Yes	No	No	26	15	10	2	1	1	0	14	17	1,800	1,316	Simple model. This is model 0013 used in the 2002 studies
SF	2304g	Gable	4:12	2	Yes	No	No	16	11	20	2	1	1	0	24	27	3,600	3,116	Simple 2 story model; not used in final production runs.
SF	2304h	Hip	4:12	2	Yes	No	No	17	12	20	2	1	1	0	24	27	3,600	3,116	Simple 2 story model; not used in final production runs.
SF	2307g	Gable	7:12	2	Yes	No	No	16	11	20	2	1	1	0	24	27	3,600	3,116	Simple 2 story model; not used in final production runs.
SF	2307h	Hip	7:12	2	Yes	No	No	17	12	20	2	1	1	0	24	27	3,600	3,116	Simple 2 story model; not used in final production runs.
SF	2204G	Gable	4:12	2	Yes	No	No	17	10	15	3	1	1	0	20	23	3,000	2,516	Simple 2 story model, used in previous studies.
SF	2204H	Hip	4:12	2	Yes	No	No	18	11	15	3	1	1	0	20	23	3,000	2,516	Simple 2 story model, used in previous studies.
SF	2207G	Gable	7:12	2	Yes	No	No	16	10	15	3	1	1	0	20	23	3,000	2,516	Simple 2 story model, used in previous studies.
SF	2207H	Hip	7:12	2	Yes	No	No	18	11	15	3	1	1	0	20	23	3,000	2,516	Simple 2 story model, used in previous studies.
SF	A103g	Gable	6:12	1	Yes	Yes	No	20	12	9	1	1	1	0	12	15	2,657	1,986	Actual Florida home w/ porch; not analyzed in study
SF	A143g	Gable	4:12	1	Yes	Yes	No	18	11	9	1	1	1	0	12	15	2,657	1,986	Actual Florida home w/ porch; not analyzed in study
SF	A143h	Hip	4:12	1	Yes	Yes	No	20	12	9	1	1	1	0	12	15	2,657	1,986	Actual Florida home w/ porch; not analyzed in study
SF	A173g	Gable	7:12	1	Yes	Yes	No	16	10	9	1	1	1	0	12	15	2,657	1,986	Actual Florida home w/ porch; not analyzed in study
SF	A173h	Hip	7:12	1	Yes	Yes	No	20	12	9	1	1	1	0	12	15	2,657	1,986	Actual Florida home w/ porch; not analyzed in study
SF	A144g	Gable	4:12	1	Yes	No	No	18	11	9	1	1	1	0	12	15	2,467	1,986	Actual Florida home design; A143g without porch;
SF	A144h	Hip	4:12	1	Yes	No	No	20	12	9	1	1	1	0	12	15	2,467	1,986	A143h without porch
SF	A174g	Gable	7:12	1	Yes	No	No	16	10	9	1	1	1	0	12	15	2,467	1,986	A173g without porch
SF	A174h	Hip	7:12	1	Yes	No	No	20	12	9	1	1	1	0	12	15	2,467	1,986	A173h without porch
SF	A175G	Gable	7:12	1	No	No	No	11	10	9	1	1	0	0	11	14	2,467	2,406	Used for no garage Sensitivity Case
SF	A176G	Gable	7:12	1	Yes	No	Yes	16	10	9	1	1	1	2	14	17	2,467	1,986	Used for skylight Sensitivity Case
SF	A177G	Gable	7:12	1	Yes	No	No	27	20	19	2	3	1	0	25	34	2,467	1,986	Used for increased Fenestration Sensitivity
SF	A178G	Gable	7:12	1	Yes	No	No	16	10	8	1	1	1	0	11	14	2,467	1,986	Used for decreased Fenestration Sensitivity
SF	K203h	Hip	6:12	2	Yes	No	No	14	11	17	1	1	1	0	20	23	4,233	3,820	Actual Florida Home- 2 story with no porch
SF	K243g	Gable	4:12	2	Yes	No	No	13	10	17	1	1	1	0	20	23	4,233	3,820	Actual Florida Home- 2 story with no porch
SF	K243h	Hip	4:12	2	Yes	No	No	14	11	17	1	1	1	0	20	23	4,233	3,820	Actual Florida Home- 2 story with no porch
SF	K273g	Gable	7:12	2	Yes	No	No	12	9	17	1	1	1	0	20	23	4,233	3,820	Actual Florida Home- 2 story with no porch
SF	K273h	Hip	7:12	2	Yes	No	No	14	11	17	1	1	1	0	20	23	4,233	3,820	Actual Florida Home- 2 story with no porch
MF-I	0024F	Flat	0:12	2				18	15	64	16	16	0	0	96	144	14,592	14,592	Simple plan; large Group I model used in the 2002 study
MF-I	0024G	Gable	4:12	2				21	17	64	16	16	0	0	96	144	14,592	14,592	Simple plan; large Group I model used in the 2002 study
MF-I	0024H	Hip	4:12	2				21	18	64	16	16	0	0	96	144	14,592	14,592	Simple plan; large Group I model used in the 2002 study
MF-I	0027G	Gable	7:12	2				20	17	64	16	16	0	0	96	144	14,592	14,592	Simple plan; large Group I model used in the 2002 study
MF-I	0027H	Hip	7:12	2				21	18	64	16	16	0	0	96	144	14,592	14,592	Simple plan; large Group I model used in the 2002 study
MF-I	S301F	Flat	0:12	3				24	21	90	24	36	0	0	150	258	35,160	35,160	Actual Fliorida Building- Group I
MF-I	S341G	Gable	4:12	3				22	19	90	24	36	0	0	150	258	35,160	35,160	Actual Fliorida Building- Group I
MF-I	S341H	Hip	4:12	3				23	20	90	24	36	0	0	150	258	35,160	35,160	Actual Fliorida Building- Group I
MF-I	S371G	Gable	7:12	3				20	18	90	24	36	0	0	150	258	35,160	35,160	Actual Fliorida Building- Group I
MF-I	S371H	Hip	7:12	3				22	19	90	24	36	0	0	150	258	35,160	35,160	Actual Fliorida Building- Group I
MF-II	0057F	Flat	0:12	5				24	24	115	0	80	0	0	195	435	33,600	33,600	Simple plan; Group II model used in 2002 study
MF-II	WW31F	Flat	0:12	3				14	12	99	18	0	0	0	117	117	28,620	28,620	Actual Florida Building-Group II
MF-III	0087F	Flat	0:12	8				24	24	184	0	128	0	0	312	696	53,760	53,760	Simple plan; Group III model used in 2002 study
MF-III	SB31F	Flat	0:12	10				28	28	90	0	360	0	0	450	1530	240,000	240,000	Actual Florida Building-Group Iii
MH-SW	0001M	Gable	3:12	1	No	No	No	5.3	3.5	10	1	0	0	0	11	11	720	720	Single Wide Manufactured/Mobile Home
MH-DW	0002M	Gable	3:12	1	No	No	No	4.8	3.3	11	1	0	0	0	12	12	1,420	1,420	Double Wide Manufactured/Mobile Home

2.4.1. Single-Family Residences

The SF models correspond to index numbers 1-30 in Table 2-10. There are four basic SF models used in the final runs of this study: 2 single-story and 2 two-story residences. Model index numbers 1-4 correspond to the simple single story rectangular floor plan and numbers 9-12 correspond to the simple two-story rectangular floor plan. The livable areas are about 1300 sf for the simple one story and 2,500 sf for the simple two-story homes. The number of windows and doors for these buildings are typical of average construction cost class. These simple rectangular plans were used in the 2002 study and hence provide a consistent benchmark for checks of new results vs. previous 2002 results.

Model numbers 18-25 correspond to an actual Florida one-story single-family home with a more complex floor plan typical of more recent construction. This home has about 1900 sf of livable space. This house has a built-in garage, as does all the basic SF models used herein. We choose to use this house for several sensitivity studies. Variations in the CAD model for this house for sensitivity analysis are given in rows 22-25, which correspond respectively to: 22, no garage (garage replaced by livable space; 23, skylights added; 24, increased number of windows and doors; and 25, decreased number of window and doors.

Model numbers 26-30 correspond to an actual Florida two-story single-family home. While this home has a rectangular floor plan, it is larger than the simple model and includes a small roof cover over the entrance way. This house has about 3,800 sf of livable space.

Photos of an *FBC* house during construction are given in Figure 2-41. Roof-to-wall, window framing, and wall-to-floor plate connections are illustrated for a post-FBC home. Figure 2-42 shows construction photos of another Florida house. The soffit blocking is illustrated as well as the substantial number of connectors in the roof-to-wall areas.

CAD views of the basic SF buildings are given in Figure 2-43. A complete set of CAD views of all the buildings is given in Appendix C. The “G”, “H”, or “F” on the CAD number denotes the roof shape as gable, hip, and flat respectively.

Figure 2-41. Framing and Connection Details for FBC Gable Roof Home.

Figure 2-42. One-Story Hip Roof FBC Home.

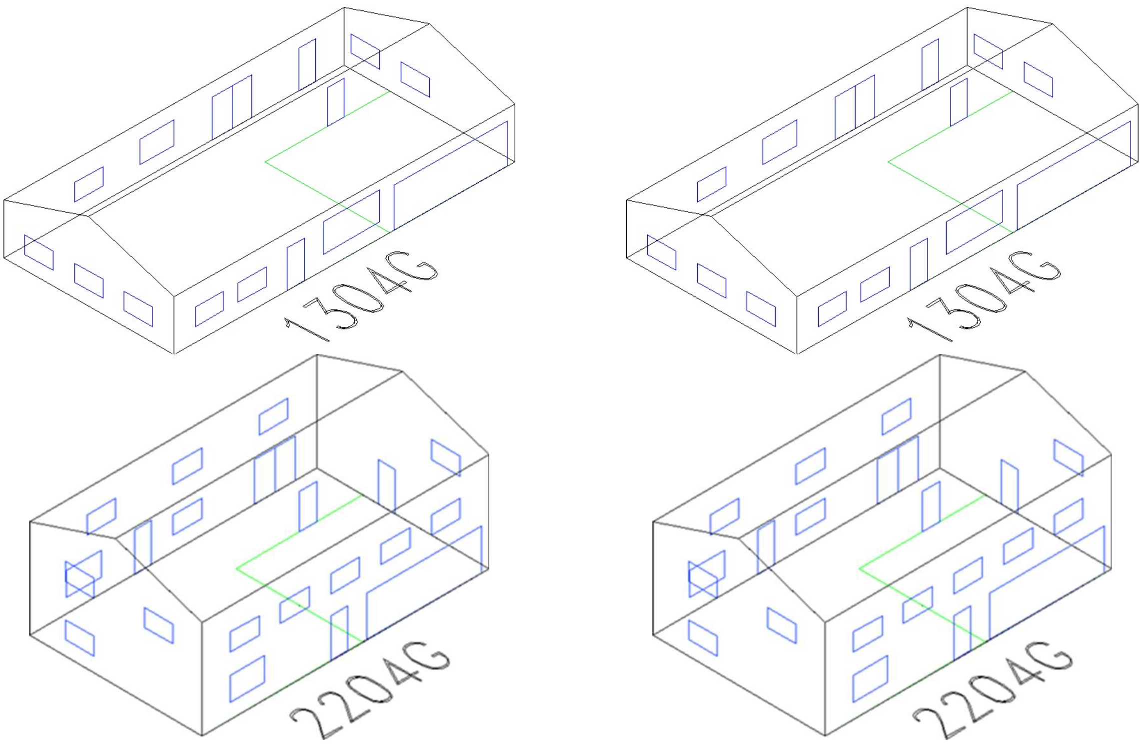


Figure 2-43. Basic Geometries of Single-Family Building Models.

2.4.2. Multi-Family

Multi-family residences include a wide range of building types and number of residential units within the building. As discussed previously, small lowrise buildings are often built to the same requirements as a single-family home, where large highrise condominium buildings are built to the *FBC Building*. Small lowrise buildings generally have wood or masonry frames, whereas large buildings often have reinforced concrete or structural steel frames. Highrise buildings generally have a reinforced concrete roof deck, whereas small lowrise buildings often have a wood roof deck.

In this study, we use the same groups for multi-family building types as was done in the 2002 (ARA, 2002b) and 2008 (ARA, 2008) studies. The first group of buildings includes lowrise, buildings, typically one to three stories in height, constructed with either wood or masonry walls and having a wood rafter or truss roof system and wood roof deck. The construction characteristics of the Group I Buildings are like that of single-family residential buildings. Group I Buildings include gable, hip, and flat roof shapes.

The second group of buildings consists of multi-story buildings less than sixty feet tall, in which the structural system is designed by an engineer. These Group II buildings are usually constructed from steel or concrete, with either steel or concrete roof decks[2]. Low-rise (1-4 stories), flat-roofed buildings with concrete roof decks should be treated as Group II as opposed to Group I.

---

[2] Engineered Group II Buildings that have wood roof decks should be considered as Group I buildings for purposes of loss mitigation relativity determination.

The third group of buildings consists of buildings over sixty feet in height. For buildings over sixty feet tall, the design of the building and its components has generally been developed using ASCE 7 instead of SBC. The use of ASCE-7 predicts designs that must withstand higher wind loads.

Table 2-11 summarizes these three building height groups. This categorization by building height is by predominant construction and design methods that have existed in the building codes. The user should select the appropriate group based on frame construction and building height. For example, a four- story wood frame building should be classified using the parameters in Group I (although Group I typically applies to less than three-story buildings). All buildings over 60 feet in height should be classified by Group III regardless of the typical construction. The Model Building Height column in Table 2-11 refers to the actual height of the modeled buildings used in the study. A simplified decision tree is illustrated in Figure 2-44 in which roof deck material distinguishes Group I from Group II buildings. This simplified approach should help avoid misclassifications of multi-family residences.

Table 2-11. Building Construction Groups for Condominiums and Tenant Buildings

Group	Typical Frame Construction	Typical Roof Deck Material	Typical Heights	Model Building Heights
I	Masonry or Wood Frame	Wood	1-4 stories	2, 3 stories
II	Steel, or Reinforced Concrete, or Reinforced Masonry	Concrete or Steel	<60 feet	3, 5 stories
III	Steel or Reinforced Concrete	Concrete or Steel	>60 feet	8, 10 stories

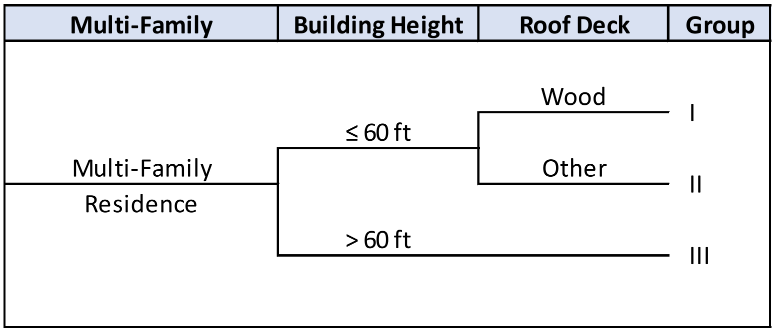
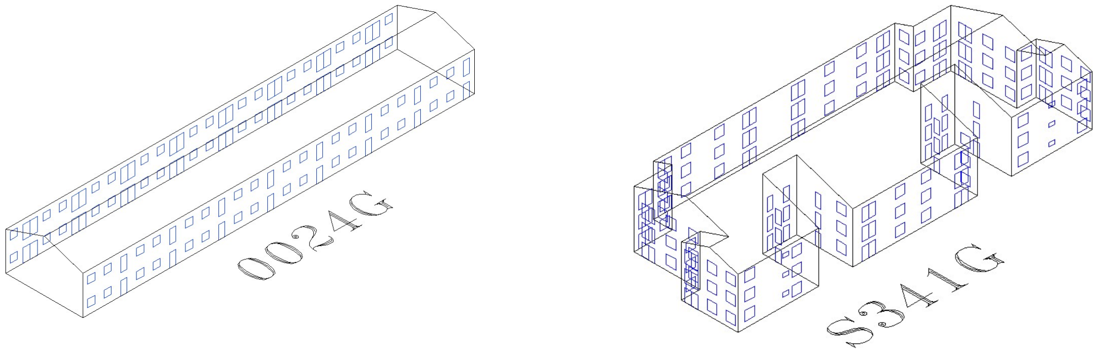


Figure 2-44. Classification Decision Tree for Multi-Family Group I, II, and III Residences.

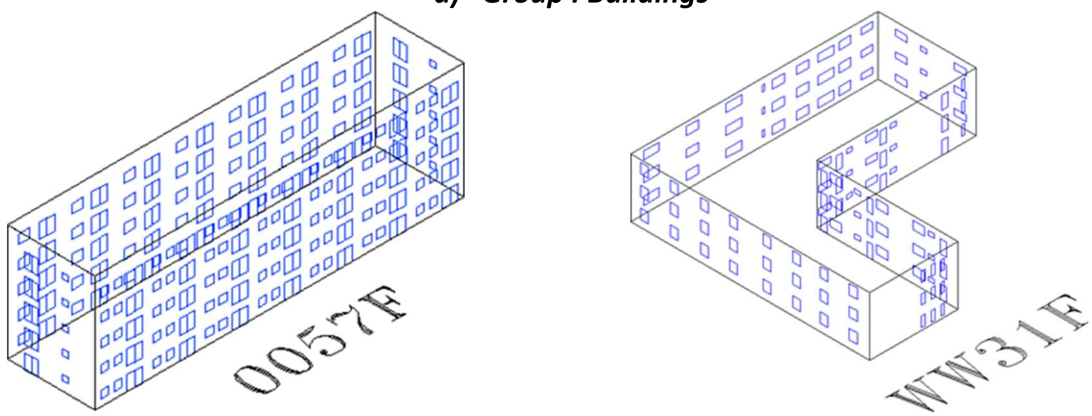
Group I Buildings. Models of Group I Buildings have been developed that consist of two geometries and 3 roof shapes (hip, gable and flat). The rectangular plan has about 15,000 square feet and includes model numbers 31-35 in Table 2-10. There are 2 roof slopes (4:12 and 7:12) for the gable and hip versions, producing a total of 5 CAD models.

Model numbers 36-40 are for an actual Florida building with a more complex plan. This is also a larger building with about 35,000 square feet. This building has also been developed with three roof shapes. We note that the introduction of the flat roof case yields a feature of Group I buildings not considered in the 2002 multi-family residential loss relativity study (flat and gable roof buildings were grouped into one class and modeled as a gable).

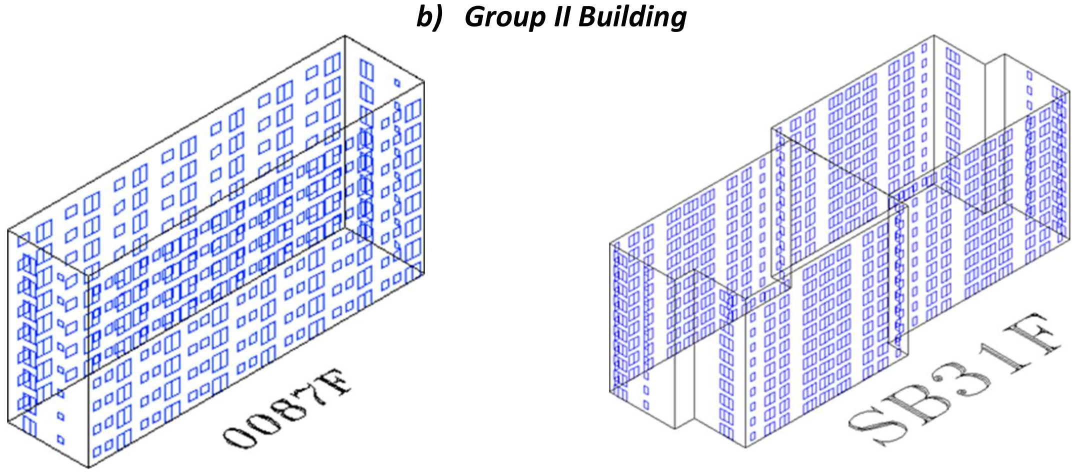
Figure 2-45 shows the basic geometries of the MF building models. Appendix C provides a complete set of CAD views.



a) Group I Buildings



b) Group II Building



c) Group III Buildings

Figure 2-45. Basic Geometries of Multi-Family Buildings.

Group II and III Buildings. All the Group II and III models have flat roof shapes. There are two models each for the Group II and Group III Buildings. Models 41 and 43 are the same Group II and Group III model buildings used in the 2002 loss relativity study. Models 42 and 44 are actual Florida buildings. Model 44 is a much larger building (240,000 square feet) than any other model in the study. This building is typical of many large condominium buildings in Florida.

2.4.3. Manufactured/Mobile Homes

The Manufactured/Mobile Home (MH) models correspond to index numbers 45 and 46 in Table 2-10. These models represent typical single- and double-wide manufactured home units.

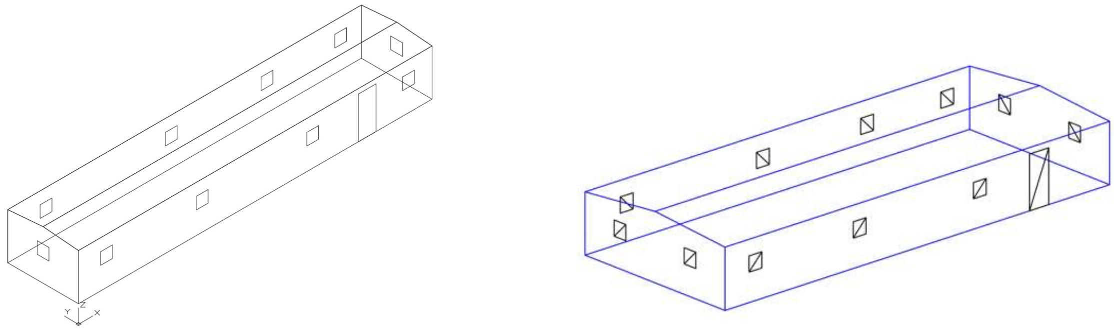


Figure 2-46. Basic Geometries of Single-Wide (left) and Double-Wide (right) Manufactured/Mobile Homes.

2.5. Replacement Cost Estimates

Table 2-12 provides estimated replacement cost values for single-family homes. These values were estimated using 2024 RS Means Residential Cost Data (RS Means 2024a). This reference provides construction costs for single-family homes based on their construction cost class and the number of stories. The replacement values compiled for this study correspond to the Average Construction Cost Class for a location in the Fort Lauderdale/West Palm Beach area for one- and two- story homes. This area was chosen as the basis for the cost estimation because it has a location adjustment factor in the RS Means data that is approximately equal to the state-wide average. The replacement costs range from about $115 to $160 per square foot for the options considered. In addition to the base costs from RS Means, the reference was used to adjust for garages, wall framing type, roof cover type, roof slope, and the number of windows, doors and skylights.

Table 2-12. Replacement Cost Values for Single-Family Building Models

Model Index No.	Builiding Group	Building Model	Roof Geometry	Roof Slope	No. of Stories	SF Garage	SF Porch	SF Skylight	Total Fens	Total Sq Ft	Livable Sq Ft	Replacement Cost Values ($)			
												Masonry - Shingle Roof	Masonry - Tile Roof	Frame - Shingle Roof	Frame - Tile Roof
1	SF	1304g	Gable	4:12	1	Yes	No	No	14	1,800	1,316	$230,651	$243,652	$212,364	$225,364
2	SF	1304h	Hip	4:12	1	Yes	No	No	14	1,800	1,316	$232,098	$248,546	$213,819	$230,259
3	SF	1307g	Gable	7:12	1	Yes	No	No	14	1,800	1,316	$231,698	$247,118	$213,411	$228,830
4	SF	1307h	Hip	7:12	1	Yes	No	No	14	1,800	1,316	$233,423	$252,892	$215,136	$234,575
5	SF	2304g	Gable	4:12	2	Yes	No	No	24	3,600	3,116	$525,958	$541,624	$467,447	$483,519
6	SF	2304h	Hip	4:12	2	Yes	No	No	24	3,600	3,116	$528,183	$549,817	$469,517	$491,153
7	SF	2307g	Gable	7:12	2	Yes	No	No	24	3,600	3,116	$527,551	$547,490	$468,929	$488,984
8	SF	2307h	Hip	7:12	2	Yes	No	No	24	3,600	3,116	$530,191	$557,208	$471,383	$498,039
9	SF	2204G	Gable	4:12	2	Yes	No	No	20	3,000	2,516	$431,025	$445,316	$383,231	$397,522
10	SF	2204H	Hip	4:12	2	Yes	No	No	20	3,000	2,516	$432,632	$450,612	$384,830	$402,818
11	SF	2207G	Gable	7:12	2	Yes	No	No	20	3,000	2,516	$432,175	$449,127	$384,381	$401,333
12	SF	2207H	Hip	7:12	2	Yes	No	No	20	3,000	2,516	$434,073	$455,442	$386,289	$407,677
13	SF	A103g	Gable	6:12	1	Yes	Yes	No	12	2,657	1,986	$333,968	$355,508	$307,180	$328,794
14	SF	A143g	Gable	4:12	1	Yes	Yes	No	12	2,657	1,986	$332,443	$349,988	$305,731	$323,537
15	SF	A143h	Hip	4:12	1	Yes	Yes	No	12	2,657	1,986	$335,167	$359,850	$308,319	$332,930
16	SF	A173g	Gable	7:12	1	Yes	Yes	No	12	2,657	1,986	$334,393	$357,049	$307,585	$330,263
17	SF	A173h	Hip	7:12	1	Yes	Yes	No	12	2,657	1,986	$337,627	$368,749	$310,655	$341,403
18	SF	A144g	Gable	4:12	1	Yes	No	No	12	2,467	1,986	$331,691	$347,274	$305,019	$320,953
19	SF	A144h	Hip	4:12	1	Yes	No	No	12	2,467	1,986	$334,224	$356,432	$307,423	$329,674
20	SF	A174g	Gable	7:12	1	Yes	No	No	12	2,467	1,986	$333,505	$353,832	$306,740	$327,198
21	SF	A174h	Hip	7:12	1	Yes	No	No	12	2,467	1,986	$336,507	$364,696	$309,591	$337,544
22	SF	A175G	Gable	7:12	1	No	No	No	11	2,467	2,406	$366,202	$385,522	$335,675	$355,315
23	SF	A176G	Gable	7:12	1	Yes	No	Yes	14	2,467	1,986	$335,237	$355,512	$308,386	$328,798
24	SF	A177G	Gable	7:12	1	Yes	No	No	25	2,467	1,986	$342,854	$362,895	$315,620	$335,828
25	SF	A178G	Gable	7:12	1	Yes	No	No	11	2,467	1,986	$348,554	$376,260	$313,667	$340,415
26	SF	K203h	Hip	6:12	2	Yes	No	No	20	4,233	3,820	$642,017	$672,438	$570,484	$600,630
27	SF	K243g	Gable	4:12	2	Yes	No	No	20	4,233	3,820	$637,520	$655,884	$566,304	$585,205
28	SF	K243h	Hip	4:12	2	Yes	No	No	20	4,233	3,820	$640,156	$665,592	$568,754	$594,251
29	SF	K273g	Gable	7:12	2	Yes	No	No	20	4,233	3,820	$639,407	$662,834	$568,058	$591,681
30	SF	K273h	Hip	7:12	2	Yes	No	No	20	4,233	3,820	$642,537	$674,350	$570,967	$602,412

Table 2-13 provides the replacements costs used in the analysis for multi-family buildings. These costs were developed following a similar method to that used for single-family homes, however the source of the cost data was RS Means 2024 Square Foot Costs (RS Means 2024b). This reference provides costs for a broad range of commercial style construction. The base models used for creating the multi-family housing costs were the basic “Apartment, 1-3 Story”, “Apartment, 4-7 Story”, and “Apartment, 8-24 Story”. The costs used correspond to the Average Construction Cost Class for a location in the Fort Lauderdale/West Palm Beach area and range from about $150 to $250 per square foot.

Table 2-13. Replacement Cost Estimates for Multi-Family Building Models

Model Index No.	Building Group	Building Model	Roof Geometry	Roof Slope	No. of Stories	Total Fens	Total Sq Ft	Livable Sq Ft	Replacement Costs($)		
									Shingle	Tile	Built-up Roof
31	MF-I	0024F	Flat	0:12	2	96	14,592	14,592			$2,393,420
32	MF-I	0024G	Gable	4:12	2	96	14,592	14,592	$2,119,770	$2,481,870	
33	MF-I	0024H	Hip	4:12	2	96	14,592	14,592	$2,406,510	$2,513,490	
34	MF-I	0027G	Gable	7:12	2	96	14,592	14,592	$2,403,800	$2,504,510	
35	MF-I	0027H	Hip	7:12	2	96	14,592	14,592	$2,415,130	$2,542,020	
36	MF-I	S301F	Flat	0:12	3	150	35,160	35,160			$5,784,181
37	MF-I	S341G	Gable	4:12	3	150	35,160	35,160	$5,715,738	$5,802,100	
38	MF-I	S341H	Hip	4:12	3	150	35,160	35,160	$5,723,954	$5,832,770	
39	MF-I	S371G	Gable	7:12	3	150	35,160	35,160	$5,721,621	$5,824,060	
40	MF-I	S371H	Hip	7:12	3	150	35,160	35,160	$5,731,365	$5,860,439	
41	MF-II	0057F	Flat	0:12	5	195	33,600	33,600			$8,345,610
42	MF-II	WW31F	Flat	0:12	3	117	28,620	28,620			$5,291,999
43	MF-III	0087F	Flat	0:12	8	312	53,760	53,760			$18,392,000
44	MF-III	SB31F	Flat	0:12	10	450	240,000	240,000			$49,699,741

Table 2-14 provides estimated replacement cost values for mobile/manufactured homes. These values were estimated using 2024 RS Means Residential Cost Data (RS Means 2024a), similar to the approach used for single-family homes. The replacement costs range from about $120 to $125 per square foot for the options considered.

Table 2-14. Replacement Cost Estimates for Mobile/Manufactured Homes

Model Index No.	Building Group	Building Model	Roof Geometry	Roof Slope	No. of Stories	Total Fens	Total Sq Ft	Livable Sq Ft	Replacement Costs($) Shingle
45	MH-SW	0001M	Gable	5:12	1	11	720	720	$88,920
46	MH-DW	0002M	Gable	5:12	1	12	1,420	1,420	$177,840

2.6. Insurance Assumptions

The insurance parameters used in this study are based on a review of the exposure dataset compiled by the Florida Hurricane Catastrophe Fund (FHCF) for their 2024 ratemaking studies. Our goal is to select a set of insurance parameters that are most representative of Florida windstorm insurance policies for residential, site-built properties. The specific insurance parameters examined are the deductible amounts and the coverage ratios.

2.6.1. Deductibles

Table 2-15 summarizes the distribution of building coverages for residential policies (i.e., owner occupied, 1-4 unit residential properties) as a function of deductible group and year built group. For residential type of business (TOB), 80% of the statewide aggregate building coverage has a windstorm deductible of 2%. Thus, we will use 2% as the default deductible for the residential relativities.

Table 2-15. Building Coverage Distribution by Deductible Group and Year Built for Residential (1-4 Units) Policies

Deductible Group	Coverage A Value (in $M) by year Built					Total ($M)	Total (%)
	1994 or earlier	1995-2001	2002-2011	2012 or later	Unknown		
1%	9,970.30	5,313.15	24.53	12,698.80	27,055.99	55,062.76	2.69%
2%	667,539.58	220,363.18	9,632.33	352,673.21	388,877.45	1,639,085.76	80.17%
3%	6,268.15	1,935.28	6.82	2,106.05	1,741.94	12,058.24	0.59%
4%	928.68	285.14	0.57	242.62	199.72	1,656.73	0.08%
5%	120,324.43	22,685.66	1,812.83	29,998.97	26,223.00	201,044.89	9.83%
6%	1.66	0.00	0.00	1.04	0.00	2.70	0.00%
7%	1.62	0.00	0.00	0.00	0.00	1.62	0.00%
9%	4.25	0.77	0.00	3.21	0.43	8.66	0.00%
10% - 14%	13,771.91	3,518.69	29.19	4,928.26	4,201.97	26,450.03	1.29%
15% or Greater	856.42	600.37	0.21	1,050.91	1,156.15	3,664.06	0.18%
$0	0.31	0.00	0.34	0.00	0.00	0.65	0.00%
$1 to $500	5,906.42	3,303.44	28.02	8,880.19	13,668.67	31,786.73	1.55%
$501 to $1,500	5,228.60	4,297.00	43.05	8,939.16	36,673.26	55,181.07	2.70%
$1,501 to $2,500	2,265.44	1,155.13	0.00	2,192.92	5,188.94	10,802.43	0.53%
Greater than $2,500	1,738.13	1,064.11	2.80	1,972.33	2,940.20	7,717.58	0.38%
Totals	834,805.91	264,521.92	11,580.68	425,687.67	507,927.72	2,044,523.91	100.00%

For condominium unit owner policies and tenant policies, the primary coverage is usually taken to be the contents coverage. Table 2-16 summarizes the distribution of contents coverages for condominium unit owner policies in the 2024 FHCF ratemaking dataset as a function of deductible group and year-built group. For the condominium unit owner TOB, 48.8% of the statewide aggregate contents coverage has a windstorm deductible of 2%, 13% has a 5% deductible 14.4% of the statewide aggregate contents coverage has a flat windstorm deductible between $1 and $500 (treated as a $500 deductible in the FHCF ratemaking studies), and 13.9% have a flat windstorm deductible between $501 and $1,500 (treated as $1000 in the FHCF ratemaking study). Within the $500 deductible group, the average condominium unit owner contents coverage is $23,531 per policy. Thus, $500 deductible represents 2.1% of the average contents coverage in the $500 deductible group. Similarly, within the $501-$1,500 deductible group, the average condominium unit owner contents coverage is $36,167 per policy. Thus, the $1,000 deductible represents 2.76% of the average contents coverage in the $500 deductible group.

Given that most of the condominium unit owner policies have a 2% deductible, and the next four most common deductibles range from 2.1% to 5%, we will use 2% as the default deductible for the condominium unit owner relativities.

Table 2-16. Contents Coverage Distribution by Deductible Group and Year Built for Condominium Unit Owner Policies

Deductible Group	Coverage C Value (in $M) by year Built					Total ($M)	Total (%)
	1994 or earlier	1995-2001	2002-2011	2012 or later	Unknown		
1%	39.92	30.26	0.00	57.65	41.65	169.48	0.37%
2%	8,634.07	3,138.53	2.35	6,619.78	4,045.80	22,440.55	48.81%
3%	36.19	7.98	0.00	40.83	28.36	113.36	0.25%
4%	6.68	2.90	0.00	3.84	1.09	14.50	0.03%
5%	2,348.29	824.03	1.68	1,544.70	1,266.28	5,984.99	13.02%
7%	0.00	0.00	0.00	1.61	0.00	1.61	0.00%
9%	0.00	0.00	0.00	0.00	0.00	0.00	0.00%
10% - 14%	605.86	153.09	0.10	259.33	320.40	1,338.78	2.91%
15% or Greater	101.52	99.31	0.03	125.05	216.41	542.30	1.18%
$0	33.82	9.80	1.71	13.57	4.80	63.70	0.14%
$1 to $500	3,985.13	648.81	34.83	1,396.51	570.93	6,636.21	14.43%
$501 to $1,500	2,861.87	701.69	13.92	1,729.33	1,064.64	6,371.46	13.86%
$1,501 to $2,500	759.97	190.56	4.25	484.07	289.67	1,728.52	3.76%
Greater than $2,500	169.85	73.05	1.28	172.12	154.51	570.81	1.24%
Totals	19,583.16	5,880.01	60.17	12,448.39	8,004.54	45,976.26	100.00%

Table 2-17 summarizes the distribution of contents coverages for tenant policies in the 2024 FHCF ratemaking dataset as a function of deductible group and year-built group. For tenant policies, 59.8% of the statewide aggregate contents coverage is reported to have a windstorm deductible of $1 to $500 (treated as a $500 deductible in the FHCF ratemaking studies), and 29.1% of the statewide aggregate contents coverage is reported to have a flat windstorm deductible between $501 and $1,500 (treated as a $1,000 deductible in the FHCF ratemaking studies). Within the $500 deductible group, the average tenant contents coverage is $22,723 per policy. Thus, the $500 deductible represents an average of 2.2% of the contents coverage. Within the $501-$1,500 deductible group, the average tenant contents coverage is $19,286 per policy. Thus, the $1,000 deductible represents an average of 5.2% of the contents coverage.

The next most common deductible for tenant policies is the 2% deductible, representing 8.6% of contents coverage. Thus, for consistency with the residential and condominium unit owner policies, we will use 2% as the default deductible for the tenant relativities.

Table 2-17.Contents Coverage Distribution by Deductible Group and Year Built for Tenant Policies

Deductible Group	Coverage C Value (in $M) by year Built					Total ($M)	Total (%)
	1994 or earlier	1995-2001	2002-2011	2012 or later	Unknown		
1%	1.0	0.3	0.0	1.5	1.6	4.4	0.02%
2%	627.6	215.4	394.8	397.2	518.8	2,153.9	8.64%
3%	0.0	0.0	0.0	0.5	0.0	0.6	0.00%
5%	96.8	38.6	0.1	48.5	77.1	261.1	1.05%
10% - 14%	34.6	23.0	0.1	14.2	21.2	93.0	0.37%
15% or Greater	12.1	4.5	0.0	8.4	13.3	38.3	0.15%
$0	10.1	5.7	0.3	8.3	10.0	34.5	0.14%
$1 to $500	4,325.5	1,769.0	1,729.5	2,470.8	4,612.2	14,907.1	59.79%
$501 to $1,500	1,771.0	658.8	2,762.1	892.8	1,167.2	7,251.9	29.09%
$1,501 to $2,500	23.7	8.9	13.9	15.4	22.8	84.7	0.34%
Greater than $2,500	22.8	8.9	33.3	11.9	24.8	101.8	0.41%
Totals	6,925.36	2,732.99	4,934.24	3,869.55	6,469.09	24,931.25	100.00%

Table 2-18 summarizes the distribution of building coverages for mobile/manufactured home policies (as a function of deductible group and year-built group. For mobile homes, 51.8% of the statewide aggregate building coverage has a 2% windstorm deductible, 16.6% have a 5% windstorm deductible and 23.1% have a deductible between $251 and $500 (treated as a $500 deductible in the FHCF ratemaking studies). Within the $500 deductible group, the average mobile home building coverage is $58,197 per policy. Thus, the $500 deductible represents an average of 0.9% of the contents coverage.

Given that the majority of the mobile home policies have a 2% deductible, and the next two most common deductibles range from 0.9% to 5%, we will use 2% as the default deductible for the mobile/manufactured homes owner relativities.

Table 2-18. Building Coverage Distribution by Deductible Group and Year Built for Mobile Home Policies

Deductible Group	Coverage A Value (in $M) by year Built					Total ($M)	Total (%)
	1994 or earlier	1995-2001	2002-2011	2012 or later	Unknown		
1%	5.2	38.1	0.0	36.5	52.6	132.4	0.58%
2%	2,584.0	2,397.6	44.4	3,300.8	3,528.7	11,855.6	51.77%
3%	3.9	2.5	1.7	2.4	2.1	12.4	0.05%
4%	0.2	0.1	0.0	0.1	0.1	0.5	0.00%
5%	2,036.5	636.1	8.1	677.6	435.9	3,794.2	16.57%
6%	1.9	0.7	0.0	0.4	0.8	3.8	0.02%
9%	0.0	0.0	0.0	0.0	0.5	0.5	0.00%
10% or Greater	276.0	59.9	0.2	73.0	57.9	466.9	2.04%
$0	0.0	0.0	0.0	0.0	0.0	0.0	0.00%
$1 to $250	4.0	0.3	0.0	0.6	0.2	5.2	0.02%
$251 to $500	2,875.9	1,118.5	0.8	914.9	380.8	5,291.0	23.10%
Greater than $500	193.8	306.3	0.4	372.1	466.5	1,339.1	5.85%
Totals	7,981.56	4,560.03	55.55	5,378.35	4,926.16	22,901.65	100.00%

2.6.2. Coverage Ratios

The second insurance parameter of potential importance to the relativity results is the ratio of secondary to primary coverages. For a typical residential windstorm policy, there are four main coverages: (A) Building, (B) Appurtenant Structures, (C) Contents, and (D) Additional Living Expenses (ALE). Typically, the building coverage (Coverage A) is taken to be the primary coverage for owner occupied, residential (1-4 unit) and mobile home policies, whereas the contents coverage (Coverage C) is taken to be the primary coverage for condominium unit owner or tenant policies.

In general, the rates at which Coverage A, B, C, and D losses are reduced by improved construction methods depend on the type of mitigation and the location of the structure. Therefore, it is important that the default coverage ratios used in the analysis be representative of typical Florida residential windstorm exposures.

Table 2-19 summarizes the average coverage ratios compiled from the 2024 FHCF ratemaking dataset for single-family and multi-family buildings. We see that the average coverage ratios are 5.0%, 37.2% and 13.3% for Coverages B, C, and D, respectively, for SF homes. For multi-family buildings, we have summed the commercial-residential, condominium unit owner, and tenant's exposure. The resulting multi-family coverage ratios are 0.1%, 77.3% and 20.2%, for Coverages B, C, and D, respectively. The resulting mobile home coverage ratios are 9.1%, 40.9% and 13.7%, for Coverages B, C, and D, respectively.

Table 2-19. Average Coverage Ratios for Single-Family, Multi-Family, and Mobile Home Occupancies form the 2024 FHCF Dataset

Type of Business	Building	Apprt. Str.	Contents	ALE
Single Family (1-4 Units)	100%	5.0%	37.2%	13.3%
Multi-Family (5+Units)	100%	0.1%	77.3%	20.0%
Mobile Homes	100%	9.1%	40.9%	13.7%

Coverage B includes attached and detached structures, such as aluminum-frame screen enclosures, fences, storage sheds, gazebos, etc. These structures are not built to the same building code requirements as dwellings. The data in Twisdale et al. (2007) suggests that these types of structures are more readily damaged than the dwelling and add to the loss costs at a faster rate than the dwelling. They are also not easily mitigated for wind effects nor are there current, proven standards for mitigating these types of structures for wind hazards. Hence, and as will be discussed later in this report, the wind mitigation rate differentials developed in this study do not apply to these types of structures. We therefore exclude Coverage B in this study. Another key assumption is that any attached structures that are covered under Coverage A are excluded from that portion of the wind premium to which the resulting rate differential is applied.

The set of coverages that we use in this study are given in Table 2-20. We have rounded up the contents percentages for each single- and multi occupancies to the nearest 5%. For mobile homes, the contents percentage was rounded down to match the contents percentage for single-family. ALE percentages have been rounded up to the next highest whole percent value. Contents and ALE coverages are included for single-family, multi-family, and mobile homes since they derive from damage to the dwelling structure. A mitigated structure will have fewer failures of the building envelope and hence fewer contents losses and reduced loss of use.

Table 2-20. Default Coverage Ratios Used in this Study for Single-Family, Multi-Family, and Mobile Home Occupancies

Type of Business	Building	Apprt. Str.	Contents	ALE
Single Family (1-4 Units)	100%	0.0%	40.0%	14.0%
Multi-Family (5+Units)	100%	0.0%	80.0%	20.0%
Mobile Homes	100%	0.0%	40.0%	14.0%

3. Recent Hurricane Insurance Loss and Damage Data

Since the 2008 loss relativity study was completed, there is a significant amount of new data relevant to loss mitigation for residential buildings. These data include insurance loss data and engineering damage surveys from Florida recent hurricanes. We have considered much of this new information to update and validate the loss relativities. This section highlights these new data and resulting analyses.

A major focus of this study included the analysis of insurance data from Hurricanes Irma (2017), Michael (2018), Ian (2022), and Idalia (2023). We were able to work directly with several insurance companies to obtain policy level data that we could analyze in an anonymous statistical approach for purposes of understanding building performance in hurricanes.

In addition to new insurance data, the hurricanes of 2017-2023 provided opportunities for engineering surveys of physical damage to residential buildings. Survey data have been collected by various organizations for different purposes. For purposes of quantification of loss mitigation effectiveness, we include a few summaries of data collected by FEMA, the Structural Extreme Events Reconnaissance Network (StEER) and IBHS. The data from these organizations was collected in a scientific fashion that included both damaged and undamaged structures.

Sections 3.1 through 3.4 summarize the new insurance data analysis research that was conducted during this project. This work is obviously very open-ended in nature and much more work is needed to continue to improve our understanding and modeling of the many interrelated variables that affect physical damage and loss mitigation. Section 3.5 summarizes these physical damage observations.

3.1. Insurance Data Summary

Insurance company data provide key inputs for: (1) understanding the relationships between physical damage and insured loss and (2) validating the effectiveness of wind mitigation features in reducing hurricane losses. This study uses policy level loss data that summarize the total loss by coverage in conjunction with a complete set of the exposure data for the policies in force at the time of the event for the affected area. The exposure data includes description of the key mitigation factors provided on the Uniform Mitigation Verification Inspection forms submitted by policyholders and includes information on all policies insured – whether they experienced a loss or not. Zero losses must be included in the policy level data analysis since the analysis of the fractions of loss must be built up with the correct denominator or exposure to the storm.

Exposure and claims data sets have been received from 14 Florida insurance companies for four events (Hurricanes Irma, Michael, Ian and Idalia). A top-level summary of the data is provided in Table 3-1. More detailed breakdowns and observations are provided in the next three sections for single-family homes, multi-family buildings, and manufactured/mobile homes, respectively.

Table 3-1. Summary of Claims Data Analyzed Across all Residential Lines of Business

Hurricane	Year	Claims	Amount Paid to Insureds ($)	Average
Irma	2017	94,522	5,161,022,571	54,601
Michael	2018	13,269	820,190,413	61,813
Ian	2022	77,873	4,611,484,985	59,218
Idalia	2023	3,307	66,922,901	20,237
Total		**188,971**	**10,659,620,871**	**56,409**

3.2. Insurance Policy Level Losses: Single-Family Homes

Sixteen sets of single-family home claims data from four companies have been analyzed for the four most recent significant Florida hurricane events. A summary of the data, aggregated across the four companies, is provided in Table 3-4. The aggregate data set includes 143,731 claims and $5.26 billion in claims paid. The average claims paid are broadly consistent with the windfield intensities of the four events, as shown in Appendix B. Policy types include both homeowners (HO-2 and HO-3) and dwelling/fire (DP-3) policies. Policies with wind coverage excluded were omitted from the analysis. Only coverages A (building), B (other structures), C (contents), and D (additional living expense) are included in the claims paid. Loss adjustment expenses and claims paid for additional endorsements are not included. For open claims, the amount reserved by the insurer was added to any claims already paid to the insured. Henceforth, the actual claims paid to the insured plus any reserve are referred to as claims paid.

Table 3-2. Summary of Single-Family Home Claims Data

Hurricane	Year	Exposed Count	Exposed TIV ($)	Average TIV ($)	Claims Count	Claims Paid to Insureds ($)	Average Claim Paid ($)	Claims Paid as % of Exposed TIV
Irma	2017	560,679	177,953,702,560	317,390	79,055	2,568,732,639	32,493	1.44%
Michael	2018	13,452	4,549,726,028	338,219	5,336	379,456,493	71,113	8.34%
Ian	2022	509,349	219,086,807,325	430,131	58,018	2,282,060,365	39,334	1.04%
Idalia	2023	90,824	43,340,544,635	477,193	1,322	26,041,939	19,699	0.06%
Total		**1,174,304**	**444,930,780,548**	**378,889**	**143,731**	**5,256,291,436**	**36,570**	**1.18%**

A plot of the average claims paid as a fraction of TIV is shown for each event in Figure 3-1. Each point represents the average claim paid across all companies for locations that were subjected to peak, 3-second gust wind speed in open terrain within ±2.5 mph of the value plotted. The curves are neither identical nor completely smooth due to differences in the hazard conditions (wind direction, wind duration, wind-driven rain intensity, wind-borne debris environment, etc.), differences in building characteristics (e.g., year built, orientation, etc.), differences in the local surface roughness (z_0), differences in the policy types and coverage ratios (C/A and D/A) and hurricane deductibles, and randomness. Although smoothed (using a simple 1:2:1 weighting scheme), the curves tend to fluctuate more at the far right due to the smaller numbers of policies that were exposed to the most extreme winds in each event.

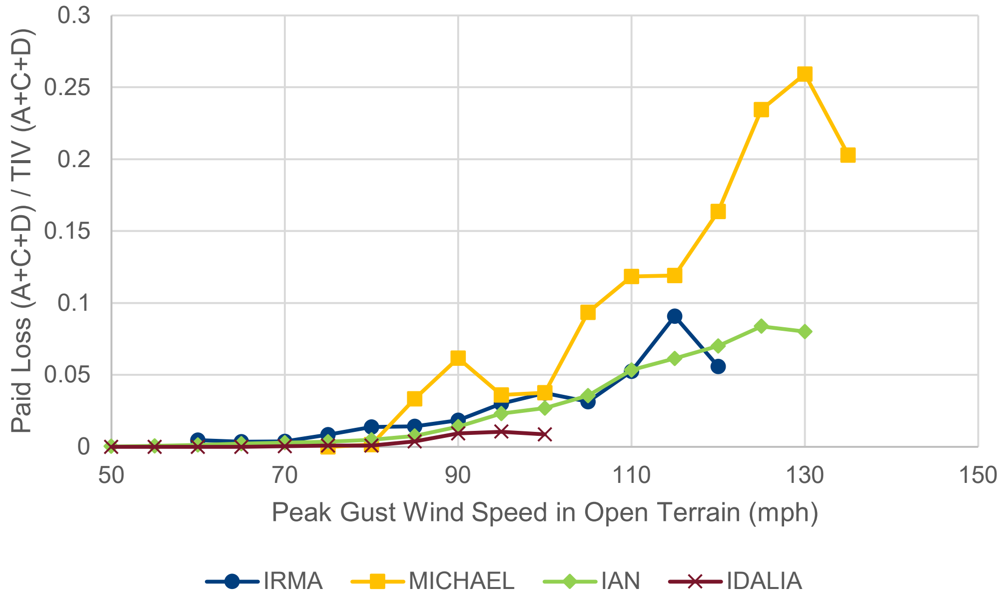


Figure 3-1. Average Normalized Loss for Single-Family Homes vs. Peak Gust Wind Speed in Open Terrain.

3.2.1. Year Built

For single-family homes constructed in Florida, there are at least four significant eras of wind design standards: (1) homes built under various editions of the Standard Building Code (SBC) and earlier standards (assumed to include years built of 1994 and earlier), (2) homes built during the period when the South Florida Building Code (SFBC) was in effect in Southeast Florida and the SBC remained in effect throughout the rest of the state (years built of 1995-2002), (3) homes built under the early editions of the Florida Building Code (FBC) (years built of 2003-2007), and (4) homes built after the FBC was amended in 2006 and 2007 following the hurricanes of 2004 and 2005 (years built of 2008 and later). The years built are assumed to lag the years of enactment by one year as a rough approximation of the time between when a building permit is initially granted and when construction is typically completed.

The average normalized claims paid for single-family homes are plotted against year built in Figure 3-16. It is clear from this plot that homes completed in 2008 and later, have experienced significantly lower claims than homes built in the prior three periods. It is notable that homes built prior to about 1937 have performed much better than other homes built prior to 2008, but those older homes only represent 2.0% of the single-family TIV analyzed for this study.

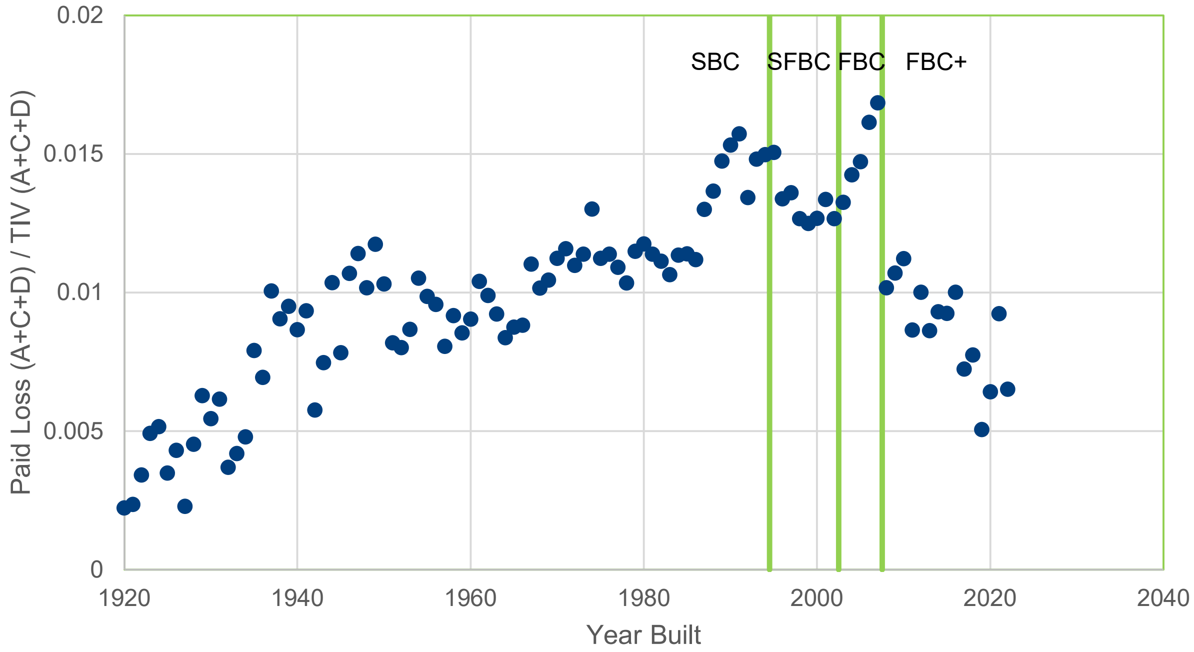


Figure 3-2. Average Normalized Loss for Single-Family Homes vs. Year Built.

3.2.2. Number of Stories

The losses for single-family housing by number of stories are plotted in Figure 3-3. There is a small reduction in losses for one story vs. two or more stories in the 80 to 90 mph range and then a much more substantial reduction in losses at peak gust wind speeds above 100 mph. This is consistent with the fact that wind loads increase with height, but there are no differences in roof covering and roof structure design requirements for one vs. two-story structures.

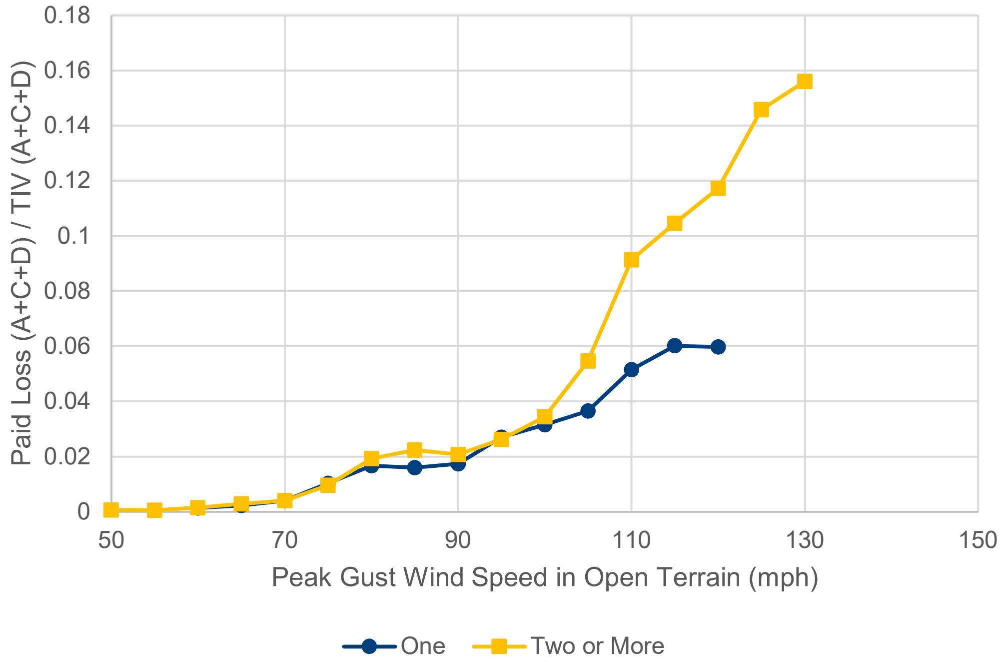


Figure 3-3. Average Normalized Loss for Single-Family Homes by Number of Stories vs. Peak Gust Wind Speed in Open Terrain.

3.2.3. Roof Cover

The losses for single-family housing by roof cover type are plotted in Figure 3-4. At wind speeds below about 100 mph, metal roofs performed the best, but in the 110 to 120 mph range metal roofs performed worse than shingle or tile roofs. The tile curve suggests that the threshold for complete replacement vs. repair of tile roofs is quite low. This may be because tile colors can be very difficult to match, especially as roofs age.

The effect of roof cover age is shown in Figure 3-5. In this figure, roof age is classified as new (0-6 years old), mid (7-13 years old) or old (14 or more years old). There is a substantial separation between the new and mid curves, but less separation between the mid and old curves. This suggests that any credits for new roofs should be mostly phased out over a period of six years or less.

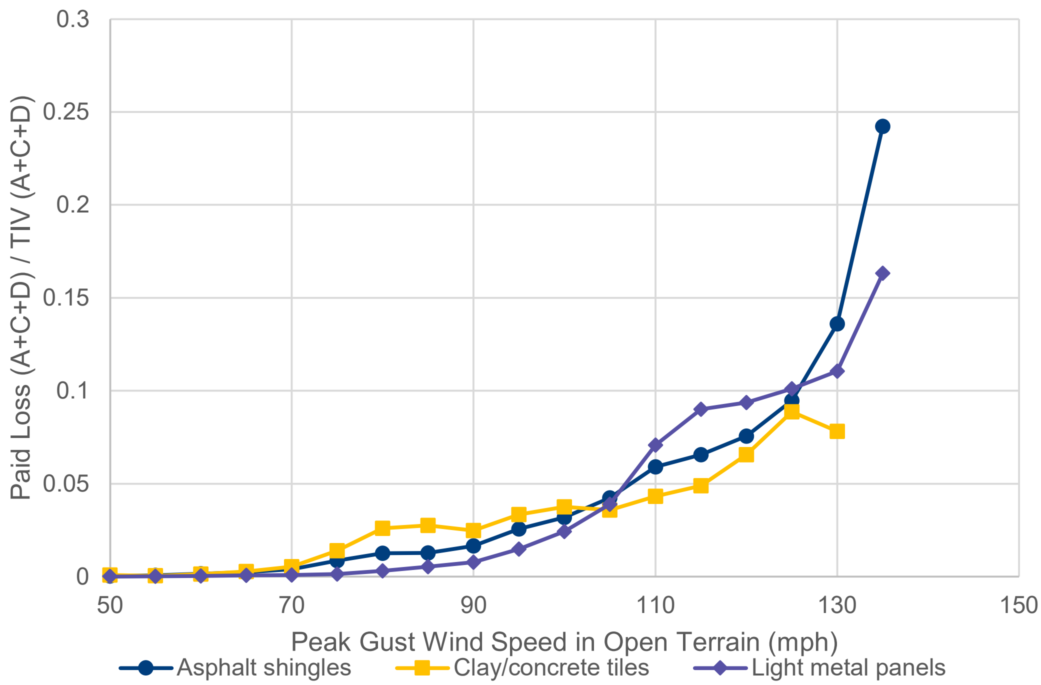


Figure 3-4. Average Normalized Loss for Single-Family Homes by Roof Cover Type vs. Peak Gust Wind Speed in Open Terrain.

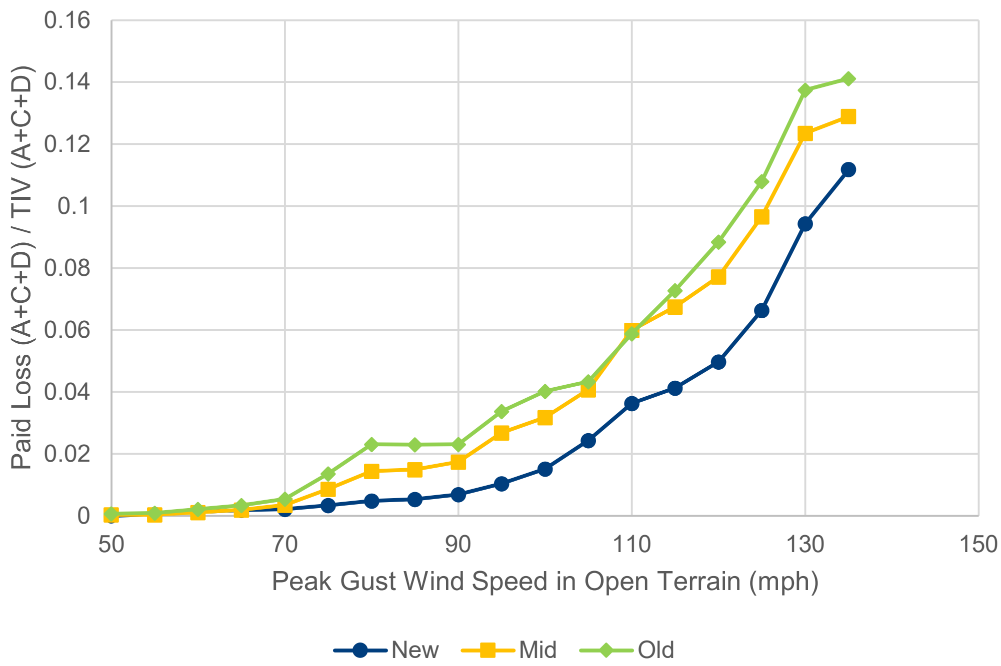


Figure 3-5. Average Normalized Loss for Single-Family Homes by Roof Cover Age vs. Peak Gust Wind Speed in Open Terrain.

3.2.4. Roof Shape

The losses for single-family housing by roof shape are plotted in Figure 3-6. At wind speeds between 70 and 90 mph, there is a moderate benefit of hip roof shapes compared to gable and flat roofs. Above 100 mph, the separation between the three roof shapes becomes more pronounced.

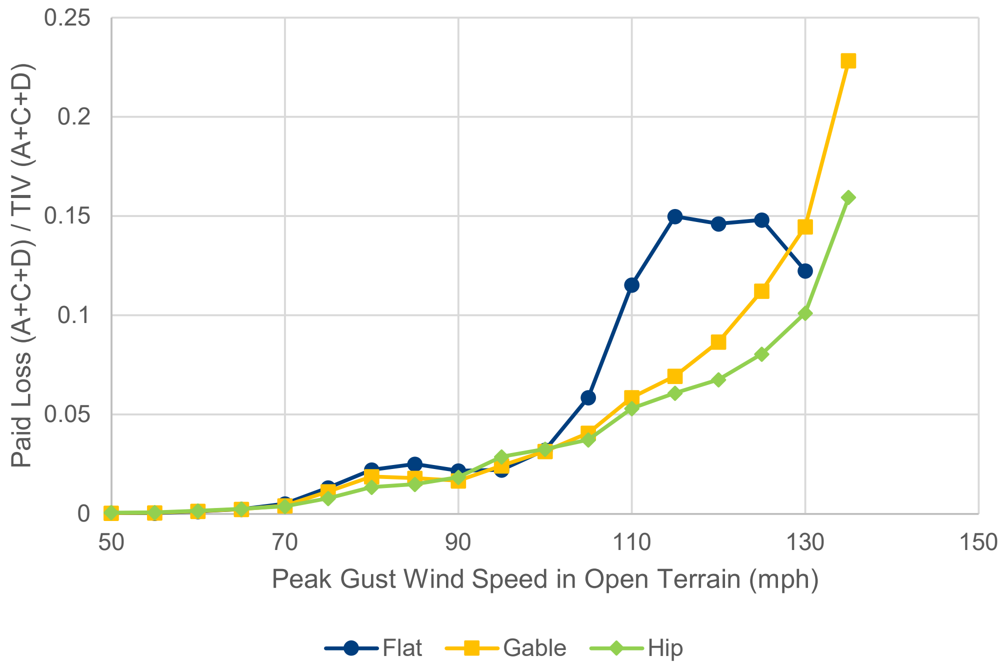


Figure 3-6. Average Normalized Loss for Single-Family Homes by Roof Shape vs. Peak Gust Wind Speed in Open Terrain.

3.2.5. Opening Protection

The losses for single-family housing with and without protection of glazed openings (i.e., windows and glazed doors) are plotted in Figure 3-7. Oddly, at wind speeds between 75 and 95 mph, the losses for house with hurricane-rated shutters or impact resistant glazing were *higher* than those of houses with a lower level of protection or no protection. There is no physical reason why this should be the case. Instead, it is likely that the presence of opening protection is confounded with other building characteristics and/or the geographic location of the building. Due to limited time and resources available for this project, this is an issue that should be investigated further.

Only at the very highest wind speeds experienced in this data set (i.e., above approximately 120 mph), do we see the benefits of opening protection. This is a good example of why wind mitigation relativities should be regionalized within the state of Florida. Opening protection will have a significant impact on loss relativities in the highest hazard areas of the state, but very little impact on loss relativities in the lowest hazard areas of the state.

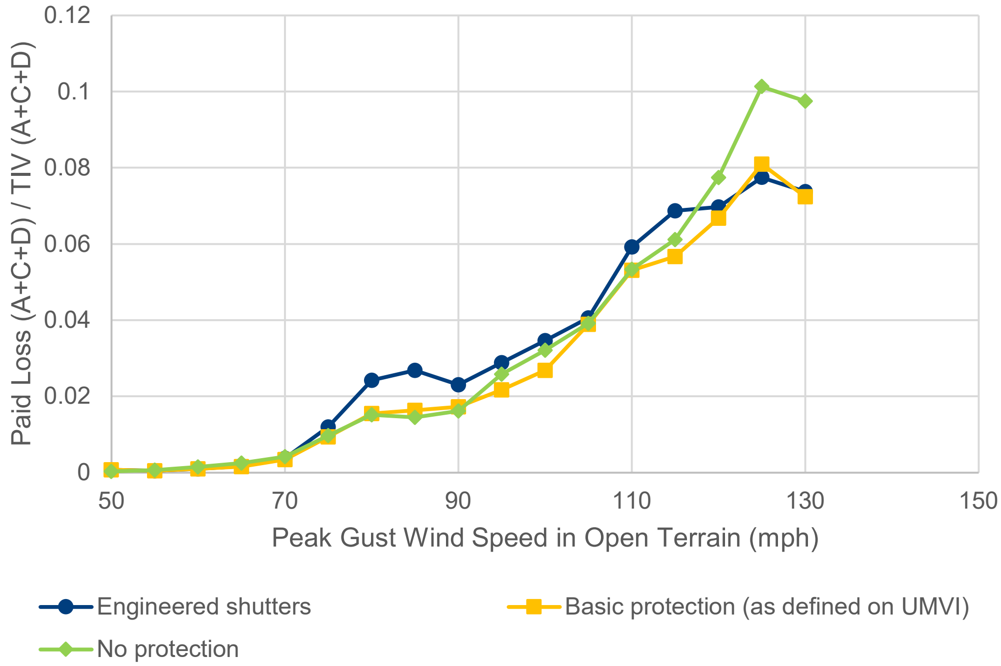


Figure 3-7. Average Normalized Loss for Single-Family Homes by Opening Protection Level vs. Peak Gust Wind Speed in Open Terrain.

3.3. Insurance Policy Level Losses: Multi-Family Buildings

Nine sets of commercial-residential claims data from three companies for multi-family buildings have been analyzed for the four most recent significant Florida hurricane events. A summary of the data, aggregated across the three companies, is provided in Table 3-4. The aggregate data set includes 2,125 claims and $365 million in claims paid. The average claims paid, when expressed as a percentage of the exposed TIV, for each event is broadly consistent with the windfield intensities of the four events, as shown in Appendix B. Policies with wind coverage excluded were omitted from the analysis. Only coverages A (building), B (other structures), C (contents), and D (additional living expense) are included in the claims paid. Loss adjustment expenses and claims paid for additional endorsements are not included. For open claims, the amount reserved by the insurer was added to any claims already paid to the insured.

Table 3-3. Summary of Commercial Residential Claims Data

Hurricane	Year	Exposed Count	Exposed TIV ($)	Average TIV ($)	Claims Count	Claims Paid to Insureds ($)	Average Claim Paid ($)	Claims Paid as % of Exposed TIV
Irma	2017	13,370	27,753,008,503	2,075,767	818	150,933,245	184,515	0.54%
Michael	2018	94	47,133,800	501,423	23	976,707	42,466	2.07%
Ian	2022	9,274	13,333,903,370	1,437,773	1,268	212,845,471	167,859	1.60%
Idalia	2023	1,160	2,558,361,865	2,205,484	16	232,266	14,517	0.01%
Total		**23,898**	**43,692,407,538**	**1,828,287**	**2,125**	**364,987,690**	**171,759**	**0.84%**

A plot of the average claims paid for Group I, II and III multi-family buildings as a fraction of TIV is shown in Figure 3-8. Each point represents the average claim paid across all companies and all events for locations that were subjected to peak, 3-second gust wind speed in open terrain within ±2.5 mph of the value plotted. Although smoothed (using a simple 1:2:1 weighting scheme), the curves still tend to fluctuate due to the small numbers of locations that were exposed winds about 90 mph.

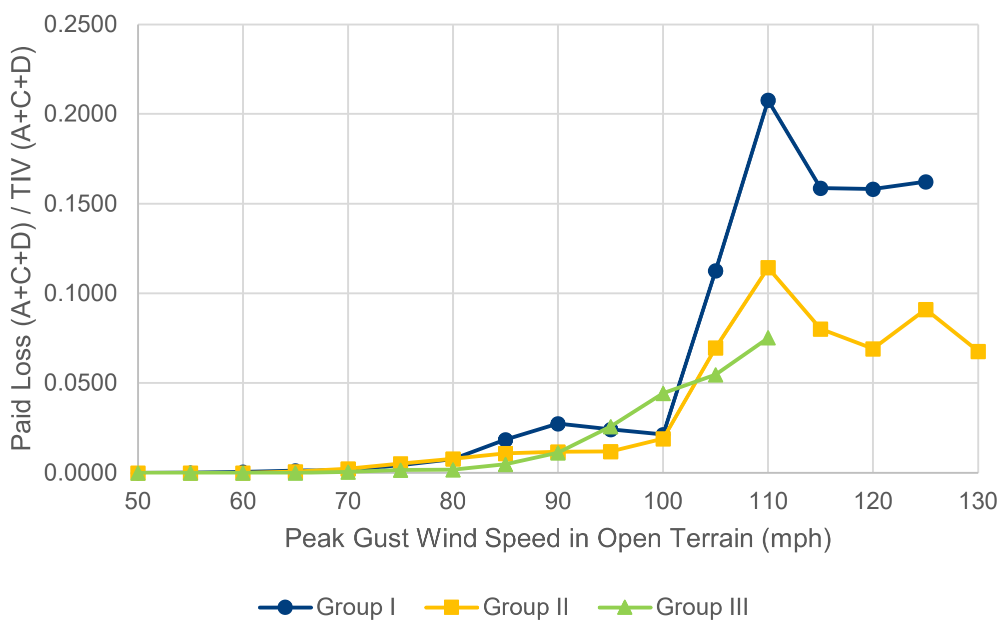


Figure 3-8. Average Normalized Loss for Group I, II, and III Multi-Family Housing vs. Peak Gust Wind Speed in Open Terrain.

3.3.1. Group I Multi-Family

The losses by construction type for Group I multi-family housing are plotted in Figure 3-9. There is not a clear difference, but when averaged across all events and locations, masonry Group I losses were about 6% less than frame Group I losses.

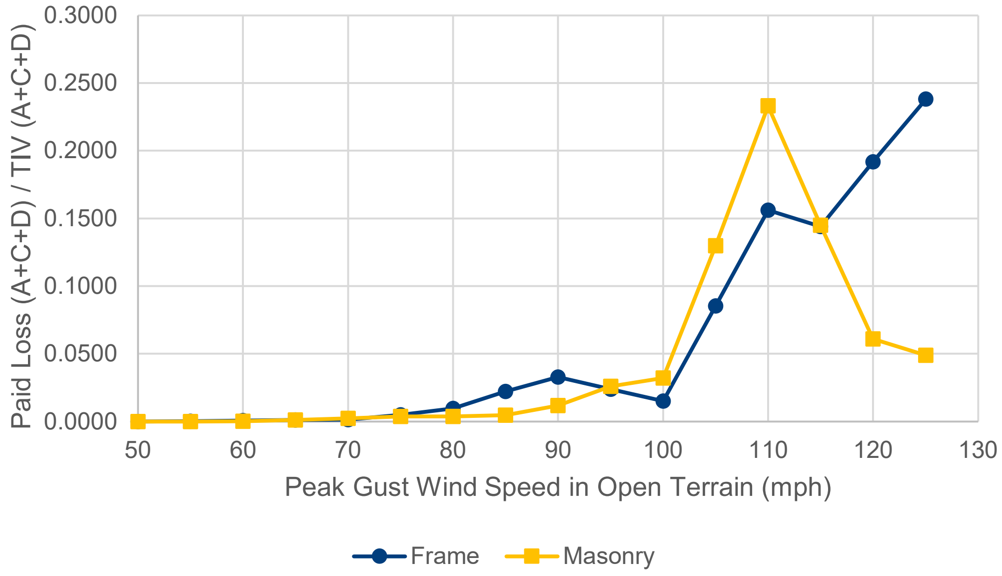


Figure 3-9. Average Normalized Loss for Group I Multi-Family Housing by Construction Type vs. Peak Gust Wind Speed in Open Terrain.

The losses for Group I multi-family housing with and without opening protection are plotted in Figure 3-10. Above about 100 mph, there is a clear reduction in losses with opening protection. When averaged across all events and locations, Group I losses with opening protection were about 13% less than frame Group I losses without opening protection.

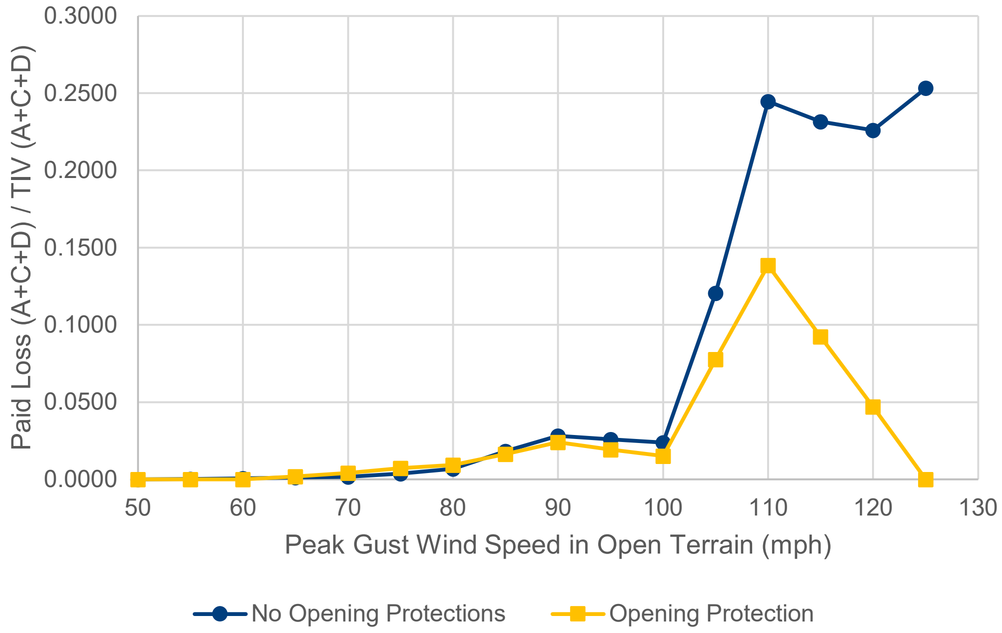


Figure 3-10. Average Normalized Loss for Group I Multi-Family Housing with and without Opening Protection vs. Peak Gust Wind Speed in Open Terrain.

The losses for Group I multi-family housing by roof cover age are plotted in Figure 3-11. In the 80 to 100 mph range, buildings with newer roofs (0 to 6 years) performed better than buildings with middle-aged roofs (7-13 years), which, in turn, performed marginally better than buildings with older roofs (14 or more years).

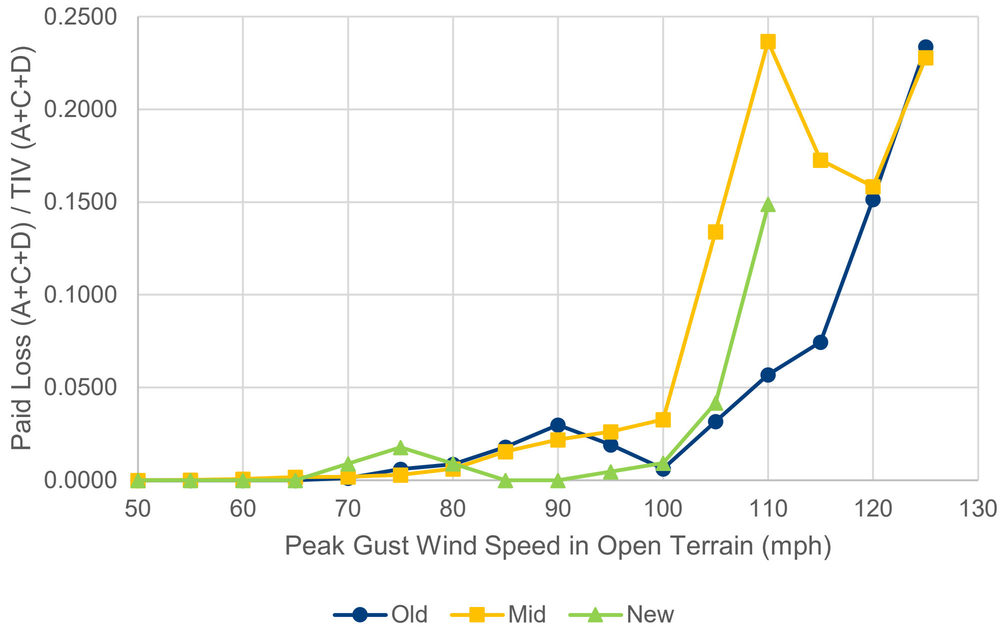


Figure 3-11. Average Normalized Loss for Group I Multi-Family Housing by Roof Cover Age (Old=14+ years, Mid=7-13 years, New=0-6 years) vs. Peak Gust Wind Speed in Open Terrain.

3.3.2. Groups II and III Multi-Family

There was much less claims data available for Group II and Group III multi-family buildings. Therefore, these two groups are presented together.

The losses by construction type for Group II and Group III multi-family housing are plotted in Figure 3-12. There is no data for steel-framed buildings and insufficient data to differentiate reliably between reinforced concrete-framed buildings and buildings coded as wind resistive.

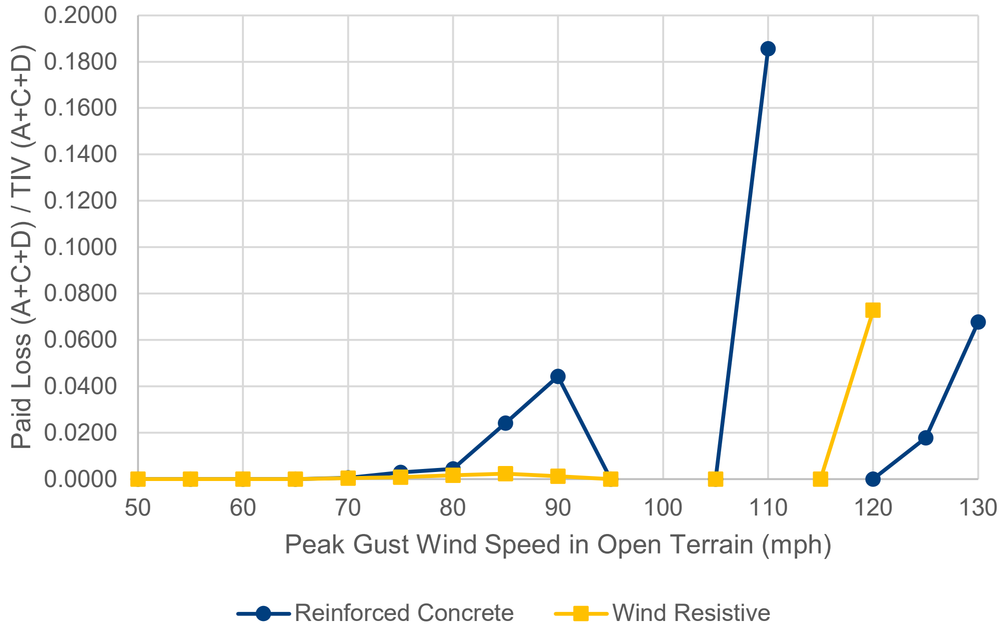


Figure 3-12. Average Normalized Loss for Group II and III Multi-Family Housing by Construction Type vs. Peak Gust Wind Speed in Open Terrain.

The losses for Group II and Group III multi-family housing with and without opening protection are plotted in Figure 3-13. As with Group I, there is a clear reduction in losses with opening protection at wind speed above about 100 mph. When averaged across all events and locations, Group II and Group III losses with opening protection were about 22% less than frame Group I losses without opening protection.

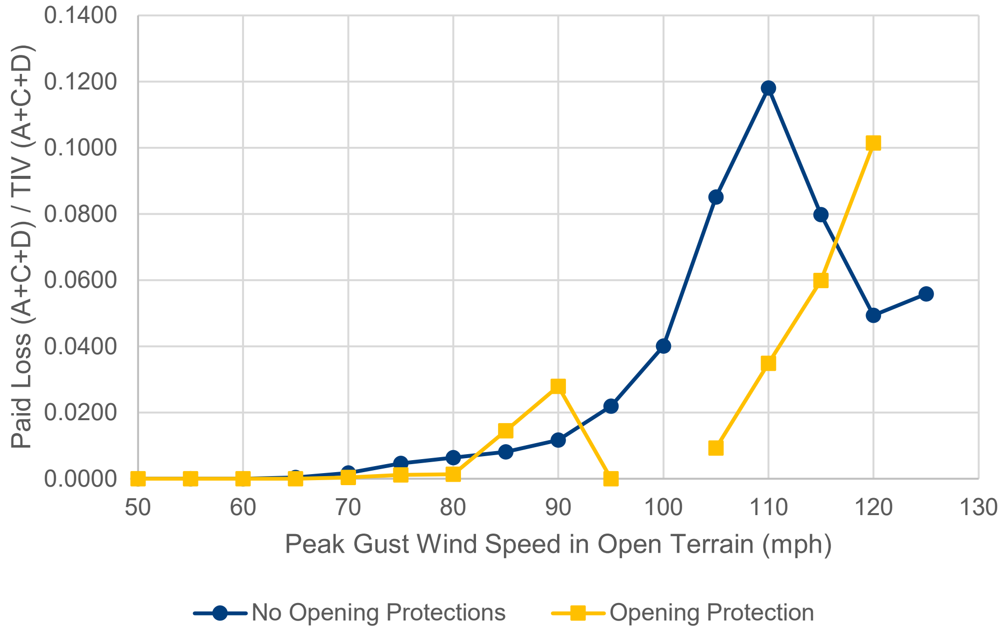


Figure 3-13. Average Normalized Loss for Group II and III Multi-Family Housing with and without Opening Protection vs. Peak Gust Wind Speed in Open Terrain.

The losses for Group II and Group III multi-family housing by roof cover age are plotted in Figure 3-14. This plot contains data from just 26 buildings reported as having newer roofs (0 to 6 years). Only five of those buildings had claims, and all of them were in the 125 mph bin. The data for buildings with middle-aged roofs (7-13 years) and older roofs (14 or more years) are less sparse. Unexpectedly, the buildings with older roofs performed a little better on average than the buildings with middle-aged roofs up to wind speeds of 100 mph

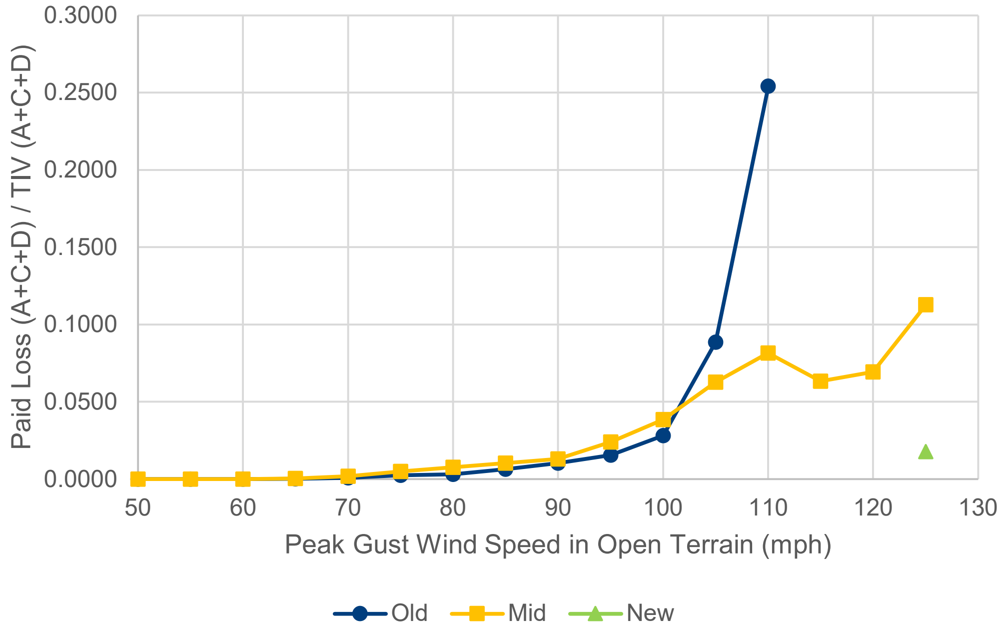


Figure 3-14. Average Normalized Loss for Group II and III Multi-Family Housing by Roof Cover Age (Old=14+ years, Mid=7-13 years, New=0-6 years) vs. Peak Gust Wind Speed in Open Terrain.

3.4. Insurance Policy Level Losses: Mobile Homes

Fourteen sets of mobile home claims data from four companies have been received and analyzed for the four most recent significant Florida hurricane events. A summary of the data, aggregated across the four companies, is provided in Table 3-4. The aggregate data set includes 43,115 claims and $585 million in claims paid. The average claims paid, when expressed as a percentage of the exposed TIV, for each event are broadly consistent with the windfield intensities of the four events, as shown in Appendix B. Policy types include both mobile homeowners (MHO) and mobile home dwelling/fire (MHDF). Policies with wind coverage excluded were omitted from the analysis. Only coverages A (building), C (contents) and D (additional living expense) are included in the TIVs and claims paid. Loss adjustment expenses and claims paid for additional endorsements are not included. For open claims, the amount reserved by the insurer was added to any claims already paid to the insured.

Table 3-4. Summary of Mobile Homes Claims Data

Hurricane	Year	Exposed Count	Exposed TIV ($)	Average TIV ($)	Claims Count	Claims Paid to Insureds ($)	Average Claim Paid ($)	Claims Paid as % of Exposed TIV
Irma	2017	81,620	5,068,081,805	62,094	14,649	97,895,139	6,683	1.93%
Michael	2018	11,626	841,075,126	72,344	7,910	102,952,411	13,015	12.24%
Ian	2022	54,858	4,810,028,715	87,681	18,587	360,978,372	19,421	7.50%
Idalia	2023	26,204	3,076,986,809	117,424	1,969	23,178,599	11,772	0.75%
Total		**174,308**	**13,796,172,455**	**79,148**	**43,115**	**585,004,521**	**13,568**	**4.24%**

A plot of the average claims paid as a fraction of TIV is shown for each event in Figure 3-15. Each point represents the average claim paid across all companies for locations that were subjected to peak, 3-second gust wind speed in open terrain within ±2.5 mph of the value plotted. The curves are neither identical nor completely smooth due to differences in the hazard conditions (wind direction, wind duration, wind-driven rain intensity, wind-borne debris environment, etc.), differences in building characteristics (e.g., year built, orientation, etc.), differences in the local surface roughness (z_0), differences in the policy types (MHO vs. DF) and coverage ratios (C/A and D/A) and hurricane deductibles, and randomness. The curves tend to fluctuate more at the far right due to the smaller numbers of policies that were exposed to the most extreme winds in each event.

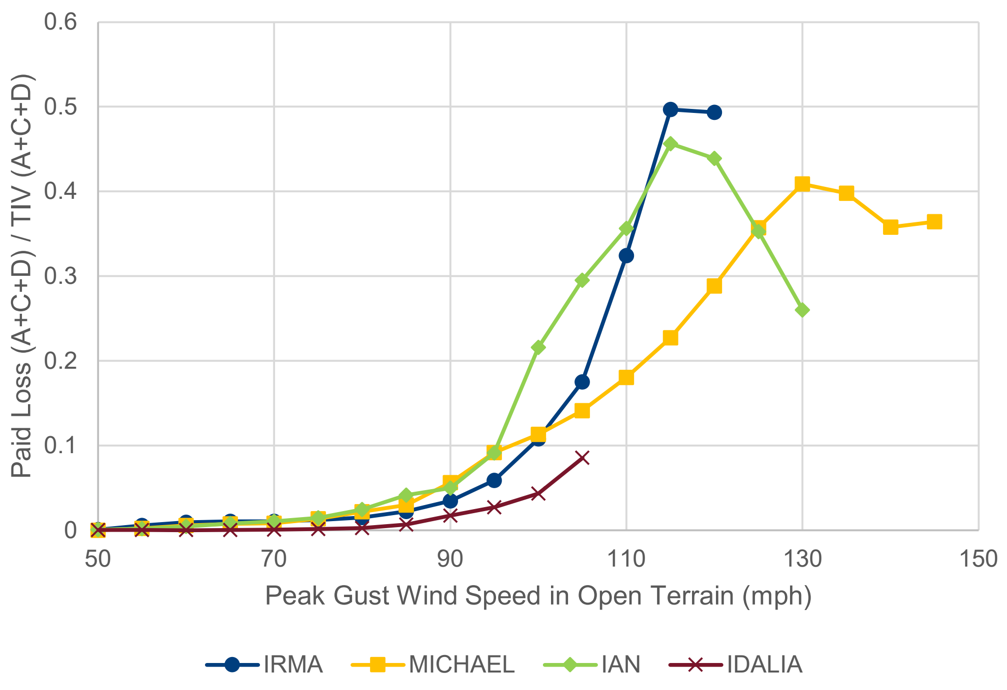


Figure 3-15. Average Normalized Loss for Mobile Homes vs. Peak Gust Wind Speed in Open Terrain.

3.4.1. Year Built

For mobile homes, there are three well-defined eras: (1) units manufactured prior to the adoption of the 1976 HUD regulations (pre-HUD), (2) units manufactured under the 1976 HUD regulations (HUD-76), and (3) units manufactured under the 1994 HUD regulations (HUD-94). For simplicity, we presume all units with a year built of 1976 or earlier are pre-HUD, all units with a year built from 1977 to 1994 are HUD76, and all units with a year built of 1995 or later are HUD94. Under the HUD94 regulations, there are three wind design zones, which are defined by counties. In Florida all counties are in either Zone II or Zone III. For simplicity, we presume that that all HUD94 units were designed for the designated wind zone of the county in which they are located.

The average claims paid for mobile homes are plotted against year built in Figure 3-16 and by era in Figure 3-17. Within the HUD-94 (1995 to present) and HUD-76 eras, there are clear trends of increasing normalized claims paid with increasing building age. Surprisingly, the trend is the opposite in the pre-HUD era (1976 and earlier), but the number of exposed risk locations from this era is only about 17% of the total population analyzed.

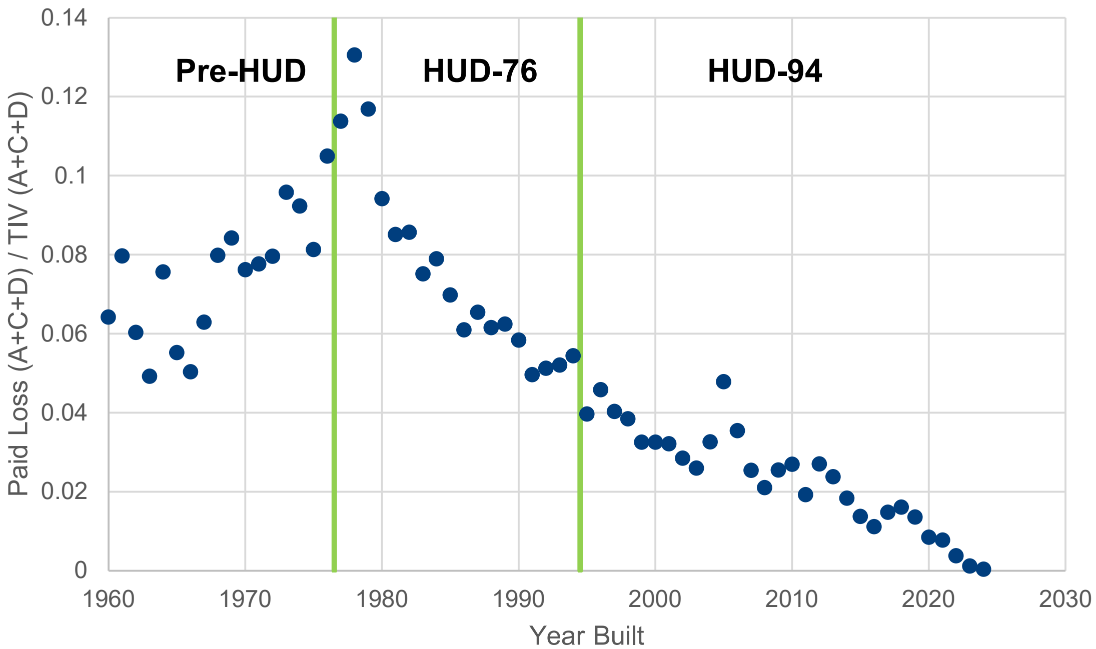


Figure 3-16. Average Normalized Loss for Mobile Homes vs. Year Built.

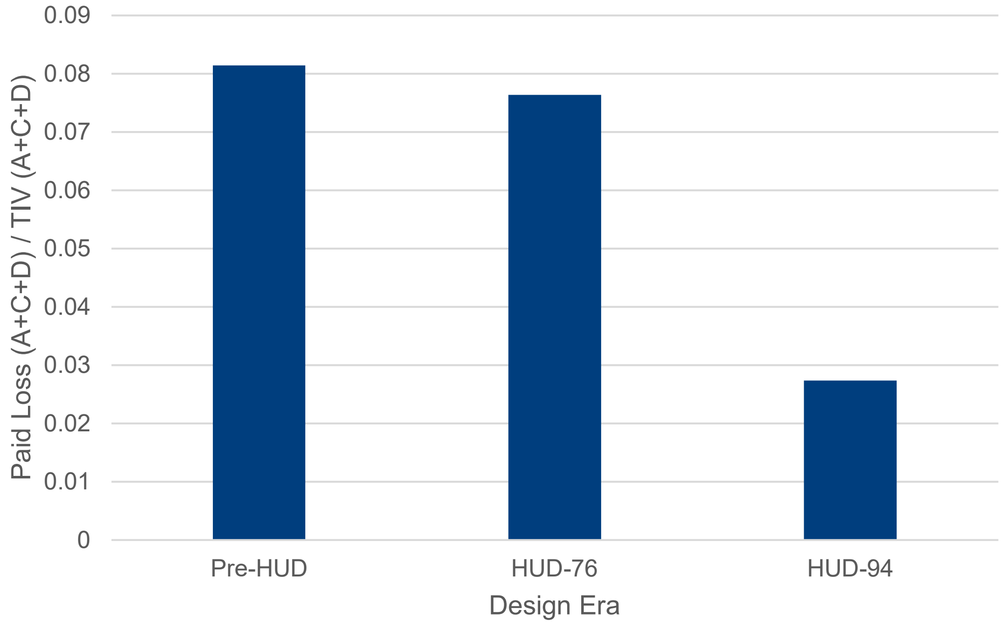


Figure 3-17. Average Normalized Loss for Mobile Homes by Era.

3.4.2. Other Factors

Roof Age: Less than 0.5% of the exposed mobile home TIV had a roof year newer than the year of construction. Therefore, no empirical conclusions can be drawn at this time about the effect of roof age on mobile home claims as a separate factor from the age of the building.

Opening Protection: None of the mobile home data sets had opening protection indicated. Therefore, no empirical conclusions can be drawn at this time about the effectiveness of opening protection on mobile home claims.

Tie Downs: None of the mobile home data sets had indicators for the type or condition of tie downs. Thus, we presume that tie downs are required by all companies, and no empirical conclusions can be drawn at this time about the performance of different tie down systems or the potential degradation of tie downs as they age.

3.5. Physical Damage Data

Datasets and reports documenting physical damage observed in recent Florida hurricanes have been reviewed and used to inform model updates. These data sources include:

University of Florida report (Prevatt and Rouche, 2019) for Hurricane Michael damage investigation has been reviewed. Prevatt and Rouche (2019) conducted a comprehensive assessment of 171 buildings damaged by Hurricane Michael. This study provides an overview of the wind performance of buildings, distinguishing between those constructed before and after the implementation of the Florida Building Code (FBC). The analysis utilizes peak gust wind speeds to evaluate damage levels across various building types, including single-family and non-single-family residences. Key findings of the study include:

- Post-FBC buildings generally exhibited better performance compared to pre-FBC buildings across all wind speeds. An anomaly was observed in post-FBC buildings, where the average damage ratings decreased in those subjected to the highest wind speeds. This unexpected trend suggests that newer homes, particularly in high-wind coastal areas, may have invested in "code-plus" construction, which exceeds standard building codes.
- Pre-FBC homes experienced more frequent roof sheathing and structural failures compared to post-FBC homes, even at similar wind speeds. Approximately 20% of pre-FBC homes had these failures, while such failures were rare in post-FBC homes.
- Both pre- and post-FBC homes frequently suffered cladding damage. However, structural wall failures were significantly lower in post-FBC homes.
- Interior damage due to rainwater ingress, driven by roof cover damage and the lack of secondary water barriers, remains a significant contributor to economic losses. The study noted that post-FBC homes generally lacked secondary water barriers in the inland study regions.

IBHS Post event damage observation report for Hurricane Ian has been obtained from IBHS. Findings from this report is discussed in Section 2.2.3.

FEMA Mitigation Assessment Team (MAT) Building performance observation reports for Hurricane Michael (FEMA, 2020) and Hurricane Ian (FEMA, 2023) have been reviewed for the performance of residential building structural system and components such as roof and wall coverings, soffits, windows, and doors etc. These reports highlighted the performance variation with the age of the construction and workmanship. In addition, the report discusses observations with significant wind-driven rain intrusion occurred through roof coverings, wall coverings and soffits. These observations were used as inputs to the building model performance modeling updates discussed in Sections 2.2.2 through 2.2.4.

FEMA (2020) MAT report focuses on the performance of residential buildings in Florida during Hurricane Michael, particularly in relation to wind-related damage. Key findings are summarized below:

1. **Main Wind-Force Resisting Systems (MWFRS)**: Post-FBC buildings generally performed better than the Pre-FBC buildings, showing fewer structural failures. Despite the overall better performance, some Post-FBC buildings did experience structural failures, often due to construction deficiencies or non-compliance with code requirements.
2. **Building Envelope**:
   a. **Roof Coverings**:
      i. **Asphalt Shingles**: Common failures included shingle blow-off due to inadequate fastening and poor adhesion.
      ii. **Metal Panel Roof Systems**: Generally performed well, but failures were observed in areas with inadequate fastening or installation errors.
      iii. **Concrete/Clay Roof Tile**: These roofs performed variably, with failures often due to improper attachment or age-related deterioration.
      iv. **Roof Re-Covers**: Roofs with additional layers of covering showed mixed performance, largely dependent on the quality of the installation.

v. **Roof Underlayment**: Failures in underlayment were a significant source of water infiltration, especially where underlayment was improperly installed or aged.

b. **Soffits**: Many failures were linked to improper soffit installation

c. **Exterior Wall Coverings**:

i. **Vinyl Siding**: Often blew off in high winds, particularly where installation was substandard.

ii. **Fiber-Cement Siding**: Generally performed better than vinyl but still showed failures where improperly fastened.

d. **Windows and Doors**:

i. **Glazed Openings**: Windows and doors with large glass areas frequently failed under wind pressure, leading to significant internal damage.

ii. **Garage Doors**: Garage doors often failed, particularly where wind pressures exceeded design specifications or installation was inadequate.

FEMA (2023) MAT report focuses on the performance of residential buildings in Florida during Hurricane Ian. Key findings are summarized below:

MWFRS: Structural failures of MWFRSs were rare in post-FBC buildings, even in areas with wind speeds exceeding design levels. Post-FBC buildings showed significantly better performance compared to pre-FBC buildings, which were more likely to experience structural failures.

Building Envelope

- **Roof Coverings**: Failures in roof coverings were widespread, particularly with asphalt shingles and metal panel roof systems. The damage varied, with some roofs experiencing total loss while others with only minor issues.
- **Soffits and Wall Coverings**: Soffit failures were common, often due to improper installation. Vinyl and fiber-cement wall siding also experienced failures, but these were less frequent compared to roof issues.

Manufactured Homes: The MAT also assessed manufactured homes, comparing pre-HUD and post-HUD standards. Post-HUD manufactured homes generally performed better, but issues with anchoring and appurtenances were noted.

4. Loss Relativities for Single-Family Residences

The key construction features for single-family houses that influence hurricane losses were introduced in Sections 1.3 and 1.4. This section presents the analysis of key wind mitigation features that influence physical damage and loss for single-family houses in a hurricane. The analysis has been done for two main construction eras: pre-FBC and post-FBC. Pre-FBC construction refers to all site-built single-family buildings built to any code or standard other than the 2001 Florida Building Code (permitted prior to March 1, 2002). Post-FBC construction refers to any Florida home permitted on or after March 1, 2002. This Post-FBC era is further subdivided into separate eras for 2002-2007, and 2008 and later as discussed in Section 2.2.1.4

The analysis by pre- and post-FBC construction follows the approach in the 2002 and 2008 loss relativity studies. The determination of the presence/absence of wind mitigation features on houses built prior to the FBC is made from an inspection/verification process. That is, since homes permitted before March 1, 2002 were built to different standards in different parts of the state, it was concluded that the determination of wind mitigation features should be accomplished though visual inspection on a house-by-house basis. In other words, it was not practical to evaluate and develop county-specific loss relativities for all the possible year-built construction eras within various counties/regions on a statewide basis. Hence, the concept of verifiable wind mitigation features through an inspection process has driven the development of rate differentials for buildings permitted prior to March 1, 2002.

The introduction of the FBC in 2002 constituted a new era for Florida in the adoption of a uniform statewide building code. The new code included improved design requirements for wind loads and adopted a statewide wind-borne debris region. A significant amount of training of contractors, building officials, and design professionals has occurred in conjunction with the introduction of the FBC. The state continues to require building code education. Further, the Florida Building Commission's research program investigates areas for code improvements and assesses new code building performance in hurricanes. In recognition of these statewide requirements, the decision was made to develop loss relativities based on the minimal requirements of the FBC for post-FBC construction. That is, the loss relativities are determined by "looking-up" the relativity in a table for the wind zone and terrain in which the building was located. Hence, the loss relativity tables for post-FBC construction are simplified over the tables for pre-FBC construction since they use building code requirements instead of a visual inspection method.

The main concern in granting rate differentials based solely on building code requirements (instead of an "inspection"), centers on the quality of construction. For example, if the building code requires 8d nails at 6-inch spacing for the roof deck, and the contractor used 12-inch spacing, then the house was not constructed to the minimal requirements of the FBC. Although we do not have evidence to indicate that post-FBC quality is an issue, this assumption should be evaluated. If quality of post-FBC construction becomes an issue in a county or region of the state, then it seems reasonable to require an inspection in those areas to determine the presence/absence of wind mitigation features. In that case, one should use the results of the inspection with the pre-FBC construction relativities to determine the rate differentials for which the building qualifies. Of course, an insurance company can always conduct its own inspection of a post-FBC property to ensure that certain verifiable features are in fact present and in good condition.

We note that insurance data analysis in Section 3.1 tends to support, in a general sense, the concept of eras based on pre- and post-FBC construction. In the 2008 Loss Mitigation Study (ARA, 2008) average losses for post-FBC construction were about 85% less than pre-FBC construction.

The main qualifications of the loss relativities developed in this section are:

1. ***Deductible.*** The relativities are based on 2% deductible. As discussed and illustrated in the 2002 report, the relativities are dependent on the deductible and the effect is nonlinear over the range from weak to strong buildings. The continued use of a 2% deductible is discussed with respect to the 2024 FHCF ratemaking study in Section 2.6.1.
2. ***Dwelling.*** Rate differentials derived from the loss relativities are applicable only to the portion of the wind premium associated with the loss costs for the dwelling, its contents, and additional living expenses resulting from damage to the dwelling. The loss relativities should not be applied to any portion of the wind premium that is associated with the loss costs for attached or detached structures.[3]
3. ***Minimal Conditions.*** The building is assumed to be in reasonably good condition. Further discussion of minimal acceptable conditions is presented in Section 0.

Section 4.2 presents loss relativities for pre-FBC single-family buildings and Section 4.2.5 presents loss relativities for post-FBC construction. Definitions and discussion of verification/inspection issues with respect to each wind-resistive feature are presented in Section 7.2 and Appendix A.

[3] As discussed in Section 2.6.2, we used 0% for appurtenant structures (generally referred to as Coverage B) in the modeled results. Equally important, we did not include any attached structures (such as pool and patio screen enclosures, which are often covered as part of Coverage A) in the modeling of the dwelling losses.

4.1. Minimal Conditions

The main qualifications of the single-family loss relativities are:

1. Loss relativities are based on the reductions in total insured loss due to the presence of hurricane windstorm mitigation features. Losses include covered wind damage to the building and contents as well as covered costs incurred due to loss of use of the building.
2. The relativities are based on 2% deductible. As discussed and illustrated in the 2002 report, the relativities are dependent on the deductible and the effect is nonlinear over the range from weak to strong buildings.
3. Rate differentials derived from the loss relativities are applicable only to the portion of the wind premium associated with the loss costs for the dwelling, its contents, and additional living expenses resulting from damage to the dwelling. The loss relativities should not be applied to any portion of the wind premium that is associated with the loss costs for attached or detached structures[4].

The loss relativities presented herein assume that each wind mitigation feature is in reasonably good condition and able to perform its function. Obviously rotting wood or heavily corroded roof straps do not qualify for mitigation rate differentials and these conditions should be noted in the mitigation inspections. Specific minimal conditions are discussed below for roof coverings, windows and doors, and roof deck attachment.

Roof Cover Condition. An important condition assumption inherent in this updated study is roof cover condition. The modeled results assume that the roof cover is in good condition and can be repaired if some of the roof cover fails. For example, if a shingle roof in good condition losses <1% of its cover in a hurricane, this amount of loss generally results in repair and replacement of the damaged shingles and does not result in a total re-roof of the building. However, if the roof cover is in disrepair and cannot be repaired because the existing material is in very poor condition, then <1% loss in roof cover may require a total recovering of the building. The loss relativities were not derived for roof covers that are not repairable. We do not believe that roof covers that cannot be repaired should qualify for mitigation rate differentials. That is, if the building has a degraded roof cover, it should ***not qualify*** for mitigation rate differentials (regardless of what other mitigation features are on the building) until the roof cover is replaced. The rationale behind this recommendation is that the loss relativities are so dependent on the roof cover that an entire table of relativities would need to be developed for poorly conditioned roof covers.

Window and Door Condition. Another condition assumption in this study is that windows and doors are in reasonably good condition. Windows that are in disrepair (or have large gaps) will allow large amounts of water (from the wind-driven rain within a hurricane) to enter the building without the window failing from wind pressure and/or missile loads. While shutters over these windows may act as a rain screen and thereby help reduce the amount of water leakage in a hurricane, the loss relativities were not developed for buildings with windows in a state of neglect

[4] As shown in Table 2-20, we used 0% for appurtenant structures (generally referred to as Coverage B) in the modeled results. Equally important, we did not include any attached structures (such as pool and patio screen enclosures, which are often covered as part of Coverage A) in the modeling of the dwelling losses.

with large visible cracks or gaps, or otherwise in obvious need of replacement. We believe that buildings with windows that are in clear need of replacement/repair ***should not qualify*** for wind mitigation rate differentials, regardless of the presence/absence of other features.

Roof Deck Minimal Strength. The weakest roof deck strength that we have analyzed is Roof Deck A, which corresponds to 6 penny nails at 6-12" spacing. If the mitigation inspection indicates that the roof deck is notably weaker than this attachment strength, we recommend that the house ***not qualify for any*** wind mitigation rate differentials. Such cases may occur when there are numerous nails that have missed the rafter or truss, or the deck has been stapled with fasteners that don't have sufficient penetration. The definitions and conditions for not meeting the minimal roof deck strength are discussed in Appendix A. Since the roof experiences the highest loads on the building, minimal roof deck strength is fundamental to building performance. Failure of a weak section of roof deck in low winds can lead to significant losses due to water entry into the building. Further, a very weak roof deck tends to negate the benefits of good roof cover condition because of potential premature failure of the deck prior to loss of roof cover.

4.2. Pre-FBC Construction

Houses permitted before March 1, 2002 fall into the pre-FBC construction category. Detailed inspections and/or owner-provided verification forms are generally required to determine what mitigation features are present on a pre-FBC house. Definitions and discussion of verification/inspection issues with respect to each wind-resistive feature are presented in Section 7.2 and Appendix A.

Analyses of insurance policy level and claim data from recent Florida hurricanes are presented in Section 3. This information updates the data presented in the 2008 study. Other relevant research and damage surveys were also discussed in Section 3.

These information sources are the starting point for determining what mitigation features to consider in this study. New features as well as old features are analyzed in this section to develop updated tables of loss relativities. Features that have a smaller effect on loss reduction are included as secondary factors due to both computational requirements and the desire to keep the main relativity tables at a reasonable size.

4.2.1. Single-Family Mitigation Features

Primary and secondary mitigation factors considered in the 2002 and 2008 loss mitigation studies were selected based on research, sensitivity analysis and related studies such as the Home Structure Rating System (HSRS) documented in Twisdale, et.al. (2007). The mitigation features selected for use in the 2024 study are based largely on the primary and secondary features analyzed in 2008. Table 4-1 summarizes the wind-resistive features modeled in the 2002, 2008, and 2024 studies. The variables in the shaded area are secondary rating factors. The 2024 study includes 20,736 combinations of features (6,912 for each of three terrains) in the primary relativity tables.

Notable changes in the features analyzed include:

- Roof cover age is added as a primary factor. Explicit modeling of age effects for asphalt shingle roofing has been performed for this study. Such modeling has not been performed for tile or metal roof coverings. Loss relativities for the old Non-FBC and FBC roofs are assumed in this analysis to be equivalent to the performance of new Non-FBC roof covers, consistent with the secondary factor guidance provided in the 208 study.
- Metal panel roof covering added as a primary factor. Background leakiness of windows, doors, and skylights (other than sliding glass doors) is now included implicitly in the primary modeling. This is due to the fact that window and door products are generally tested to a maximum of 15% of the design wind pressure load for water intrusion. As such, this leakiness will be inherent in all homes. Note that water intrusion through tracks of sliding glass doors is treated separately (see below).
- Preventing water intrusion through the tracks of sliding glass doors was considered for the single-family relativities through the use of the sliding glass door leakiness model discussed in Section 2.2.2. We initially considered providing a secondary factor for protecting such doors from leaking, however, the model runs did not support the development of such a factor. This is because single family homes have a limited number of sliding glass doors on a single face of the home. This makes it unlikely that the sliding glass doors on a single-family home will experience the wind-driven rain and positive wind pressure to cause water to enter through the tracks of the doors in every storm. The hit or miss nature of these losses result in minimal overall impact on average annual losses. This modeling has a much more dramatic effect on large multi-family buildings. See discussion in Section 5.3.4
- Soffit construction type was shown to have a small overall effect on loss relativity as a primary rating factor in the 2008 study. We elected to pursue additional modeling for roof cover aging and including metal panel roof coverings instead of accounting for soffit construction as a part of this project.

Details on the features modeled in the 2002 and 2008 loss mitigation studies can be found in ARA (2002a) and ARA (2008), respectively.

Table 4-1. Single-Family Construction Classification Features from 2002, 2008, and 2024 Loss Mitigation Studies

Basic Feature	Applies to Pre-FBC / Post-FBC	Number of Levels Considered			Description and/or Comments
		2002	2008	2024	
Primary Rating Features					
1. Terrain	Both	2	2	3	FBC Terrain B, FBC Terrain C, Treed Terrain A added for 2024 study
2. Roof Shape	Both	2	2	2	Hip, Other
3. Roof Covering	Both	2	4	4	FBC and non-FBC equivalent asphalt shingles & tiles
4. Secondary Water Resistance	Both	2	2	2	No, Yes
5. Roof-to-Wall Connection	Pre-FBC Only	4	3	3	Toe Nail, Clip, Wrap. Double Wrap (2002) replaced by secondary factor (11) in 2008
6. Roof Deck Material/Attachment	Pre-FBC Only	3	3	3	Plywood/OSB (3 nail size/spacing: A, B, C)
7. Openings: Protection Level	Both	3	2	2	None, Hurricane (SFBC/SSTD 12/ASTM E 1996) -- Basic (2002 only) replaced by secondary factor (8)
8. Number of Stories	Both		2	2	One, Two or more
9. Soffit Construction Type	Pre-FBC Only		2	-	Wood, Other -- Made secondary factor for 2024 study
10. Roof Slope	Both		2	2	4:12 (low), 7:12 (high)
11. Metal Panel Roof Covering	Both	-	-	2	New research for 2024 study
12. Roof Cover Age	Both			3	New research for 2024 study
Total Combinations		**576**	**4608**	**20736**	
Secondary Rating Features					
1. Openings: Protection Coverage	Both (HVHZ Hurricane Only)	2	2	2	Based on 2002 Study --applies to Hurricane Protection Level only
2. Gable End Bracing / Unbraced Gable Ends	Pre-FBC Only	2	2	2	Based on 2002 study
3. Wall Construction (Wood Frame/Reinforced Masonry/ Unreinforced Masonry	Both (URM Pre-FBC only)	3	3	3	Based on 2002 study
4. Wall-to-Foundation Restraint	Pre-FBC Only	2	2	2	Based on 2002 study
5. Roof Deck Enhancements (Dimensional Lumber Deck)	Both	2	2	2	Based on 2002 study -- Applies to Deck C
6. Reinforced Concrete Roof Deck (integral with Concrete or RM walls)	Both	-	2	2	Based on 2008 Sensitivity Study (secondary factors 2, 3, 4, 5, 7, and 11 do not apply to reinforced concrete roof decks)
7. Enhanced Wood Panel Roof Deck (≥ 5/8" plywood with 2.5" screws or 8d ring-shank nails)	Both (except where required by FBC)	-	2	2	Secondary factors 5 and 8 are mutually exclusive. Additional factor on Deck C relativities.
8. Shutter Interpolation between None and Hurricane	Both	primary	4	4	Based on 2003-2004 DCA Shutter Impact Tests for OSB and Plywood values
9. Vinyl Siding	Both	-	2	2	Based on HSRS study
10. Window, Door, and Skylight Leak Potential (other than sliding glass doors)	Both	-	10	-	Base fenestration leakiness is due to limitations of window and door pressure testing for water resistance. Baseline leakiness of these openings included implicitly in base relativities for 2024 study
11. Double Wrap Roof-to-Wall Connection	Pre-FBC Only	primary	2	2	Based on 2008 sensitivity study.
12. Roof Cover Age Interpolations	Both	-	2	2	Interpolates between FBC and non-FBC roof cover values -- applied only for non-asphalt shingle roofs in 2024 study
13. Partially Enclosed Design	Post-FBC Only	-	2	2	Partially enclosed design for FBC construction only.

4.2.2. Comparison of New Functionality to Insured Loss History

This section presents comparisons of loss functions developed using updated roof cover modeling method with the analysis of insured losses for single family homes discussed in Section 3.2. The subsections below specifically discuss the updates made for aging of asphalt shingle roof covers and performance modeling of metal panel roofing.

4.2.2.1. Asphalt Shingle Roof Cover Aging

Post-hurricane damage surveys conducted by FEMA, IBHS, and others that aging of asphalt shingles plays a significant role in the roof cover's performance. This is especially important because the 2002 and 2008 studies provided loss relativities for FBC compliant asphalt shingles based on their performance when brand new. This was appropriate in 2008 as FBC compliant roofs were all less than 5 years old at that point. However, in 2024, FBC compliant roofs are up to 21 years old. As such, the research discussed in Section 2.2.3 was undertaken to update the ARA roof covering models.

Figure 4-1 compares the empirical loss curves developed from our analysis of insurance losses from recent hurricanes with the loss curves developed for this study for new (0-5 years old), mid (6-13 years old), and old (14 years or older). The three ARA loss functions shown in the figure (short, dashed lines) are weighted based on the wind mitigation characteristics reported in the exposure data provided with the insured loss data. The long, dashed red line in the figure shows the ARA loss function considering the proportion of roofs in the dataset in each of the age ranges. The difference between the solid lines representing the empirical loss functions reinforces the need to consider roof cover aging.

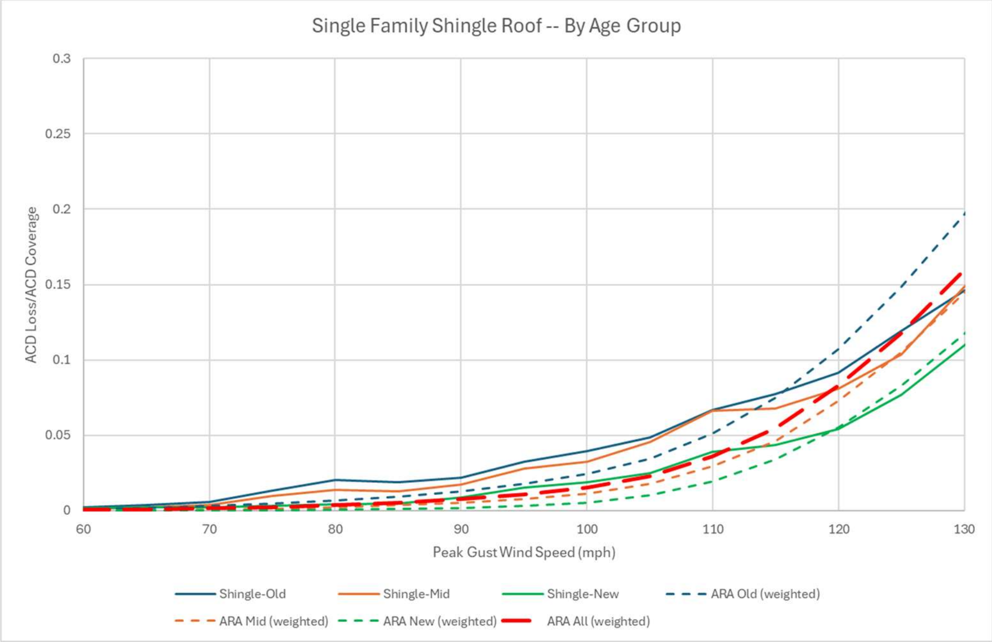


Figure 4-1. Comparison of Empirical Loss Functions (solid lines) with weighted ARA Loss Functions (dashed lines) for Single-Family Homes with Asphalt Shingles.

The ARA loss curves shown in Figure 4-1 generally produce lower losses than those observed in the empirical. This is due, in part, to the fact that the modeling completed for this study does account for losses to attached structures that are commonly included in coverage A (building) losses. It is also possibly due to outside factors such as social inflation and claim-related litigation. Additional analysis of the insurance loss data discussed in Section 3.2 may be warranted. Overall, the ARA loss functions used for this study compare well with the loss data and accurately account for aging of asphalt shingles.

4.2.2.2. Metal Panel Roof Covering

Recent post-hurricane damage surveys and anecdotal accounts from inspectors, Florida homeowners (including ARA employees – see Section 7.1), and other interested stakeholders have indicated that metal roof coverings have performed better in recent Florida hurricanes than more traditional asphalt shingles and concrete roof tiles. This is supported for wind speeds less than 105 mph by the insurance data analysis presented in Section 3.2, however, the insurance data also show higher claims for homes with metal roofs above 105 mph. The conclusion of improved performance below 105 mph only is also supported by the discussion of the metal panel roof model updates discussed in Section 2.2.4. The effect of this can be seen in the loss relativity tables where the relativities for metal roofs are often higher than those for asphalt shingle or tile roofs in higher hazard areas (Region 1), and lower for in lower hazard areas (Regions 2 and 3).

Example loss modeled loss curves for single-family homes with metal panel roofs is presented in Figure 4-2. The two ARA loss functions shown in the figure (short, dashed lines) are weighted based on the wind mitigation characteristics reported in the exposure data provided with the insured loss data. The long, dashed red line in the figure shows the ARA loss function considering the proportion of roofs in the dataset in each of the age ranges. The difference between the solid lines representing the empirical loss functions indicates that there is potential need to consider roof cover aging for metal panel roofs in addition to the modeling currently implanted for asphalt shingle roofs.

The ARA loss curves shown in Figure 4-2 generally produce lower losses than those observed in the empirical data. This is due, in part, to the fact that the modeling completed for this study does account for losses to attached structures that are commonly included in coverage A (building) losses. I It is also possibly due to outside factors such as social inflation and claim-related litigation. Additional analysis of the insurance loss data discussed in Section 3.2 may be warranted. However, it is apparent that the weighted ARA loss curves shown match more closely with the performance of new metal roofs (i.e., 5 years old or less) even though the ARA performance models agree well with metal panel testing data (see Section 2.2.4.). Additional research into the causes of the discrepancies.

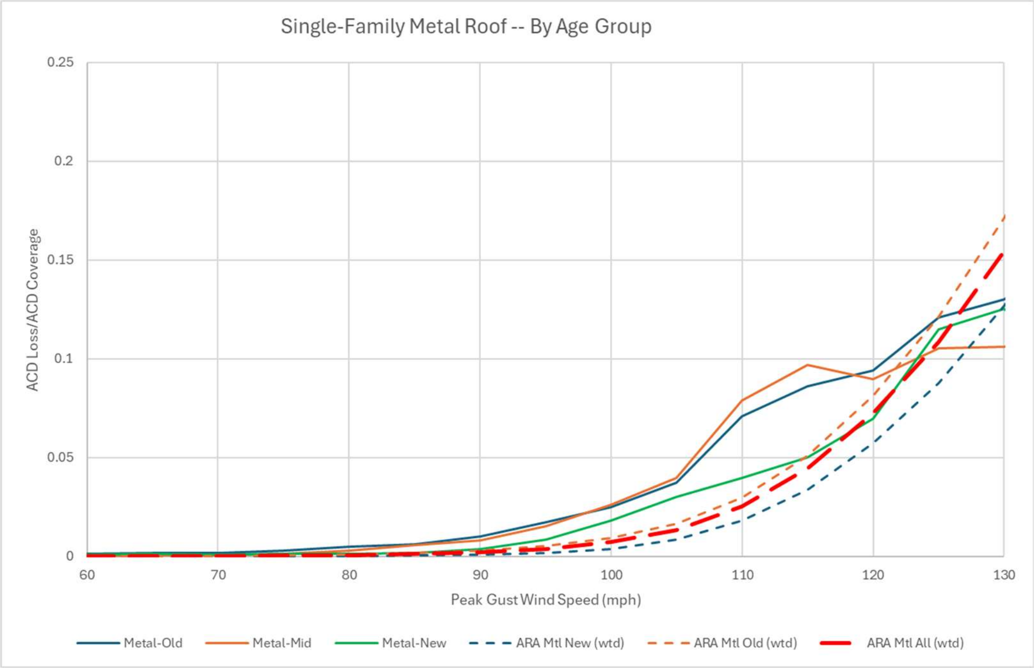


Figure 4-2. Comparison of Empirical Loss Functions (solid lines) with weighted ARA Loss Functions (dashed lines) for Single-Family Homes with Metal Roofing.

4.2.3. Loss Relativity Tables

Loss relativities are defined as the loss cost for a given house (computed using a 2% deductible and excluding exterior attached or detached structures) divided by the loss cost associated with an arbitrarily selected house within the matrix. The loss relativities can be normalized by any cell in the tables and retain the linear relationship between loss costs and loss relativities.

The 2008 study presented loss relativities normalized to both a typical Florida house and the weakest *conceivable* house (i.e., house with the highest loss cost). Normalizing by a typical house allows the user to measure differences from a typical building. This is analogous to the fact that insurance base rates in each rating territory are derived from averages losses over many building types and wind mitigation features.

Normalizing by the weakest conceivable house, on the other hand, has the advantage of presenting tables where every home other than the weakest has a relativity less than one, thereby showing a "discount" for all combinations of wind mitigation features. However, the weakest conceivable house is not likely to represent typical construction and may not even be relevant for all regions of the state. This approach also requires insurers to offset their base rates to account for the difference between typical homes and the weakest homes within each rating territory.

Loss relativities for single-family homes in this study are developed by normalizing loss costs for first by architectural features and then by strength features. These features and their respective normalizations are discussed below.

Architectural features include roof shape, roof slope, and number of stories. These wind mitigation features have a dramatic effect on a home's wind performance. For example, homes become more wind-resistive by going from two stories to one story, from a gable roof to a hip roof, and from a low slope to a high slope. While a homeowner may want to consider these features when building or buying a new home, it is not likely that they would choose to change these features on an existing home.

Strength features, on the other hand, can be more easily changed on an existing structure and homeowners may consider upgrading these features when remodeling or updating their existing home. Strength features include roof cover strength and type, roof deck attachment, roof-to-wall connection, opening protection, and secondary water resistance. In fact, the FBC requires a minimum roof cover strength and re-nailing of the roof deck when a home is re-roofed.

For this study, loss relativities are developed by normalizing to the weakest *reasonable* house by region and era. This is defined by the house description with the highest loss cost with a minimum roof deck "C" level (i.e., minimum 8d nails at 6" spacing on all framing members) and at least and old FBC strength roof covering. This level was selected based on the FBC re-roofing requirements that require re-nailing of the roof deck when re-roofing. With the FBC being enforced for over 20 years now, this makes the number of non-FBC roof coverings and weaker roof decks very small.

As such, single-family loss relativities for the three regions and three terrains discussed in Section 2.3 are presented in two steps, including:

1. Relativities between the eight unique combinations of architectural features (number of stories, roof shape, and roof slope). These are calculated by comparing the loss costs of the weakest *reasonable* building in each category. This results in the weakest configuration (two-story, gable roof, low slope) having a loss relativity of 1.0 and all other configurations having a relativity less than one.
2. Relativities for strength features for each unique combination of architectural features noted above. These relativities are calculated by dividing the loss cost for each combination of strength features by the loss cost corresponding to the weakest *reasonable* building within the architectural group. This results in the weakest *reasonable* building having a loss relativity of 1.0 and all other having a relativity less than or equal to 1.0. We note that loss relativities for buildings weaker than the weakest reasonable building (such as those with non-FBC roof coverings and/or weak roof deck connections) are assigned a loss relativity of 1.0, indicating that they are not eligible for a wind mitigation rate differential.

Table 4-2 presents loss relativities between the eight unique combinations of architectural features discussed in item 1 above.

Table 4-2. Loss Relativities between Weakest Reasonable Strength Homes by Combination of Architectural Features, Analysis Region, and Terrain Category

Region	Terrain	Low Slope (<=6:12)				High Slope (> 6:12)			
		2-Story		1-Story		2-Story		1-Story	
		Other	Hip	Other	Hip	Other	Hip	Other	Hip
Region 1	Terrain A	1.0000	0.5025	0.3694	0.2459	0.6656	0.3858	0.4052	0.2356
	Terrain B	1.0000	0.5279	0.3939	0.2681	0.6900	0.4154	0.4485	0.2551
	Terrain C	1.0000	0.5865	0.4852	0.3507	0.7413	0.4698	0.5678	0.3294
Region 2	Terrain A	1.0000	0.5209	0.4450	0.2550	0.6066	0.3824	0.3728	0.2370
	Terrain B	1.0000	0.5123	0.4174	0.2375	0.6113	0.3796	0.3726	0.2180
	Terrain C	1.0000	0.5283	0.4439	0.2810	0.6329	0.3979	0.4519	0.2600
Region 3	Terrain A	1.0000	0.5059	0.5439	0.2542	0.5384	0.3549	0.3443	0.2274
	Terrain B	1.0000	0.4944	0.4922	0.2128	0.5489	0.3406	0.3286	0.1846
	Terrain C	1.0000	0.5222	0.4995	0.2575	0.6019	0.3669	0.4195	0.2271

The following tables present the single-family, Pre-FBC loss relativities by analysis region and terrain.

- Table 4-3. Single-Family, Pre-FBC, Region 1, Terrain A Loss Relativity Table
- Table 4-4. Single-Family, Pre-FBC, Region 1, Terrain B Loss Relativity Table
- Table 4-5. Single-Family, Pre-FBC, Region 1, Terrain C Loss Relativity Table
- Table 4-6. Single-Family, Pre-FBC, Region 2, Terrain A Loss Relativity Table
- Table 4-7. Single-Family, Pre-FBC, Region 2, Terrain B Loss Relativity Table
- Table 4-8. Single-Family, Pre-FBC, Region 2, Terrain C Loss Relativity Table
- Table 4-9. Single-Family, Pre-FBC, Region 3, Terrain A Loss Relativity Table
- Table 4-10. Single-Family, Pre-FBC, Region 3, Terrain B Loss Relativity Table
- Table 4-11. Single-Family, Pre-FBC, Region 3, Terrain C Loss Relativity Table

There are several minor reversals[5].in the loss relativity tables that occur when the change in the feature is not a significant feature for the particular combination of building, region, and terrain. These reversals represent less than 1% difference in relativity and generally occur at locations and terrains with lower hurricane wind hazard curves.

[5] i.e., relativity greater for home with “C” roof deck than “B” roof deck

Table 4-3. Single-Family, Pre-FBC, Region 1, Terrain A Loss Relativity Table

Roof Cover Strength	Roof Deck	RWC	Opening Protection	Low Slope (<=6:12)																							
				2-Story												1-Story											
				Other						Hip						Other						Hip					
				Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel	
				NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR
Non-FBC	A	TN	None	1.0000	1.0000	0.8469	0.7952	1.0000	1.0000	1.0000	0.9967	0.8522	0.7815	1.0000	0.8760	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8329	0.8033	0.8883	0.7737
			Hurricane	1.0000	1.0000	0.8241	0.7732	1.0000	1.0000	1.0000	0.9485	0.7957	0.7287	1.0000	0.8243	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.7550	0.7273	0.8010	0.6930
		Clip	None	1.0000	0.9140	0.8323	0.7762	1.0000	0.8784	1.0000	0.9831	0.8516	0.7803	1.0000	0.8387	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.7852	0.7543	0.8579	0.7344
			Hurricane	1.0000	0.8932	0.8141	0.7601	1.0000	0.8561	1.0000	0.9268	0.7925	0.7242	1.0000	0.7805	1.0000	1.0000	1.0000	0.9932	1.0000	1.0000	1.0000	1.0000	0.7127	0.6848	0.7786	0.6634
		Wrap	None	1.0000	0.9112	0.8278	0.7738	1.0000	0.8663	1.0000	0.9832	0.8516	0.7803	1.0000	0.8372	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.7829	0.7560	0.8542	0.7312
			Hurricane	1.0000	0.8931	0.8119	0.7591	1.0000	0.8471	1.0000	0.9268	0.7925	0.7242	1.0000	0.7820	1.0000	1.0000	1.0000	0.9847	1.0000	1.0000	1.0000	1.0000	0.7090	0.6822	0.7809	0.6641
	B	TN	None	1.0000	0.7693	0.4725	0.4289	1.0000	0.9065	1.0000	0.8096	0.6436	0.5703	0.9324	0.7387	1.0000	0.9793	0.7868	0.7532	0.9230	0.7831	1.0000	1.0000	0.8083	0.7849	0.8319	0.7355
			Hurricane	1.0000	0.7392	0.4334	0.3922	0.9604	0.8707	1.0000	0.7395	0.5635	0.4944	0.8597	0.6805	1.0000	0.9157	0.7146	0.6862	0.8451	0.7181	1.0000	1.0000	0.7422	0.7194	0.7596	0.6726
		Clip	None	0.9016	0.4460	0.4020	0.3418	0.6142	0.4525	1.0000	0.6308	0.6065	0.5142	0.7747	0.5022	1.0000	0.8386	0.6469	0.6093	0.8099	0.6426	1.0000	1.0000	0.7191	0.6925	0.7540	0.6399
			Hurricane	0.8363	0.4076	0.3583	0.3018	0.5660	0.4185	1.0000	0.5509	0.5205	0.4836	0.6699	0.4239	1.0000	0.7796	0.5931	0.5578	0.7399	0.5881	1.0000	0.9364	0.6489	0.6233	0.6718	0.5705
		Wrap	None	0.8689	0.3782	0.3940	0.3260	0.5573	0.3589	1.0000	0.6061	0.6023	0.5039	0.7530	0.4676	1.0000	0.8097	0.6247	0.5837	0.7933	0.6171	1.0000	1.0000	0.7126	0.6851	0.7496	0.6316
			Hurricane	0.8006	0.3372	0.3470	0.2840	0.5027	0.3187	1.0000	0.5303	0.5185	0.4302	0.6623	0.3964	1.0000	0.7574	0.5751	0.5397	0.7240	0.5660	1.0000	0.9299	0.6432	0.6185	0.6668	0.5648
	C	TN	None	1.0000	0.7709	0.4606	0.4194	1.0000	0.9048	1.0000	0.8082	0.6461	0.5716	0.9374	0.7355	1.0000	0.9824	0.7772	0.7473	0.9147	0.7827	1.0000	1.0000	0.8077	0.7830	0.8319	0.7355
			Hurricane	1.0000	0.7387	0.4174	0.3797	0.9674	0.8772	1.0000	0.7464	0.5600	0.4932	0.8598	0.6815	1.0000	0.9125	0.7148	0.6861	0.8397	0.7196	1.0000	1.0000	0.7436	0.7223	0.7558	0.6711
		Clip	None	0.8925	0.4337	0.3750	0.3194	0.6028	0.4466	1.0000	0.6302	0.6031	0.5082	0.7703	0.5002	1.0000	0.8284	0.6364	0.6018	0.7924	0.6315	1.0000	1.0000	0.7212	0.6909	0.7590	0.6394
			Hurricane	0.8222	0.3940	0.3251	0.2740	0.5568	0.4113	1.0000	0.5485	0.5181	0.4325	0.6707	0.4223	1.0000	0.7681	0.5794	0.5460	0.7215	0.5781	1.0000	0.9399	0.6476	0.6225	0.6710	0.5694
		Wrap	None	0.8393	0.3513	0.3593	0.2925	0.5295	0.3382	1.0000	0.5965	0.5994	0.4949	0.7541	0.4614	1.0000	0.7903	0.6097	0.5697	0.7732	0.6010	1.0000	1.0000	0.7115	0.6833	0.7513	0.6313
			Hurricane	0.7649	0.3060	0.3042	0.2449	0.4680	0.2911	1.0000	0.5212	0.5110	0.4200	0.6536	0.3880	1.0000	0.7373	0.5550	0.5196	0.7018	0.5495	1.0000	0.9305	0.6449	0.6189	0.6668	0.5624
FBC Old (Shingle > 13 yr // Tile or Metal > 20 yr)	A	TN	None	1.0000	0.9756	0.8469	0.7952	1.0000	1.0000	1.0000	0.8780	0.8522	0.7815	1.0000	0.8760	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8718	0.8329	0.8033	0.8883	0.7737
			Hurricane	1.0000	0.9525	0.8241	0.7732	1.0000	1.0000	1.0000	0.8182	0.7957	0.7287	1.0000	0.8243	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9626	0.7956	0.7550	0.7273	0.8010	0.6930
		Clip	None	1.0000	0.8556	0.8323	0.7762	1.0000	0.8784	1.0000	0.8522	0.8516	0.7803	1.0000	0.8387	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8328	0.7852	0.7543	0.8579	0.7344
			Hurricane	1.0000	0.8357	0.8141	0.7601	1.0000	0.8561	1.0000	0.8003	0.7925	0.7242	1.0000	0.7805	1.0000	1.0000	1.0000	0.9932	1.0000	1.0000	0.9355	0.7542	0.7127	0.6848	0.7786	0.6634
		Wrap	None	1.0000	0.8512	0.8278	0.7738	1.0000	0.8663	1.0000	0.8522	0.8516	0.7803	1.0000	0.8372	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8344	0.7829	0.7560	0.8542	0.7312
			Hurricane	1.0000	0.8320	0.8119	0.7591	1.0000	0.8471	1.0000	0.8002	0.7925	0.7242	1.0000	0.7820	1.0000	1.0000	1.0000	0.9847	1.0000	1.0000	0.9347	0.7538	0.7090	0.6822	0.7809	0.6641
	B	TN	None	0.8879	0.7301	0.4725	0.4289	1.0000	0.9065	1.0000	0.6942	0.6436	0.5703	0.9324	0.7387	0.9978	0.8131	0.7868	0.7532	0.9230	0.7831	0.9965	0.8394	0.8083	0.7849	0.8319	0.7355
			Hurricane	0.8481	0.6993	0.4334	0.3922	0.9604	0.8707	0.9121	0.6327	0.5635	0.4944	0.8597	0.6805	0.9147	0.7402	0.7146	0.6862	0.8451	0.7181	0.9187	0.7735	0.7422	0.7194	0.7596	0.6726
		Clip	None	0.6125	0.4002	0.4020	0.3418	0.6142	0.4525	0.8738	0.5212	0.6065	0.5142	0.7747	0.5022	0.8806	0.6627	0.6469	0.6093	0.8099	0.6426	0.9204	0.7350	0.7191	0.6925	0.7540	0.6399
			Hurricane	0.5573	0.3617	0.3583	0.3018	0.5660	0.4185	0.7594	0.4394	0.5205	0.4836	0.6699	0.4239	0.8006	0.6066	0.5931	0.5578	0.7399	0.5881	0.8245	0.6679	0.6489	0.6233	0.6718	0.5705
		Wrap	None	0.5716	0.3328	0.3940	0.3260	0.5573	0.3589	0.8674	0.4980	0.6023	0.5039	0.7530	0.4676	0.8621	0.6387	0.6247	0.5837	0.7933	0.6171	0.9124	0.7298	0.7126	0.6851	0.7496	0.6316
			Hurricane	0.5097	0.2925	0.3470	0.2840	0.5027	0.3187	0.7519	0.4187	0.5185	0.4302	0.6623	0.3964	0.7916	0.5878	0.5751	0.5397	0.7240	0.5660	0.8237	0.6607	0.6432	0.6185	0.6668	0.5648
	C	TN	None	0.8836	0.7252	0.4606	0.4194	1.0000	0.9048	1.0000	0.6971	0.6461	0.5716	0.9374	0.7355	1.0000	0.8137	0.7772	0.7473	0.9147	0.7827	1.0000	0.8385	0.8077	0.7830	0.8347	0.7373
			Hurricane	0.8458	0.6961	0.4174	0.3797	0.9674	0.8772	0.9118	0.6323	0.5600	0.4932	0.8598	0.6815	0.9173	0.7401	0.7148	0.6861	0.8397	0.7196	0.9177	0.7730	0.7436	0.7223	0.7558	0.6711
		Clip	None	0.5997	0.3909	0.3750	0.3194	0.6028	0.4466	0.8735	0.5209	0.6031	0.5082	0.7703	0.5002	0.8664	0.6602	0.6364	0.6018	0.7924	0.6315	0.9210	0.7376	0.7212	0.6909	0.7590	0.6394
			Hurricane	0.5440	0.3497	0.3251	0.2740	0.5568	0.4113	0.7595	0.4361	0.5181	0.4325	0.6707	0.4223	0.7807	0.5960	0.5794	0.5460	0.7215	0.5781	0.8290	0.6690	0.6476	0.6225	0.6710	0.5694
		Wrap	None	0.5398	0.3077	0.3593	0.2925	0.5295	0.3382	0.8626	0.4887	0.5994	0.4949	0.7541	0.4614	0.8443	0.6261	0.6097	0.5697	0.7732	0.6010	0.9183	0.7341	0.7115	0.6833	0.7513	0.6313
			Hurricane	0.4753	0.2610	0.3042	0.2449	0.4680	0.2911	0.7452	0.4087	0.5110	0.4200	0.6536	0.3880	0.7639	0.5710	0.5550	0.5196	0.7018	0.5495	0.8215	0.6625	0.6449	0.6189	0.6668	0.5624
FBC Mid Range (Shingle = 6-13 yr // Tile or Metal = 6-20 yr)	A	TN	None	1.0000	0.9481	0.7656	0.7372	1.0000	1.0000	1.0000	0.8419	0.7407	0.7019	0.9809	0.8400	1.0000	1.0000	0.9871	0.9617	1.0000	1.0000	0.9243	0.8296	0.7423	0.7243	0.7858	0.7172
			Hurricane	1.0000	0.9339	0.7440	0.7158	1.0000	1.0000	0.9634	0.7834	0.6837	0.6468	0.9206	0.7841	1.0000	1.0000	0.9327	0.9102	1.0000	1.0000	0.8351	0.7469	0.6690	0.6518	0.7037	0.6397
		Clip	None	1.0000	0.8325	0.7461	0.7152	0.9805	0.8469	1.0000	0.8211	0.7394	0.7011	0.9455	0.7946	1.0000	1.0000	0.9467	0.9236	1.0000	1.0000	0.8789	0.7820	0.6849	0.6674	0.7504	0.6785
			Hurricane	0.9686	0.8075	0.7291	0.6997	0.9579	0.8266	0.9522	0.7639	0.6812	0.6440	0.8880	0.7407	1.0000	1.0000	0.9022	0.8782	1.0000	1.0000	0.7930	0.7030	0.6135	0.5919	0.6739	0.6061
		Wrap	None	0.9930	0.8249	0.7464	0.7171	0.9707	0.8364	1.0000	0.8212	0.7394	0.7011	0.9460	0.7959	1.0000	1.0000	0.9356	0.9135	1.0000	1.0000	0.8777	0.7818	0.6825	0.6681	0.7495	0.6777
			Hurricane	0.9736	0.8101	0.7273	0.6984	0.9522	0.8173	0.9526	0.7626	0.6812	0.6440	0.8891	0.7413	1.0000	1.0000	0.8968	0.8755	1.0000	1.0000	0.7891	0.6993	0.6113	0.5907	0.6748	0.6068
	B	TN	None	0.8075	0.7164	0.4227	0.3978	0.9428	0.8824	0.8493	0.6767	0.5554	0.5150	0.8146	0.6986	0.8679	0.7644	0.6959	0.6724	0.7928	0.7057	0.8797	0.7911	0.7248	0.7093	0.7387	0.6816
			Hurricane	0.7713	0.6845	0.3842	0.3604	0.9033	0.8457	0.7673	0.6100	0.4781	0.4400	0.7492	0.6417	0.7865	0.6956	0.6282	0.6076	0.7188	0.6396	0.8021	0.7272	0.6588	0.6431	0.6690	0.6177
		Clip	None	0.5105	0.3833	0.3440	0.3104	0.5266	0.4244	0.7083	0.5002	0.5098	0.4586	0.6339	0.4606	0.7335	0.6200	0.5513	0.5291	0.6728	0.5666	0.7851	0.6938	0.6284	0.6134	0.6531	0.5835
			Hurricane	0.4639	0.3475	0.3011	0.2690	0.4834	0.3896	0.6096	0.4178	0.4273	0.4038	0.5413	0.3837	0.6634	0.5590	0.4949	0.4750	0.6059	0.5097	0.7016	0.6198	0.5593	0.5447	0.5748	0.5144
		Wrap	None	0.4649	0.3201	0.3315	0.2929	0.4604	0.3287	0.6950	0.4740	0.5038	0.4482	0.6158	0.4284	0.7104	0.5916	0.5251	0.5024	0.6522	0.5401	0.7848	0.6864	0.6224	0.6077	0.6476	0.5761
			Hurricane	0.4114	0.2775	0.2882	0.2512	0.4116	0.2884	0.5970	0.3970	0.4248	0.3748	0.5293	0.3542	0.6447	0.5368	0.4762	0.4561	0.5911	0.4892	0.6959	0.6154	0.5525	0.5381	0.5706	0.5082
	C	TN	None	0.8003	0.7090	0.4128	0.3891	0.9371	0.8768	0.8449	0.6737	0.5565	0.5161	0.8172	0.6976	0.8605	0.7624	0.6924	0.6710	0.7866	0.7044	0.8813	0.7968	0.7253	0.7089	0.7408	0.6823
			Hurricane	0.7614	0.6766	0.3713	0.3493	0.9092	0.8518	0.7677	0.6092	0.4751	0.4384	0.7501	0.6425	0.7823	0.6933	0.6256	0.6049	0.7152	0.6400	0.8012	0.7266	0.6600	0.6453	0.6677	0.6188
		Clip	None	0.5007	0.3752	0.3198	0.2883	0.5161	0.4182	0.7091	0.4974	0.5067	0.4534	0.6318	0.4603	0.7235	0.6102	0.5419	0.5219	0.6570	0.5558	0.7859	0.6903	0.6291	0.6126	0.6551	0.5836
			Hurricane	0.4477	0.3336	0.2722	0.2436	0.4722	0.3806	0.6056	0.4153	0.4246	0.3772	0.5415	0.3817	0.6458	0.5495	0.4847	0.4661	0.5891	0.5006	0.7035	0.6209	0.5583	0.5441	0.5738	0.5135
		Wrap	None	0.4365	0.2926	0.2990	0.2609	0.4328	0.3077	0.6918	0.4642	0.4991	0.4384	0.6155	0.4218	0.6884	0.5707	0.5098	0.4879	0.6328	0.5237	0.7821	0.6865	0.6207	0.6050	0.6480	0.5761
			Hurricane	0.3765	0.2463	0.2482	0.2142	0.3775	0.2618	0.5901	0.3875	0.4177	0.3655	0.5210	0.3466	0.6232	0.5194	0.4583	0.4385	0.5671	0.4709	0.6973	0.6120	0.5541	0.5399	0.5708	0.5073
FBC New (0-5 yr, all types)	A	TN	None	0.9147	0.9048	0.6842	0.6793	1.0000	1.0000	0.7828	0.7759	0.6293	0.6223	0.8501	0.8039	1.0000	1.0000	0.8614	0.8526	1.0000	1.0000	0.7244	0.7160	0.6517	0.6453	0.6834	0.6606
			Hurricane	0.8936	0.8846	0.6640	0.6585	1.0000	1.0000	0.7270	0.7204	0.5717	0.5649	0.7903	0.7438	0.9660	0.9588	0.8075	0.8022	1.0000	0.9616	0.6413	0.6216	0.5829	0.5762	0.6065	0.5864
		Clip	None	0.7835	0.7765	0.6600	0.6541	0.8597	0.8154	0.7603	0.7540	0.6272	0.6219	0.7994	0.7505	0.9851	0.9801	0.8142	0.8088	1.0000	0.9856	0.6726	0.6680	0.5845	0.5805	0.6428	0.6226
			Hurricane	0.7688	0.7636	0.6442	0.6393	0.8430	0.7971	0.6964	0.6908	0.5699	0.5638	0.7511	0.7010	0.9268	0.9232	0.7689	0.7633	0.9889	0.9465	0.5924	0.5880	0.5142	0.4991	0.5692	0.5488
		Wrap	None	0.7861	0.7804	0.6651	0.6605	0.8538	0.8064	0.7582	0.7536	0.6272	0.6219	0.8036	0.7546	0.9743	0.9686	0.8061	0.8028	1.0000	0.9854	0.6713	0.6677	0.5822	0.5802	0.6447	0.6241
			Hurricane	0.7621	0.7560	0.6428	0.6377	0.8358	0.7875	0.6973	0.6917	0.5699	0.5638	0.7507	0.7007	0.9298	0.9255	0.7693	0.7663	0.9860	0.9426	0.5925	0.5907	0.5136	0.4991	0.5687	0.5495
	B	TN	None	0.6895	0.6786	0.3728	0.3666	0.8833	0.8583	0.6301	0.6223	0.4672	0.4596	0.6968	0.6585	0.6509	0.6363	0.6050	0.5917	0.6626	0.6282	0.6962	0.6884	0.6413	0.6337	0.6456	0.6277
			Hurricane	0.6538	0.6431	0.3350	0.3286	0.8463	0.8208	0.5674	0.5602	0.3927	0.3855	0.6387	0.6030	0.5864	0.5763	0.5417	0.5289	0.5926	0.5610	0.6266	0.6184	0.5754	0.5668	0.5783	0.5627
		Clip	None	0.3588	0.3508	0.2860	0.2790	0.4389	0.3963	0.4618	0.4488	0.4132	0.4031	0.4931	0.4191	0.5066	0.4996	0.4556	0.4489	0.5356	0.4906	0.5905	0.5862	0.5377	0.5343	0.5521	0.5270
			Hurricane	0.3204	0.3127	0.2438	0.2362	0.4009	0.3607	0.3791	0.3645	0.3342	0.3241	0.4127	0.3436	0.4444	0.4368	0.3966	0.3922	0.4718	0.4314	0.5160	0.5145	0.4697	0.4662	0.4777	0.4584
		Wrap	None	0.2991	0.2870	0.2691	0.2598	0.3636	0.2985	0.4426	0.4225	0.4053	0.3925	0.4786	0.3891	0.4780	0.4690	0.4254	0.4211	0.5111	0.4630	0.5851	0.5840	0.5321	0.5304	0.5456	0.5206
			Hurricane	0.2534	0.2411	0.2294	0.2184	0.3205	0.2582	0.3629	0.3438	0.3310	0.3195	0.3962	0.3120	0.4215	0.4147	0.3772	0.3725	0.4581	0.4124	0.5100	0.5072	0.4618	0.4578	0.4745	0.4516
	C	TN	None	0.6948	0.6842	0.3650	0.3587	0.8742	0.8488	0.6299	0.6215	0.4669	0.4605	0.6969	0.6596	0.6545	0.6409	0.6076	0.5946	0.6586	0.6262	0.6961	0.6899	0.6428	0.6349	0.6468	0.6274
			Hurricane	0.6573	0.6461	0.3252	0.3190	0.8510	0.8263	0.5659	0.5525	0.3902	0.3836	0.6404	0.6036	0.5853	0.5736	0.5364	0.5236	0.5908	0.5604	0.6246	0.6158	0.5765	0.5683	0.5796	0.5665
		Clip	None	0.3461	0.3389	0.2646	0.2571	0.4293	0.3897	0.4594	0.4472	0.4103	0.3986	0.4934	0.4204	0.4928	0.4868	0.4474	0.4420	0.5216	0.4801	0.5915	0.5885	0.5371	0.5344	0.5513	0.5278
			Hurricane	0.3053	0.2981	0.2193	0.2133	0.3877	0.3499	0.3747	0.3624	0.3311	0.3219	0.4122	0.3411	0.4318	0.4272	0.3901	0.3862	0.4567	0.4232	0.5174	0.5136	0.4689	0.4656	0.4766	0.4576
		Wrap	None	0.2701	0.2583	0.2387	0.2293	0.3361	0.2772	0.4370	0.4139	0.3987	0.3819	0.4768	0.3823	0.4587	0.4515	0.4099	0.4060	0.4924	0.4463	0.5872	0.5816	0.5299	0.5266	0.5447	0.5209
			Hurricane	0.2212	0.2099	0.1921	0.1834	0.2871	0.2326	0.3544	0.3357	0.3243	0.3111	0.3884	0.3051	0.4017	0.3968	0.3616	0.3574	0.4324	0.3924	0.5093	0.4919	0.4634	0.4610	0.4748	0.4522

Table 4-3. Single-Family, Pre-FBC, Region 1, Terrain A Loss Relativity Table (Continued)

Roof Cover Strength	Roof Deck	RWC	Opening Protection	High Slope (> 6:12)																							
				2-Story												1-Story											
				Other						Hip						Other						Hip					
				Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel	
				NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR
Non-FBC	A	TN	None	1.0000	0.8599	0.6148	0.5669	1.0000	0.9297	1.0000	0.9928	0.8561	0.7934	0.8798	0.7827	1.0000	1.0000	0.6357	0.6132	1.0000	0.9351	1.0000	1.0000	0.8265	0.8060	0.8277	0.7802
			Hurricane	1.0000	0.7962	0.5417	0.4934	0.9643	0.8782	1.0000	0.8840	0.7487	0.7004	0.7752	0.6836	1.0000	0.9099	0.5566	0.5339	0.9060	0.8424	1.0000	1.0000	0.7300	0.7116	0.7079	0.6645
		Clip	None	1.0000	0.6421	0.5933	0.5380	0.7305	0.5799	1.0000	0.9487	0.8486	0.7885	0.8318	0.7273	1.0000	0.7995	0.5975	0.5736	0.6890	0.5979	1.0000	1.0000	0.8194	0.7961	0.7376	0.6884
			Hurricane	1.0000	0.5684	0.5142	0.4604	0.6524	0.5071	1.0000	0.8542	0.7450	0.6795	0.7227	0.6196	1.0000	0.7162	0.5314	0.5075	0.6058	0.5218	1.0000	1.0000	0.7230	0.7032	0.6423	0.5953
		Wrap	None	1.0000	0.6305	0.5905	0.5366	0.7107	0.5487	1.0000	0.9623	0.8486	0.7885	0.8305	0.7245	1.0000	0.7775	0.5946	0.5709	0.6604	0.5651	1.0000	1.0000	0.8193	0.7960	0.7373	0.6887
			Hurricane	1.0000	0.5528	0.5120	0.4603	0.6269	0.4734	1.0000	0.8542	0.7450	0.6795	0.7256	0.6207	1.0000	0.7078	0.5309	0.5081	0.5823	0.4946	1.0000	1.0000	0.7250	0.7042	0.6392	0.5922
	B	TN	None	1.0000	0.8250	0.5500	0.5034	1.0000	0.9192	1.0000	0.8988	0.7520	0.6918	0.7980	0.7141	1.0000	1.0000	0.6088	0.5845	1.0000	0.9354	1.0000	1.0000	0.7988	0.7771	0.8198	0.7779
			Hurricane	1.0000	0.7671	0.4652	0.4232	0.9411	0.8608	1.0000	0.7806	0.6334	0.5742	0.6892	0.6088	1.0000	0.9144	0.5329	0.5138	0.9023	0.8411	1.0000	1.0000	0.7062	0.6860	0.7016	0.6654
		Clip	None	1.0000	0.5602	0.5025	0.4426	0.6498	0.5095	1.0000	0.8033	0.7306	0.6546	0.6953	0.5867	1.0000	0.7665	0.5534	0.5278	0.6651	0.5814	1.0000	1.0000	0.7848	0.7611	0.6925	0.6423
			Hurricane	0.9757	0.4743	0.4132	0.3561	0.5610	0.4337	1.0000	0.6831	0.6129	0.5457	0.5699	0.4668	1.0000	0.6869	0.4901	0.4680	0.5749	0.5015	1.0000	1.0000	0.6959	0.6758	0.6009	0.5568
		Wrap	None	1.0000	0.5034	0.4901	0.4214	0.6011	0.4350	1.0000	0.7813	0.7284	0.6493	0.6851	0.5623	1.0000	0.7099	0.5457	0.5177	0.6038	0.5087	1.0000	1.0000	0.7833	0.7620	0.6878	0.6380
			Hurricane	0.9467	0.4129	0.4018	0.3387	0.5032	0.3494	1.0000	0.6713	0.6131	0.5412	0.5636	0.4520	1.0000	0.6464	0.4812	0.4588	0.5260	0.4416	1.0000	0.9949	0.6933	0.6750	0.5963	0.5551
	C	TN	None	1.0000	0.8203	0.5505	0.5045	1.0000	0.9134	1.0000	0.9006	0.7532	0.6912	0.7972	0.7122	1.0000	0.9984	0.6091	0.5856	1.0000	0.9348	1.0000	1.0000	0.7956	0.7763	0.8189	0.7764
			Hurricane	1.0000	0.7660	0.4670	0.4225	0.9418	0.8621	1.0000	0.7794	0.6326	0.5712	0.6867	0.6059	1.0000	0.9144	0.5356	0.5125	0.9023	0.8411	1.0000	1.0000	0.7084	0.6871	0.7006	0.6643
		Clip	None	1.0000	0.5608	0.5023	0.4430	0.6496	0.5101	1.0000	0.8036	0.7316	0.6553	0.6956	0.5867	1.0000	0.7662	0.5548	0.5283	0.6660	0.5818	1.0000	1.0000	0.7799	0.7577	0.6940	0.6436
			Hurricane	0.9752	0.4751	0.4081	0.3535	0.5624	0.4327	1.0000	0.6824	0.6122	0.5415	0.5711	0.4681	1.0000	0.6905	0.4904	0.4658	0.5718	0.5019	1.0000	1.0000	0.6946	0.6751	0.5974	0.5557
		Wrap	None	1.0000	0.5030	0.4895	0.4197	0.6042	0.4351	1.0000	0.7806	0.7262	0.6466	0.6795	0.5601	1.0000	0.7123	0.5448	0.5161	0.6028	0.5084	1.0000	1.0000	0.7820	0.7579	0.6865	0.6356
			Hurricane	0.9430	0.4127	0.4002	0.3371	0.5018	0.3464	1.0000	0.6688	0.6090	0.5384	0.5597	0.4490	1.0000	0.6431	0.4859	0.4614	0.5246	0.4409	1.0000	0.9945	0.6940	0.6753	0.5924	0.5514
FBC Old (Shingle > 13 yr // Tile or Metal > 20 yr)	A	TN	None	0.9792	0.7817	0.6148	0.5669	1.0000	0.9297	1.0000	0.8210	0.8561	0.7934	0.8798	0.7827	0.9603	0.8329	0.6357	0.6132	1.0000	0.9351	1.0000	0.8929	0.8265	0.8060	0.8277	0.7802
			Hurricane	0.8987	0.7207	0.5417	0.4934	0.9643	0.8782	0.9690	0.7274	0.7487	0.7004	0.7752	0.6836	0.8710	0.7523	0.5566	0.5339	0.9060	0.8424	0.8849	0.7735	0.7300	0.7116	0.7079	0.6645
		Clip	None	0.8067	0.5657	0.5933	0.5380	0.7305	0.5799	1.0000	0.8031	0.8486	0.7885	0.8318	0.7273	0.7786	0.6321	0.5975	0.5736	0.6890	0.5979	0.9697	0.8356	0.8194	0.7961	0.7376	0.6884
			Hurricane	0.7113	0.4879	0.5142	0.4604	0.6524	0.5071	0.9440	0.6939	0.7450	0.6795	0.7227	0.6196	0.6844	0.5502	0.5314	0.5075	0.6058	0.5218	0.8514	0.7306	0.7230	0.7032	0.6423	0.5953
		Wrap	None	0.7987	0.5491	0.5905	0.5366	0.7107	0.5487	1.0000	0.8048	0.8486	0.7885	0.8305	0.7245	0.7619	0.6093	0.5946	0.5709	0.6604	0.5651	0.9702	0.8383	0.8193	0.7960	0.7373	0.6887
			Hurricane	0.7018	0.4686	0.5120	0.4603	0.6269	0.4734	0.9462	0.6953	0.7450	0.6795	0.7256	0.6207	0.6743	0.5372	0.5309	0.5081	0.5823	0.4946	0.8488	0.7284	0.7250	0.7042	0.6392	0.5922
	B	TN	None	0.9423	0.7533	0.5500	0.5034	1.0000	0.9192	0.9894	0.7455	0.7520	0.6918	0.7980	0.7141	0.9572	0.8367	0.6088	0.5845	1.0000	0.9354	1.0000	0.8775	0.7988	0.7771	0.8198	0.7779
			Hurricane	0.8583	0.6875	0.4652	0.4232	0.9411	0.8608	0.8614	0.6310	0.6334	0.5742	0.6892	0.6088	0.8569	0.7446	0.5329	0.5138	0.9023	0.8411	0.8690	0.7627	0.7062	0.6860	0.7016	0.6654
		Clip	None	0.7207	0.4861	0.5025	0.4426	0.6498	0.5095	0.9356	0.6574	0.7306	0.6546	0.6953	0.5867	0.7431	0.5994	0.5534	0.5278	0.6651	0.5814	0.9242	0.7898	0.7848	0.7611	0.6925	0.6423
			Hurricane	0.6150	0.3997	0.4132	0.3561	0.5610	0.4337	0.7826	0.5312	0.6129	0.5457	0.5699	0.4668	0.6474	0.5221	0.4901	0.4680	0.5749	0.5015	0.8067	0.6917	0.6959	0.6758	0.6009	0.5568
		Wrap	None	0.6851	0.4278	0.4901	0.4214	0.6011	0.4350	0.9272	0.6347	0.7284	0.6493	0.6851	0.5623	0.6950	0.5445	0.5457	0.5177	0.6038	0.5087	0.9158	0.7807	0.7833	0.7620	0.6878	0.6380
			Hurricane	0.5702	0.3365	0.4018	0.3387	0.5032	0.3494	0.7739	0.5200	0.6131	0.5412	0.5636	0.4520	0.6149	0.4785	0.4812	0.4588	0.5260	0.4416	0.8055	0.6902	0.6933	0.6750	0.5963	0.5551
	C	TN	None	0.9448	0.7552	0.5505	0.5045	1.0000	0.9134	1.0000	0.7478	0.7532	0.6912	0.7972	0.7122	0.9576	0.8373	0.6091	0.5856	1.0000	0.9348	1.0000	0.8791	0.7956	0.7763	0.8189	0.7764
			Hurricane	0.8579	0.6863	0.4670	0.4225	0.9418	0.8621	0.8580	0.6337	0.6326	0.5712	0.6867	0.6059	0.8569	0.7446	0.5356	0.5125	0.9023	0.8411	0.8664	0.7612	0.7084	0.6871	0.7006	0.6643
		Clip	None	0.7245	0.4857	0.5023	0.4430	0.6496	0.5101	0.9330	0.6577	0.7316	0.6553	0.6956	0.5867	0.7474	0.6017	0.5548	0.5283	0.6660	0.5818	0.9250	0.7904	0.7799	0.7577	0.6940	0.6436
			Hurricane	0.6158	0.3988	0.4081	0.3535	0.5624	0.4327	0.7830	0.5314	0.6122	0.5415	0.5711	0.4681	0.6464	0.5206	0.4904	0.4658	0.5718	0.5019	0.8046	0.6918	0.6946	0.6751	0.5974	0.5557
		Wrap	None	0.6837	0.4272	0.4895	0.4197	0.6042	0.4351	0.9224	0.6315	0.7262	0.6466	0.6795	0.5601	0.6979	0.5448	0.5448	0.5161	0.6028	0.5084	0.9155	0.7816	0.7820	0.7579	0.6865	0.6356
			Hurricane	0.5725	0.3354	0.4002	0.3371	0.5018	0.3464	0.7768	0.5184	0.6090	0.5384	0.5597	0.4490	0.6137	0.4793	0.4859	0.4614	0.5246	0.4409	0.8044	0.6892	0.6940	0.6753	0.5924	0.5514
FBC Mid Range (Shingle = 6-13 yr // Tile or Metal = 6-20 yr)	A	TN	None	0.8708	0.7628	0.5483	0.5215	0.9628	0.9066	0.9319	0.7903	0.7511	0.7171	0.8097	0.7544	0.8734	0.8059	0.5639	0.5496	0.9482	0.8967	0.8982	0.8441	0.7262	0.7144	0.7779	0.7478
			Hurricane	0.8023	0.7048	0.4744	0.4474	0.9068	0.8543	0.8206	0.6968	0.6428	0.6160	0.7084	0.6562	0.7736	0.7139	0.4850	0.4715	0.8507	0.8040	0.7731	0.7250	0.6311	0.6202	0.6566	0.6299
		Clip	None	0.6877	0.5478	0.5186	0.4884	0.6397	0.5499	0.9183	0.7740	0.7438	0.7112	0.7578	0.6986	0.6745	0.6008	0.5220	0.5082	0.6103	0.5554	0.8396	0.7855	0.7161	0.7030	0.6817	0.6552
			Hurricane	0.5937	0.4681	0.4410	0.4113	0.5616	0.4749	0.7934	0.6634	0.6375	0.6017	0.6475	0.5896	0.5814	0.5149	0.4562	0.4437	0.5282	0.4772	0.7347	0.6844	0.6242	0.6147	0.5849	0.5576
		Wrap	None	0.6692	0.5303	0.5164	0.4866	0.6151	0.5185	0.9161	0.7747	0.7438	0.7112	0.7555	0.6960	0.6496	0.5746	0.5200	0.5065	0.5751	0.5196	0.8418	0.7857	0.7155	0.7037	0.6815	0.6553
			Hurricane	0.5781	0.4489	0.4368	0.4086	0.5352	0.4426	0.7934	0.6646	0.6375	0.6019	0.6480	0.5889	0.5718	0.5039	0.4550	0.4425	0.5024	0.4504	0.7340	0.6970	0.6253	0.6150	0.5814	0.5550
	B	TN	None	0.8363	0.7362	0.4915	0.4655	0.9453	0.8929	0.8479	0.7226	0.6618	0.6291	0.7342	0.6865	0.8733	0.8075	0.5432	0.5282	0.9472	0.8985	0.8834	0.8298	0.7008	0.6886	0.7694	0.7428
			Hurricane	0.7619	0.6725	0.4085	0.3848	0.8834	0.8344	0.7222	0.6078	0.5404	0.5090	0.6247	0.5791	0.7727	0.7182	0.4654	0.4536	0.8498	0.8041	0.7624	0.7185	0.6100	0.5999	0.6539	0.6311
		Clip	None	0.6004	0.4695	0.4368	0.4037	0.5658	0.4813	0.7746	0.6286	0.6328	0.5915	0.6209	0.5590	0.6404	0.5720	0.4844	0.4703	0.5863	0.5360	0.8028	0.7428	0.6848	0.6724	0.6358	0.6077
			Hurricane	0.5006	0.3823	0.3491	0.3170	0.4803	0.4029	0.6382	0.5071	0.5173	0.4794	0.4956	0.4357	0.5501	0.4892	0.4199	0.4082	0.5005	0.4567	0.6941	0.6479	0.5999	0.5891	0.5445	0.5199
		Wrap	None	0.5599	0.4137	0.4218	0.3836	0.5073	0.4039	0.7614	0.6069	0.6284	0.5852	0.6027	0.5301	0.5904	0.5159	0.4743	0.4590	0.5182	0.4605	0.7920	0.7336	0.6833	0.6719	0.6297	0.6017
			Hurricane	0.4525	0.3217	0.3356	0.3005	0.4135	0.3171	0.6293	0.4930	0.5164	0.4771	0.4859	0.4201	0.5107	0.4477	0.4116	0.3992	0.4474	0.3967	0.6916	0.6425	0.5974	0.5878	0.5406	0.5172
	C	TN	None	0.8388	0.7382	0.4918	0.4659	0.9432	0.8904	0.8462	0.7209	0.6605	0.6273	0.7320	0.6831	0.8733	0.8075	0.5433	0.5287	0.9467	0.8981	0.8853	0.8336	0.6983	0.6876	0.7684	0.7416
			Hurricane	0.7674	0.6767	0.4089	0.3841	0.8828	0.8340	0.7187	0.6038	0.5393	0.5062	0.6235	0.5770	0.7727	0.7182	0.4671	0.4537	0.8497	0.8043	0.7641	0.7204	0.6132	0.6021	0.6549	0.6315
		Clip	None	0.5969	0.4679	0.4367	0.4038	0.5665	0.4826	0.7764	0.6303	0.6332	0.5912	0.6202	0.5578	0.6394	0.5695	0.4850	0.4697	0.5860	0.5354	0.7976	0.7413	0.6820	0.6700	0.6384	0.6092
			Hurricane	0.5015	0.3820	0.3455	0.3156	0.4804	0.4019	0.6351	0.5048	0.5152	0.4775	0.4949	0.4351	0.5503	0.4902	0.4204	0.4070	0.4992	0.4573	0.6941	0.6479	0.5989	0.5885	0.5435	0.5198
		Wrap	None	0.5613	0.4130	0.4210	0.3822	0.5102	0.4053	0.7604	0.6077	0.6270	0.5831	0.5997	0.5295	0.5901	0.5142	0.4736	0.4574	0.5182	0.4610	0.7945	0.7355	0.6830	0.6692	0.6290	0.5999
			Hurricane	0.4536	0.3212	0.3341	0.2990	0.4130	0.3157	0.6322	0.4930	0.5131	0.4734	0.4837	0.4178	0.5145	0.4481	0.4143	0.4000	0.4466	0.3962	0.6952	0.6431	0.5990	0.5892	0.5374	0.5144
FBC New (0-5 yr, all types)	A	TN	None	0.7348	0.7262	0.4818	0.4761	0.9036	0.8835	0.7480	0.7404	0.6460	0.6407	0.7397	0.7260	0.7593	0.7394	0.4920	0.4860	0.8925	0.8583	0.7511	0.7469	0.6258	0.6228	0.7281	0.7154
			Hurricane	0.6755	0.6677	0.4071	0.4015	0.8494	0.8303	0.6418	0.6354	0.5369	0.5315	0.6416	0.6288	0.6633	0.6477	0.4133	0.4091	0.7953	0.7656	0.6334	0.6125	0.5321	0.5287	0.6054	0.5953
		Clip	None	0.5137	0.5073	0.4439	0.4388	0.5488	0.5200	0.7125	0.7057	0.6390	0.6339	0.6838	0.6700	0.5327	0.5287	0.4465	0.4429	0.5315	0.5128	0.6828	0.6808	0.6128	0.6099	0.6258	0.6221
			Hurricane	0.4345	0.4294	0.3678	0.3623	0.4709	0.4426	0.5986	0.5930	0.5300	0.5239	0.5724	0.5595	0.4492	0.4462	0.3810	0.3799	0.4507	0.4326	0.5833	0.5842	0.5254	0.5261	0.5276	0.5199
		Wrap	None	0.4966	0.4907	0.4423	0.4365	0.5195	0.4883	0.7119	0.7060	0.6390	0.6339	0.6804	0.6674	0.5098	0.5066	0.4453	0.4421	0.4899	0.4741	0.6815	0.6802	0.6117	0.6115	0.6256	0.6218
			Hurricane	0.4173	0.4105	0.3615	0.3569	0.4436	0.4118	0.5975	0.5926	0.5299	0.5243	0.5704	0.5572	0.4322	0.4294	0.3790	0.3768	0.4225	0.4062	0.5835	0.5830	0.5256	0.5258	0.5236	0.5178
	B	TN	None	0.7116	0.7038	0.4330	0.4276	0.8852	0.8667	0.6700	0.6625	0.5717	0.5663	0.6704	0.6588	0.7614	0.7409	0.4777	0.4720	0.8941	0.8617	0.7382	0.7334	0.6028	0.6000	0.7190	0.7077
			Hurricane	0.6452	0.6386	0.3518	0.3464	0.8258	0.8080	0.5502	0.5446	0.4474	0.4438	0.5601	0.5495	0.6619	0.6454	0.3979	0.3933	0.7974	0.7672	0.6231	0.6065	0.5139	0.5137	0.6062	0.5969
		Clip	None	0.4446	0.4383	0.3712	0.3648	0.4819	0.4532	0.5810	0.5704	0.5351	0.5284	0.5465	0.5313	0.5113	0.5044	0.4154	0.4129	0.5075	0.4907	0.6424	0.6412	0.5848	0.5837	0.5791	0.5731
			Hurricane	0.3547	0.3489	0.2849	0.2779	0.3996	0.3722	0.4543	0.4446	0.4217	0.4131	0.4212	0.4045	0.4237	0.4195	0.3497	0.3485	0.4260	0.4119	0.5648	0.5618	0.5039	0.5024	0.4880	0.4830
		Wrap	None	0.3936	0.3809	0.3536	0.3458	0.4134	0.3728	0.5676	0.5517	0.5284	0.5211	0.5203	0.4979	0.4509	0.4461	0.4029	0.4004	0.4327	0.4124	0.6358	0.6323	0.5832	0.5819	0.5716	0.5655
			Hurricane	0.2983	0.2886	0.2694	0.2623	0.3237	0.2848	0.4453	0.4322	0.4197	0.4130	0.4083	0.3882	0.3816	0.3781	0.3419	0.3396	0.3688	0.3518	0.5606	0.5595	0.5016	0.5005	0.4849	0.4793
	C	TN	None	0.7116	0.7036	0.4331	0.4273	0.8865	0.8674	0.6719	0.6642	0.5679	0.5633	0.6667	0.6539	0.7614	0.7409	0.4776	0.4718	0.8934	0.8615	0.7379	0.7294	0.6009	0.5988	0.7179	0.7068
			Hurricane	0.6472	0.6398	0.3508	0.3458	0.8238	0.8059	0.5503	0.5439	0.4460	0.4411	0.5602	0.5480	0.6619	0.6454	0.3987	0.3948	0.7972	0.7675	0.6222	0.6173	0.5180	0.5172	0.6092	0.5988
		Clip	None	0.4423	0.4362	0.3710	0.3645	0.4833	0.4550	0.5803	0.5684	0.5349	0.5271	0.5448	0.5288	0.5085	0.5022	0.4153	0.4111	0.5059	0.4890	0.6435	0.6418	0.5841	0.5824	0.5828	0.5747
			Hurricane	0.3554	0.3488	0.2829	0.2778	0.3984	0.3712	0.4515	0.4420	0.4183	0.4135	0.4187	0.4021	0.4227	0.4182	0.3504	0.3483	0.4267	0.4127	0.5660	0.5621	0.5031	0.5019	0.4896	0.4840
		Wrap	None	0.3911	0.3798	0.3525	0.3447	0.4162	0.3754	0.5608	0.5462	0.5278	0.5195	0.5200	0.4989	0.4540	0.4493	0.4023	0.3986	0.4335	0.4136	0.6365	0.6353	0.5840	0.5805	0.5716	0.5642
			Hurricane	0.2975	0.2863	0.2681	0.2609	0.3242	0.2850	0.4424	0.4303	0.4172	0.4085	0.4077	0.3867	0.3829	0.3784	0.3426	0.3386	0.3685	0.3514	0.5471	0.5449	0.5040	0.5030	0.4823	0.4774

Table 4-4. Single-Family, Pre-FBC, Region 1, Terrain B Loss Relativity Table

Roof Cover Strength	Roof Deck	RWC	Opening Protection	Low Slope (<=6:12)																							
				2-Story												1-Story											
				Other						Hip						Other						Hip					
				Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel	
				NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR
Non-FBC	A	TN	None	1.0000	1.0000	0.8507	0.8009	1.0000	1.0000	1.0000	0.9750	0.8680	0.8014	1.0000	0.8931	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8355	0.7980	0.9101	0.7783
			Hurricane	1.0000	0.9851	0.8253	0.7773	1.0000	1.0000	1.0000	0.8819	0.7782	0.7146	1.0000	0.8067	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9140	0.7069	0.6748	0.7618	0.6388
		Clip	None	1.0000	0.9036	0.8404	0.7888	1.0000	0.8777	1.0000	0.9630	0.8616	0.7952	1.0000	0.8557	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.7783	0.7429	0.8738	0.7337
			Hurricane	1.0000	0.8809	0.8202	0.7696	1.0000	0.8450	1.0000	0.8626	0.7791	0.7136	0.9916	0.7626	1.0000	1.0000	1.0000	0.9755	1.0000	1.0000	1.0000	0.8721	0.6554	0.6210	0.7379	0.6070
		Wrap	None	1.0000	0.9047	0.8384	0.7880	1.0000	0.8729	1.0000	0.9603	0.7952	0.7952	1.0000	0.8556	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.7777	0.7414	0.8744	0.7355
			Hurricane	1.0000	0.8770	0.8136	0.7631	1.0000	0.8456	1.0000	0.8626	0.7761	0.7094	0.9871	0.7595	1.0000	1.0000	1.0000	0.9715	1.0000	1.0000	1.0000	0.8780	0.6513	0.6185	0.7373	0.6051
	B	TN	None	1.0000	0.7745	0.4985	0.4531	0.9914	0.9007	1.0000	0.7845	0.6601	0.5810	0.9419	0.7503	1.0000	0.9180	0.8026	0.7624	0.9297	0.7798	1.0000	1.0000	0.8053	0.7740	0.8416	0.7269
			Hurricane	1.0000	0.7214	0.4414	0.3980	0.9475	0.8589	1.0000	0.6829	0.5472	0.4735	0.8408	0.6634	1.0000	0.8019	0.6884	0.6519	0.8136	0.6762	1.0000	0.8841	0.6860	0.6591	0.7113	0.6121
		Clip	None	0.8970	0.4565	0.4284	0.3624	0.6377	0.4748	1.0000	0.6024	0.6269	0.5187	0.8010	0.5175	1.0000	0.7520	0.6499	0.6014	0.8182	0.6231	1.0000	0.8799	0.7019	0.6641	0.7518	0.6080
			Hurricane	0.8001	0.3958	0.3651	0.3034	0.5682	0.4191	1.0000	0.4878	0.5039	0.4077	0.6593	0.4064	1.0000	0.6524	0.5533	0.5089	0.6974	0.5283	1.0000	0.7703	0.5791	0.5437	0.6143	0.4922
		Wrap	None	0.8644	0.3839	0.4172	0.3418	0.5779	0.3741	1.0000	0.5715	0.6199	0.5055	0.7835	0.4794	1.0000	0.7198	0.6236	0.5703	0.7989	0.5908	1.0000	0.8714	0.6981	0.6527	0.7486	0.5994
			Hurricane	0.7597	0.3223	0.3547	0.2850	0.5056	0.3164	1.0000	0.4630	0.4401	0.3467	0.6433	0.3723	1.0000	0.6265	0.5336	0.4825	0.6809	0.5017	1.0000	0.7502	0.5719	0.5357	0.6088	0.4821
	C	TN	None	1.0000	0.7797	0.4865	0.4421	1.0000	0.9103	1.0000	0.7849	0.6618	0.5808	0.9478	0.7537	1.0000	0.9135	0.7953	0.7593	0.9272	0.7779	1.0000	1.0000	0.8049	0.7749	0.8370	0.7221
			Hurricane	1.0000	0.7218	0.4233	0.3819	0.9415	0.8549	1.0000	0.6832	0.5481	0.4712	0.8435	0.6614	1.0000	0.8030	0.6862	0.6539	0.8038	0.6727	1.0000	0.8858	0.6866	0.6614	0.7104	0.6104
		Clip	None	0.8759	0.4430	0.4011	0.3385	0.6246	0.4656	1.0000	0.6021	0.6238	0.5138	0.7992	0.5166	1.0000	0.7322	0.6337	0.5877	0.7981	0.6082	1.0000	0.8830	0.7023	0.6620	0.7525	0.6074
			Hurricane	0.7836	0.3802	0.3304	0.2726	0.5541	0.4087	1.0000	0.4848	0.4387	0.3455	0.6592	0.4045	1.0000	0.6371	0.5372	0.4997	0.6757	0.5164	1.0000	0.7619	0.5746	0.5416	0.6147	0.4933
		Wrap	None	0.8266	0.3560	0.3833	0.3056	0.5529	0.3500	1.0000	0.5588	0.6152	0.4904	0.7849	0.4708	1.0000	0.6926	0.6055	0.5489	0.7786	0.5733	1.0000	0.8752	0.6980	0.6555	0.7486	0.6001
			Hurricane	0.7212	0.2879	0.3096	0.2412	0.4692	0.2855	1.0000	0.4512	0.4349	0.3323	0.6399	0.3637	1.0000	0.6028	0.5101	0.4631	0.6549	0.4809	1.0000	0.7513	0.5715	0.5359	0.6092	0.4837
FBC Old (Shingle > 13 yr // Tile or Metal > 20 yr)	A	TN	None	1.0000	0.9683	0.8507	0.8009	1.0000	1.0000	1.0000	0.8841	0.8680	0.8014	1.0000	0.8931	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8496	0.8355	0.7980	0.9101	0.7783
			Hurricane	1.0000	0.9381	0.8253	0.7773	1.0000	1.0000	1.0000	0.7911	0.7782	0.7146	1.0000	0.8067	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8961	0.7107	0.7069	0.6748	0.7618	0.6388
		Clip	None	1.0000	0.8606	0.8404	0.7888	1.0000	0.8777	1.0000	0.8631	0.8616	0.7952	1.0000	0.8557	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8025	0.7783	0.7429	0.8738	0.7337
			Hurricane	1.0000	0.8327	0.8202	0.7696	1.0000	0.8450	1.0000	0.7746	0.7791	0.7136	0.9916	0.7626	1.0000	1.0000	1.0000	0.9755	1.0000	1.0000	0.8622	0.6680	0.6554	0.6210	0.7379	0.6070
		Wrap	None	1.0000	0.8580	0.8384	0.7880	1.0000	0.8729	1.0000	0.8647	0.7952	0.7952	1.0000	0.8556	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8022	0.7777	0.7414	0.8744	0.7355
			Hurricane	1.0000	0.8300	0.8136	0.7631	1.0000	0.8456	1.0000	0.7746	0.7761	0.7094	0.9871	0.7595	1.0000	1.0000	1.0000	0.9715	1.0000	1.0000	0.8624	0.6691	0.6513	0.6185	0.7373	0.6051
	B	TN	None	0.8929	0.7405	0.4985	0.4531	0.9914	0.9007	0.9991	0.7021	0.6601	0.5810	0.9419	0.7503	1.0000	0.7943	0.8026	0.7624	0.9297	0.7798	0.9977	0.8003	0.8053	0.7740	0.8416	0.7269
			Hurricane	0.8373	0.6951	0.4414	0.3980	0.9475	0.8589	0.8734	0.6030	0.5472	0.4735	0.8408	0.6634	0.8627	0.6780	0.6884	0.6519	0.8136	0.6762	0.8470	0.6835	0.6860	0.6591	0.7113	0.6121
		Clip	None	0.6345	0.4206	0.4284	0.3624	0.6377	0.4748	0.8855	0.5215	0.6269	0.5187	0.8010	0.5175	0.8725	0.6283	0.6499	0.6014	0.8182	0.6231	0.9070	0.6853	0.7019	0.6641	0.7518	0.6080
			Hurricane	0.5569	0.3622	0.3651	0.3034	0.5682	0.4191	0.7260	0.4062	0.5039	0.4077	0.6593	0.4064	0.7443	0.5289	0.5533	0.5089	0.6974	0.5283	0.7503	0.5610	0.5791	0.5437	0.6143	0.4922
		Wrap	None	0.5940	0.3505	0.4172	0.3418	0.5779	0.3741	0.8754	0.4908	0.6199	0.5055	0.7835	0.4794	0.8502	0.5951	0.6236	0.5703	0.7989	0.5908	0.9057	0.6753	0.6981	0.6527	0.7486	0.5994
			Hurricane	0.5087	0.2889	0.3547	0.2850	0.5056	0.3164	0.7166	0.3806	0.4401	0.3467	0.6433	0.3723	0.7198	0.4995	0.5336	0.4825	0.6809	0.5017	0.7396	0.5477	0.5719	0.5357	0.6088	0.4821
	C	TN	None	0.8911	0.7370	0.4865	0.4421	1.0000	0.9103	1.0000	0.7031	0.6618	0.5808	0.9478	0.7537	1.0000	0.7975	0.7953	0.7593	0.9272	0.7779	1.0000	0.8012	0.8049	0.7749	0.8370	0.7221
			Hurricane	0.8291	0.6893	0.4233	0.3819	0.9415	0.8549	0.8789	0.6031	0.5481	0.4712	0.8435	0.6614	0.8595	0.6761	0.6862	0.6539	0.8038	0.6727	0.8497	0.6859	0.6866	0.6614	0.7104	0.6104
		Clip	None	0.6195	0.4091	0.4011	0.3385	0.6246	0.4656	0.8845	0.5223	0.6238	0.5138	0.7992	0.5166	0.8520	0.6149	0.6337	0.5877	0.7981	0.6082	0.9078	0.6844	0.7023	0.6620	0.7525	0.6074
			Hurricane	0.5385	0.3456	0.3304	0.2726	0.5541	0.4087	0.7295	0.4039	0.4387	0.3455	0.6592	0.4045	0.7213	0.5157	0.5372	0.4997	0.6757	0.5164	0.7434	0.5615	0.5746	0.5416	0.6147	0.4933
		Wrap	None	0.5642	0.3204	0.3833	0.3056	0.5529	0.3500	0.8643	0.4780	0.6152	0.4904	0.7849	0.4708	0.8239	0.5712	0.6055	0.5489	0.7786	0.5733	0.9009	0.6720	0.6980	0.6555	0.7486	0.6001
			Hurricane	0.4699	0.2525	0.3096	0.2412	0.4692	0.2855	0.7136	0.3705	0.4349	0.3323	0.6399	0.3637	0.6982	0.4783	0.5101	0.4631	0.6549	0.4809	0.7405	0.5498	0.5715	0.5359	0.6092	0.4837
FBC Mid Range (Shingle = 6-13 yr // Tile or Metal = 6-20 yr)	A	TN	None	1.0000	0.9545	0.7779	0.7505	1.0000	1.0000	1.0000	0.8572	0.7673	0.7311	0.9948	0.8598	1.0000	1.0000	1.0000	0.9834	1.0000	1.0000	0.9243	0.8125	0.7460	0.7227	0.8042	0.7251
			Hurricane	1.0000	0.9275	0.7535	0.7274	1.0000	1.0000	0.9361	0.7613	0.6767	0.6426	0.9001	0.7711	1.0000	1.0000	0.9294	0.9027	1.0000	1.0000	0.7738	0.6734	0.6198	0.5995	0.6628	0.5889
		Clip	None	0.9921	0.8356	0.7640	0.7359	0.9771	0.8529	1.0000	0.8354	0.7602	0.7248	0.9637	0.8228	1.0000	1.0000	0.9621	0.9365	1.0000	1.0000	0.8886	0.7705	0.6809	0.6624	0.7645	0.6823
			Hurricane	0.9620	0.8119	0.7422	0.7144	0.9451	0.8238	0.9295	0.7454	0.6751	0.6393	0.8688	0.7319	1.0000	1.0000	0.8952	0.8705	1.0000	1.0000	0.7264	0.6253	0.5585	0.5391	0.6313	0.5532
		Wrap	None	0.9923	0.8346	0.7648	0.7377	0.9707	0.8449	1.0000	0.8354	0.7265	0.7244	0.9630	0.8223	1.0000	1.0000	0.9633	0.9381	1.0000	1.0000	0.8847	0.7703	0.6806	0.6598	0.7651	0.6833
			Hurricane	0.9573	0.8058	0.7393	0.7115	0.9411	0.8168	0.9290	0.7451	0.6739	0.6374	0.8651	0.7290	1.0000	1.0000	0.8932	0.8670	1.0000	1.0000	0.7317	0.6288	0.5546	0.5380	0.6302	0.5518
	B	TN	None	0.8240	0.7360	0.4521	0.4263	0.9418	0.8846	0.8688	0.6887	0.5796	0.5349	0.8363	0.7208	0.8769	0.7581	0.7211	0.6925	0.8114	0.7165	0.8712	0.7681	0.7202	0.7001	0.7422	0.6740
			Hurricane	0.7591	0.6759	0.3950	0.3704	0.8928	0.8365	0.7465	0.5865	0.4679	0.4265	0.7384	0.6310	0.7451	0.6420	0.6081	0.5827	0.6970	0.6099	0.7345	0.6467	0.6070	0.5884	0.6189	0.5599
		Clip	None	0.5412	0.4086	0.3718	0.3342	0.5545	0.4508	0.7312	0.5045	0.5310	0.4704	0.6647	0.4822	0.7296	0.5898	0.5559	0.5284	0.6813	0.5554	0.7657	0.6464	0.6084	0.5875	0.6425	0.5545
			Hurricane	0.4676	0.3502	0.3096	0.2745	0.4913	0.3956	0.5909	0.3891	0.4149	0.3606	0.5363	0.3712	0.6090	0.4905	0.4624	0.4366	0.5709	0.4619	0.6228	0.5194	0.4892	0.4697	0.5153	0.4406
		Wrap	None	0.4907	0.3386	0.3570	0.3136	0.4858	0.3492	0.7120	0.4710	0.5228	0.4568	0.6474	0.4430	0.7047	0.5593	0.5275	0.4977	0.6595	0.5239	0.7643	0.6394	0.6036	0.5786	0.6375	0.5458
			Hurricane	0.4166	0.2767	0.2959	0.2557	0.4190	0.2909	0.5740	0.3629	0.3804	0.3263	0.5205	0.3376	0.5917	0.4631	0.4393	0.4099	0.5548	0.4368	0.6151	0.5120	0.4799	0.4596	0.5087	0.4308
	C	TN	None	0.8190	0.7290	0.4423	0.4170	0.9500	0.8933	0.8646	0.6877	0.5781	0.5333	0.8361	0.7198	0.8674	0.7525	0.7161	0.6904	0.8071	0.7126	0.8735	0.7662	0.7197	0.6997	0.7397	0.6716
			Hurricane	0.7552	0.6727	0.3801	0.3562	0.8898	0.8350	0.7444	0.5837	0.4662	0.4236	0.7414	0.6315	0.7416	0.6402	0.6076	0.5847	0.6921	0.6090	0.7350	0.6500	0.6060	0.5885	0.6191	0.5589
		Clip	None	0.5294	0.3985	0.3476	0.3123	0.5418	0.4416	0.7281	0.5036	0.5278	0.4656	0.6639	0.4809	0.7080	0.5756	0.5430	0.5166	0.6633	0.5431	0.7702	0.6478	0.6092	0.5876	0.6426	0.5552
			Hurricane	0.4509	0.3356	0.2786	0.2462	0.4767	0.3839	0.5834	0.3874	0.3805	0.3275	0.5350	0.3699	0.5907	0.4755	0.4495	0.4272	0.5520	0.4509	0.6225	0.5243	0.4855	0.4672	0.5160	0.4417
		Wrap	None	0.4617	0.3102	0.3236	0.2792	0.4608	0.3262	0.7055	0.4601	0.5161	0.4436	0.6460	0.4340	0.6816	0.5348	0.5076	0.4767	0.6390	0.5054	0.7625	0.6389	0.6021	0.5794	0.6381	0.5462
			Hurricane	0.3770	0.2404	0.2529	0.2139	0.3833	0.2607	0.5668	0.3529	0.3734	0.3134	0.5142	0.3285	0.5665	0.4419	0.4172	0.3910	0.5274	0.4148	0.6163	0.5140	0.4811	0.4620	0.5090	0.4311
FBC New (0-5 yr, all types)	A	TN	None	0.9197	0.9103	0.7051	0.7001	1.0000	1.0000	0.8063	0.8006	0.6665	0.6608	0.8703	0.8266	1.0000	1.0000	0.8996	0.8878	1.0000	1.0000	0.7349	0.7247	0.6566	0.6474	0.6983	0.6720
			Hurricane	0.8924	0.8838	0.6817	0.6775	1.0000	1.0000	0.7187	0.7121	0.5753	0.5705	0.7799	0.7355	0.9538	0.9451	0.8119	0.8024	1.0000	0.9694	0.5938	0.5871	0.5327	0.5243	0.5637	0.5389
		Clip	None	0.7998	0.7945	0.6876	0.6830	0.8721	0.8280	0.7820	0.7766	0.6589	0.6544	0.8340	0.7900	1.0000	0.9957	0.8399	0.8361	1.0000	1.0000	0.6768	0.6744	0.5836	0.5819	0.6553	0.6310
			Hurricane	0.7738	0.7696	0.6641	0.6592	0.8461	0.8025	0.6893	0.6826	0.5710	0.5650	0.7460	0.7011	0.9239	0.9179	0.7704	0.7656	0.9864	0.9399	0.5384	0.5355	0.4616	0.4572	0.5248	0.4994
		Wrap	None	0.7993	0.7938	0.6912	0.6875	0.8618	0.8170	0.7809	0.7757	0.6578	0.6536	0.8329	0.7890	1.0000	0.9971	0.8411	0.8360	1.0000	1.0000	0.6752	0.6741	0.5836	0.5783	0.6559	0.6311
			Hurricane	0.7663	0.7611	0.6650	0.6599	0.8313	0.7879	0.6890	0.6826	0.5717	0.5653	0.7431	0.6985	0.9197	0.9140	0.7677	0.7625	0.9979	0.9524	0.5394	0.5350	0.4580	0.4575	0.5230	0.4985
	B	TN	None	0.7137	0.7033	0.4057	0.3995	0.8921	0.8685	0.6559	0.6474	0.4991	0.4887	0.7308	0.6913	0.6817	0.6664	0.6395	0.6226	0.6932	0.6531	0.6946	0.6856	0.6350	0.6263	0.6429	0.6211
			Hurricane	0.6658	0.6552	0.3485	0.3428	0.8382	0.8141	0.5538	0.5465	0.3887	0.3794	0.6359	0.5987	0.5645	0.5504	0.5278	0.5136	0.5804	0.5436	0.5727	0.5636	0.5280	0.5177	0.5265	0.5077
		Clip	None	0.3897	0.3809	0.3153	0.3060	0.4714	0.4267	0.4827	0.4663	0.4351	0.4221	0.5283	0.4468	0.5066	0.4949	0.4619	0.4554	0.5443	0.4876	0.5678	0.5621	0.5149	0.5109	0.5333	0.5009
			Hurricane	0.3319	0.3242	0.2541	0.2456	0.4145	0.3722	0.3652	0.3495	0.3259	0.3136	0.4133	0.3361	0.4071	0.3982	0.3716	0.3642	0.4444	0.3955	0.4427	0.4376	0.3992	0.3956	0.4163	0.3891
		Wrap	None	0.3246	0.3101	0.2967	0.2854	0.3938	0.3243	0.4581	0.4335	0.4257	0.4080	0.5114	0.4066	0.4754	0.4639	0.4314	0.4250	0.5202	0.4570	0.5582	0.5523	0.5092	0.5046	0.5265	0.4923
			Hurricane	0.2644	0.2496	0.2370	0.2265	0.3325	0.2654	0.3464	0.3234	0.3206	0.3059	0.3978	0.3029	0.3824	0.3722	0.3449	0.3373	0.4286	0.3718	0.4349	0.4320	0.3879	0.3835	0.4086	0.3794
	C	TN	None	0.7148	0.7041	0.3981	0.3920	0.9000	0.8763	0.6581	0.6489	0.4944	0.4859	0.7244	0.6860	0.6795	0.6649	0.6370	0.6215	0.6870	0.6473	0.6944	0.6849	0.6345	0.6246	0.6423	0.6210
			Hurricane	0.6560	0.6460	0.3369	0.3305	0.8382	0.8151	0.5555	0.5456	0.3843	0.3760	0.6393	0.6017	0.5642	0.5504	0.5290	0.5154	0.5804	0.5454	0.5710	0.5529	0.5254	0.5156	0.5279	0.5074
		Clip	None	0.3796	0.3710	0.2941	0.2862	0.4590	0.4175	0.4835	0.4669	0.4318	0.4174	0.5285	0.4453	0.4926	0.4830	0.4523	0.4454	0.5284	0.4781	0.5687	0.5623	0.5161	0.5132	0.5327	0.5029
			Hurricane	0.3142	0.3062	0.2268	0.2199	0.3993	0.3591	0.3639	0.3493	0.3224	0.3095	0.4108	0.3352	0.3930	0.3854	0.3618	0.3548	0.4283	0.3854	0.4433	0.4386	0.3963	0.3928	0.4174	0.3901
		Wrap	None	0.2976	0.2846	0.2639	0.2527	0.3687	0.3025	0.4522	0.4221	0.4170	0.3967	0.5070	0.3973	0.4514	0.4387	0.4097	0.4044	0.4994	0.4374	0.5604	0.5530	0.5062	0.5034	0.5276	0.4923
			Hurricane	0.2277	0.2146	0.1961	0.1866	0.2974	0.2359	0.3392	0.3135	0.3120	0.2945	0.3885	0.2932	0.3591	0.3461	0.3243	0.3189	0.3999	0.3487	0.4336	0.4280	0.3908	0.3880	0.4089	0.3784

Table 4-4. Single-Family, Pre-FBC, Region 1, Terrain B Loss Relativity Table (Continued)

Roof Cover Strength	Roof Deck	RWC	Opening Protection	High Slope (> 6:12)																							
				2-Story												1-Story											
				Other						Hip						Other						Hip					
				Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel	
				NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR
Non-FBC	A	TN	None	1.0000	0.8541	0.6435	0.5935	1.0000	0.9433	1.0000	0.9481	0.8589	0.7946	0.8953	0.7997	1.0000	0.9354	0.6300	0.6011	0.9983	0.9276	1.0000	1.0000	0.8183	0.7907	0.8405	0.7851
			Hurricane	1.0000	0.7577	0.5396	0.4912	0.9377	0.8582	1.0000	0.8037	0.7131	0.6512	0.7538	0.6623	1.0000	0.8108	0.5153	0.4882	0.8728	0.8082	1.0000	0.9258	0.6714	0.6454	0.6612	0.6132
		Clip	None	1.0000	0.6478	0.6161	0.5622	0.7504	0.6037	1.0000	0.9240	0.8525	0.7890	0.8491	0.7428	1.0000	0.7357	0.5927	0.5648	0.6900	0.5918	1.0000	1.0000	0.8116	0.7825	0.7414	0.6840
			Hurricane	1.0000	0.5426	0.5127	0.4582	0.6394	0.5012	1.0000	0.7746	0.7133	0.6493	0.6998	0.5973	0.9667	0.6154	0.4888	0.4626	0.5702	0.4780	1.0000	0.8874	0.6662	0.6405	0.5853	0.5319
		Wrap	None	1.0000	0.6326	0.6129	0.5594	0.7254	0.5713	1.0000	0.9238	0.8520	0.7888	0.8462	0.7434	1.0000	0.7125	0.5945	0.5632	0.6625	0.5586	1.0000	1.0000	0.8118	0.7825	0.7463	0.6841
			Hurricane	1.0000	0.5284	0.5145	0.4597	0.6191	0.4682	1.0000	0.7716	0.7133	0.6493	0.7017	0.5991	0.9567	0.6042	0.4893	0.4606	0.5452	0.4487	1.0000	0.8883	0.6661	0.6404	0.5868	0.5314
	B	TN	None	1.0000	0.8269	0.5789	0.5272	0.9995	0.9192	1.0000	0.8553	0.7558	0.6874	0.8115	0.7260	1.0000	0.9421	0.6052	0.5771	1.0000	0.9321	1.0000	1.0000	0.7817	0.7519	0.8284	0.7759
			Hurricane	1.0000	0.7289	0.4654	0.4195	0.9148	0.8381	1.0000	0.6993	0.5986	0.5342	0.6642	0.5832	1.0000	0.8123	0.4911	0.4664	0.8642	0.8010	1.0000	0.9149	0.6360	0.6089	0.6512	0.6093
		Clip	None	1.0000	0.5618	0.5291	0.4614	0.6751	0.5344	1.0000	0.7485	0.7330	0.6450	0.7088	0.5924	1.0000	0.6950	0.5462	0.5142	0.6590	0.5679	1.0000	0.9889	0.7668	0.7350	0.6879	0.6215
			Hurricane	0.9208	0.4464	0.4104	0.3479	0.5592	0.4275	1.0000	0.5947	0.5791	0.5002	0.5461	0.4380	0.9172	0.5753	0.4425	0.4125	0.5302	0.4524	1.0000	0.8295	0.6272	0.5987	0.5365	0.4820
		Wrap	None	1.0000	0.4985	0.5136	0.4350	0.6267	0.4520	1.0000	0.7198	0.7287	0.6337	0.6893	0.5543	1.0000	0.6305	0.5339	0.4966	0.5912	0.4841	1.0000	0.9775	0.7666	0.7347	0.6797	0.6124
			Hurricane	0.8816	0.3778	0.3959	0.3254	0.4995	0.3396	1.0000	0.5779	0.5769	0.4976	0.5387	0.4188	0.8895	0.5272	0.4336	0.4037	0.4811	0.3871	1.0000	0.8237	0.6212	0.5947	0.5320	0.4756
	C	TN	None	1.0000	0.8229	0.5771	0.5260	1.0000	0.9203	1.0000	0.8488	0.7589	0.6882	0.8091	0.7226	1.0000	0.9421	0.6036	0.5760	1.0000	0.9321	1.0000	1.0000	0.7857	0.7554	0.8318	0.7774
			Hurricane	1.0000	0.7294	0.4626	0.4165	0.9158	0.8402	1.0000	0.6974	0.5986	0.5364	0.6666	0.5848	1.0000	0.8122	0.4888	0.4648	0.8642	0.8010	1.0000	0.9179	0.6353	0.6124	0.6538	0.6103
		Clip	None	1.0000	0.5615	0.5253	0.4579	0.6770	0.5344	1.0000	0.7488	0.7309	0.6421	0.7060	0.5885	1.0000	0.6963	0.5455	0.5115	0.6585	0.5677	1.0000	0.9864	0.7663	0.7326	0.6863	0.6232
			Hurricane	0.9162	0.4469	0.4053	0.3447	0.5592	0.4278	1.0000	0.5948	0.5778	0.4995	0.5461	0.4377	0.9165	0.5750	0.4436	0.4151	0.5349	0.4550	1.0000	0.8271	0.6268	0.5990	0.5345	0.4812
		Wrap	None	1.0000	0.4957	0.5118	0.4328	0.6244	0.4515	1.0000	0.7177	0.7221	0.6269	0.6900	0.5533	1.0000	0.6352	0.5334	0.4963	0.5941	0.4836	1.0000	0.9796	0.7656	0.7353	0.6786	0.6122
			Hurricane	0.8796	0.3792	0.3950	0.3238	0.4970	0.3369	1.0000	0.5736	0.5722	0.4917	0.5315	0.4140	0.8875	0.5289	0.4342	0.4022	0.4799	0.3870	1.0000	0.8229	0.6259	0.5945	0.5308	0.4737
FBC Old (Shingle > 13 yr // Tile or Metal > 20 yr)	A	TN	None	0.9847	0.7972	0.6435	0.5935	1.0000	0.9433	1.0000	0.8340	0.8589	0.7946	0.8953	0.7997	0.9498	0.8184	0.6300	0.6011	0.9983	0.9276	1.0000	0.8705	0.8183	0.7907	0.8405	0.7851
			Hurricane	0.8722	0.6991	0.5396	0.4912	0.9377	0.8582	0.9186	0.6878	0.7131	0.6512	0.7538	0.6623	0.8085	0.6903	0.5153	0.4882	0.8728	0.8082	0.8219	0.6927	0.6714	0.6454	0.6612	0.6132
		Clip	None	0.8208	0.5861	0.6161	0.5622	0.7504	0.6037	1.0000	0.8051	0.8525	0.7890	0.8491	0.7428	0.7744	0.6126	0.5927	0.5648	0.6900	0.5918	0.9712	0.8090	0.8116	0.7825	0.7414	0.6840
			Hurricane	0.6964	0.4808	0.5127	0.4582	0.6394	0.5012	0.9006	0.6535	0.7133	0.6493	0.6998	0.5973	0.6338	0.4910	0.4888	0.4626	0.5702	0.4780	0.7843	0.6456	0.6662	0.6405	0.5853	0.5319
		Wrap	None	0.8073	0.5690	0.6129	0.5594	0.7254	0.5713	1.0000	0.7952	0.8520	0.7888	0.8462	0.7434	0.7520	0.5899	0.5945	0.5632	0.6625	0.5586	0.9645	0.8087	0.8118	0.7825	0.7463	0.6841
			Hurricane	0.6911	0.4635	0.5145	0.4597	0.6191	0.4682	0.8985	0.6536	0.7133	0.6493	0.7017	0.5991	0.6219	0.4764	0.4893	0.4606	0.5452	0.4487	0.7830	0.6446	0.6661	0.6404	0.5868	0.5314
	B	TN	None	0.9514	0.7676	0.5789	0.5272	0.9995	0.9192	1.0000	0.7489	0.7558	0.6874	0.8115	0.7260	0.9494	0.8206	0.6052	0.5771	1.0000	0.9321	0.9988	0.8526	0.7817	0.7519	0.8284	0.7759
			Hurricane	0.8422	0.6754	0.4654	0.4195	0.9148	0.8381	0.8115	0.5880	0.5986	0.5342	0.6642	0.5832	0.8007	0.6865	0.4911	0.4664	0.8642	0.8010	0.8013	0.6759	0.6360	0.6089	0.6512	0.6093
		Clip	None	0.7407	0.5051	0.5291	0.4614	0.6751	0.5344	0.9350	0.6456	0.7330	0.6450	0.7088	0.5924	0.7356	0.5752	0.5462	0.5142	0.6590	0.5679	0.9158	0.7456	0.7668	0.7350	0.6879	0.6215
			Hurricane	0.6040	0.3901	0.4104	0.3479	0.5592	0.4275	0.7437	0.4839	0.5791	0.5002	0.5461	0.4380	0.5933	0.4550	0.4425	0.4125	0.5302	0.4524	0.7381	0.5964	0.6272	0.5987	0.5365	0.4820
		Wrap	None	0.7008	0.4390	0.5136	0.4350	0.6267	0.4520	0.9134	0.6131	0.7287	0.6337	0.6893	0.5543	0.6862	0.5103	0.5339	0.4966	0.5912	0.4841	0.9085	0.7376	0.7666	0.7347	0.6797	0.6124
			Hurricane	0.5623	0.3229	0.3959	0.3254	0.4995	0.3396	0.7331	0.4646	0.5769	0.4976	0.5387	0.4188	0.5568	0.4078	0.4336	0.4037	0.4811	0.3871	0.7243	0.5840	0.6212	0.5947	0.5320	0.4756
	C	TN	None	0.9513	0.7704	0.5771	0.5260	1.0000	0.9203	1.0000	0.7474	0.7589	0.6882	0.8091	0.7226	0.9494	0.8206	0.6036	0.5760	1.0000	0.9321	1.0000	0.8523	0.7857	0.7554	0.8318	0.7774
			Hurricane	0.8366	0.6708	0.4626	0.4165	0.9158	0.8402	0.8150	0.5890	0.5986	0.5364	0.6666	0.5848	0.8007	0.6865	0.4888	0.4648	0.8642	0.8010	0.8055	0.6788	0.6353	0.6124	0.6538	0.6103
		Clip	None	0.7418	0.5041	0.5253	0.4579	0.6770	0.5344	0.9361	0.6454	0.7309	0.6421	0.7060	0.5885	0.7363	0.5762	0.5455	0.5115	0.6585	0.5677	0.9150	0.7456	0.7663	0.7326	0.6863	0.6232
			Hurricane	0.5988	0.3860	0.4053	0.3447	0.5592	0.4278	0.7423	0.4834	0.5778	0.4995	0.5461	0.4377	0.5929	0.4543	0.4436	0.4151	0.5349	0.4550	0.7327	0.5948	0.6268	0.5990	0.5345	0.4812
		Wrap	None	0.7044	0.4396	0.5118	0.4328	0.6244	0.4515	0.9164	0.6128	0.7221	0.6269	0.6900	0.5533	0.6867	0.5106	0.5334	0.4963	0.5941	0.4836	0.9111	0.7388	0.7656	0.7353	0.6786	0.6122
			Hurricane	0.5591	0.3206	0.3950	0.3238	0.4970	0.3369	0.7366	0.4669	0.5722	0.4917	0.5315	0.4140	0.5545	0.4059	0.4342	0.4022	0.4799	0.3870	0.7270	0.5858	0.6259	0.5945	0.5308	0.4737
FBC Mid Range (Shingle = 6-13 yr // Tile or Metal = 6-20 yr)	A	TN	None	0.8864	0.7817	0.5791	0.5522	0.9749	0.9222	0.9473	0.8079	0.7615	0.7261	0.8268	0.7739	0.8718	0.8000	0.5644	0.5468	0.9486	0.8957	0.9040	0.8333	0.7183	0.7035	0.7894	0.7542
			Hurricane	0.7847	0.6914	0.4768	0.4497	0.8844	0.8350	0.7951	0.6673	0.6176	0.5838	0.6905	0.6382	0.7277	0.6647	0.4472	0.4317	0.8210	0.7725	0.7142	0.6561	0.5705	0.5556	0.6106	0.5814
		Clip	None	0.7067	0.5736	0.5472	0.5175	0.6660	0.5792	0.9136	0.7690	0.7551	0.7209	0.7759	0.7163	0.6682	0.5866	0.5209	0.5056	0.6146	0.5545	0.8429	0.7683	0.7092	0.6937	0.6829	0.6504
			Hurricane	0.5918	0.4660	0.4436	0.4139	0.5600	0.4773	0.7588	0.6278	0.6162	0.5803	0.6294	0.5715	0.5387	0.4688	0.4180	0.4040	0.4956	0.4403	0.6687	0.6080	0.5641	0.5508	0.5262	0.4954
		Wrap	None	0.6864	0.5453	0.5441	0.5153	0.6380	0.5457	0.9250	0.7800	0.7548	0.7208	0.7748	0.7174	0.6485	0.5643	0.5216	0.5045	0.5802	0.5187	0.8407	0.7669	0.7089	0.6932	0.6848	0.6501
			Hurricane	0.5757	0.4458	0.4438	0.4138	0.5345	0.4437	0.7596	0.6295	0.6162	0.5803	0.6310	0.5730	0.5245	0.4511	0.4178	0.4022	0.4679	0.4107	0.6671	0.6051	0.5639	0.5507	0.5275	0.4969
	B	TN	None	0.8552	0.7555	0.5241	0.4953	0.9470	0.8981	0.8600	0.7263	0.6695	0.6325	0.7501	0.7013	0.8671	0.7960	0.5424	0.5240	0.9555	0.9043	0.8789	0.8095	0.6873	0.6716	0.7787	0.7460
			Hurricane	0.7490	0.6566	0.4138	0.3879	0.8619	0.8154	0.6826	0.6346	0.5151	0.4801	0.6046	0.5576	0.7247	0.6635	0.4282	0.4126	0.8136	0.7672	0.6942	0.6377	0.5407	0.5255	0.6035	0.5781
		Clip	None	0.6268	0.4933	0.4646	0.4266	0.5956	0.5107	0.7799	0.6229	0.6363	0.5868	0.6344	0.5666	0.6349	0.5525	0.4773	0.4594	0.5868	0.5315	0.7826	0.7053	0.6701	0.6524	0.6270	0.5893
			Hurricane	0.4991	0.3777	0.3478	0.3136	0.4827	0.4025	0.5400	0.4075	0.4892	0.4447	0.4752	0.4115	0.5000	0.4326	0.3753	0.3582	0.4643	0.4166	0.6175	0.5554	0.5289	0.5144	0.4786	0.4471
		Wrap	None	0.5849	0.4294	0.4451	0.4010	0.5356	0.4258	0.7635	0.5926	0.6297	0.5767	0.6070	0.5261	0.5832	0.4913	0.4629	0.4422	0.5102	0.4448	0.7828	0.7024	0.6696	0.6512	0.6152	0.5773
			Hurricane	0.4503	0.3108	0.3335	0.2936	0.4134	0.3129	0.5345	0.3930	0.4858	0.4408	0.4631	0.3909	0.4611	0.3841	0.3660	0.3501	0.4056	0.3483	0.6118	0.5493	0.5245	0.5115	0.4716	0.4398
	C	TN	None	0.8558	0.7565	0.5228	0.4948	0.9499	0.9013	0.8550	0.7243	0.6722	0.6329	0.7505	0.7001	0.8671	0.7960	0.5411	0.5230	0.9555	0.9043	0.8829	0.8127	0.6911	0.6726	0.7798	0.7452
			Hurricane	0.7462	0.6557	0.4096	0.3839	0.8651	0.8188	0.6902	0.5677	0.5137	0.4797	0.6048	0.5590	0.7247	0.6635	0.4279	0.4130	0.8136	0.7672	0.6951	0.6389	0.5400	0.5276	0.6046	0.5785
		Clip	None	0.6287	0.4926	0.4630	0.4253	0.5974	0.5111	0.7799	0.6229	0.6358	0.5857	0.6321	0.5620	0.6349	0.5497	0.4767	0.4579	0.5863	0.5312	0.7887	0.7090	0.6685	0.6500	0.6253	0.5894
			Hurricane	0.5008	0.3778	0.3456	0.3118	0.4827	0.4029	0.5400	0.4075	0.4872	0.4437	0.4750	0.4113	0.5000	0.4311	0.3769	0.3609	0.4656	0.4170	0.6183	0.5579	0.5290	0.5142	0.4774	0.4469
		Wrap	None	0.5857	0.4291	0.4443	0.3994	0.5353	0.4260	0.7635	0.5926	0.6257	0.5723	0.6083	0.5249	0.5802	0.4882	0.4620	0.4424	0.5110	0.4438	0.7823	0.7043	0.6686	0.6527	0.6154	0.5780
			Hurricane	0.4494	0.3108	0.3304	0.2902	0.4122	0.3110	0.5345	0.3930	0.4820	0.4359	0.4570	0.3869	0.4601	0.3853	0.3659	0.3486	0.4056	0.3483	0.6103	0.5462	0.5276	0.5107	0.4706	0.4375
FBC New (0-5 yr, all types)	A	TN	None	0.7652	0.7575	0.5147	0.5109	0.9203	0.9011	0.7662	0.7593	0.6641	0.6576	0.7584	0.7480	0.7707	0.7499	0.4988	0.4924	0.8989	0.8639	0.7691	0.7605	0.6183	0.6164	0.7384	0.7234
			Hurricane	0.6692	0.6620	0.4141	0.4081	0.8312	0.8118	0.6225	0.6160	0.5220	0.5165	0.6272	0.6141	0.6323	0.6157	0.3792	0.3751	0.7693	0.7367	0.5775	0.5704	0.4696	0.4658	0.5600	0.5495
		Clip	None	0.5499	0.5438	0.4784	0.4728	0.5816	0.5547	0.7388	0.7320	0.6577	0.6527	0.7028	0.6897	0.5374	0.5326	0.4491	0.4465	0.5392	0.5171	0.6954	0.6905	0.6069	0.6049	0.6243	0.6167
			Hurricane	0.4412	0.4355	0.3745	0.3696	0.4806	0.4534	0.5842	0.5777	0.5192	0.5113	0.5590	0.5457	0.4161	0.4111	0.3472	0.3453	0.4210	0.4027	0.5249	0.5235	0.4620	0.4610	0.4670	0.4589
		Wrap	None	0.5305	0.5243	0.4753	0.4712	0.5506	0.5201	0.7345	0.7279	0.6577	0.6529	0.7035	0.6914	0.5123	0.5086	0.4487	0.4458	0.4979	0.4788	0.6960	0.6932	0.6060	0.6039	0.6232	0.6161
			Hurricane	0.4222	0.4173	0.3731	0.3679	0.4499	0.4192	0.5842	0.5773	0.5192	0.5113	0.5603	0.5470	0.3988	0.3964	0.3462	0.3437	0.3906	0.3727	0.5239	0.5209	0.4617	0.4611	0.4682	0.4624
	B	TN	None	0.7406	0.7322	0.4693	0.4635	0.8946	0.8770	0.6882	0.6823	0.5833	0.5777	0.6888	0.6765	0.7776	0.7568	0.4796	0.4708	0.9110	0.8766	0.7445	0.7376	0.5929	0.5913	0.7291	0.7161
			Hurricane	0.6415	0.6336	0.3621	0.3564	0.8090	0.7927	0.5285	0.5229	0.4316	0.4261	0.5449	0.5320	0.6327	0.6149	0.3653	0.3588	0.7631	0.7334	0.5640	0.5585	0.4454	0.4421	0.5558	0.5469
		Clip	None	0.4743	0.4668	0.4001	0.3918	0.5161	0.4870	0.5926	0.5803	0.5395	0.5287	0.5599	0.5407	0.5065	0.4985	0.4084	0.4047	0.5146	0.4950	0.6379	0.6335	0.5734	0.5698	0.5661	0.5571
			Hurricane	0.3575	0.3511	0.2852	0.2792	0.4062	0.3775	0.4320	0.4190	0.3993	0.3892	0.4044	0.3850	0.3851	0.3794	0.3080	0.3039	0.3984	0.3809	0.4786	0.4743	0.4305	0.4300	0.4208	0.4122
		Wrap	None	0.4146	0.4016	0.3766	0.3670	0.4445	0.3996	0.5669	0.5493	0.5307	0.5196	0.5247	0.4980	0.4430	0.4360	0.3919	0.3878	0.4293	0.4055	0.6324	0.6271	0.5726	0.5676	0.5507	0.5422
			Hurricane	0.2965	0.2856	0.2711	0.2618	0.3272	0.2861	0.4178	0.4012	0.3948	0.3839	0.3875	0.3630	0.3375	0.3322	0.2983	0.2965	0.3301	0.3096	0.4121	0.4084	0.4279	0.4284	0.4113	0.4039
	C	TN	None	0.7391	0.7306	0.4685	0.4636	0.8998	0.8822	0.6897	0.6828	0.5855	0.5777	0.6918	0.6776	0.7776	0.7568	0.4785	0.4699	0.9110	0.8766	0.7474	0.7403	0.5964	0.5898	0.7278	0.7131
			Hurricane	0.6415	0.6339	0.3567	0.3513	0.8143	0.7975	0.5286	0.5208	0.4289	0.4230	0.5431	0.5332	0.6327	0.6149	0.3669	0.3611	0.7631	0.7334	0.5617	0.5566	0.4446	0.4428	0.5554	0.5466
		Clip	None	0.4741	0.4669	0.4006	0.3926	0.5179	0.4878	0.5876	0.5759	0.5408	0.5294	0.5582	0.5356	0.5033	0.4977	0.4078	0.4043	0.5140	0.4946	0.6359	0.6302	0.5706	0.5674	0.5644	0.5556
			Hurricane	0.3569	0.3512	0.2860	0.2789	0.4062	0.3781	0.4292	0.4169	0.3965	0.3879	0.4039	0.3848	0.3846	0.3795	0.3102	0.3067	0.3963	0.3791	0.4770	0.4740	0.4312	0.4295	0.4203	0.4126
		Wrap	None	0.4155	0.4036	0.3769	0.3660	0.4462	0.4006	0.5662	0.5467	0.5293	0.5176	0.5266	0.4965	0.4434	0.4355	0.3907	0.3885	0.4278	0.4040	0.6330	0.6262	0.5716	0.5702	0.5522	0.5439
			Hurricane	0.2975	0.2851	0.2657	0.2567	0.3274	0.2850	0.4140	0.3968	0.3918	0.3801	0.3824	0.3598	0.3378	0.3331	0.2976	0.2950	0.3314	0.3095	0.4091	0.4130	0.4293	0.4269	0.4105	0.4013

Table 4-5. Single-Family, Pre-FBC, Region 1, Terrain C Loss Relativity Table

Roof Cover Strength	Roof Deck	RWC	Opening Protection	Low Slope (<=6:12)																							
				2-Story												1-Story											
				Other						Hip						Other						Hip					
				Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel	
				NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR
Non-FBC	A	TN	None	1.0000	1.0000	0.8761	0.8328	1.0000	1.0000	1.0000	0.9759	0.9003	0.8364	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9451	0.8573	0.8009	0.9581	0.7886
			Hurricane	1.0000	0.9543	0.8370	0.7919	1.0000	1.0000	1.0000	0.8421	0.7801	0.7161	0.9972	0.8119	1.0000	1.0000	1.0000	0.9907	1.0000	1.0000	1.0000	0.7882	0.7210	0.6678	0.8053	0.6498
		Clip	None	1.0000	0.9064	0.8679	0.8232	1.0000	0.8907	1.0000	0.9591	0.8981	0.8351	1.0000	0.8986	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8955	0.7954	0.7348	0.9222	0.7417
			Hurricane	1.0000	0.8618	0.8230	0.7766	1.0000	0.8389	1.0000	0.8312	0.7747	0.7094	0.9677	0.7706	1.0000	1.0000	1.0000	0.9495	1.0000	1.0000	1.0000	0.7314	0.6517	0.5927	0.7657	0.5946
		Wrap	None	1.0000	0.9026	0.8659	0.8200	1.0000	0.8776	1.0000	0.9594	0.8981	0.8351	1.0000	0.9022	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8950	0.7916	0.7305	0.9194	0.7390
			Hurricane	1.0000	0.8551	0.8219	0.7761	1.0000	0.8329	1.0000	0.8312	0.7747	0.7094	0.9677	0.7711	1.0000	1.0000	1.0000	0.9433	1.0000	1.0000	1.0000	0.7315	0.6482	0.5902	0.7683	0.5971
	B	TN	None	1.0000	0.8039	0.5593	0.5076	1.0000	0.9230	1.0000	0.7696	0.6897	0.5945	0.9718	0.7838	1.0000	0.8508	0.8425	0.7905	0.9605	0.7942	1.0000	0.8675	0.8187	0.7713	0.8689	0.7258
			Hurricane	0.9869	0.7297	0.4774	0.4284	0.9378	0.8612	1.0000	0.6286	0.5374	0.4953	0.8361	0.6640	1.0000	0.7254	0.7191	0.6717	0.8336	0.6826	1.0000	0.7331	0.6882	0.6452	0.7311	0.6046
		Clip	None	0.8818	0.4937	0.4837	0.4041	0.6879	0.5262	1.0000	0.5612	0.6352	0.4980	0.8238	0.5265	1.0000	0.6335	0.6603	0.5824	0.8254	0.5887	1.0000	0.6855	0.6714	0.5994	0.7606	0.5565
			Hurricane	0.7522	0.4083	0.3963	0.3212	0.5962	0.4499	1.0000	0.4111	0.4829	0.3641	0.6509	0.3831	0.9830	0.5122	0.5431	0.4737	0.6806	0.4769	1.0000	0.5370	0.5206	0.4587	0.5917	0.4164
		Wrap	None	0.8464	0.4070	0.4676	0.3717	0.6293	0.4109	1.0000	0.5011	0.6278	0.4753	0.8114	0.4580	1.0000	0.5804	0.6292	0.5351	0.7985	0.5398	1.0000	0.6724	0.6616	0.5848	0.7500	0.5380
			Hurricane	0.7120	0.3215	0.3812	0.2943	0.5249	0.3289	0.9904	0.3691	0.4771	0.3489	0.6327	0.3314	0.9574	0.4661	0.5075	0.4247	0.6560	0.4297	1.0000	0.5123	0.5047	0.4353	0.5808	0.3940
	C	TN	None	1.0000	0.7935	0.5460	0.4944	1.0000	0.9190	1.0000	0.7666	0.6881	0.5931	0.9705	0.7849	1.0000	0.8488	0.8393	0.7870	0.9539	0.7947	1.0000	0.8681	0.8184	0.7702	0.8701	0.7245
			Hurricane	0.9809	0.7222	0.4608	0.4118	0.9392	0.8626	1.0000	0.6315	0.5361	0.4469	0.8365	0.6608	1.0000	0.7206	0.7160	0.6713	0.8152	0.6753	1.0000	0.7325	0.6878	0.6463	0.7238	0.6002
		Clip	None	0.8616	0.4759	0.4542	0.3756	0.6798	0.5194	1.0000	0.5584	0.6314	0.4912	0.8260	0.5269	1.0000	0.6165	0.6418	0.5683	0.8032	0.5724	1.0000	0.6885	0.6733	0.6011	0.7571	0.5534
			Hurricane	0.7315	0.3863	0.3547	0.2821	0.5793	0.4317	0.9928	0.4035	0.4786	0.3577	0.6503	0.3818	0.9585	0.4980	0.5190	0.4570	0.6600	0.4638	1.0000	0.5375	0.5167	0.4570	0.5915	0.4183
		Wrap	None	0.8118	0.3699	0.4257	0.3241	0.6029	0.3840	1.0000	0.4793	0.6176	0.4448	0.8021	0.4445	1.0000	0.5444	0.5936	0.4996	0.7671	0.5061	1.0000	0.6699	0.6631	0.5799	0.7447	0.5338
			Hurricane	0.6638	0.2732	0.3250	0.2356	0.4833	0.2886	0.9811	0.3509	0.4668	0.3254	0.6266	0.3201	0.9164	0.4272	0.4685	0.3891	0.6145	0.3946	1.0000	0.5096	0.5040	0.4336	0.5772	0.3912
FBC Old (Shingle > 13 yr // Tile or Metal > 20 yr)	A	TN	None	1.0000	0.9815	0.8761	0.8328	1.0000	1.0000	1.0000	0.9208	0.9003	0.8364	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8238	0.8573	0.8009	0.9581	0.7886
			Hurricane	1.0000	0.9349	0.8370	0.7919	1.0000	1.0000	1.0000	0.7906	0.7801	0.7161	0.9972	0.8119	1.0000	1.0000	1.0000	0.9907	1.0000	1.0000	0.8970	0.6811	0.7210	0.6678	0.8053	0.6498
		Clip	None	1.0000	0.8786	0.8679	0.8232	1.0000	0.8907	1.0000	0.8995	0.8981	0.8351	1.0000	0.8986	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.7772	0.7954	0.7348	0.9222	0.7417
			Hurricane	1.0000	0.8337	0.8230	0.7766	1.0000	0.8389	1.0000	0.7645	0.7747	0.7094	0.9677	0.7706	1.0000	1.0000	1.0000	0.9495	1.0000	1.0000	0.8465	0.6180	0.6517	0.5927	0.7657	0.5946
		Wrap	None	1.0000	0.8741	0.8659	0.8200	1.0000	0.8776	1.0000	0.9003	0.8981	0.8351	1.0000	0.9022	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.7781	0.7916	0.7305	0.9194	0.7390
			Hurricane	1.0000	0.8240	0.8219	0.7761	1.0000	0.8329	1.0000	0.7645	0.7747	0.7094	0.9677	0.7711	1.0000	1.0000	1.0000	0.9433	1.0000	1.0000	0.8476	0.6190	0.6482	0.5902	0.7683	0.5971
	B	TN	None	0.9107	0.7787	0.5593	0.5076	1.0000	0.9230	1.0000	0.7227	0.6897	0.5945	0.9718	0.7838	1.0000	0.7850	0.8425	0.7905	0.9605	0.7942	1.0000	0.7605	0.8187	0.7713	0.8689	0.7258
			Hurricane	0.8336	0.7119	0.4774	0.4284	0.9378	0.8612	0.8353	0.5897	0.5374	0.4953	0.8361	0.6640	0.8506	0.6632	0.7191	0.6717	0.8336	0.6826	0.8226	0.6278	0.6882	0.6452	0.7311	0.6046
		Clip	None	0.6776	0.4712	0.4837	0.4041	0.6879	0.5262	0.8738	0.5140	0.6352	0.4980	0.8238	0.5265	0.8563	0.5692	0.6603	0.5824	0.8254	0.5887	0.8913	0.5836	0.6714	0.5994	0.7606	0.5565
			Hurricane	0.5706	0.3895	0.3963	0.3212	0.5962	0.4499	0.6751	0.3621	0.4829	0.3641	0.6509	0.3831	0.6917	0.4521	0.5431	0.4737	0.6806	0.4769	0.6841	0.4306	0.5206	0.4587	0.5917	0.4164
		Wrap	None	0.6304	0.3851	0.4676	0.3717	0.6293	0.4109	0.8547	0.4550	0.6278	0.4753	0.8114	0.4580	0.8304	0.5183	0.6292	0.5351	0.7985	0.5398	0.8843	0.5674	0.6616	0.5848	0.7500	0.5380
			Hurricane	0.5183	0.3007	0.3812	0.2943	0.5249	0.3289	0.6586	0.3237	0.4771	0.3489	0.6327	0.3314	0.6681	0.4040	0.5075	0.4247	0.6560	0.4297	0.6695	0.4111	0.5047	0.4353	0.5808	0.3940
	C	TN	None	0.9119	0.7777	0.5460	0.4944	1.0000	0.9190	1.0000	0.7194	0.6881	0.5931	0.9705	0.7849	1.0000	0.7827	0.8393	0.7870	0.9539	0.7947	1.0000	0.7600	0.8184	0.7702	0.8701	0.7245
			Hurricane	0.8307	0.7093	0.4608	0.4118	0.9392	0.8626	0.8264	0.5820	0.5361	0.4469	0.8365	0.6608	0.8422	0.6604	0.7160	0.6713	0.8152	0.6753	0.8207	0.6266	0.6878	0.6463	0.7238	0.6002
		Clip	None	0.6633	0.4574	0.4542	0.3756	0.6798	0.5194	0.8702	0.5116	0.6314	0.4912	0.8260	0.5269	0.8387	0.5532	0.6418	0.5683	0.8032	0.5724	0.8932	0.5841	0.6733	0.6011	0.7571	0.5534
			Hurricane	0.5467	0.3644	0.3547	0.2821	0.5793	0.4317	0.6747	0.3601	0.4786	0.3577	0.6503	0.3818	0.6695	0.4352	0.5190	0.4570	0.6600	0.4638	0.6811	0.4287	0.5167	0.4570	0.5915	0.4183
		Wrap	None	0.5995	0.3507	0.4257	0.3241	0.6029	0.3840	0.8473	0.4348	0.6176	0.4448	0.8021	0.4445	0.8023	0.4819	0.5936	0.4996	0.7671	0.5061	0.8773	0.5600	0.6631	0.5799	0.7447	0.5338
			Hurricane	0.4709	0.2528	0.3250	0.2356	0.4833	0.2886	0.6514	0.3069	0.4668	0.3254	0.6266	0.3201	0.6250	0.3632	0.4685	0.3891	0.6145	0.3946	0.6694	0.4067	0.5040	0.4336	0.5772	0.3912
FBC Mid Range (Shingle = 6-13 yr // Tile or Metal = 6-20 yr)	A	TN	None	1.0000	0.9623	0.8201	0.7953	1.0000	1.0000	1.0000	0.8995	0.8134	0.7778	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9522	0.8038	0.7693	0.7343	0.8493	0.7440
			Hurricane	1.0000	0.9187	0.7786	0.7521	1.0000	1.0000	0.9215	0.7700	0.6890	0.6535	0.8993	0.7873	1.0000	1.0000	0.9495	0.9134	1.0000	1.0000	0.7802	0.6520	0.6377	0.6032	0.7062	0.6075
		Clip	None	0.9921	0.8622	0.8052	0.7800	0.9728	0.8716	1.0000	0.8818	0.8104	0.7746	0.9929	0.8744	1.0000	1.0000	0.9825	0.9481	1.0000	1.0000	0.8962	0.7417	0.6901	0.6564	0.8055	0.6949
			Hurricane	0.9448	0.8192	0.7611	0.7352	0.9257	0.8240	0.9000	0.7490	0.6853	0.6494	0.8650	0.7456	1.0000	0.9976	0.9010	0.8667	1.0000	0.9762	0.7241	0.5871	0.5491	0.5157	0.6562	0.5498
		Wrap	None	0.9906	0.8609	0.8037	0.7779	0.9613	0.8593	1.0000	0.8823	0.8100	0.7743	0.9943	0.8759	1.0000	1.0000	0.9783	0.9450	1.0000	1.0000	0.8975	0.7420	0.6898	0.6553	0.8027	0.6918
			Hurricane	0.9382	0.8089	0.7595	0.7339	0.9182	0.8152	0.9001	0.7490	0.6846	0.6485	0.8655	0.7458	1.0000	0.9939	0.8974	0.8634	1.0000	0.9702	0.7216	0.5872	0.5452	0.4999	0.6574	0.5509
	B	TN	None	0.8552	0.7727	0.5169	0.4867	0.9629	0.9109	0.8867	0.7131	0.6129	0.5588	0.8759	0.7608	0.9020	0.7645	0.7774	0.7392	0.8628	0.7518	0.8876	0.7413	0.7409	0.7081	0.7694	0.6809
			Hurricane	0.7798	0.7046	0.4385	0.4096	0.8959	0.8456	0.7273	0.5740	0.4660	0.4390	0.7459	0.6375	0.7589	0.6433	0.6573	0.6222	0.7383	0.6370	0.7199	0.6048	0.6149	0.5853	0.6396	0.5596
		Clip	None	0.6002	0.4650	0.4281	0.3822	0.6138	0.5086	0.7459	0.5057	0.5406	0.4621	0.6996	0.5016	0.7313	0.5499	0.5756	0.5295	0.7032	0.5433	0.7470	0.5608	0.5750	0.5346	0.6391	0.5084
			Hurricane	0.4991	0.3819	0.3429	0.2994	0.5283	0.4313	0.5590	0.3546	0.3962	0.3281	0.5375	0.3560	0.5855	0.4318	0.4615	0.4201	0.5731	0.4328	0.5606	0.4087	0.4309	0.3958	0.4845	0.3706
		Wrap	None	0.5423	0.3796	0.4054	0.3494	0.5447	0.3939	0.7158	0.4455	0.5261	0.4374	0.6776	0.4310	0.7032	0.5014	0.5341	0.4803	0.6733	0.4939	0.7413	0.5443	0.5615	0.5182	0.6308	0.4917
			Hurricane	0.4386	0.2938	0.3231	0.2715	0.4490	0.3116	0.5358	0.3134	0.3865	0.3120	0.5159	0.3045	0.5515	0.3815	0.4192	0.3707	0.5452	0.3855	0.5497	0.3849	0.4122	0.3732	0.4709	0.3478
	C	TN	None	0.8503	0.7672	0.5049	0.4748	0.9573	0.9050	0.8869	0.7127	0.6118	0.5583	0.8756	0.7616	0.8970	0.7627	0.7772	0.7388	0.8593	0.7535	0.8867	0.7412	0.7409	0.7077	0.7720	0.6825
			Hurricane	0.7740	0.6978	0.4220	0.3933	0.8953	0.8450	0.7294	0.5751	0.4632	0.4130	0.7451	0.6347	0.7483	0.6349	0.6557	0.6222	0.7271	0.6331	0.7211	0.6055	0.6146	0.5858	0.6373	0.5591
		Clip	None	0.5836	0.4489	0.4010	0.3561	0.6051	0.5013	0.7411	0.5029	0.5362	0.4552	0.7007	0.5016	0.7122	0.5329	0.5574	0.5138	0.6822	0.5279	0.7475	0.5614	0.5753	0.5349	0.6382	0.5071
			Hurricane	0.4799	0.3613	0.3047	0.2627	0.5129	0.4158	0.5595	0.3508	0.3916	0.3220	0.5370	0.3548	0.5619	0.4160	0.4413	0.4046	0.5498	0.4174	0.5610	0.4085	0.4288	0.3946	0.4851	0.3721
		Wrap	None	0.5112	0.3440	0.3636	0.3045	0.5172	0.3667	0.7096	0.4259	0.5137	0.4103	0.6707	0.4172	0.6705	0.4610	0.4996	0.4454	0.6407	0.4598	0.7395	0.5392	0.5608	0.5144	0.6250	0.4866
			Hurricane	0.3915	0.2458	0.2681	0.2157	0.4081	0.2720	0.5284	0.2956	0.3744	0.2909	0.5098	0.2928	0.5141	0.3453	0.3834	0.3373	0.5043	0.3515	0.5450	0.3826	0.4109	0.3711	0.4693	0.3461
FBC New (0-5 yr, all types)	A	TN	None	0.9520	0.9424	0.7641	0.7577	1.0000	1.0000	0.8715	0.8617	0.7266	0.7191	0.9190	0.8834	1.0000	1.0000	0.9435	0.9275	1.0000	1.0000	0.7597	0.7447	0.6812	0.6678	0.7405	0.6994
			Hurricane	0.9085	0.8981	0.7201	0.7123	1.0000	0.9883	0.7394	0.7302	0.5980	0.5908	0.8014	0.7626	0.9740	0.9606	0.8513	0.8362	1.0000	0.9574	0.6137	0.5748	0.5545	0.5386	0.6071	0.5652
		Clip	None	0.8440	0.8369	0.7424	0.7368	0.8887	0.8525	0.8460	0.8377	0.7227	0.7142	0.8891	0.8502	1.0000	1.0000	0.8814	0.8715	1.0000	1.0000	0.6926	0.6844	0.5849	0.5781	0.6887	0.6481
			Hurricane	0.7972	0.7903	0.6992	0.6938	0.8464	0.8092	0.7168	0.7082	0.5960	0.5894	0.7623	0.7206	0.9372	0.9268	0.7927	0.7838	0.9832	0.9284	0.5358	0.5284	0.4464	0.4387	0.5466	0.5051
		Wrap	None	0.8356	0.8286	0.7416	0.7357	0.8769	0.8409	0.8450	0.8364	0.7220	0.7136	0.8874	0.8495	1.0000	1.0000	0.8709	0.8626	1.0000	1.0000	0.6911	0.6825	0.5879	0.5802	0.6860	0.6445
			Hurricane	0.7950	0.7875	0.6971	0.6917	0.8348	0.7975	0.7169	0.7082	0.5945	0.5875	0.7634	0.7205	0.9368	0.9258	0.7914	0.7835	0.9773	0.9228	0.5376	0.5286	0.4421	0.4097	0.5465	0.5047
	B	TN	None	0.7695	0.7577	0.4745	0.4659	0.9224	0.8987	0.7037	0.6926	0.5361	0.5230	0.7801	0.7378	0.7402	0.7158	0.7122	0.6879	0.7651	0.7095	0.7034	0.6872	0.6631	0.6450	0.6698	0.6361
			Hurricane	0.6985	0.6871	0.3996	0.3907	0.8539	0.8300	0.5622	0.5507	0.3945	0.3827	0.6558	0.6110	0.6130	0.5900	0.5956	0.5727	0.6431	0.5914	0.5723	0.5550	0.5415	0.5255	0.5482	0.5147
		Clip	None	0.4566	0.4455	0.3724	0.3603	0.5397	0.4910	0.5039	0.4805	0.4461	0.4261	0.5754	0.4766	0.5183	0.4979	0.4910	0.4765	0.5811	0.4979	0.5237	0.5083	0.4786	0.4699	0.5177	0.4603
			Hurricane	0.3735	0.3626	0.2895	0.2777	0.4604	0.4126	0.3521	0.3299	0.3095	0.2921	0.4242	0.3290	0.3995	0.3807	0.3798	0.3664	0.4657	0.3887	0.3748	0.3611	0.3413	0.3329	0.3773	0.3248
		Wrap	None	0.3810	0.3621	0.3431	0.3271	0.4602	0.3769	0.4597	0.4209	0.4244	0.3996	0.5438	0.4039	0.4723	0.4472	0.4390	0.4254	0.5480	0.4481	0.5144	0.4940	0.4613	0.4516	0.5116	0.4453
			Hurricane	0.2966	0.2772	0.2651	0.2487	0.3730	0.2943	0.3239	0.2900	0.2960	0.2751	0.3990	0.2775	0.3548	0.3307	0.3309	0.3167	0.4345	0.3412	0.3540	0.3357	0.3198	0.3111	0.3610	0.3015
	C	TN	None	0.7649	0.7539	0.4638	0.4552	0.9146	0.8909	0.6993	0.6887	0.5355	0.5234	0.7807	0.7383	0.7438	0.7197	0.7151	0.6906	0.7646	0.7123	0.7073	0.6923	0.6634	0.6452	0.6739	0.6404
			Hurricane	0.6926	0.6806	0.3832	0.3748	0.8514	0.8273	0.5635	0.5516	0.3903	0.3792	0.6537	0.6087	0.6097	0.5885	0.5954	0.5731	0.6391	0.5908	0.5719	0.5553	0.5413	0.5253	0.5508	0.5179
		Clip	None	0.4437	0.4329	0.3478	0.3365	0.5304	0.4832	0.5021	0.4787	0.4409	0.4193	0.5755	0.4762	0.4983	0.4793	0.4731	0.4593	0.5613	0.4833	0.5227	0.5069	0.4772	0.4688	0.5193	0.4608
			Hurricane	0.3531	0.3424	0.2548	0.2434	0.4465	0.3999	0.3495	0.3242	0.3045	0.2864	0.4236	0.3277	0.3786	0.3617	0.3637	0.3522	0.4396	0.3710	0.3736	0.3579	0.3409	0.3321	0.3786	0.3260
		Wrap	None	0.3455	0.3261	0.3016	0.2848	0.4315	0.3493	0.4490	0.4012	0.4098	0.3758	0.5394	0.3899	0.4382	0.4106	0.4055	0.3912	0.5143	0.4135	0.5087	0.4870	0.4585	0.4489	0.5053	0.4394
			Hurricane	0.2470	0.2289	0.2112	0.1959	0.3330	0.2553	0.3099	0.2732	0.2820	0.2564	0.3929	0.2655	0.3200	0.2953	0.2984	0.2855	0.3941	0.3083	0.3520	0.3324	0.3178	0.3087	0.3615	0.3010

Table 4-5. Single-Family, Pre-FBC, Region 1, Terrain C Loss Relativity Table (Continued)

Roof Cover Strength	Roof Deck	RWC	Opening Protection	High Slope (> 6:12)																							
				2-Story												1-Story											
				Other						Hip						Other						Hip					
				Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel	
				NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR
Non-FBC	A	TN	None	1.0000	0.8562	0.6744	0.6244	1.0000	0.9455	1.0000	0.9086	0.8619	0.7926	0.9191	0.8247	1.0000	0.8735	0.6281	0.5893	1.0000	0.9287	1.0000	0.9600	0.8035	0.7540	0.8728	0.7951
			Hurricane	1.0000	0.7320	0.5504	0.4999	0.9057	0.8337	1.0000	0.7279	0.6930	0.6198	0.7516	0.6572	0.9915	0.7339	0.5066	0.4702	0.8668	0.7991	1.0000	0.7556	0.6278	0.5811	0.6801	0.6081
		Clip	None	1.0000	0.6630	0.6420	0.5856	0.7761	0.6423	1.0000	0.8756	0.8543	0.7823	0.8620	0.7588	1.0000	0.6543	0.5911	0.5491	0.6995	0.5901	1.0000	0.8884	0.7990	0.7478	0.7563	0.6672
			Hurricane	0.9186	0.5254	0.5187	0.4612	0.6447	0.5141	1.0000	0.6936	0.6921	0.6159	0.6923	0.5866	0.8421	0.5211	0.4734	0.4351	0.5629	0.4618	1.0000	0.6939	0.6217	0.5753	0.5767	0.4946
		Wrap	None	1.0000	0.6426	0.6400	0.5828	0.7528	0.6063	1.0000	0.8756	0.8543	0.7823	0.8699	0.7638	1.0000	0.6318	0.5886	0.5479	0.6683	0.5488	1.0000	0.8932	0.7988	0.7477	0.7602	0.6704
			Hurricane	0.9132	0.5085	0.5192	0.4618	0.6244	0.4794	1.0000	0.6936	0.6921	0.6159	0.6955	0.5859	0.8302	0.5012	0.4713	0.4333	0.5384	0.4294	1.0000	0.6941	0.6229	0.5758	0.5755	0.4929
	B	TN	None	1.0000	0.8225	0.6134	0.5580	0.9999	0.9270	1.0000	0.8042	0.7592	0.6756	0.8383	0.7487	1.0000	0.8745	0.5978	0.5567	0.9971	0.9287	1.0000	0.9209	0.7506	0.6968	0.8496	0.7786
			Hurricane	1.0000	0.6976	0.4739	0.4195	0.8887	0.8189	1.0000	0.6145	0.5678	0.4887	0.6603	0.5700	0.9831	0.7319	0.4679	0.4326	0.8650	0.8009	1.0000	0.7250	0.5751	0.5273	0.6605	0.5983
		Clip	None	1.0000	0.5665	0.5494	0.4686	0.7161	0.5741	1.0000	0.6658	0.7045	0.5842	0.7128	0.5821	0.9890	0.6003	0.5214	0.4696	0.6644	0.5600	1.0000	0.7757	0.7254	0.6660	0.6669	0.5700
			Hurricane	0.8246	0.4192	0.4070	0.3328	0.5640	0.4301	1.0000	0.4842	0.5314	0.4318	0.5266	0.4021	0.7918	0.4665	0.4024	0.3561	0.5270	0.4328	1.0000	0.5944	0.5497	0.4959	0.4926	0.4075
		Wrap	None	0.9858	0.4784	0.5234	0.4221	0.6517	0.4671	1.0000	0.6050	0.6979	0.5656	0.6791	0.5077	0.9412	0.5120	0.5103	0.4509	0.5815	0.4457	1.0000	0.7616	0.7258	0.6644	0.6573	0.5526
			Hurricane	0.7858	0.3395	0.3879	0.3009	0.4962	0.3269	1.0000	0.4462	0.5287	0.4173	0.5032	0.3596	0.7504	0.3923	0.3920	0.3404	0.4522	0.3346	1.0000	0.5771	0.5478	0.4933	0.4762	0.3849
	C	TN	None	1.0000	0.8238	0.6125	0.5574	1.0000	0.9271	1.0000	0.8079	0.7569	0.6748	0.8402	0.7489	1.0000	0.8745	0.5960	0.5555	1.0000	0.9307	1.0000	0.9235	0.7483	0.6939	0.8510	0.7802
			Hurricane	1.0000	0.6968	0.4703	0.4158	0.8887	0.8189	1.0000	0.6135	0.5646	0.4865	0.6606	0.5695	0.9831	0.7319	0.4705	0.4348	0.8650	0.8009	1.0000	0.7262	0.5756	0.5282	0.6599	0.5954
		Clip	None	1.0000	0.5677	0.5475	0.4681	0.7132	0.5713	1.0000	0.6621	0.7041	0.5820	0.7160	0.5804	0.9878	0.6005	0.5231	0.4699	0.6699	0.5644	1.0000	0.7748	0.7240	0.6634	0.6646	0.5681
			Hurricane	0.8239	0.4177	0.4062	0.3326	0.5674	0.4326	1.0000	0.4815	0.5294	0.4274	0.5259	0.4027	0.7912	0.4669	0.4037	0.3580	0.5250	0.4323	1.0000	0.5921	0.5497	0.4948	0.4893	0.4048
		Wrap	None	0.9838	0.4765	0.5209	0.4185	0.6538	0.4661	1.0000	0.6025	0.6952	0.5585	0.6753	0.5023	0.9459	0.5129	0.5067	0.4471	0.5828	0.4461	1.0000	0.7625	0.7186	0.6581	0.6525	0.5498
			Hurricane	0.7832	0.3364	0.3874	0.2985	0.4928	0.3253	1.0000	0.4407	0.5232	0.4085	0.5024	0.3558	0.7497	0.3932	0.3885	0.3357	0.4527	0.3354	1.0000	0.5775	0.5449	0.4910	0.4793	0.3880
FBC Old (Shingle > 13 yr // Tile or Metal > 20 yr)	A	TN	None	0.9835	0.8179	0.6744	0.6244	1.0000	0.9455	1.0000	0.8413	0.8619	0.7926	0.9191	0.8247	0.9487	0.8113	0.6281	0.5893	1.0000	0.9287	1.0000	0.8316	0.8035	0.7540	0.8728	0.7951
			Hurricane	0.8483	0.6993	0.5504	0.4999	0.9057	0.8337	0.8861	0.6622	0.6930	0.6198	0.7516	0.6572	0.7896	0.6702	0.5066	0.4702	0.8668	0.7991	0.7940	0.6267	0.6278	0.5811	0.6801	0.6081
		Clip	None	0.8429	0.6263	0.6420	0.5856	0.7761	0.6423	1.0000	0.8025	0.8543	0.7823	0.8620	0.7588	0.7657	0.5875	0.5911	0.5491	0.6995	0.5901	0.9716	0.7582	0.7990	0.7478	0.7563	0.6672
			Hurricane	0.6830	0.4875	0.5187	0.4612	0.6447	0.5141	0.8600	0.6211	0.6921	0.6159	0.6923	0.5866	0.6111	0.4571	0.4734	0.4351	0.5629	0.4618	0.7411	0.5610	0.6217	0.5753	0.5767	0.4946
		Wrap	None	0.8277	0.5998	0.6400	0.5828	0.7528	0.6063	1.0000	0.8074	0.8543	0.7823	0.8699	0.7638	0.7496	0.5669	0.5886	0.5479	0.6683	0.5488	0.9695	0.7555	0.7988	0.7477	0.7602	0.6704
			Hurricane	0.6738	0.4686	0.5192	0.4618	0.6244	0.4794	0.8611	0.6223	0.6921	0.6159	0.6955	0.5859	0.5920	0.4343	0.4713	0.4333	0.5384	0.4294	0.7409	0.5605	0.6229	0.5758	0.5755	0.4929
	B	TN	None	0.9508	0.7895	0.6134	0.5580	0.9999	0.9270	1.0000	0.7463	0.7592	0.6756	0.8383	0.7487	0.9461	0.8127	0.5978	0.5567	0.9971	0.9287	1.0000	0.7968	0.7506	0.6968	0.8496	0.7786
			Hurricane	0.8071	0.6615	0.4739	0.4195	0.8887	0.8189	0.7731	0.5478	0.5678	0.4887	0.6603	0.5700	0.7834	0.6710	0.4679	0.4326	0.8650	0.8009	0.7649	0.6021	0.5751	0.5273	0.6605	0.5983
		Clip	None	0.7625	0.5345	0.5494	0.4686	0.7161	0.5741	0.9113	0.6027	0.7045	0.5842	0.7128	0.5821	0.7238	0.5351	0.5214	0.4696	0.6644	0.5600	0.8902	0.6469	0.7254	0.6660	0.6669	0.5700
			Hurricane	0.5886	0.3839	0.4070	0.3328	0.5640	0.4301	0.6925	0.4232	0.5314	0.4318	0.5266	0.4021	0.5585	0.4029	0.4024	0.3561	0.5270	0.4328	0.6620	0.4628	0.5497	0.4959	0.4926	0.4075
		Wrap	None	0.7139	0.4440	0.5234	0.4221	0.6517	0.4671	0.8861	0.5423	0.6979	0.5656	0.6791	0.5077	0.6722	0.4512	0.5103	0.4509	0.5815	0.4457	0.8840	0.6357	0.7258	0.6644	0.6573	0.5526
			Hurricane	0.5399	0.3047	0.3879	0.3009	0.4962	0.3269	0.6759	0.3835	0.5287	0.4173	0.5032	0.3596	0.5084	0.3283	0.3920	0.3404	0.4522	0.3346	0.6525	0.4507	0.5478	0.4933	0.4762	0.3849
	C	TN	None	0.9515	0.7898	0.6125	0.5574	1.0000	0.9271	1.0000	0.7480	0.7569	0.6748	0.8402	0.7489	0.9455	0.8128	0.5960	0.5555	1.0000	0.9307	1.0000	0.7963	0.7483	0.6939	0.8510	0.7802
			Hurricane	0.8072	0.6614	0.4703	0.4158	0.8887	0.8189	0.7745	0.5485	0.5646	0.4865	0.6606	0.5695	0.7834	0.6710	0.4705	0.4348	0.8650	0.8009	0.7635	0.6024	0.5756	0.5282	0.6599	0.5954
		Clip	None	0.7636	0.5335	0.5475	0.4681	0.7132	0.5713	0.9077	0.5999	0.7041	0.5820	0.7160	0.5804	0.7239	0.5354	0.5231	0.4699	0.6699	0.5644	0.8905	0.6450	0.7240	0.6634	0.6646	0.5681
			Hurricane	0.5898	0.3855	0.4062	0.3326	0.5674	0.4326	0.6939	0.4227	0.5294	0.4274	0.5259	0.4027	0.5574	0.4015	0.4037	0.3580	0.5250	0.4323	0.6627	0.4628	0.5497	0.4948	0.4893	0.4048
		Wrap	None	0.7098	0.4430	0.5209	0.4185	0.6538	0.4661	0.8850	0.5336	0.6952	0.5585	0.6753	0.5023	0.6674	0.4488	0.5067	0.4471	0.5828	0.4461	0.8833	0.6326	0.7186	0.6581	0.6525	0.5498
			Hurricane	0.5389	0.3039	0.3874	0.2985	0.4928	0.3253	0.6734	0.3804	0.5232	0.4085	0.5024	0.3558	0.5094	0.3295	0.3885	0.3357	0.4527	0.3354	0.6532	0.4491	0.5449	0.4910	0.4793	0.3880
FBC Mid Range (Shingle = 6-13 yr // Tile or Metal = 6-20 yr)	A	TN	None	0.9067	0.8133	0.6207	0.5921	0.9784	0.9314	0.9663	0.8281	0.7750	0.7363	0.8621	0.8074	0.8793	0.7970	0.5685	0.5439	0.9612	0.9060	0.9055	0.8028	0.7036	0.6758	0.8187	0.7681
			Hurricane	0.7810	0.6939	0.4946	0.4663	0.8692	0.8236	0.7713	0.6448	0.6048	0.5645	0.6944	0.6393	0.7312	0.6597	0.4458	0.4235	0.8280	0.7755	0.6931	0.6046	0.5308	0.5044	0.6241	0.5774
		Clip	None	0.7432	0.6141	0.5796	0.5479	0.7061	0.6250	0.9343	0.7864	0.7656	0.7253	0.7986	0.7395	0.6750	0.5734	0.5216	0.4979	0.6296	0.5613	0.8341	0.7258	0.6941	0.6661	0.6835	0.6325
			Hurricane	0.5945	0.4768	0.4565	0.4244	0.5756	0.4964	0.7378	0.6046	0.5996	0.5576	0.6252	0.5644	0.5259	0.4411	0.4066	0.3847	0.4988	0.4346	0.6282	0.5341	0.5168	0.4907	0.5091	0.4611
		Wrap	None	0.7262	0.5909	0.5771	0.5444	0.6754	0.5874	0.9328	0.7850	0.7656	0.7254	0.8049	0.7436	0.6467	0.5454	0.5190	0.4960	0.5899	0.5180	0.8371	0.7267	0.6940	0.6662	0.6865	0.6345
			Hurricane	0.5813	0.4575	0.4551	0.4225	0.5472	0.4596	0.7368	0.6036	0.5996	0.5576	0.6263	0.5640	0.5077	0.4201	0.4043	0.3827	0.4650	0.3983	0.6290	0.5339	0.5177	0.4916	0.5069	0.4590
	B	TN	None	0.8788	0.7861	0.5646	0.5331	0.9613	0.9158	0.8701	0.7302	0.6775	0.6305	0.7850	0.7322	0.8764	0.7972	0.5427	0.5166	0.9617	0.9074	0.8793	0.7732	0.6525	0.6216	0.7953	0.7489
			Hurricane	0.7485	0.6643	0.4254	0.3947	0.8477	0.8038	0.6616	0.5359	0.4904	0.4461	0.6013	0.5488	0.7247	0.6580	0.4143	0.3920	0.8308	0.7804	0.6610	0.5772	0.4836	0.4564	0.6080	0.5663
		Clip	None	0.6630	0.5263	0.4880	0.4423	0.6426	0.5554	0.7682	0.5883	0.6091	0.5409	0.6387	0.5599	0.6282	0.5217	0.4553	0.4257	0.5962	0.5308	0.7525	0.6222	0.6230	0.5896	0.5924	0.5345
			Hurricane	0.5001	0.3768	0.3498	0.3078	0.4958	0.4123	0.5704	0.4116	0.4452	0.3885	0.4551	0.3807	0.4787	0.3911	0.3411	0.3147	0.4649	0.4054	0.5459	0.4430	0.4534	0.4236	0.4230	0.3721
		Wrap	None	0.6035	0.4376	0.4549	0.3959	0.5656	0.4469	0.7405	0.5284	0.5980	0.5214	0.5902	0.4837	0.5625	0.4357	0.4407	0.4070	0.5015	0.4153	0.7439	0.6130	0.6237	0.5893	0.5792	0.5161
			Hurricane	0.4429	0.2983	0.3262	0.2760	0.4175	0.3075	0.5458	0.3716	0.4379	0.3738	0.4250	0.3368	0.4200	0.3170	0.3258	0.2964	0.3809	0.3049	0.5353	0.4271	0.4506	0.4205	0.4064	0.3508
	C	TN	None	0.8784	0.7856	0.5638	0.5322	0.9601	0.9146	0.8719	0.7319	0.6760	0.6303	0.7846	0.7314	0.8764	0.7972	0.5418	0.5160	0.9631	0.9085	0.8793	0.7731	0.6515	0.6210	0.7967	0.7500
			Hurricane	0.7482	0.6625	0.4217	0.3911	0.8493	0.8056	0.6648	0.5378	0.4881	0.4449	0.6020	0.5483	0.7247	0.6580	0.4152	0.3927	0.8308	0.7804	0.6620	0.5778	0.4836	0.4567	0.6086	0.5657
		Clip	None	0.6624	0.5257	0.4871	0.4419	0.6397	0.5529	0.7690	0.5888	0.6083	0.5388	0.6390	0.5582	0.6289	0.5221	0.4560	0.4256	0.6005	0.5339	0.7556	0.6272	0.6217	0.5884	0.5900	0.5324
			Hurricane	0.5024	0.3795	0.3489	0.3071	0.4971	0.4137	0.5659	0.4085	0.4436	0.3855	0.4544	0.3801	0.4788	0.3906	0.3415	0.3154	0.4616	0.4031	0.5431	0.4403	0.4529	0.4227	0.4222	0.3710
		Wrap	None	0.6007	0.4351	0.4524	0.3931	0.5670	0.4468	0.7339	0.5258	0.5938	0.5137	0.5873	0.4784	0.5652	0.4365	0.4373	0.4034	0.5023	0.4160	0.7459	0.6108	0.6181	0.5846	0.5763	0.5143
			Hurricane	0.4438	0.2970	0.3247	0.2737	0.4160	0.3072	0.5429	0.3662	0.4323	0.3565	0.4240	0.3333	0.4203	0.3153	0.3249	0.2946	0.3806	0.3052	0.5338	0.4267	0.4498	0.4082	0.4068	0.3513
FBC New (0-5 yr, all types)	A	TN	None	0.8068	0.7974	0.5670	0.5598	0.9360	0.9173	0.8006	0.7926	0.6881	0.6800	0.8052	0.7901	0.7908	0.7645	0.5089	0.4985	0.9221	0.8832	0.7582	0.7467	0.6037	0.5975	0.7645	0.7411
			Hurricane	0.6850	0.6764	0.4389	0.4326	0.8326	0.8135	0.6231	0.6135	0.5165	0.5092	0.6371	0.6214	0.6499	0.6273	0.3850	0.3768	0.7892	0.7518	0.5649	0.5525	0.4338	0.4278	0.5681	0.5467
		Clip	None	0.5985	0.5913	0.5172	0.5102	0.6361	0.6077	0.7569	0.7488	0.6770	0.6682	0.7352	0.7202	0.5447	0.5355	0.4522	0.4467	0.5598	0.5326	0.6755	0.6681	0.5893	0.5845	0.6107	0.5979
			Hurricane	0.4623	0.4557	0.3942	0.3876	0.5065	0.4786	0.5789	0.5690	0.5071	0.4993	0.5580	0.5421	0.4144	0.4057	0.3397	0.3344	0.4346	0.4075	0.4841	0.4781	0.4118	0.4062	0.4416	0.4275
		Wrap	None	0.5735	0.5665	0.5143	0.5060	0.5981	0.5685	0.7567	0.7486	0.6769	0.6685	0.7398	0.7234	0.5172	0.5112	0.4493	0.4442	0.5116	0.4871	0.6744	0.6693	0.5892	0.5847	0.6129	0.5987
			Hurricane	0.4398	0.4324	0.3911	0.3833	0.4699	0.4397	0.5788	0.5688	0.5071	0.4993	0.5572	0.5421	0.3877	0.3818	0.3372	0.3321	0.3917	0.3672	0.4845	0.4780	0.4125	0.4075	0.4383	0.4251
	B	TN	None	0.7816	0.7721	0.5159	0.5082	0.9227	0.9046	0.7151	0.7052	0.5958	0.5854	0.7317	0.7158	0.7947	0.7684	0.4876	0.4765	0.9263	0.8862	0.7355	0.7217	0.5545	0.5464	0.7410	0.7191
			Hurricane	0.6526	0.6444	0.3769	0.3698	0.8066	0.7888	0.5150	0.5062	0.4129	0.4035	0.5423	0.5276	0.6496	0.6257	0.3608	0.3514	0.7966	0.7598	0.5399	0.5264	0.3922	0.3856	0.5554	0.5343
		Clip	None	0.5181	0.5093	0.4266	0.4160	0.5690	0.5367	0.5818	0.5622	0.5138	0.4976	0.5647	0.5377	0.5038	0.4931	0.3892	0.3818	0.5280	0.5015	0.5845	0.5715	0.5206	0.5133	0.5179	0.4991
			Hurricane	0.3716	0.3620	0.2927	0.2828	0.4277	0.3945	0.3953	0.3796	0.3590	0.3451	0.3836	0.3594	0.3690	0.3585	0.2797	0.2734	0.4027	0.3779	0.4022	0.3902	0.3570	0.3512	0.3533	0.3366
		Wrap	None	0.4391	0.4218	0.3863	0.3698	0.4795	0.4267	0.5346	0.4998	0.4982	0.4773	0.5012	0.4597	0.4193	0.4047	0.3710	0.3631	0.4216	0.3848	0.5724	0.5567	0.5215	0.5143	0.5010	0.4796
			Hurricane	0.2989	0.2824	0.2644	0.2511	0.3388	0.2881	0.3700	0.3428	0.3471	0.3303	0.3469	0.3140	0.2988	0.2853	0.2596	0.2524	0.3096	0.2753	0.3904	0.3770	0.3535	0.3477	0.3366	0.3167
	C	TN	None	0.7818	0.7721	0.5152	0.5070	0.9202	0.9020	0.7150	0.7056	0.5951	0.5858	0.7291	0.7140	0.7947	0.7684	0.4876	0.4766	0.9263	0.8862	0.7353	0.7215	0.5548	0.5480	0.7423	0.7197
			Hurricane	0.6526	0.6444	0.3732	0.3664	0.8098	0.7923	0.5174	0.5076	0.4117	0.4034	0.5434	0.5271	0.6496	0.6257	0.3600	0.3506	0.7966	0.7598	0.5428	0.5303	0.3916	0.3852	0.5574	0.5361
		Clip	None	0.5202	0.5111	0.4267	0.4157	0.5662	0.5345	0.5798	0.5598	0.5125	0.4956	0.5620	0.5361	0.5049	0.4941	0.3889	0.3813	0.5310	0.5035	0.5853	0.5724	0.5194	0.5134	0.5154	0.4968
			Hurricane	0.3720	0.3628	0.2916	0.2817	0.4267	0.3947	0.3946	0.3766	0.3578	0.3436	0.3829	0.3576	0.3691	0.3581	0.2793	0.2727	0.3983	0.3738	0.4050	0.3919	0.3561	0.3506	0.3552	0.3372
		Wrap	None	0.4394	0.4217	0.3838	0.3678	0.4801	0.4274	0.5297	0.4935	0.4924	0.4689	0.4992	0.4545	0.4177	0.4041	0.3679	0.3596	0.4218	0.3858	0.5748	0.5595	0.5177	0.5110	0.5000	0.4789
			Hurricane	0.2986	0.2822	0.2620	0.2489	0.3392	0.2892	0.3652	0.3373	0.3414	0.3044	0.3456	0.3109	0.2981	0.2852	0.2613	0.2535	0.3085	0.2750	0.3897	0.3745	0.3547	0.3254	0.3343	0.3145

Table 4-6. Single-Family, Pre-FBC, Region 2, Terrain A Loss Relativity Table

Roof Cover Strength	Roof Deck	RWC	Opening Protection	Low Slope (<=6:12)																							
				2-Story												1-Story											
				Other						Hip						Other						Hip					
				Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel	
				NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR
Non-FBC	A	TN	None	1.0000	1.0000	0.8246	0.7814	1.0000	1.0000	1.0000	1.0000	0.6911	0.6481	0.8962	0.6941	1.0000	1.0000	0.8300	0.8092	1.0000	0.9427	1.0000	1.0000	0.7158	0.7038	0.7272	0.6695
			Hurricane	1.0000	1.0000	0.7935	0.7513	1.0000	1.0000	1.0000	1.0000	0.6443	0.6026	0.8434	0.6496	1.0000	1.0000	0.7925	0.7745	1.0000	0.9132	1.0000	1.0000	0.6601	0.6509	0.6714	0.6156
		Clip	None	1.0000	1.0000	0.8124	0.7646	1.0000	0.9232	1.0000	1.0000	0.6901	0.6453	0.8869	0.6727	1.0000	1.0000	0.8173	0.7991	1.0000	0.9370	1.0000	1.0000	0.6980	0.6853	0.7173	0.6528
			Hurricane	1.0000	1.0000	0.7892	0.7454	1.0000	0.8908	1.0000	1.0000	0.6429	0.5991	0.8308	0.6250	1.0000	1.0000	0.7860	0.7690	1.0000	0.9028	1.0000	1.0000	0.6504	0.6419	0.6673	0.6106
		Wrap	None	1.0000	1.0000	0.8053	0.7610	1.0000	0.9109	1.0000	1.0000	0.6901	0.6453	0.8840	0.6711	1.0000	1.0000	0.8063	0.7899	1.0000	0.9352	1.0000	1.0000	0.6946	0.6880	0.7123	0.6490
			Hurricane	1.0000	1.0000	0.7859	0.7438	1.0000	0.8861	1.0000	1.0000	0.6429	0.5991	0.8320	0.6258	1.0000	1.0000	0.7784	0.7631	1.0000	0.9054	1.0000	1.0000	0.6432	0.6368	0.6702	0.6115
	B	TN	None	1.0000	0.9169	0.4303	0.3988	1.0000	0.8903	1.0000	1.0000	0.5635	0.5223	0.7608	0.5936	1.0000	1.0000	0.5967	0.5836	0.7419	0.6591	1.0000	1.0000	0.7049	0.6949	0.7044	0.6543
			Hurricane	1.0000	0.8835	0.3984	0.3689	0.9576	0.8537	1.0000	0.9951	0.5030	0.4637	0.7001	0.5462	1.0000	1.0000	0.5553	0.5455	0.6982	0.6205	1.0000	1.0000	0.6563	0.6482	0.6560	0.6048
		Clip	None	1.0000	0.6396	0.3836	0.3446	0.6185	0.4567	1.0000	0.9535	0.5462	0.4999	0.6728	0.4596	1.0000	1.0000	0.5373	0.5237	0.6958	0.6009	1.0000	1.0000	0.6717	0.6657	0.6729	0.6186
			Hurricane	1.0000	0.6073	0.3490	0.3120	0.5739	0.4258	1.0000	0.9021	0.4851	0.4564	0.5913	0.4024	1.0000	1.0000	0.5096	0.4967	0.6586	0.5729	1.0000	1.0000	0.6283	0.6166	0.6201	0.5695
		Wrap	None	1.0000	0.6017	0.3816	0.3396	0.5806	0.3987	1.0000	0.9488	0.5451	0.4945	0.6569	0.4451	1.0000	1.0000	0.5284	0.5155	0.6912	0.5951	1.0000	1.0000	0.6674	0.6628	0.6691	0.6143
			Hurricane	1.0000	0.5686	0.3428	0.3046	0.5356	0.3674	1.0000	0.8951	0.4845	0.4396	0.5931	0.3959	1.0000	1.0000	0.5039	0.4962	0.6467	0.5647	1.0000	1.0000	0.6236	0.6157	0.6170	0.5713
	C	TN	None	1.0000	0.9229	0.4230	0.3932	1.0000	0.8899	1.0000	1.0000	0.5653	0.5242	0.7687	0.5902	1.0000	1.0000	0.5916	0.5805	0.7363	0.6592	1.0000	1.0000	0.7049	0.6937	0.7066	0.6541
			Hurricane	1.0000	0.8891	0.3859	0.3601	0.9687	0.8633	1.0000	1.0000	0.4995	0.4628	0.6980	0.5445	1.0000	1.0000	0.5567	0.5446	0.6961	0.6240	1.0000	1.0000	0.6569	0.6518	0.6517	0.6039
		Clip	None	1.0000	0.6332	0.3681	0.3322	0.6114	0.4540	1.0000	0.9558	0.5469	0.4985	0.6667	0.4594	1.0000	1.0000	0.5347	0.5246	0.6834	0.5952	1.0000	1.0000	0.6740	0.6628	0.6787	0.6179
			Hurricane	1.0000	0.6003	0.3287	0.2975	0.5702	0.4228	1.0000	0.8934	0.4846	0.4430	0.5938	0.4027	1.0000	1.0000	0.5062	0.4919	0.6496	0.5696	1.0000	1.0000	0.6273	0.6159	0.6191	0.5706
		Wrap	None	1.0000	0.5845	0.3632	0.3213	0.5664	0.3879	1.0000	0.9434	0.5465	0.4943	0.6599	0.4439	1.0000	1.0000	0.5294	0.5158	0.6836	0.5909	1.0000	1.0000	0.6683	0.6632	0.6748	0.6144
			Hurricane	1.0000	0.5518	0.3177	0.2833	0.5139	0.3497	1.0000	0.8912	0.4810	0.4358	0.5898	0.3918	1.0000	1.0000	0.4990	0.4852	0.6453	0.5587	1.0000	1.0000	0.6278	0.6184	0.6166	0.5671
FBC Old (Shingle > 13 yr // Tile or Metal > 20 yr)	A	TN	None	1.0000	1.0000	0.8246	0.7814	1.0000	1.0000	1.0000	0.8144	0.6911	0.6481	0.8962	0.6941	1.0000	1.0000	0.8300	0.8092	1.0000	0.9427	1.0000	0.9074	0.7158	0.7038	0.7272	0.6695
			Hurricane	1.0000	1.0000	0.7935	0.7513	1.0000	1.0000	1.0000	0.7617	0.6443	0.6026	0.8434	0.6496	1.0000	1.0000	0.7925	0.7745	1.0000	0.9132	0.9684	0.8600	0.6601	0.6509	0.6714	0.6156
		Clip	None	1.0000	0.9420	0.8124	0.7646	1.0000	0.9232	1.0000	0.7959	0.6901	0.6453	0.8869	0.6727	1.0000	1.0000	0.8173	0.7991	1.0000	0.9370	1.0000	0.8963	0.6980	0.6853	0.7173	0.6528
			Hurricane	1.0000	0.9147	0.7892	0.7454	1.0000	0.8908	1.0000	0.7507	0.6429	0.5991	0.8308	0.6250	1.0000	1.0000	0.7860	0.7690	1.0000	0.9028	0.9645	0.8441	0.6504	0.6419	0.6673	0.6106
		Wrap	None	1.0000	0.9400	0.8053	0.7610	1.0000	0.9109	1.0000	0.7959	0.6901	0.6453	0.8840	0.6711	1.0000	1.0000	0.8063	0.7899	1.0000	0.9352	1.0000	0.8941	0.6946	0.6880	0.7123	0.6490
			Hurricane	1.0000	0.9125	0.7859	0.7438	1.0000	0.8861	1.0000	0.7506	0.6429	0.5991	0.8320	0.6258	1.0000	1.0000	0.7784	0.7631	1.0000	0.9054	0.9629	0.8418	0.6432	0.6368	0.6702	0.6115
	B	TN	None	0.9622	0.7481	0.4303	0.3988	1.0000	0.8903	1.0000	0.6823	0.5635	0.5223	0.7608	0.5936	0.9959	0.8633	0.5967	0.5836	0.7419	0.6591	0.9985	0.8986	0.7049	0.6949	0.7044	0.6543
			Hurricane	0.9206	0.7146	0.3984	0.3689	0.9576	0.8537	0.9317	0.6369	0.5030	0.4637	0.7001	0.5462	0.9449	0.8139	0.5553	0.5455	0.6982	0.6205	0.9462	0.8460	0.6563	0.6482	0.6560	0.6048
		Clip	None	0.7207	0.4644	0.3836	0.3446	0.6185	0.4567	0.9337	0.5935	0.5462	0.4999	0.6728	0.4596	0.9498	0.7961	0.5373	0.5237	0.6958	0.6009	0.9727	0.8555	0.6717	0.6657	0.6729	0.6186
			Hurricane	0.6688	0.4312	0.3490	0.3120	0.5739	0.4258	0.8423	0.5358	0.4851	0.4564	0.5913	0.4024	0.9036	0.7621	0.5096	0.4967	0.6586	0.5729	0.9093	0.8112	0.6283	0.6166	0.6201	0.5695
		Wrap	None	0.6959	0.4219	0.3816	0.3396	0.5806	0.3987	0.9373	0.5907	0.5451	0.4945	0.6569	0.4451	0.9491	0.7954	0.5284	0.5155	0.6912	0.5951	0.9626	0.8527	0.6674	0.6628	0.6691	0.6143
			Hurricane	0.6384	0.3914	0.3428	0.3046	0.5356	0.3674	0.8443	0.5299	0.4845	0.4396	0.5931	0.3959	0.9170	0.7699	0.5039	0.4962	0.6467	0.5647	0.9135	0.8074	0.6236	0.6157	0.6170	0.5713
	C	TN	None	0.9626	0.7434	0.4230	0.3932	1.0000	0.8899	1.0000	0.6839	0.5653	0.5242	0.7687	0.5902	1.0000	0.8633	0.5916	0.5805	0.7363	0.6592	1.0000	0.8963	0.7049	0.6937	0.7066	0.6541
			Hurricane	0.9225	0.7158	0.3859	0.3601	0.9687	0.8633	0.9311	0.6340	0.4995	0.4628	0.6980	0.5445	0.9606	0.8196	0.5567	0.5446	0.6961	0.6240	0.9455	0.8457	0.6569	0.6518	0.6517	0.6039
		Clip	None	0.7122	0.4587	0.3681	0.3322	0.6114	0.4540	0.9375	0.5989	0.5469	0.4985	0.6667	0.4594	0.9523	0.8097	0.5347	0.5246	0.6834	0.5952	0.9662	0.8559	0.6740	0.6628	0.6787	0.6179
			Hurricane	0.6649	0.4257	0.3287	0.2975	0.5702	0.4228	0.8464	0.5335	0.4846	0.4430	0.5938	0.4027	0.8929	0.7599	0.5062	0.4919	0.6496	0.5696	0.9145	0.8118	0.6273	0.6159	0.6191	0.5706
		Wrap	None	0.6766	0.4095	0.3632	0.3213	0.5664	0.3879	0.9368	0.5870	0.5465	0.4943	0.6599	0.4439	0.9471	0.8003	0.5294	0.5158	0.6836	0.5909	0.9743	0.8629	0.6683	0.6632	0.6748	0.6144
			Hurricane	0.6242	0.3774	0.3177	0.2833	0.5139	0.3497	0.8437	0.5239	0.4810	0.4358	0.5898	0.3918	0.9020	0.7670	0.4990	0.4852	0.6453	0.5587	0.9091	0.8118	0.6278	0.6184	0.6166	0.5671
FBC Mid Range (Shingle = 6-13 yr // Tile or Metal = 6-20 yr)	A	TN	None	1.0000	0.9848	0.7193	0.6967	1.0000	1.0000	0.9363	0.7500	0.5820	0.5587	0.7622	0.6460	1.0000	1.0000	0.7101	0.6981	0.9142	0.8396	0.8822	0.8289	0.6396	0.6314	0.6507	0.6189
			Hurricane	1.0000	0.9637	0.6925	0.6697	1.0000	1.0000	0.8685	0.6974	0.5348	0.5126	0.7099	0.5970	1.0000	0.9936	0.6744	0.6650	0.8818	0.8039	0.8269	0.7731	0.5869	0.5818	0.5968	0.5664
		Clip	None	1.0000	0.8839	0.7032	0.6774	1.0000	0.8582	0.9308	0.7353	0.5820	0.5585	0.7412	0.6176	1.0000	1.0000	0.6950	0.6843	0.9075	0.8302	0.8621	0.8087	0.6166	0.6083	0.6384	0.6026
			Hurricane	1.0000	0.8546	0.6829	0.6596	0.9697	0.8292	0.8657	0.6851	0.5342	0.5103	0.6925	0.5725	1.0000	0.9770	0.6649	0.6552	0.8750	0.7998	0.8084	0.7551	0.5699	0.5620	0.5889	0.5579
		Wrap	None	1.0000	0.8811	0.7034	0.6800	0.9915	0.8490	0.9310	0.7353	0.5820	0.5585	0.7416	0.6188	1.0000	1.0000	0.6875	0.6789	0.9045	0.8280	0.8605	0.8080	0.6134	0.6105	0.6365	0.6007
			Hurricane	1.0000	0.8610	0.6810	0.6583	0.9668	0.8237	0.8662	0.6844	0.5342	0.5103	0.6925	0.5722	1.0000	0.9842	0.6620	0.6541	0.8756	0.8004	0.8051	0.7516	0.5674	0.5634	0.5898	0.5589
	B	TN	None	0.8196	0.7031	0.3641	0.3468	0.9016	0.8345	0.8029	0.6363	0.4725	0.4499	0.6377	0.5420	0.8188	0.7481	0.5032	0.4941	0.6021	0.5535	0.8613	0.8060	0.6327	0.6262	0.6328	0.6038
			Hurricane	0.7827	0.6727	0.3311	0.3150	0.8588	0.7952	0.7332	0.5810	0.4136	0.3926	0.5812	0.4941	0.7728	0.7092	0.4653	0.4571	0.5597	0.5153	0.8105	0.7626	0.5825	0.5780	0.5831	0.5563
		Clip	None	0.5541	0.4141	0.3129	0.2922	0.4919	0.3954	0.7273	0.5466	0.4530	0.4289	0.5344	0.4074	0.7630	0.6966	0.4445	0.4356	0.5543	0.4981	0.8242	0.7756	0.5968	0.5936	0.5999	0.5670
			Hurricane	0.5185	0.3850	0.2784	0.2579	0.4531	0.3648	0.6529	0.4816	0.3931	0.3768	0.4639	0.3516	0.7280	0.6565	0.4139	0.4074	0.5173	0.4668	0.7729	0.7208	0.5511	0.5441	0.5471	0.5188
		Wrap	None	0.5293	0.3807	0.3080	0.2848	0.4489	0.3362	0.7200	0.5347	0.4510	0.4237	0.5242	0.3961	0.7534	0.6837	0.4338	0.4275	0.5470	0.4907	0.8273	0.7710	0.5949	0.5929	0.5980	0.5640
			Hurricane	0.4847	0.3451	0.2723	0.2500	0.4089	0.3041	0.6479	0.4772	0.3923	0.3680	0.4621	0.3424	0.7203	0.6539	0.4089	0.4041	0.5104	0.4604	0.7726	0.7255	0.5478	0.5418	0.5469	0.5180
	C	TN	None	0.8075	0.6931	0.3586	0.3417	0.8942	0.8277	0.7971	0.6330	0.4732	0.4517	0.6413	0.5405	0.8107	0.7452	0.5018	0.4947	0.5985	0.5530	0.8638	0.8127	0.6330	0.6259	0.6349	0.6041
			Hurricane	0.7688	0.6601	0.3227	0.3082	0.8690	0.8053	0.7349	0.5801	0.4112	0.3919	0.5813	0.4940	0.7652	0.7060	0.4636	0.4554	0.5592	0.5163	0.8109	0.7637	0.5830	0.5802	0.5814	0.5580
		Clip	None	0.5507	0.4111	0.2988	0.2788	0.4858	0.3924	0.7300	0.5411	0.4530	0.4262	0.5317	0.4084	0.7618	0.6899	0.4424	0.4364	0.5459	0.4931	0.8251	0.7718	0.5978	0.5920	0.6020	0.5678
			Hurricane	0.5070	0.3775	0.2611	0.2442	0.4467	0.3595	0.6540	0.4811	0.3920	0.3703	0.4655	0.3511	0.7185	0.6554	0.4112	0.4034	0.5099	0.4637	0.7740	0.7260	0.5514	0.5450	0.5473	0.5178
		Wrap	None	0.5129	0.3622	0.2907	0.2675	0.4328	0.3242	0.7214	0.5323	0.4504	0.4207	0.5259	0.3939	0.7452	0.6733	0.4326	0.4254	0.5411	0.4864	0.8261	0.7740	0.5940	0.5903	0.5999	0.5649
			Hurricane	0.4653	0.3286	0.2496	0.2303	0.3876	0.2877	0.6446	0.4723	0.3899	0.3647	0.4586	0.3388	0.7149	0.6465	0.4038	0.3966	0.5044	0.4537	0.7748	0.7206	0.5508	0.5457	0.5457	0.5165
FBC New (0-5 yr, all types)	A	TN	None	0.8745	0.8662	0.6140	0.6120	1.0000	0.9902	0.6211	0.6197	0.4730	0.4692	0.6283	0.5979	0.7586	0.7562	0.5902	0.5871	0.7554	0.7364	0.6487	0.6432	0.5634	0.5589	0.5742	0.5682
			Hurricane	0.8460	0.8406	0.5915	0.5882	1.0000	0.9719	0.5735	0.5714	0.4253	0.4226	0.5763	0.5445	0.7321	0.7306	0.5563	0.5555	0.7166	0.6945	0.5897	0.5741	0.5137	0.5127	0.5222	0.5172
		Clip	None	0.7588	0.7537	0.5941	0.5903	0.8309	0.7932	0.6092	0.6059	0.4739	0.4717	0.5954	0.5624	0.7542	0.7537	0.5726	0.5694	0.7425	0.7234	0.6283	0.6224	0.5352	0.5313	0.5595	0.5523
			Hurricane	0.7395	0.7370	0.5766	0.5739	0.8083	0.7675	0.5539	0.5516	0.4254	0.4216	0.5542	0.5200	0.7154	0.7154	0.5438	0.5414	0.7168	0.6968	0.5738	0.5704	0.4895	0.4822	0.5105	0.5051
		Wrap	None	0.7688	0.7647	0.6016	0.5989	0.8296	0.7872	0.6072	0.6072	0.4739	0.4717	0.5993	0.5665	0.7474	0.7461	0.5687	0.5679	0.7414	0.7208	0.6274	0.6227	0.5321	0.5329	0.5606	0.5525
			Hurricane	0.7366	0.7316	0.5760	0.5729	0.8042	0.7613	0.5555	0.5533	0.4254	0.4216	0.5529	0.5187	0.7146	0.7141	0.5457	0.5451	0.7136	0.6954	0.5745	0.5723	0.4915	0.4901	0.5094	0.5063
	B	TN	None	0.6037	0.5947	0.2979	0.2947	0.8011	0.7787	0.5191	0.5164	0.3814	0.3775	0.5146	0.4905	0.4979	0.4902	0.4098	0.4045	0.4623	0.4478	0.6338	0.6306	0.5605	0.5576	0.5612	0.5533
			Hurricane	0.5650	0.5568	0.2639	0.2611	0.7600	0.7366	0.4670	0.4637	0.3242	0.3215	0.4624	0.4420	0.4578	0.4593	0.3754	0.3687	0.4213	0.4100	0.5866	0.5811	0.5086	0.5077	0.5102	0.5079
		Clip	None	0.3168	0.3127	0.2423	0.2397	0.3654	0.3341	0.4300	0.4262	0.3599	0.3579	0.3959	0.3553	0.4410	0.4380	0.3517	0.3476	0.4127	0.3954	0.5982	0.5948	0.5219	0.5215	0.5270	0.5153
			Hurricane	0.2836	0.2790	0.2078	0.2037	0.3323	0.3037	0.3697	0.3629	0.3010	0.2971	0.3364	0.3009	0.4053	0.4018	0.3183	0.3180	0.3760	0.3607	0.5430	0.5451	0.4738	0.4715	0.4741	0.4681
		Wrap	None	0.2826	0.2773	0.2344	0.2299	0.3172	0.2737	0.4225	0.4151	0.3569	0.3529	0.3914	0.3471	0.4325	0.4280	0.3391	0.3395	0.4028	0.3863	0.5941	0.5956	0.5224	0.5231	0.5270	0.5137
			Hurricane	0.2434	0.2391	0.2018	0.1955	0.2821	0.2407	0.3645	0.3569	0.3001	0.2964	0.3311	0.2888	0.3977	0.3985	0.3138	0.3121	0.3741	0.3560	0.5447	0.5414	0.4719	0.4679	0.4768	0.4648
	C	TN	None	0.6076	0.5992	0.2941	0.2902	0.7885	0.7654	0.5175	0.5140	0.3810	0.3792	0.5139	0.4907	0.5015	0.4959	0.4120	0.4089	0.4606	0.4467	0.6322	0.6318	0.5611	0.5582	0.5633	0.5541
			Hurricane	0.5721	0.5620	0.2594	0.2563	0.7692	0.7473	0.4664	0.4522	0.3229	0.3210	0.4646	0.4436	0.4584	0.4551	0.3704	0.3662	0.4222	0.4085	0.5849	0.5790	0.5091	0.5086	0.5111	0.5121
		Clip	None	0.3080	0.3051	0.2295	0.2254	0.3603	0.3307	0.4283	0.4253	0.3592	0.3539	0.3966	0.3574	0.4364	0.4340	0.3501	0.3482	0.4084	0.3911	0.5967	0.5977	0.5216	0.5212	0.5253	0.5177
			Hurricane	0.2736	0.2700	0.1935	0.1909	0.3232	0.2962	0.3660	0.3632	0.2994	0.2976	0.3372	0.2994	0.4018	0.4006	0.3163	0.3149	0.3703	0.3578	0.5456	0.5434	0.4756	0.4741	0.4756	0.4651
		Wrap	None	0.2649	0.2600	0.2182	0.2138	0.2991	0.2605	0.4232	0.4135	0.3543	0.3471	0.3919	0.3438	0.4255	0.4239	0.3358	0.3350	0.3986	0.3819	0.5977	0.5951	0.5196	0.5174	0.5250	0.5153
			Hurricane	0.2282	0.2219	0.1815	0.1772	0.2613	0.2256	0.3605	0.3563	0.2989	0.2936	0.3274	0.2858	0.3914	0.3917	0.3086	0.3079	0.3634	0.3486	0.5450	0.5314	0.4737	0.4731	0.4749	0.4660

Table 4-6. Single-Family, Pre-FBC, Region 2, Terrain A Loss Relativity Table (Continued)

Roof Cover Strength	Roof Deck	RWC	Opening Protection	High Slope (> 6:12)																							
				2-Story												1-Story											
				Other						Hip						Other						Hip					
				Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel	
				NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR
Non-FBC	A	TN	None	1.0000	1.0000	0.5804	0.5469	0.9623	0.8629	1.0000	1.0000	0.7476	0.7137	0.7228	0.6570	1.0000	1.0000	0.6217	0.6119	0.8913	0.8377	1.0000	1.0000	0.7659	0.7607	0.7119	0.6907
			Hurricane	1.0000	0.9814	0.5084	0.4744	0.8956	0.8036	1.0000	1.0000	0.6538	0.6160	0.6289	0.5675	1.0000	1.0000	0.5614	0.5505	0.8029	0.7576	1.0000	1.0000	0.6987	0.6948	0.6373	0.6170
		Clip	None	1.0000	0.8818	0.5714	0.5305	0.7103	0.5694	1.0000	1.0000	0.7419	0.7125	0.6971	0.6281	1.0000	1.0000	0.5983	0.5886	0.6670	0.6036	1.0000	1.0000	0.7634	0.7539	0.6733	0.6525
			Hurricane	1.0000	0.8163	0.4907	0.4570	0.6304	0.4971	1.0000	1.0000	0.6537	0.6169	0.6044	0.5378	1.0000	1.0000	0.5487	0.5363	0.6062	0.5477	1.0000	1.0000	0.6932	0.6876	0.6115	0.5914
		Wrap	None	1.0000	0.8810	0.5689	0.5314	0.7005	0.5501	1.0000	1.0000	0.7419	0.7125	0.6960	0.6254	1.0000	1.0000	0.5947	0.5842	0.6494	0.5880	1.0000	1.0000	0.7634	0.7538	0.6742	0.6546
			Hurricane	1.0000	0.8070	0.4894	0.4556	0.6173	0.4774	1.0000	1.0000	0.6537	0.6169	0.6065	0.5381	1.0000	1.0000	0.5494	0.5387	0.5903	0.5355	1.0000	1.0000	0.6947	0.6887	0.6104	0.5882
	B	TN	None	1.0000	1.0000	0.5363	0.5060	0.9501	0.8550	1.0000	1.0000	0.6917	0.6627	0.6731	0.6186	1.0000	1.0000	0.6034	0.5908	0.8864	0.8373	1.0000	1.0000	0.7533	0.7513	0.7171	0.6972
			Hurricane	1.0000	0.9616	0.4550	0.4300	0.8741	0.7884	1.0000	1.0000	0.5970	0.5684	0.5771	0.5240	1.0000	1.0000	0.5508	0.5420	0.7991	0.7528	1.0000	1.0000	0.6906	0.6825	0.6338	0.6159
		Clip	None	1.0000	0.8328	0.5106	0.4757	0.6463	0.5160	1.0000	1.0000	0.6812	0.6478	0.6216	0.5568	1.0000	1.0000	0.5754	0.5650	0.6592	0.5994	1.0000	1.0000	0.7528	0.7434	0.6596	0.6368
			Hurricane	1.0000	0.7511	0.4308	0.3946	0.5591	0.4432	1.0000	1.0000	0.5889	0.5555	0.5226	0.4588	1.0000	1.0000	0.5295	0.5226	0.5892	0.5380	1.0000	1.0000	0.6876	0.6788	0.5965	0.5761
		Wrap	None	1.0000	0.8078	0.5042	0.4640	0.6221	0.4794	1.0000	1.0000	0.6816	0.6477	0.6211	0.5517	1.0000	1.0000	0.5740	0.5617	0.6233	0.5632	1.0000	1.0000	0.7489	0.7425	0.6593	0.6407
			Hurricane	1.0000	0.7206	0.4242	0.3873	0.5322	0.4028	1.0000	1.0000	0.5900	0.5544	0.5206	0.4543	1.0000	1.0000	0.5253	0.5177	0.5661	0.5101	1.0000	1.0000	0.6833	0.6811	0.5948	0.5797
	C	TN	None	1.0000	1.0000	0.5360	0.5063	0.9446	0.8491	1.0000	1.0000	0.6904	0.6610	0.6725	0.6135	1.0000	1.0000	0.6040	0.5931	0.8863	0.8370	1.0000	1.0000	0.7524	0.7505	0.7157	0.6956
			Hurricane	1.0000	0.9605	0.4588	0.4293	0.8747	0.7894	1.0000	1.0000	0.5934	0.5622	0.5739	0.5206	1.0000	1.0000	0.5559	0.5395	0.7991	0.7528	1.0000	1.0000	0.6925	0.6832	0.6330	0.6153
		Clip	None	1.0000	0.8319	0.5117	0.4765	0.6475	0.5173	1.0000	1.0000	0.6825	0.6493	0.6234	0.5578	1.0000	1.0000	0.5760	0.5644	0.6599	0.5997	1.0000	1.0000	0.7465	0.7399	0.6613	0.6403
			Hurricane	1.0000	0.7515	0.4246	0.3930	0.5613	0.4426	1.0000	1.0000	0.5886	0.5536	0.5249	0.4620	1.0000	1.0000	0.5315	0.5197	0.5839	0.5380	1.0000	1.0000	0.6871	0.6800	0.5947	0.5761
		Wrap	None	1.0000	0.8074	0.5060	0.4642	0.6282	0.4806	1.0000	1.0000	0.6797	0.6453	0.6159	0.5492	1.0000	1.0000	0.5730	0.5611	0.6249	0.5642	1.0000	1.0000	0.7495	0.7404	0.6594	0.6369
			Hurricane	1.0000	0.7219	0.4231	0.3868	0.5295	0.3973	1.0000	1.0000	0.5868	0.5562	0.5188	0.4528	1.0000	1.0000	0.5316	0.5223	0.5679	0.5115	1.0000	1.0000	0.6852	0.6794	0.5918	0.5769
FBC Old (Shingle > 13 yr // Tile or Metal > 20 yr)	A	TN	None	1.0000	0.7763	0.5804	0.5469	0.9623	0.8629	1.0000	0.8156	0.7476	0.7137	0.7228	0.6570	1.0000	0.8875	0.6217	0.6119	0.8913	0.8377	1.0000	0.9277	0.7659	0.7607	0.7119	0.6907
			Hurricane	0.9353	0.7058	0.5084	0.4744	0.8956	0.8036	0.9486	0.7323	0.6538	0.6160	0.6289	0.5675	0.9275	0.8210	0.5614	0.5505	0.8029	0.7576	0.9160	0.8470	0.6987	0.6948	0.6373	0.6170
		Clip	None	0.8911	0.6144	0.5714	0.5305	0.7103	0.5694	1.0000	0.8106	0.7419	0.7125	0.6971	0.6281	0.8834	0.7630	0.5983	0.5886	0.6670	0.6036	0.9895	0.9038	0.7634	0.7539	0.6733	0.6525
			Hurricane	0.7920	0.5361	0.4907	0.4570	0.6304	0.4971	0.9346	0.7156	0.6537	0.6169	0.6044	0.5378	0.8137	0.7022	0.5487	0.5363	0.6062	0.5477	0.9036	0.8310	0.6932	0.6876	0.6115	0.5914
		Wrap	None	0.8929	0.6043	0.5689	0.5314	0.7005	0.5501	1.0000	0.8122	0.7419	0.7125	0.6960	0.6254	0.8757	0.7517	0.5947	0.5842	0.6494	0.5880	0.9896	0.9093	0.7634	0.7538	0.6742	0.6546
			Hurricane	0.7877	0.5224	0.4894	0.4556	0.6173	0.4774	0.9360	0.7166	0.6537	0.6169	0.6065	0.5381	0.8113	0.6962	0.5494	0.5387	0.5903	0.5355	0.9030	0.8291	0.6947	0.6887	0.6104	0.5882
	B	TN	None	0.9981	0.7555	0.5363	0.5060	0.9501	0.8550	0.9865	0.7696	0.6917	0.6627	0.6731	0.6186	1.0000	0.8906	0.6034	0.5908	0.8864	0.8373	1.0000	0.9248	0.7533	0.7513	0.7171	0.6972
			Hurricane	0.9034	0.6837	0.4550	0.4300	0.8741	0.7884	0.8867	0.6788	0.5970	0.5684	0.5771	0.5240	0.9126	0.8055	0.5508	0.5420	0.7991	0.7528	0.9131	0.8429	0.6906	0.6825	0.6338	0.6159
		Clip	None	0.8287	0.5625	0.5106	0.4757	0.6463	0.5160	0.9737	0.7389	0.6812	0.6478	0.6216	0.5568	0.8597	0.7446	0.5754	0.5650	0.6592	0.5994	0.9711	0.8888	0.7528	0.7434	0.6596	0.6368
			Hurricane	0.7253	0.4778	0.4308	0.3946	0.5591	0.4432	0.8416	0.6334	0.5889	0.5555	0.5226	0.4588	0.7992	0.6923	0.5295	0.5226	0.5892	0.5380	0.8877	0.8181	0.6876	0.6788	0.5965	0.5761
		Wrap	None	0.8084	0.5305	0.5042	0.4640	0.6221	0.4794	0.9722	0.7316	0.6816	0.6477	0.6211	0.5517	0.8373	0.7191	0.5740	0.5617	0.6233	0.5632	0.9643	0.8825	0.7489	0.7425	0.6593	0.6407
			Hurricane	0.7030	0.4458	0.4242	0.3873	0.5322	0.4028	0.8370	0.6310	0.5900	0.5544	0.5206	0.4543	0.7846	0.6728	0.5253	0.5177	0.5661	0.5101	0.8879	0.8200	0.6833	0.6811	0.5948	0.5797
	C	TN	None	1.0000	0.7572	0.5360	0.5063	0.9446	0.8491	1.0000	0.7715	0.6904	0.6610	0.6725	0.6135	1.0000	0.8908	0.6040	0.5931	0.8863	0.8370	1.0000	0.9236	0.7524	0.7505	0.7157	0.6956
			Hurricane	0.9037	0.6809	0.4588	0.4293	0.8747	0.7894	0.8814	0.6869	0.5934	0.5622	0.5739	0.5206	0.9126	0.8055	0.5559	0.5395	0.7991	0.7528	0.9110	0.8415	0.6925	0.6832	0.6330	0.6153
		Clip	None	0.8363	0.5628	0.5117	0.4765	0.6475	0.5173	0.9695	0.7414	0.6825	0.6493	0.6234	0.5578	0.8687	0.7468	0.5760	0.5644	0.6599	0.5997	0.9728	0.8904	0.7465	0.7399	0.6613	0.6403
			Hurricane	0.7275	0.4764	0.4246	0.3930	0.5613	0.4426	0.8435	0.6341	0.5886	0.5536	0.5249	0.4620	0.8004	0.6907	0.5315	0.5197	0.5839	0.5380	0.8821	0.8193	0.6871	0.6800	0.5947	0.5761
		Wrap	None	0.8083	0.5302	0.5060	0.4642	0.6282	0.4806	0.9617	0.7279	0.6797	0.6453	0.6159	0.5492	0.8442	0.7204	0.5730	0.5611	0.6249	0.5642	0.9635	0.8858	0.7495	0.7404	0.6594	0.6369
			Hurricane	0.7087	0.4472	0.4231	0.3868	0.5295	0.3973	0.8465	0.6338	0.5868	0.5562	0.5188	0.4528	0.7829	0.6733	0.5316	0.5223	0.5679	0.5115	0.8868	0.8186	0.6852	0.6794	0.5918	0.5769
FBC Mid Range (Shingle = 6-13 yr // Tile or Metal = 6-20 yr)	A	TN	None	0.8616	0.7315	0.5039	0.4854	0.8758	0.8176	0.8709	0.7521	0.6484	0.6305	0.6599	0.6234	0.8733	0.8175	0.5467	0.5395	0.8186	0.7811	0.8796	0.8516	0.6823	0.6796	0.6780	0.6640
			Hurricane	0.7827	0.6680	0.4306	0.4119	0.8099	0.7565	0.7702	0.6671	0.5549	0.5355	0.5685	0.5345	0.7916	0.7436	0.4859	0.4794	0.7316	0.7008	0.7973	0.7681	0.6175	0.6139	0.5975	0.5862
		Clip	None	0.7230	0.5724	0.4892	0.4666	0.5981	0.5170	0.8669	0.7510	0.6442	0.6289	0.6335	0.5955	0.7515	0.6931	0.5227	0.5162	0.5827	0.5456	0.8517	0.8231	0.6781	0.6721	0.6376	0.6270
			Hurricane	0.6271	0.4918	0.4110	0.3928	0.5183	0.4412	0.7604	0.6587	0.5535	0.5334	0.5399	0.5035	0.6784	0.6257	0.4719	0.4671	0.5221	0.4887	0.7855	0.7553	0.6129	0.6110	0.5718	0.5594
		Wrap	None	0.7075	0.5594	0.4885	0.4676	0.5847	0.4976	0.8641	0.7495	0.6442	0.6289	0.6319	0.5935	0.7300	0.6715	0.5218	0.5146	0.5611	0.5269	0.8516	0.8255	0.6778	0.6729	0.6369	0.6278
			Hurricane	0.6173	0.4803	0.4077	0.3898	0.5051	0.4243	0.7601	0.6591	0.5534	0.5333	0.5404	0.5025	0.6757	0.6233	0.4723	0.4667	0.5077	0.4771	0.7825	0.7476	0.6138	0.6115	0.5688	0.5575
	B	TN	None	0.8346	0.7145	0.4657	0.4489	0.8613	0.8055	0.8221	0.7151	0.6029	0.5880	0.6156	0.5856	0.8745	0.8219	0.5348	0.5278	0.8158	0.7822	0.8715	0.8421	0.6701	0.6694	0.6780	0.6669
			Hurricane	0.7482	0.6412	0.3863	0.3732	0.7884	0.7389	0.7146	0.6220	0.5042	0.4898	0.5185	0.4899	0.7879	0.7460	0.4773	0.4722	0.7315	0.6984	0.7943	0.7686	0.6089	0.6053	0.5957	0.5858
		Clip	None	0.6583	0.5168	0.4367	0.4181	0.5413	0.4657	0.7889	0.6742	0.5904	0.5740	0.5615	0.5264	0.7284	0.6781	0.5060	0.5002	0.5716	0.5379	0.8467	0.8069	0.6682	0.6629	0.6206	0.6091
			Hurricane	0.5601	0.4330	0.3573	0.3374	0.4574	0.3903	0.6772	0.5772	0.4971	0.4775	0.4582	0.4234	0.6637	0.6138	0.4560	0.4528	0.5067	0.4776	0.7657	0.7443	0.6072	0.6022	0.5564	0.5450
		Wrap	None	0.6387	0.4935	0.4309	0.4090	0.5112	0.4272	0.7816	0.6677	0.5907	0.5725	0.5546	0.5154	0.7038	0.6506	0.5014	0.4966	0.5345	0.4989	0.8362	0.8024	0.6663	0.6618	0.6192	0.6097
			Hurricane	0.5369	0.4055	0.3507	0.3314	0.4247	0.3473	0.6729	0.5710	0.4968	0.4785	0.4568	0.4188	0.6428	0.5969	0.4538	0.4495	0.4828	0.4515	0.7648	0.7379	0.6037	0.6040	0.5561	0.5483
	C	TN	None	0.8357	0.7154	0.4664	0.4490	0.8591	0.8028	0.8198	0.7159	0.6008	0.5866	0.6136	0.5804	0.8742	0.8218	0.5350	0.5286	0.8151	0.7816	0.8742	0.8453	0.6696	0.6677	0.6770	0.6664
			Hurricane	0.7550	0.6448	0.3882	0.3714	0.7880	0.7388	0.7102	0.6174	0.5019	0.4860	0.5169	0.4875	0.7879	0.7460	0.4801	0.4712	0.7313	0.6989	0.7936	0.7687	0.6122	0.6078	0.5971	0.5860
		Clip	None	0.6554	0.5163	0.4377	0.4187	0.5427	0.4681	0.7902	0.6778	0.5913	0.5743	0.5616	0.5263	0.7272	0.6743	0.5053	0.4984	0.5718	0.5378	0.8363	0.8061	0.6644	0.6608	0.6233	0.6112
			Hurricane	0.5608	0.4331	0.3532	0.3367	0.4578	0.3891	0.6749	0.5750	0.4950	0.4775	0.4589	0.4240	0.6629	0.6147	0.4580	0.4519	0.5044	0.4779	0.7642	0.7390	0.6071	0.6032	0.5550	0.5449
		Wrap	None	0.6407	0.4916	0.4309	0.4094	0.5161	0.4294	0.7835	0.6728	0.5899	0.5715	0.5531	0.5162	0.7034	0.6484	0.5009	0.4941	0.5358	0.5001	0.8357	0.8031	0.6664	0.6602	0.6197	0.6070
			Hurricane	0.5381	0.4060	0.3496	0.3304	0.4233	0.3448	0.6787	0.5731	0.4940	0.4770	0.4553	0.4183	0.6495	0.5964	0.4571	0.4507	0.4838	0.4522	0.7736	0.7387	0.6057	0.6043	0.5534	0.5454
FBC New (0-5 yr, all types)	A	TN	None	0.6513	0.6445	0.4274	0.4239	0.7892	0.7723	0.6423	0.6371	0.5492	0.5472	0.5971	0.5897	0.6839	0.6727	0.4716	0.4670	0.7459	0.7245	0.6972	0.6978	0.5987	0.5984	0.6440	0.6373
			Hurricane	0.5836	0.5794	0.3527	0.3494	0.7241	0.7095	0.5483	0.5455	0.4560	0.4549	0.5081	0.5016	0.6032	0.5952	0.4104	0.4084	0.6602	0.6440	0.6195	0.6039	0.5362	0.5330	0.5577	0.5553
		Clip	None	0.4831	0.4782	0.4069	0.4028	0.4858	0.4646	0.6264	0.6216	0.5465	0.5453	0.5699	0.5630	0.5413	0.5405	0.4471	0.4437	0.4983	0.4875	0.6648	0.6638	0.5928	0.5903	0.6019	0.6014
			Hurricane	0.4031	0.4020	0.3312	0.3287	0.4062	0.3853	0.5267	0.5253	0.4533	0.4499	0.4753	0.4692	0.4788	0.4779	0.3952	0.3979	0.4379	0.4297	0.5976	0.6019	0.5325	0.5344	0.5321	0.5275
		Wrap	None	0.4750	0.4714	0.4080	0.4037	0.4690	0.4451	0.6255	0.6219	0.5465	0.5453	0.5678	0.5616	0.5322	0.5304	0.4488	0.4449	0.4727	0.4657	0.6615	0.6619	0.5923	0.5920	0.5995	0.6009
			Hurricane	0.3963	0.3912	0.3260	0.3239	0.3929	0.3711	0.5255	0.5260	0.4531	0.4498	0.4743	0.4668	0.4728	0.4711	0.3953	0.3948	0.4251	0.4186	0.5981	0.6006	0.5329	0.5343	0.5272	0.5269
	B	TN	None	0.6329	0.6287	0.3951	0.3918	0.7725	0.7560	0.6012	0.5973	0.5142	0.5134	0.5581	0.5527	0.6852	0.6727	0.4661	0.4647	0.7453	0.7272	0.6896	0.6915	0.5869	0.5876	0.6388	0.6366
			Hurricane	0.5594	0.5554	0.3177	0.3164	0.7027	0.6893	0.4979	0.4966	0.4114	0.4112	0.4598	0.4558	0.6018	0.5945	0.4039	0.4024	0.6639	0.6440	0.6135	0.6006	0.5272	0.5281	0.5575	0.5557
		Clip	None	0.4388	0.4353	0.3628	0.3605	0.4364	0.4153	0.5624	0.5577	0.4997	0.5002	0.5015	0.4960	0.5375	0.5341	0.4366	0.4354	0.4839	0.4763	0.6516	0.6533	0.5835	0.5824	0.5816	0.5814
			Hurricane	0.3499	0.3484	0.2837	0.2803	0.3558	0.3373	0.4563	0.4533	0.4053	0.3996	0.3937	0.3879	0.4660	0.4644	0.3826	0.3831	0.4241	0.4171	0.6053	0.6036	0.5267	0.5256	0.5164	0.5140
		Wrap	None	0.4153	0.4076	0.3576	0.3540	0.4002	0.3750	0.5617	0.5533	0.4999	0.4974	0.4882	0.4791	0.5030	0.5008	0.4288	0.4315	0.4457	0.4346	0.6498	0.6480	0.5836	0.5811	0.5791	0.5786
			Hurricane	0.3236	0.3203	0.2772	0.2754	0.3171	0.2919	0.4540	0.4485	0.4037	0.4025	0.3930	0.3833	0.4494	0.4498	0.3824	0.3814	0.3995	0.3929	0.6003	0.6057	0.5241	0.5269	0.5173	0.5168
	C	TN	None	0.6348	0.6302	0.3968	0.3917	0.7736	0.7565	0.6027	0.5982	0.5113	0.5121	0.5546	0.5473	0.6852	0.6727	0.4659	0.4640	0.7439	0.7262	0.6892	0.6862	0.5868	0.5849	0.6382	0.6371
			Hurricane	0.5605	0.5562	0.3177	0.3135	0.7013	0.6882	0.4977	0.4961	0.4104	0.4097	0.4599	0.4544	0.6018	0.5945	0.4044	0.4029	0.6635	0.6449	0.6129	0.6134	0.5319	0.5324	0.5612	0.5568
		Clip	None	0.4365	0.4342	0.3637	0.3610	0.4378	0.4188	0.5626	0.5569	0.5002	0.4994	0.4998	0.4947	0.5331	0.5296	0.4346	0.4323	0.4837	0.4758	0.6546	0.6538	0.5822	0.5816	0.5854	0.5822
			Hurricane	0.3507	0.3471	0.2818	0.2804	0.3542	0.3356	0.4540	0.4517	0.4014	0.4014	0.3930	0.3860	0.4655	0.4643	0.3845	0.3842	0.4249	0.4177	0.6061	0.6049	0.5270	0.5264	0.5154	0.5137
		Wrap	None	0.4120	0.4074	0.3558	0.3546	0.4039	0.3782	0.5541	0.5511	0.5000	0.4976	0.4902	0.4832	0.5066	0.5054	0.4288	0.4270	0.4466	0.4361	0.6517	0.6530	0.5833	0.5800	0.5800	0.5770
			Hurricane	0.3242	0.3190	0.2761	0.2739	0.3170	0.2924	0.4506	0.4484	0.4012	0.3978	0.3918	0.3839	0.4510	0.4502	0.3826	0.3791	0.3997	0.3930	0.5910	0.5887	0.5261	0.5292	0.5149	0.5138

Table 4-7. Single-Family, Pre-FBC, Region 2, Terrain B Loss Relativity Table

Roof Cover Strength	Roof Deck	RWC	Opening Protection	Low Slope (<=6:12)																							
				2-Story												1-Story											
				Other						Hip						Other						Hip					
				Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel	
				NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR
Non-FBC	A	TN	None	1.0000	1.0000	0.8262	0.7813	1.0000	1.0000	1.0000	1.0000	0.7083	0.6606	0.9481	0.7213	1.0000	1.0000	0.9042	0.8760	1.0000	1.0000	1.0000	1.0000	0.6968	0.6747	0.7332	0.6459
			Hurricane	1.0000	1.0000	0.7977	0.7553	1.0000	1.0000	1.0000	1.0000	0.6235	0.5789	0.8432	0.6319	1.0000	1.0000	0.8396	0.8175	1.0000	0.9596	1.0000	1.0000	0.5803	0.5667	0.6004	0.5199
		Clip	None	1.0000	1.0000	0.8205	0.7751	1.0000	0.9135	1.0000	1.0000	0.7015	0.6551	0.9251	0.6916	1.0000	1.0000	0.8815	0.8558	1.0000	1.0000	1.0000	1.0000	0.6617	0.6447	0.7074	0.6176
			Hurricane	1.0000	1.0000	0.7994	0.7546	1.0000	0.8749	1.0000	0.9901	0.6269	0.5787	0.8236	0.6030	1.0000	1.0000	0.8315	0.8088	1.0000	0.9494	1.0000	1.0000	0.5593	0.5309	0.5963	0.5127
		Wrap	None	1.0000	1.0000	0.8201	0.7750	1.0000	0.9171	1.0000	1.0000	0.6551	0.6551	0.9249	0.6915	1.0000	1.0000	0.8860	0.8621	1.0000	1.0000	1.0000	1.0000	0.6596	0.6426	0.7086	0.6198
			Hurricane	1.0000	1.0000	0.7889	0.7444	1.0000	0.8824	1.0000	0.9901	0.6209	0.5734	0.8170	0.5977	1.0000	1.0000	0.8277	0.8036	1.0000	0.9496	1.0000	1.0000	0.5545	0.5412	0.5945	0.5100
	B	TN	None	1.0000	0.8561	0.4277	0.3947	0.9858	0.8748	1.0000	0.9427	0.5601	0.5101	0.7824	0.5941	1.0000	1.0000	0.6120	0.5889	0.7569	0.6481	1.0000	1.0000	0.6782	0.6598	0.6856	0.6085
			Hurricane	1.0000	0.8046	0.3755	0.3435	0.9470	0.8385	1.0000	0.8536	0.4627	0.4169	0.6887	0.5149	1.0000	1.0000	0.5243	0.5052	0.6788	0.5752	1.0000	1.0000	0.5730	0.5587	0.5739	0.5033
		Clip	None	1.0000	0.5636	0.3769	0.3314	0.6134	0.4398	1.0000	0.8343	0.5447	0.4817	0.6955	0.4497	1.0000	1.0000	0.5285	0.5084	0.7040	0.5744	1.0000	1.0000	0.6275	0.6139	0.6363	0.5511
			Hurricane	1.0000	0.5071	0.3221	0.2803	0.5454	0.3890	1.0000	0.7355	0.4437	0.3870	0.5693	0.3538	1.0000	1.0000	0.4645	0.4429	0.6215	0.5061	1.0000	1.0000	0.5229	0.5070	0.5256	0.4498
		Wrap	None	1.0000	0.5178	0.3709	0.3215	0.5697	0.3726	1.0000	0.8211	0.5433	0.4779	0.6828	0.4349	1.0000	1.0000	0.5177	0.4982	0.6953	0.5613	1.0000	1.0000	0.6276	0.6076	0.6386	0.5493
			Hurricane	1.0000	0.4631	0.3173	0.2717	0.5044	0.3220	1.0000	0.7279	0.3742	0.3235	0.5635	0.3408	1.0000	1.0000	0.4557	0.4325	0.6144	0.4967	1.0000	1.0000	0.5212	0.5060	0.5223	0.4454
	C	TN	None	1.0000	0.8653	0.4204	0.3856	1.0000	0.8897	1.0000	0.9446	0.5603	0.5093	0.7880	0.5965	1.0000	1.0000	0.6052	0.5868	0.7568	0.6467	1.0000	1.0000	0.6799	0.6636	0.6826	0.6065
			Hurricane	1.0000	0.8052	0.3616	0.3312	0.9367	0.8307	1.0000	0.8515	0.4664	0.4165	0.6926	0.5131	1.0000	1.0000	0.5240	0.5088	0.6721	0.5743	1.0000	1.0000	0.5711	0.5592	0.5743	0.5020
		Clip	None	1.0000	0.5506	0.3587	0.3173	0.6022	0.4330	1.0000	0.8341	0.5480	0.4808	0.6938	0.4481	1.0000	1.0000	0.5218	0.5012	0.6944	0.5652	1.0000	1.0000	0.6287	0.6131	0.6406	0.5491
			Hurricane	1.0000	0.4955	0.3005	0.2620	0.5359	0.3817	1.0000	0.7351	0.3747	0.3223	0.5697	0.3532	1.0000	1.0000	0.4564	0.4423	0.6104	0.5005	1.0000	1.0000	0.5164	0.5047	0.5249	0.4507
		Wrap	None	1.0000	0.4989	0.3518	0.3015	0.5531	0.3555	1.0000	0.8152	0.5403	0.4715	0.6899	0.4327	1.0000	1.0000	0.5140	0.4881	0.6913	0.5579	1.0000	1.0000	0.6283	0.6101	0.6361	0.5503
			Hurricane	1.0000	0.4429	0.2909	0.2488	0.4788	0.3029	1.0000	0.7224	0.3765	0.3192	0.5621	0.3372	1.0000	1.0000	0.4469	0.4268	0.6040	0.4886	1.0000	1.0000	0.5178	0.5065	0.5260	0.4484
FBC Old (Shingle > 13 yr // Tile or Metal > 20 yr)	A	TN	None	1.0000	1.0000	0.8262	0.7813	1.0000	1.0000	1.0000	0.8053	0.7083	0.6606	0.9481	0.7213	1.0000	1.0000	0.9042	0.8760	1.0000	1.0000	1.0000	0.8676	0.6968	0.6747	0.7332	0.6459
			Hurricane	1.0000	0.9912	0.7977	0.7553	1.0000	1.0000	1.0000	0.7116	0.6235	0.5789	0.8432	0.6319	1.0000	1.0000	0.8396	0.8175	1.0000	0.9596	0.8974	0.7449	0.5803	0.5667	0.6004	0.5199
		Clip	None	1.0000	0.9290	0.8205	0.7751	1.0000	0.9135	1.0000	0.7875	0.7015	0.6551	0.9251	0.6916	1.0000	1.0000	0.8815	0.8558	1.0000	1.0000	1.0000	0.8380	0.6617	0.6447	0.7074	0.6176
			Hurricane	1.0000	0.8944	0.7994	0.7546	1.0000	0.8749	1.0000	0.7014	0.6269	0.5787	0.8236	0.6030	1.0000	1.0000	0.8315	0.8088	1.0000	0.9494	0.8838	0.7314	0.5593	0.5309	0.5963	0.5127
		Wrap	None	1.0000	0.9301	0.8201	0.7750	1.0000	0.9171	1.0000	0.7876	0.6551	0.6551	0.9249	0.6915	1.0000	1.0000	0.8860	0.8621	1.0000	1.0000	1.0000	0.8402	0.6596	0.6426	0.7086	0.6198
			Hurricane	1.0000	0.8933	0.7889	0.7444	1.0000	0.8824	1.0000	0.7014	0.6209	0.5734	0.8170	0.5977	1.0000	1.0000	0.8277	0.8036	1.0000	0.9496	0.8828	0.7321	0.5545	0.5412	0.5945	0.5100
	B	TN	None	0.9452	0.7261	0.4277	0.3947	0.9858	0.8748	0.9999	0.6580	0.5601	0.5101	0.7824	0.5941	1.0000	0.8190	0.6120	0.5889	0.7569	0.6481	0.9997	0.8330	0.6782	0.6598	0.6856	0.6085
			Hurricane	0.8866	0.6810	0.3755	0.3435	0.9470	0.8385	0.8805	0.5654	0.4627	0.4169	0.6887	0.5149	0.8929	0.7307	0.5243	0.5052	0.6788	0.5752	0.8645	0.7278	0.5730	0.5587	0.5739	0.5033
		Clip	None	0.6933	0.4280	0.3769	0.3314	0.6134	0.4398	0.9337	0.5507	0.5447	0.4817	0.6955	0.4497	0.9344	0.7363	0.5285	0.5084	0.7040	0.5744	0.9520	0.7832	0.6275	0.6139	0.6363	0.5511
			Hurricane	0.6204	0.3773	0.3221	0.2803	0.5454	0.3890	0.7898	0.4510	0.4437	0.3870	0.5693	0.3538	0.8475	0.6664	0.4645	0.4429	0.6215	0.5061	0.8297	0.6826	0.5229	0.5070	0.5256	0.4498
		Wrap	None	0.6692	0.3859	0.3709	0.3215	0.5697	0.3726	0.9325	0.5397	0.5433	0.4779	0.6828	0.4349	0.9215	0.7173	0.5177	0.4982	0.6953	0.5613	0.9531	0.7801	0.6276	0.6076	0.6386	0.5493
			Hurricane	0.5890	0.3322	0.3173	0.2717	0.5044	0.3220	0.7909	0.4428	0.3742	0.3235	0.5635	0.3408	0.8286	0.6530	0.4557	0.4325	0.6144	0.4967	0.8204	0.6697	0.5212	0.5060	0.5223	0.4454
	C	TN	None	0.9425	0.7214	0.4204	0.3856	1.0000	0.8897	1.0000	0.6579	0.5603	0.5093	0.7880	0.5965	1.0000	0.8278	0.6052	0.5868	0.7568	0.6467	1.0000	0.8368	0.6799	0.6636	0.6826	0.6065
			Hurricane	0.8777	0.6780	0.3616	0.3312	0.9367	0.8307	0.8876	0.5663	0.4664	0.4165	0.6926	0.5131	0.8968	0.7259	0.5240	0.5088	0.6721	0.5743	0.8709	0.7319	0.5711	0.5592	0.5743	0.5020
		Clip	None	0.6821	0.4213	0.3587	0.3173	0.6022	0.4330	0.9309	0.5540	0.5480	0.4808	0.6938	0.4481	0.9181	0.7266	0.5218	0.5012	0.6944	0.5652	0.9527	0.7827	0.6287	0.6131	0.6406	0.5491
			Hurricane	0.6047	0.3642	0.3005	0.2620	0.5359	0.3817	0.7963	0.4518	0.3747	0.3223	0.5697	0.3532	0.8297	0.6578	0.4564	0.4423	0.6104	0.5005	0.8225	0.6839	0.5164	0.5047	0.5249	0.4507
		Wrap	None	0.6510	0.3654	0.3518	0.3015	0.5531	0.3555	0.9200	0.5330	0.5403	0.4715	0.6899	0.4327	0.9091	0.7163	0.5140	0.4881	0.6913	0.5579	0.9460	0.7747	0.6283	0.6101	0.6361	0.5503
			Hurricane	0.5638	0.3087	0.2909	0.2488	0.4788	0.3029	0.7932	0.4413	0.3765	0.3192	0.5621	0.3372	0.8290	0.6461	0.4469	0.4268	0.6040	0.4886	0.8206	0.6766	0.5178	0.5065	0.5260	0.4484
FBC Mid Range (Shingle = 6-13 yr // Tile or Metal = 6-20 yr)	A	TN	None	1.0000	0.9902	0.7288	0.7049	1.0000	1.0000	0.9559	0.7515	0.6005	0.5750	0.8023	0.6721	1.0000	1.0000	0.7764	0.7597	1.0000	0.9275	0.8694	0.7908	0.6060	0.5937	0.6370	0.5862
			Hurricane	1.0000	0.9531	0.7017	0.6794	1.0000	1.0000	0.8475	0.6562	0.5142	0.4915	0.7049	0.5827	1.0000	1.0000	0.7100	0.6964	0.9555	0.8591	0.7382	0.6625	0.4909	0.4826	0.5098	0.4647
		Clip	None	1.0000	0.8736	0.7206	0.6963	1.0000	0.8627	0.9416	0.7331	0.5935	0.5697	0.7791	0.6448	1.0000	1.0000	0.7485	0.7355	1.0000	0.9133	0.8588	0.7732	0.5693	0.5616	0.6118	0.5627
			Hurricane	1.0000	0.8465	0.6972	0.6731	0.9658	0.8272	0.8462	0.6472	0.5153	0.4896	0.6839	0.5566	1.0000	1.0000	0.6964	0.6843	0.9418	0.8455	0.7125	0.6412	0.4662	0.4510	0.4984	0.4524
		Wrap	None	1.0000	0.8779	0.7225	0.6996	1.0000	0.8593	0.9391	0.7349	0.5699	0.5694	0.7786	0.6444	1.0000	1.0000	0.7536	0.7405	1.0000	0.9027	0.8511	0.7693	0.5687	0.5582	0.6128	0.5634
			Hurricane	1.0000	0.8396	0.6923	0.6681	0.9653	0.8241	0.8459	0.6470	0.5127	0.4873	0.6795	0.5529	1.0000	0.9984	0.6936	0.6799	0.9501	0.8528	0.7172	0.6460	0.4605	0.4561	0.4972	0.4510
	B	TN	None	0.8118	0.6980	0.3657	0.3476	0.9001	0.8330	0.8138	0.6199	0.4708	0.4425	0.6592	0.5500	0.8147	0.7185	0.5113	0.4962	0.6116	0.5471	0.8303	0.7530	0.5895	0.5778	0.5941	0.5499
			Hurricane	0.7458	0.6363	0.3133	0.2958	0.8523	0.7858	0.6963	0.5257	0.3740	0.3486	0.5677	0.4677	0.7166	0.6319	0.4277	0.4144	0.5322	0.4712	0.7154	0.6468	0.4866	0.4772	0.4851	0.4454
		Clip	None	0.5459	0.3916	0.3094	0.2843	0.4922	0.3875	0.7229	0.5028	0.4471	0.4133	0.5479	0.4004	0.7389	0.6381	0.4246	0.4138	0.5470	0.4690	0.7815	0.6985	0.5362	0.5278	0.5414	0.4917
			Hurricane	0.4732	0.3382	0.2545	0.2314	0.4319	0.3370	0.6023	0.4054	0.3501	0.3193	0.4355	0.3049	0.6504	0.5657	0.3617	0.3497	0.4712	0.4024	0.6644	0.5863	0.4324	0.4240	0.4355	0.3928
		Wrap	None	0.5101	0.3493	0.3017	0.2741	0.4433	0.3198	0.7110	0.4884	0.4453	0.4082	0.5384	0.3841	0.7297	0.6281	0.4149	0.4037	0.5385	0.4568	0.7842	0.6983	0.5364	0.5251	0.5408	0.4896
			Hurricane	0.4452	0.2956	0.2483	0.2231	0.3839	0.2689	0.5936	0.3964	0.3144	0.2863	0.4302	0.2919	0.6485	0.5543	0.3532	0.3405	0.4659	0.3946	0.6635	0.5929	0.4292	0.4208	0.4325	0.3890
	C	TN	None	0.8100	0.6902	0.3599	0.3408	0.9139	0.8472	0.8059	0.6162	0.4685	0.4410	0.6590	0.5496	0.8020	0.7097	0.5077	0.4955	0.6109	0.5442	0.8384	0.7550	0.5895	0.5782	0.5920	0.5484
			Hurricane	0.7441	0.6339	0.3024	0.2855	0.8496	0.7859	0.6955	0.5223	0.3741	0.3473	0.5714	0.4684	0.7161	0.6271	0.4284	0.4183	0.5297	0.4719	0.7153	0.6496	0.4846	0.4767	0.4863	0.4449
		Clip	None	0.5363	0.3862	0.2935	0.2710	0.4815	0.3808	0.7221	0.5040	0.4481	0.4113	0.5472	0.3985	0.7240	0.6299	0.4200	0.4091	0.5397	0.4639	0.7885	0.6989	0.5378	0.5298	0.5440	0.4929
			Hurricane	0.4635	0.3300	0.2357	0.2149	0.4216	0.3289	0.5979	0.4100	0.3150	0.2855	0.4357	0.3047	0.6442	0.5535	0.3554	0.3464	0.4624	0.3974	0.6633	0.5965	0.4273	0.4215	0.4375	0.3953
		Wrap	None	0.4908	0.3309	0.2827	0.2554	0.4263	0.3041	0.7095	0.4872	0.4420	0.4039	0.5397	0.3811	0.7170	0.6142	0.4084	0.3947	0.5330	0.4522	0.7844	0.6976	0.5346	0.5264	0.5416	0.4913
			Hurricane	0.4180	0.2719	0.2232	0.2005	0.3597	0.2501	0.5921	0.3937	0.3144	0.2819	0.4266	0.2882	0.6407	0.5504	0.3448	0.3330	0.4544	0.3855	0.6650	0.5965	0.4294	0.4237	0.4369	0.3911
FBC New (0-5 yr, all types)	A	TN	None	0.8886	0.8805	0.6315	0.6284	1.0000	1.0000	0.6379	0.6353	0.4927	0.4894	0.6566	0.6228	0.8431	0.8355	0.6487	0.6433	0.8473	0.8200	0.6174	0.6102	0.5151	0.5127	0.5407	0.5266
			Hurricane	0.8542	0.8480	0.6056	0.6036	1.0000	0.9821	0.5519	0.5494	0.4050	0.4040	0.5666	0.5335	0.7670	0.7631	0.5805	0.5753	0.7850	0.7586	0.4942	0.4911	0.4016	0.3985	0.4192	0.4094
		Clip	None	0.7753	0.7720	0.6207	0.6174	0.8548	0.8119	0.6225	0.6216	0.4855	0.4842	0.6331	0.5979	0.8185	0.8164	0.6155	0.6151	0.8368	0.8109	0.5813	0.5837	0.4768	0.4785	0.5162	0.5078
			Hurricane	0.7441	0.7423	0.5950	0.5917	0.8215	0.7796	0.5305	0.5274	0.4037	0.4006	0.5442	0.5102	0.7508	0.7502	0.5612	0.5599	0.7679	0.7415	0.4657	0.4640	0.3731	0.3710	0.4005	0.3921
		Wrap	None	0.7775	0.7740	0.6248	0.6242	0.8443	0.8014	0.6214	0.6203	0.4848	0.4836	0.6323	0.5972	0.8191	0.8161	0.6212	0.6189	0.8262	0.7984	0.5819	0.5856	0.4778	0.4737	0.5170	0.5070
			Hurricane	0.7380	0.7339	0.5958	0.5918	0.8062	0.7657	0.5302	0.5274	0.4045	0.4012	0.5421	0.5082	0.7462	0.7447	0.5595	0.5563	0.7818	0.7560	0.4654	0.4636	0.3665	0.3710	0.3999	0.3919
	B	TN	None	0.6188	0.6091	0.3036	0.3005	0.8144	0.7913	0.5198	0.5168	0.3815	0.3749	0.5360	0.5059	0.4968	0.4909	0.4106	0.4035	0.4664	0.4461	0.5892	0.5852	0.5009	0.4959	0.5027	0.4913
			Hurricane	0.5684	0.5590	0.2510	0.2482	0.7577	0.7332	0.4261	0.4231	0.2853	0.2802	0.4466	0.4204	0.4141	0.4086	0.3312	0.3236	0.3856	0.3671	0.4788	0.4745	0.4002	0.3957	0.3962	0.3875
		Clip	None	0.3144	0.3091	0.2418	0.2372	0.3711	0.3352	0.4137	0.4078	0.3494	0.3450	0.4002	0.3510	0.4114	0.4046	0.3207	0.3192	0.3901	0.3636	0.5233	0.5221	0.4449	0.4417	0.4464	0.4322
			Hurricane	0.2606	0.2570	0.1869	0.1826	0.3185	0.2851	0.3136	0.3078	0.2565	0.2515	0.3016	0.2559	0.3397	0.3377	0.2590	0.2564	0.3210	0.2986	0.4198	0.4176	0.3419	0.3411	0.3455	0.3358
		Wrap	None	0.2723	0.2655	0.2326	0.2266	0.3168	0.2669	0.4021	0.3924	0.3474	0.3385	0.3939	0.3333	0.3976	0.3939	0.3120	0.3092	0.3817	0.3522	0.5228	0.5233	0.4453	0.4426	0.4430	0.4298
			Hurricane	0.2200	0.2114	0.1793	0.1745	0.2634	0.2159	0.3080	0.2968	0.2545	0.2492	0.2969	0.2430	0.3311	0.3311	0.2507	0.2485	0.3174	0.2925	0.4157	0.4202	0.3372	0.3356	0.3428	0.3326
	C	TN	None	0.6195	0.6100	0.2994	0.2960	0.8279	0.8047	0.5217	0.5179	0.3768	0.3727	0.5299	0.5028	0.4945	0.4900	0.4103	0.4043	0.4651	0.4416	0.5882	0.5837	0.4990	0.4928	0.5013	0.4903
			Hurricane	0.5610	0.5526	0.2432	0.2398	0.7626	0.7411	0.4289	0.4220	0.2819	0.2780	0.4502	0.4237	0.4122	0.4053	0.3329	0.3278	0.3874	0.3696	0.4762	0.4574	0.3980	0.3942	0.3983	0.3877
		Clip	None	0.3090	0.3035	0.2282	0.2247	0.3609	0.3285	0.4153	0.4090	0.3483	0.3418	0.4006	0.3490	0.4032	0.3990	0.3183	0.3170	0.3850	0.3625	0.5288	0.5258	0.4470	0.4466	0.4474	0.4367
			Hurricane	0.2486	0.2435	0.1709	0.1677	0.3072	0.2760	0.3143	0.3104	0.2552	0.2488	0.3016	0.2561	0.3337	0.3329	0.2544	0.2506	0.3143	0.2944	0.4212	0.4221	0.3381	0.3384	0.3502	0.3400
		Wrap	None	0.2560	0.2503	0.2136	0.2093	0.2995	0.2527	0.4024	0.3889	0.3436	0.3364	0.3896	0.3294	0.3865	0.3826	0.3027	0.3014	0.3747	0.3464	0.5255	0.5229	0.4409	0.4426	0.4471	0.4323
			Hurricane	0.1968	0.1905	0.1554	0.1523	0.2405	0.1972	0.3062	0.2861	0.2524	0.2446	0.2912	0.2393	0.3242	0.3171	0.2427	0.2392	0.3048	0.2823	0.4172	0.4167	0.3410	0.3409	0.3477	0.3338

Table 4-7. Single-Family, Pre-FBC, Region 2, Terrain B Loss Relativity Table (Continued)

Roof Cover Strength	Roof Deck	RWC	Opening Protection	High Slope (>6:12)																							
				2-Story												1-Story											
				Other						Hip						Other						Hip					
				Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel	
				NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	YeSWR	NoSWR	YeSWR
Non-FBC	A	TN	None	1.0000	0.9883	0.5916	0.5519	0.9909	0.8875	1.0000	1.0000	0.7486	0.7074	0.7393	0.6603	1.0000	1.0000	0.5993	0.5808	0.9177	0.8538	1.0000	1.0000	0.7335	0.7252	0.6937	0.6613
			Hurricane	1.0000	0.8732	0.4776	0.4395	0.8762	0.7837	1.0000	1.0000	0.6018	0.5648	0.5922	0.5203	1.0000	1.0000	0.4877	0.4715	0.7829	0.7258	1.0000	1.0000	0.6075	0.5956	0.5389	0.5109
		Clip	None	1.0000	0.8060	0.5741	0.5330	0.7180	0.5668	1.0000	1.0000	0.7416	0.7026	0.7100	0.6265	1.0000	1.0000	0.5722	0.5557	0.6519	0.5722	1.0000	1.0000	0.7331	0.7207	0.6358	0.6051
			Hurricane	1.0000	0.6991	0.4599	0.4182	0.5936	0.4533	1.0000	1.0000	0.6046	0.5662	0.5602	0.4837	1.0000	1.0000	0.4721	0.4597	0.5439	0.4671	1.0000	1.0000	0.6040	0.5948	0.4996	0.4700
		Wrap	None	1.0000	0.8008	0.5733	0.5327	0.6985	0.5434	1.0000	1.0000	0.7412	0.7024	0.7069	0.6269	1.0000	1.0000	0.5733	0.5544	0.6375	0.5541	1.0000	1.0000	0.7331	0.7209	0.6446	0.6045
			Hurricane	1.0000	0.6914	0.4633	0.4225	0.5821	0.4327	1.0000	0.9982	0.6046	0.5662	0.5638	0.4864	1.0000	1.0000	0.4746	0.4563	0.5252	0.4486	1.0000	1.0000	0.6040	0.5948	0.5027	0.4699
	B	TN	None	1.0000	0.9583	0.5398	0.5021	0.9567	0.8616	1.0000	1.0000	0.6785	0.6392	0.6767	0.6098	1.0000	1.0000	0.5837	0.5683	0.9209	0.8564	1.0000	1.0000	0.7142	0.7059	0.6921	0.6602
			Hurricane	1.0000	0.8475	0.4206	0.3891	0.8543	0.7632	1.0000	0.9526	0.5327	0.4968	0.5314	0.4683	1.0000	1.0000	0.4779	0.4634	0.7770	0.7204	1.0000	1.0000	0.5875	0.5767	0.5346	0.5111
		Clip	None	1.0000	0.7422	0.5128	0.4682	0.6507	0.5095	1.0000	1.0000	0.6731	0.6250	0.6160	0.5352	1.0000	1.0000	0.5434	0.5314	0.6319	0.5572	1.0000	1.0000	0.7102	0.6967	0.6170	0.5740
			Hurricane	1.0000	0.6258	0.3923	0.3508	0.5277	0.3964	1.0000	0.8958	0.5274	0.4851	0.4648	0.3897	1.0000	0.9994	0.4500	0.4331	0.5128	0.4494	1.0000	1.0000	0.5898	0.5783	0.4767	0.4470
		Wrap	None	1.0000	0.7122	0.5037	0.4547	0.6240	0.4622	1.0000	1.0000	0.6723	0.6214	0.6076	0.5180	1.0000	1.0000	0.5399	0.5191	0.5865	0.5074	1.0000	1.0000	0.7137	0.7008	0.6116	0.5721
			Hurricane	1.0000	0.5845	0.3830	0.3393	0.4953	0.3486	1.0000	0.8917	0.5258	0.4853	0.4650	0.3854	1.0000	0.9722	0.4465	0.4326	0.4906	0.4169	1.0000	1.0000	0.5824	0.5756	0.4779	0.4475
	C	TN	None	1.0000	0.9554	0.5395	0.5006	0.9579	0.8629	1.0000	1.0000	0.6823	0.6424	0.6732	0.6064	1.0000	1.0000	0.5819	0.5676	0.9209	0.8564	1.0000	1.0000	0.7210	0.7091	0.6949	0.6614
			Hurricane	1.0000	0.8478	0.4189	0.3864	0.8539	0.7643	1.0000	0.9464	0.5346	0.5001	0.5310	0.4684	1.0000	1.0000	0.4759	0.4627	0.7770	0.7204	1.0000	1.0000	0.5856	0.5808	0.5352	0.5103
		Clip	None	1.0000	0.7437	0.5067	0.4623	0.6551	0.5104	1.0000	1.0000	0.6710	0.6253	0.6122	0.5299	1.0000	1.0000	0.5463	0.5293	0.6305	0.5557	1.0000	1.0000	0.7097	0.6963	0.6124	0.5797
			Hurricane	1.0000	0.6289	0.3842	0.3459	0.5278	0.3964	1.0000	0.9017	0.5253	0.4861	0.4652	0.3909	1.0000	0.9954	0.4548	0.4383	0.5199	0.4524	1.0000	1.0000	0.5878	0.5777	0.4771	0.4465
		Wrap	None	1.0000	0.7054	0.5028	0.4531	0.6222	0.4627	1.0000	1.0000	0.6630	0.6157	0.6093	0.5192	1.0000	1.0000	0.5397	0.5190	0.5902	0.5070	1.0000	1.0000	0.7110	0.7021	0.6089	0.5731
			Hurricane	1.0000	0.5903	0.3829	0.3382	0.4923	0.3468	1.0000	0.8885	0.5224	0.4823	0.4585	0.3820	1.0000	0.9770	0.4493	0.4310	0.4884	0.4176	1.0000	1.0000	0.5894	0.5734	0.4773	0.4450
FBC Old (Shingle > 13 yr // Tile or Metal > 20 yr)	A	TN	None	1.0000	0.7747	0.5916	0.5519	0.9909	0.8875	1.0000	0.8008	0.7486	0.7074	0.7393	0.6603	0.9983	0.8619	0.5993	0.5808	0.9177	0.8538	1.0000	0.8913	0.7335	0.7252	0.6937	0.6613
			Hurricane	0.8995	0.6600	0.4776	0.4395	0.8762	0.7837	0.8853	0.6530	0.6018	0.5648	0.5922	0.5203	0.8581	0.7332	0.4877	0.4715	0.7829	0.7258	0.8390	0.7413	0.6075	0.5956	0.5389	0.5109
		Clip	None	0.8832	0.5903	0.5741	0.5330	0.7180	0.5668	1.0000	0.7830	0.7416	0.7026	0.7100	0.6265	0.8630	0.7042	0.5722	0.5557	0.6519	0.5722	0.9811	0.8577	0.7331	0.7207	0.6358	0.6051
			Hurricane	0.7442	0.4784	0.4599	0.4182	0.5936	0.4533	0.8797	0.6338	0.6046	0.5662	0.5602	0.4837	0.7283	0.5893	0.4721	0.4597	0.5439	0.4671	0.8220	0.7146	0.6040	0.5948	0.4996	0.4700
		Wrap	None	0.8756	0.5828	0.5733	0.5327	0.6985	0.5434	1.0000	0.7758	0.7412	0.7024	0.7069	0.6269	0.8438	0.6867	0.5733	0.5544	0.6375	0.5541	0.9745	0.8572	0.7331	0.7209	0.6446	0.6045
			Hurricane	0.7488	0.4698	0.4633	0.4225	0.5821	0.4327	0.8768	0.6343	0.6046	0.5662	0.5638	0.4864	0.7243	0.5825	0.4746	0.4563	0.5252	0.4486	0.8180	0.7117	0.6040	0.5948	0.5027	0.4699
	B	TN	None	1.0000	0.7496	0.5398	0.5021	0.9567	0.8616	0.9967	0.7409	0.6785	0.6392	0.6767	0.6098	1.0000	0.8589	0.5837	0.5683	0.9209	0.8564	0.9981	0.8866	0.7142	0.7059	0.6921	0.6602
			Hurricane	0.8714	0.6404	0.4206	0.3891	0.8543	0.7632	0.8130	0.5892	0.5327	0.4968	0.5314	0.4683	0.8505	0.7277	0.4779	0.4634	0.7770	0.7204	0.8292	0.7295	0.5875	0.5767	0.5346	0.5111
		Clip	None	0.8215	0.5327	0.5128	0.4682	0.6507	0.5095	0.9651	0.6906	0.6731	0.6250	0.6160	0.5352	0.8356	0.6815	0.5434	0.5314	0.6319	0.5572	0.9552	0.8274	0.7102	0.6967	0.6170	0.5740
			Hurricane	0.6752	0.4124	0.3923	0.3508	0.5277	0.3964	0.7805	0.5383	0.5274	0.4851	0.4648	0.3897	0.7048	0.5682	0.4500	0.4331	0.5128	0.4494	0.8053	0.7008	0.5898	0.5783	0.4767	0.4470
		Wrap	None	0.7944	0.4949	0.5037	0.4547	0.6240	0.4622	0.9454	0.6759	0.6723	0.6214	0.6076	0.5180	0.7988	0.6369	0.5399	0.5191	0.5865	0.5074	0.9489	0.8253	0.7137	0.7008	0.6116	0.5721
			Hurricane	0.6544	0.3792	0.3830	0.3393	0.4953	0.3486	0.7726	0.5280	0.5258	0.4853	0.4650	0.3854	0.6923	0.5484	0.4465	0.4326	0.4906	0.4169	0.7863	0.6823	0.5824	0.5756	0.4779	0.4475
	C	TN	None	1.0000	0.7515	0.5395	0.5006	0.9579	0.8629	1.0000	0.7431	0.6823	0.6424	0.6732	0.6064	1.0000	0.8589	0.5819	0.5676	0.9209	0.8564	1.0000	0.8833	0.7210	0.7091	0.6949	0.6614
			Hurricane	0.8663	0.6370	0.4189	0.3864	0.8539	0.7643	0.8155	0.5913	0.5346	0.5001	0.5310	0.4684	0.8505	0.7277	0.4759	0.4627	0.7770	0.7204	0.8362	0.7325	0.5856	0.5808	0.5352	0.5103
		Clip	None	0.8252	0.5303	0.5067	0.4623	0.6551	0.5104	0.9710	0.6963	0.6710	0.6253	0.6122	0.5299	0.8362	0.6793	0.5463	0.5293	0.6305	0.5557	0.9520	0.8257	0.7097	0.6963	0.6124	0.5797
			Hurricane	0.6686	0.4079	0.3842	0.3459	0.5278	0.3964	0.7833	0.5374	0.5253	0.4861	0.4652	0.3909	0.7044	0.5669	0.4548	0.4383	0.5199	0.4524	0.7965	0.6972	0.5878	0.5777	0.4771	0.4465
		Wrap	None	0.8028	0.4949	0.5028	0.4531	0.6222	0.4627	0.9538	0.6808	0.6630	0.6157	0.6093	0.5192	0.8040	0.6394	0.5397	0.5190	0.5902	0.5070	0.9535	0.8280	0.7110	0.7021	0.6089	0.5731
			Hurricane	0.6483	0.3748	0.3829	0.3382	0.4923	0.3468	0.7798	0.5336	0.5224	0.4823	0.4585	0.3820	0.6856	0.5441	0.4493	0.4310	0.4884	0.4176	0.7943	0.6903	0.5894	0.5734	0.4773	0.4450
FBC Mid Range (Shingle = 6-13 yr // Tile or Metal = 6-20 yr)	A	TN	None	0.8751	0.7385	0.5139	0.4935	0.9077	0.8468	0.8778	0.7442	0.6469	0.6245	0.6695	0.6288	0.8711	0.8043	0.5221	0.5114	0.8453	0.8001	0.8643	0.8159	0.6353	0.6315	0.6496	0.6290
			Hurricane	0.7492	0.6288	0.4030	0.3811	0.7952	0.7399	0.7274	0.6049	0.5033	0.4842	0.5300	0.4897	0.7247	0.6662	0.4082	0.4000	0.7090	0.6686	0.7017	0.6637	0.5051	0.4986	0.4927	0.4788
		Clip	None	0.7138	0.5585	0.4949	0.4731	0.6085	0.5219	0.8571	0.7237	0.6415	0.6217	0.6396	0.5932	0.7157	0.6419	0.4911	0.4821	0.5617	0.5146	0.8347	0.7791	0.6318	0.6252	0.5897	0.5729
			Hurricane	0.5899	0.4438	0.3814	0.3594	0.4899	0.4088	0.7014	0.5804	0.5051	0.4835	0.4939	0.4520	0.5946	0.5343	0.3918	0.3850	0.4528	0.4097	0.6806	0.6400	0.5027	0.4985	0.4509	0.4334
		Wrap	None	0.7010	0.5395	0.4943	0.4730	0.5886	0.4981	0.8703	0.7303	0.6411	0.6216	0.6395	0.5953	0.7021	0.6271	0.4919	0.4814	0.5414	0.4937	0.8316	0.7766	0.6318	0.6252	0.5937	0.5721
			Hurricane	0.5786	0.4304	0.3828	0.3615	0.4756	0.3878	0.7026	0.5824	0.5051	0.4834	0.4961	0.4540	0.5844	0.5181	0.3936	0.3833	0.4344	0.3912	0.6786	0.6360	0.5023	0.4986	0.4523	0.4355
	B	TN	None	0.8426	0.7141	0.4718	0.4513	0.8768	0.8207	0.8175	0.6897	0.5870	0.5667	0.6153	0.5784	0.8664	0.7961	0.5069	0.4963	0.8524	0.8076	0.8512	0.7990	0.6225	0.6194	0.6470	0.6287
			Hurricane	0.7205	0.6015	0.3582	0.3406	0.7729	0.7198	0.6464	0.5946	0.4440	0.4253	0.4725	0.4361	0.7261	0.6684	0.4001	0.3914	0.7024	0.6636	0.6895	0.6466	0.4901	0.4841	0.4891	0.4787
		Clip	None	0.6497	0.4988	0.4376	0.4136	0.5473	0.4655	0.7738	0.6390	0.5758	0.5490	0.5487	0.5039	0.6959	0.6234	0.4654	0.4589	0.5443	0.5013	0.7966	0.7479	0.6175	0.6089	0.5703	0.5461
			Hurricane	0.5160	0.3803	0.3186	0.2972	0.4273	0.3509	0.5281	0.4157	0.4357	0.4109	0.3996	0.3571	0.5694	0.5086	0.3706	0.3606	0.4317	0.3941	0.6574	0.6164	0.4909	0.4854	0.4296	0.4136
		Wrap	None	0.6305	0.4653	0.4282	0.4023	0.5121	0.4160	0.7658	0.6277	0.5735	0.5462	0.5360	0.4847	0.6640	0.5875	0.4587	0.4472	0.4942	0.4485	0.8070	0.7510	0.6202	0.6103	0.5606	0.5410
			Hurricane	0.4925	0.3453	0.3135	0.2893	0.3878	0.3013	0.5303	0.4152	0.4334	0.4106	0.3972	0.3515	0.5536	0.4851	0.3673	0.3608	0.4012	0.3588	0.6541	0.6134	0.4843	0.4827	0.4290	0.4126
	C	TN	None	0.8435	0.7155	0.4716	0.4506	0.8799	0.8242	0.8132	0.6894	0.5905	0.5685	0.6142	0.5763	0.8664	0.7961	0.5064	0.4963	0.8524	0.8076	0.8552	0.8057	0.6273	0.6193	0.6465	0.6263
			Hurricane	0.7189	0.6003	0.3529	0.3354	0.7763	0.7237	0.6545	0.5366	0.4437	0.4248	0.4697	0.4366	0.7261	0.6684	0.4000	0.3922	0.7024	0.6636	0.6901	0.6479	0.4888	0.4868	0.4893	0.4783
		Clip	None	0.6536	0.4973	0.4348	0.4105	0.5501	0.4663	0.7768	0.6390	0.5762	0.5504	0.5463	0.4984	0.6927	0.6166	0.4654	0.4575	0.5432	0.5004	0.8085	0.7561	0.6150	0.6082	0.5653	0.5472
			Hurricane	0.5184	0.3803	0.3156	0.2947	0.4278	0.3518	0.6103	0.4925	0.4333	0.4114	0.3999	0.3600	0.5692	0.5076	0.3747	0.3658	0.4346	0.3952	0.6571	0.6205	0.4899	0.4858	0.4287	0.4136
		Wrap	None	0.6313	0.4655	0.4285	0.4009	0.5119	0.4172	0.7715	0.6285	0.5695	0.5440	0.5381	0.4853	0.6618	0.5837	0.4582	0.4481	0.4954	0.4475	0.8044	0.7526	0.6183	0.6134	0.5605	0.5421
			Hurricane	0.4906	0.3453	0.3105	0.2860	0.3870	0.3007	0.6070	0.4848	0.4311	0.4079	0.3927	0.3495	0.5512	0.4868	0.3682	0.3593	0.4000	0.3587	0.6508	0.6074	0.4895	0.4821	0.4282	0.4098
FBC New (0-5 yr, all types)	A	TN	None	0.6768	0.6712	0.4362	0.4351	0.8246	0.8060	0.6434	0.6393	0.5452	0.5415	0.5997	0.5973	0.6888	0.6754	0.4450	0.4421	0.7729	0.7463	0.6859	0.6824	0.5371	0.5378	0.6055	0.5967
			Hurricane	0.5626	0.5571	0.3283	0.3228	0.7142	0.6960	0.4992	0.4967	0.4047	0.4037	0.4678	0.4592	0.5504	0.5412	0.3288	0.3286	0.6352	0.6114	0.5054	0.5024	0.4028	0.4015	0.4465	0.4467
		Clip	None	0.4941	0.4887	0.4157	0.4131	0.4989	0.4770	0.6334	0.6304	0.5414	0.5409	0.5693	0.5600	0.5143	0.5125	0.4099	0.4085	0.4715	0.4571	0.6403	0.6372	0.5305	0.5296	0.5436	0.5407
			Hurricane	0.3739	0.3702	0.3028	0.3006	0.3861	0.3642	0.4761	0.4759	0.4056	0.4007	0.4276	0.4203	0.4004	0.3966	0.3115	0.3102	0.3616	0.3522	0.4871	0.4837	0.4013	0.4022	0.4022	0.3967
		Wrap	None	0.4822	0.4785	0.4154	0.4134	0.4786	0.4528	0.6281	0.6248	0.5410	0.5408	0.5721	0.5637	0.4982	0.4968	0.4106	0.4084	0.4453	0.4333	0.6395	0.6398	0.5306	0.5296	0.5428	0.5397
			Hurricane	0.3628	0.3618	0.3024	0.3004	0.3691	0.3430	0.4764	0.4756	0.4056	0.4006	0.4285	0.4216	0.3898	0.3879	0.3125	0.3102	0.3435	0.3339	0.4844	0.4800	0.4007	0.4024	0.4020	0.4012
	B	TN	None	0.6581	0.6494	0.4038	0.4005	0.7969	0.7797	0.5923	0.5910	0.4955	0.4942	0.5540	0.5470	0.6995	0.6852	0.4300	0.4242	0.7838	0.7587	0.6655	0.6653	0.5307	0.5329	0.6019	0.5972
			Hurricane	0.5396	0.5332	0.2958	0.2920	0.6915	0.6763	0.4382	0.4361	0.3552	0.3539	0.4137	0.4039	0.5511	0.5389	0.3224	0.3193	0.6278	0.6068	0.5041	0.5024	0.3928	0.3915	0.4437	0.4463
		Clip	None	0.4354	0.4311	0.3624	0.3590	0.4438	0.4216	0.5443	0.5408	0.4785	0.4730	0.4813	0.4725	0.4950	0.4895	0.3873	0.3863	0.4566	0.4455	0.6124	0.6112	0.5248	0.5210	0.5237	0.5182
			Hurricane	0.3126	0.3106	0.2448	0.2436	0.3270	0.3053	0.3922	0.3867	0.3439	0.3368	0.3344	0.3246	0.3816	0.3782	0.2911	0.2881	0.3507	0.3389	0.4627	0.4616	0.3920	0.3924	0.3825	0.3801
		Wrap	None	0.3997	0.3931	0.3526	0.3499	0.4001	0.3699	0.5314	0.5275	0.4746	0.4709	0.4644	0.4514	0.4560	0.4524	0.3774	0.3753	0.4020	0.3896	0.6113	0.6081	0.5268	0.5198	0.5097	0.5100
			Hurricane	0.2793	0.2758	0.2439	0.2393	0.2802	0.2541	0.3856	0.3787	0.3410	0.3360	0.3295	0.3175	0.3567	0.3572	0.2882	0.2890	0.3118	0.3008	0.3951	0.3970	0.3862	0.3898	0.3801	0.3777
	C	TN	None	0.6562	0.6473	0.4036	0.4006	0.8020	0.7855	0.5966	0.5934	0.4987	0.4945	0.5552	0.5461	0.6995	0.6852	0.4308	0.4251	0.7838	0.7587	0.6682	0.6674	0.5336	0.5295	0.5981	0.5912
			Hurricane	0.5392	0.5339	0.2868	0.2844	0.6987	0.6831	0.4400	0.4350	0.3528	0.3495	0.4083	0.4048	0.5511	0.5389	0.3242	0.3216	0.6278	0.6068	0.5025	0.5007	0.3919	0.3929	0.4434	0.4463
		Clip	None	0.4333	0.4296	0.3629	0.3588	0.4452	0.4221	0.5372	0.5352	0.4814	0.4754	0.4803	0.4668	0.4897	0.4887	0.3844	0.3856	0.4560	0.4450	0.6080	0.6060	0.5202	0.5201	0.5182	0.5148
			Hurricane	0.3109	0.3099	0.2470	0.2435	0.3278	0.3072	0.3885	0.3834	0.3414	0.3368	0.3346	0.3292	0.3795	0.3774	0.2947	0.2934	0.3494	0.3380	0.4619	0.4637	0.3919	0.3939	0.3804	0.3808
		Wrap	None	0.4029	0.3987	0.3542	0.3487	0.4017	0.3717	0.5339	0.5281	0.4760	0.4724	0.4668	0.4514	0.4569	0.4522	0.3768	0.3771	0.4007	0.3879	0.6148	0.6096	0.5257	0.5248	0.5122	0.5111
			Hurricane	0.2816	0.2766	0.2381	0.2338	0.2816	0.2545	0.3818	0.3749	0.3398	0.3336	0.3269	0.3171	0.3604	0.3589	0.2871	0.2877	0.3116	0.2999	0.3976	0.3960	0.3895	0.3909	0.3792	0.3746

Table 4-8. Single-Family, Pre-FBC, Region 2, Terrain C Loss Relativity Table

Roof Cover Strength	Roof Deck	RWC	Opening Protection	Low Slope (<=6:12)																							
				2-Story												1-Story											
				Other						Hip						Other						Hip					
				Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel	
				NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR
Non-FBC	A	TN	None	1.0000	1.0000	0.8454	0.8029	1.0000	1.0000	1.0000	1.0000	0.7734	0.7177	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.7435	0.7083	0.8237	0.6831
			Hurricane	1.0000	1.0000	0.7973	0.7523	1.0000	1.0000	1.0000	0.8541	0.6417	0.5876	0.8814	0.6652	1.0000	1.0000	0.9811	0.9418	1.0000	1.0000	1.0000	1.0000	0.6026	0.5705	0.6647	0.5377
		Clip	None	1.0000	0.9712	0.8387	0.7951	1.0000	0.9018	1.0000	0.9869	0.7727	0.7182	1.0000	0.7729	1.0000	1.0000	1.0000	0.9835	1.0000	1.0000	1.0000	1.0000	0.7020	0.6658	0.7970	0.6514
			Hurricane	1.0000	0.9170	0.7838	0.7383	1.0000	0.8365	1.0000	0.8468	0.6371	0.5822	0.8551	0.6306	1.0000	1.0000	0.9546	0.9135	1.0000	1.0000	1.0000	0.9889	0.5612	0.5277	0.6401	0.5046
		Wrap	None	1.0000	0.9715	0.8363	0.7917	1.0000	0.8870	1.0000	0.9869	0.7727	0.7182	1.0000	0.7767	1.0000	1.0000	1.0000	0.9931	1.0000	1.0000	1.0000	1.0000	0.6973	0.6605	0.7938	0.6480
			Hurricane	1.0000	0.9127	0.7839	0.7395	1.0000	0.8320	1.0000	0.8468	0.6371	0.5822	0.8552	0.6311	1.0000	1.0000	0.9479	0.9066	1.0000	1.0000	1.0000	0.9888	0.5575	0.5246	0.6426	0.5074
	B	TN	None	1.0000	0.7980	0.4582	0.4162	1.0000	0.8987	1.0000	0.8018	0.5889	0.5142	0.8609	0.6480	1.0000	0.9894	0.7025	0.6677	0.8619	0.7024	1.0000	1.0000	0.7108	0.6823	0.7493	0.6256
			Hurricane	1.0000	0.7223	0.3780	0.3390	0.9290	0.8304	1.0000	0.6627	0.4395	0.4003	0.7164	0.5268	1.0000	0.8710	0.5884	0.5573	0.7422	0.5990	1.0000	0.9792	0.5789	0.5528	0.6067	0.4985
		Clip	None	1.0000	0.4770	0.3975	0.3373	0.6255	0.4450	1.0000	0.6507	0.5558	0.4610	0.7413	0.4464	1.0000	0.8433	0.5742	0.5247	0.7610	0.5615	1.0000	1.0000	0.6239	0.5840	0.6801	0.5250
			Hurricane	0.9239	0.3940	0.3146	0.2595	0.5312	0.3721	1.0000	0.5057	0.4085	0.3290	0.5650	0.3101	1.0000	0.7322	0.4721	0.4317	0.6342	0.4635	1.0000	0.8644	0.4775	0.4451	0.5219	0.3884
		Wrap	None	1.0000	0.4171	0.3890	0.3197	0.5799	0.3595	1.0000	0.6190	0.5522	0.4520	0.7382	0.4134	1.0000	0.8104	0.5576	0.5044	0.7435	0.5385	1.0000	1.0000	0.6181	0.5799	0.6735	0.5196
			Hurricane	0.8990	0.3370	0.3053	0.2458	0.4761	0.2820	1.0000	0.4894	0.4053	0.3225	0.5604	0.2870	1.0000	0.7154	0.4534	0.4097	0.6230	0.4442	1.0000	0.8533	0.4680	0.4340	0.5154	0.3790
	C	TN	None	1.0000	0.7889	0.4476	0.4047	1.0000	0.8936	1.0000	0.8011	0.5865	0.5137	0.8592	0.6487	1.0000	0.9865	0.7016	0.6653	0.8525	0.7000	1.0000	1.0000	0.7114	0.6815	0.7492	0.6237
			Hurricane	1.0000	0.7142	0.3655	0.3279	0.9317	0.8345	1.0000	0.6648	0.4402	0.3753	0.7165	0.5227	1.0000	0.8656	0.5857	0.5574	0.7240	0.5916	1.0000	0.9786	0.5798	0.5554	0.5996	0.4940
		Clip	None	1.0000	0.4614	0.3753	0.3164	0.6197	0.4404	1.0000	0.6507	0.5541	0.4579	0.7420	0.4490	1.0000	0.8314	0.5598	0.5157	0.7450	0.5492	1.0000	1.0000	0.6251	0.5855	0.6763	0.5218
			Hurricane	0.9092	0.3802	0.2839	0.2314	0.5168	0.3562	1.0000	0.5021	0.4081	0.3275	0.5695	0.3124	1.0000	0.7253	0.4567	0.4192	0.6267	0.4582	1.0000	0.8662	0.4740	0.4436	0.5219	0.3913
		Wrap	None	1.0000	0.3894	0.3589	0.2882	0.5587	0.3372	1.0000	0.6115	0.5454	0.4369	0.7304	0.4088	1.0000	0.7937	0.5362	0.4827	0.7257	0.5193	1.0000	1.0000	0.6235	0.5780	0.6708	0.5170
			Hurricane	0.8600	0.3022	0.2685	0.2079	0.4432	0.2535	1.0000	0.4803	0.4020	0.3130	0.5605	0.2839	1.0000	0.6915	0.4322	0.3897	0.5979	0.4228	1.0000	0.8549	0.4706	0.4354	0.5147	0.3796
FBC Old (Shingle > 13 yr // Tile or Metal > 20 yr)	A	TN	None	1.0000	1.0000	0.8454	0.8029	1.0000	1.0000	1.0000	0.8362	0.7734	0.7177	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8153	0.7435	0.7083	0.8237	0.6831
			Hurricane	1.0000	0.9512	0.7973	0.7523	1.0000	1.0000	1.0000	0.6923	0.6417	0.5876	0.8814	0.6652	1.0000	1.0000	0.9811	0.9418	1.0000	1.0000	0.8789	0.6700	0.6026	0.5705	0.6647	0.5377
		Clip	None	1.0000	0.8954	0.8387	0.7951	1.0000	0.9018	1.0000	0.8184	0.7727	0.7182	1.0000	0.7729	1.0000	1.0000	1.0000	0.9835	1.0000	1.0000	1.0000	0.7877	0.7020	0.6658	0.7970	0.6514
			Hurricane	1.0000	0.8406	0.7838	0.7383	1.0000	0.8365	0.9882	0.6704	0.6371	0.5822	0.8551	0.6306	1.0000	1.0000	0.9546	0.9135	1.0000	1.0000	0.8457	0.6305	0.5612	0.5277	0.6401	0.5046
		Wrap	None	1.0000	0.8951	0.8363	0.7917	1.0000	0.8870	1.0000	0.8202	0.7727	0.7182	1.0000	0.7767	1.0000	1.0000	1.0000	0.9931	1.0000	1.0000	1.0000	0.7896	0.6973	0.6605	0.7938	0.6480
			Hurricane	1.0000	0.8325	0.7839	0.7395	1.0000	0.8320	0.9881	0.6706	0.6371	0.5822	0.8552	0.6311	1.0000	1.0000	0.9479	0.9066	1.0000	1.0000	0.8501	0.6325	0.5575	0.5246	0.6426	0.5074
	B	TN	None	0.9175	0.7286	0.4582	0.4162	1.0000	0.8987	1.0000	0.6460	0.5889	0.5142	0.8609	0.6480	0.9969	0.7680	0.7025	0.6677	0.8619	0.7024	0.9996	0.7637	0.7108	0.6823	0.7493	0.6256
			Hurricane	0.8327	0.6571	0.3780	0.3390	0.9290	0.8304	0.8189	0.5120	0.4395	0.4003	0.7164	0.5268	0.8575	0.6556	0.5884	0.5573	0.7422	0.5990	0.8177	0.6258	0.5789	0.5528	0.6067	0.4985
		Clip	None	0.6678	0.4099	0.3975	0.3373	0.6255	0.4450	0.9012	0.4929	0.5558	0.4610	0.7413	0.4464	0.8906	0.6196	0.5742	0.5247	0.7610	0.5615	0.9337	0.6619	0.6239	0.5840	0.6801	0.5250
			Hurricane	0.5562	0.3305	0.3146	0.2595	0.5312	0.3721	0.6982	0.3475	0.4085	0.3290	0.5650	0.3101	0.7476	0.5190	0.4721	0.4317	0.6342	0.4635	0.7396	0.5093	0.4775	0.4451	0.5219	0.3884
		Wrap	None	0.6327	0.3484	0.3890	0.3197	0.5799	0.3595	0.8920	0.4648	0.5522	0.4520	0.7382	0.4134	0.8774	0.5932	0.5576	0.5044	0.7435	0.5385	0.9315	0.6577	0.6181	0.5799	0.6735	0.5196
			Hurricane	0.5197	0.2691	0.3053	0.2458	0.4761	0.2820	0.6945	0.3338	0.4053	0.3225	0.5604	0.2870	0.7422	0.4981	0.4534	0.4097	0.6230	0.4442	0.7311	0.5081	0.4680	0.4340	0.5154	0.3790
	C	TN	None	0.9203	0.7261	0.4476	0.4047	1.0000	0.8936	1.0000	0.6417	0.5865	0.5137	0.8592	0.6487	1.0000	0.7680	0.7016	0.6653	0.8525	0.7000	1.0000	0.7633	0.7114	0.6815	0.7492	0.6237
			Hurricane	0.8300	0.6561	0.3655	0.3279	0.9317	0.8345	0.8106	0.5050	0.4402	0.3753	0.7165	0.5227	0.8502	0.6539	0.5857	0.5574	0.7240	0.5916	0.8159	0.6249	0.5798	0.5554	0.5996	0.4940
		Clip	None	0.6537	0.3974	0.3753	0.3164	0.6197	0.4404	0.8948	0.4895	0.5541	0.4579	0.7420	0.4490	0.8789	0.6108	0.5598	0.5157	0.7450	0.5492	0.9372	0.6627	0.6251	0.5855	0.6763	0.5218
			Hurricane	0.5351	0.3107	0.2839	0.2314	0.5168	0.3562	0.7009	0.3491	0.4081	0.3275	0.5695	0.3124	0.7354	0.5065	0.4567	0.4192	0.6267	0.4582	0.7322	0.5059	0.4740	0.4436	0.5219	0.3913
		Wrap	None	0.6078	0.3236	0.3589	0.2882	0.5587	0.3372	0.8925	0.4571	0.5454	0.4369	0.7304	0.4088	0.8632	0.5775	0.5362	0.4827	0.7257	0.5193	0.9259	0.6537	0.6235	0.5780	0.6708	0.5170
			Hurricane	0.4838	0.2371	0.2685	0.2079	0.4432	0.2535	0.6927	0.3269	0.4020	0.3130	0.5605	0.2839	0.7118	0.4727	0.4322	0.3897	0.5979	0.4228	0.7347	0.5079	0.4706	0.4354	0.5147	0.3796
FBC Mid Range (Shingle = 6-13 yr // Tile or Metal = 6-20 yr)	A	TN	None	1.0000	0.9736	0.7677	0.7444	1.0000	1.0000	1.0000	0.7982	0.6703	0.6400	0.8906	0.8812	1.0000	1.0000	0.9392	0.9139	1.0000	1.0000	0.9006	0.7651	0.6395	0.6191	0.7063	0.6234
			Hurricane	1.0000	0.9153	0.7161	0.6903	1.0000	1.0000	0.8420	0.6555	0.5362	0.5076	0.7517	0.6258	1.0000	1.0000	0.8499	0.8259	1.0000	0.9668	0.7225	0.6080	0.5043	0.4837	0.5567	0.4806
		Clip	None	1.0000	0.8621	0.7538	0.7300	0.9896	0.8612	0.9861	0.7827	0.6680	0.6380	0.8679	0.7335	1.0000	1.0000	0.8949	0.8724	1.0000	1.0000	0.8591	0.7191	0.5880	0.5685	0.6735	0.5893
			Hurricane	0.9807	0.8079	0.7009	0.6765	0.9322	0.8044	0.8208	0.6390	0.5332	0.5039	0.7225	0.5910	1.0000	1.0000	0.8171	0.7950	1.0000	0.9477	0.6879	0.5669	0.4510	0.4318	0.5239	0.4444
		Wrap	None	1.0000	0.8623	0.7532	0.7289	0.9783	0.8503	0.9870	0.7831	0.6681	0.6380	0.8701	0.7357	1.0000	1.0000	0.8935	0.8723	1.0000	1.0000	0.8596	0.7193	0.5879	0.5677	0.6704	0.5853
			Hurricane	0.9763	0.8002	0.7006	0.6768	0.9248	0.7963	0.8209	0.6390	0.5328	0.5034	0.7219	0.5902	1.0000	1.0000	0.8143	0.7921	1.0000	0.9427	0.6837	0.5672	0.4466	0.4180	0.5255	0.4459
	B	TN	None	0.8221	0.7098	0.4038	0.3801	0.9332	0.8685	0.8273	0.6192	0.4996	0.4580	0.7359	0.6110	0.8391	0.7057	0.6088	0.5842	0.7204	0.6205	0.8467	0.7099	0.6158	0.5955	0.6357	0.5635
			Hurricane	0.7378	0.6379	0.3277	0.3055	0.8587	0.7970	0.6585	0.4788	0.3565	0.3334	0.5984	0.4852	0.7058	0.5922	0.4978	0.4755	0.6043	0.5147	0.6743	0.5682	0.4863	0.4697	0.5027	0.4383
		Clip	None	0.5480	0.3889	0.3339	0.3000	0.5209	0.4091	0.7221	0.4683	0.4570	0.4045	0.5922	0.4077	0.7166	0.5603	0.4685	0.4404	0.6037	0.4779	0.7536	0.6036	0.5179	0.4957	0.5547	0.4623
			Hurricane	0.4449	0.3088	0.2534	0.2227	0.4349	0.3348	0.5335	0.3228	0.3159	0.2721	0.4310	0.2695	0.5939	0.4574	0.3698	0.3465	0.4904	0.3813	0.5797	0.4552	0.3768	0.3592	0.4077	0.3273
		Wrap	None	0.5028	0.3295	0.3216	0.2826	0.4671	0.3240	0.7053	0.4399	0.4498	0.3942	0.5827	0.3727	0.7078	0.5390	0.4470	0.4177	0.5864	0.4539	0.7538	0.5994	0.5111	0.4899	0.5524	0.4584
			Hurricane	0.4013	0.2504	0.2424	0.2081	0.3735	0.2466	0.5229	0.3064	0.3117	0.2655	0.4233	0.2460	0.5778	0.4344	0.3482	0.3236	0.4779	0.3610	0.5745	0.4438	0.3679	0.3494	0.4008	0.3180
	C	TN	None	0.8161	0.7028	0.3936	0.3692	0.9269	0.8613	0.8283	0.6194	0.4981	0.4581	0.7358	0.6125	0.8352	0.7045	0.6095	0.5841	0.7159	0.6205	0.8458	0.7084	0.6167	0.5956	0.6374	0.5644
			Hurricane	0.7329	0.6308	0.3148	0.2934	0.8591	0.7980	0.6606	0.4799	0.3553	0.3201	0.5978	0.4824	0.7013	0.5883	0.4963	0.4762	0.5941	0.5108	0.6750	0.5689	0.4867	0.4710	0.4996	0.4368
		Clip	None	0.5320	0.3748	0.3138	0.2812	0.5135	0.4035	0.7163	0.4670	0.4543	0.4008	0.5930	0.4090	0.7037	0.5501	0.4559	0.4301	0.5898	0.4668	0.7558	0.6058	0.5182	0.4970	0.5543	0.4611
			Hurricane	0.4303	0.2944	0.2263	0.1968	0.4216	0.3218	0.5408	0.3246	0.3155	0.2708	0.4337	0.2706	0.5765	0.4465	0.3567	0.3353	0.4787	0.3721	0.5816	0.4573	0.3754	0.3582	0.4096	0.3301
		Wrap	None	0.4802	0.3024	0.2928	0.2531	0.4450	0.3018	0.7020	0.4314	0.4433	0.3818	0.5783	0.3674	0.6879	0.5151	0.4273	0.3974	0.5678	0.4344	0.7543	0.5967	0.5139	0.4892	0.5481	0.4545
			Hurricane	0.3662	0.2158	0.2068	0.1726	0.3425	0.2186	0.5211	0.2978	0.3078	0.2578	0.4225	0.2423	0.5537	0.4155	0.3295	0.3057	0.4541	0.3424	0.5719	0.4468	0.3689	0.3502	0.4021	0.3195
FBC New (0-5 yr, all types)	A	TN	None	0.9272	0.9196	0.6900	0.6858	1.0000	1.0000	0.7249	0.7179	0.5671	0.5624	0.7549	0.7222	0.9915	0.9840	0.8060	0.7976	1.0000	0.9796	0.6455	0.6350	0.5355	0.5300	0.5889	0.5638
			Hurricane	0.8714	0.8628	0.6349	0.6283	1.0000	0.9833	0.5806	0.5738	0.4307	0.4275	0.6219	0.5865	0.8982	0.8919	0.7186	0.7100	0.9203	0.8778	0.4939	0.4594	0.4060	0.3970	0.4486	0.4236
		Clip	None	0.8045	0.7993	0.6689	0.6649	0.8602	0.8206	0.7068	0.7010	0.5633	0.5578	0.7306	0.6941	0.9608	0.9548	0.7663	0.7614	0.9909	0.9480	0.5981	0.5941	0.4740	0.4712	0.5500	0.5271
			Hurricane	0.7509	0.7462	0.6180	0.6147	0.8122	0.7723	0.5629	0.5582	0.4293	0.4257	0.5898	0.5514	0.8783	0.8735	0.6797	0.6765	0.9025	0.8608	0.4424	0.4406	0.3407	0.3359	0.4076	0.3841
		Wrap	None	0.7985	0.7926	0.6701	0.6660	0.8520	0.8135	0.7056	0.6995	0.5635	0.5579	0.7298	0.6946	0.9607	0.9551	0.7551	0.7515	0.9857	0.9455	0.5966	0.5924	0.4785	0.4749	0.5471	0.5226
			Hurricane	0.7506	0.7443	0.6173	0.6140	0.8007	0.7607	0.5630	0.5582	0.4286	0.4247	0.5887	0.5493	0.8769	0.8709	0.6806	0.6776	0.8985	0.8568	0.4446	0.4399	0.3357	0.3114	0.4084	0.3844
	B	TN	None	0.6751	0.6646	0.3494	0.3441	0.8629	0.8383	0.5673	0.5600	0.4102	0.4018	0.6109	0.5739	0.5786	0.5650	0.5151	0.5006	0.5788	0.5387	0.5952	0.5871	0.5208	0.5086	0.5222	0.5014
			Hurricane	0.5970	0.5875	0.2773	0.2721	0.7884	0.7636	0.4241	0.4163	0.2735	0.2665	0.4804	0.4437	0.4639	0.4491	0.4073	0.3937	0.4663	0.4304	0.4588	0.4490	0.3936	0.3866	0.3986	0.3781
		Clip	None	0.3462	0.3384	0.2702	0.2628	0.4164	0.3732	0.4190	0.4055	0.3582	0.3480	0.4431	0.3689	0.4266	0.4175	0.3629	0.3562	0.4463	0.3942	0.4869	0.4804	0.4120	0.4075	0.4293	0.3996
			Hurricane	0.2652	0.2586	0.1922	0.1860	0.3387	0.2975	0.2732	0.2612	0.2234	0.2151	0.2971	0.2288	0.3225	0.3158	0.2676	0.2612	0.3467	0.2990	0.3431	0.3377	0.2761	0.2733	0.2935	0.2662
		Wrap	None	0.2921	0.2817	0.2542	0.2455	0.3543	0.2886	0.3955	0.3762	0.3475	0.3363	0.4272	0.3320	0.4021	0.3935	0.3365	0.3311	0.4293	0.3693	0.4866	0.4803	0.4041	0.3999	0.4313	0.3971
			Hurricane	0.2125	0.2021	0.1795	0.1704	0.2710	0.2112	0.2600	0.2445	0.2182	0.2085	0.2861	0.2050	0.3005	0.2910	0.2431	0.2375	0.3327	0.2778	0.3322	0.3263	0.2677	0.2649	0.2861	0.2569
	C	TN	None	0.6684	0.6587	0.3396	0.3338	0.8538	0.8290	0.5632	0.5572	0.4098	0.4025	0.6123	0.5762	0.5814	0.5683	0.5174	0.5028	0.5793	0.5410	0.5976	0.5913	0.5219	0.5097	0.5257	0.5052
			Hurricane	0.5941	0.5826	0.2641	0.2589	0.7866	0.7616	0.4260	0.4179	0.2704	0.2649	0.4790	0.4421	0.4592	0.4486	0.4069	0.3950	0.4642	0.4301	0.4585	0.4493	0.3936	0.3867	0.3997	0.3797
		Clip	None	0.3350	0.3279	0.2522	0.2460	0.4073	0.3665	0.4167	0.4038	0.3545	0.3436	0.4439	0.3691	0.4125	0.4034	0.3521	0.3446	0.4346	0.3844	0.4881	0.4795	0.4114	0.4085	0.4324	0.4004
			Hurricane	0.2501	0.2437	0.1687	0.1622	0.3264	0.2875	0.2718	0.2488	0.2229	0.2140	0.2978	0.2288	0.3089	0.3015	0.2568	0.2515	0.3307	0.2859	0.3430	0.3347	0.2769	0.2729	0.2973	0.2689
		Wrap	None	0.2662	0.2547	0.2266	0.2180	0.3313	0.2664	0.3890	0.3673	0.3412	0.3267	0.4261	0.3261	0.3828	0.3725	0.3185	0.3121	0.4098	0.3494	0.4823	0.4747	0.4044	0.4003	0.4254	0.3921
			Hurricane	0.1764	0.1678	0.1450	0.1374	0.2417	0.1838	0.2531	0.2377	0.2135	0.2025	0.2844	0.2007	0.2815	0.2722	0.2268	0.2217	0.3102	0.2619	0.3319	0.3265	0.2672	0.2650	0.2895	0.2594

Table 4-8. Single-Family, Pre-FBC, Region 2, Terrain C Loss Relativity Table (Continued)

Roof Cover Strength	Roof Deck	RWC	Opening Protection	High Slope (> 6:12)																							
				2-Story												1-Story											
				Other						Hip						Other						Hip					
				Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel	
				NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR
Non-FBC	A	TN	None	1.0000	0.9141	0.6229	0.5784	1.0000	0.9262	1.0000	0.9944	0.7716	0.7212	0.7923	0.7036	1.0000	1.0000	0.5987	0.5723	0.9873	0.9127	1.0000	1.0000	0.7374	0.7112	0.7461	0.6890
			Hurricane	1.0000	0.7588	0.4709	0.4284	0.8747	0.7833	1.0000	0.7916	0.5816	0.5281	0.5983	0.5124	1.0000	0.8864	0.4653	0.4420	0.8158	0.7469	1.0000	1.0000	0.5624	0.5382	0.5439	0.4924
		Clip	None	1.0000	0.7211	0.5969	0.5488	0.7475	0.5923	1.0000	0.9756	0.7679	0.7151	0.7493	0.6569	1.0000	0.8513	0.5709	0.5434	0.6732	0.5716	1.0000	1.0000	0.7415	0.7131	0.6556	0.5940
			Hurricane	1.0000	0.5599	0.4477	0.4001	0.5847	0.4389	1.0000	0.7696	0.5815	0.5262	0.5574	0.4653	1.0000	0.7025	0.4411	0.4178	0.5182	0.4259	1.0000	0.9929	0.5614	0.5370	0.4772	0.4217
		Wrap	None	1.0000	0.7069	0.5971	0.5494	0.7332	0.5680	1.0000	0.9758	0.7679	0.7151	0.7585	0.6624	1.0000	0.8336	0.5686	0.5421	0.6464	0.5384	1.0000	1.0000	0.7411	0.7131	0.6608	0.5985
			Hurricane	1.0000	0.5475	0.4497	0.4020	0.5739	0.4171	1.0000	0.7696	0.5815	0.5261	0.5601	0.4642	1.0000	0.6879	0.4422	0.4173	0.5022	0.4062	1.0000	0.9925	0.5623	0.5379	0.4760	0.4206
	B	TN	None	1.0000	0.8765	0.5666	0.5199	0.9999	0.9048	1.0000	0.9063	0.6940	0.6366	0.7158	0.6342	1.0000	1.0000	0.5800	0.5516	0.9834	0.9111	1.0000	1.0000	0.7140	0.6867	0.7317	0.6777
			Hurricane	1.0000	0.7247	0.4055	0.3618	0.8571	0.7678	1.0000	0.7051	0.4939	0.4398	0.5226	0.4430	1.0000	0.8841	0.4375	0.4156	0.8135	0.7475	1.0000	1.0000	0.5357	0.5110	0.5276	0.4830
		Clip	None	1.0000	0.6320	0.5219	0.4599	0.6879	0.5295	1.0000	0.8254	0.6622	0.5879	0.6333	0.5278	1.0000	0.8122	0.5218	0.4920	0.6429	0.5453	1.0000	1.0000	0.7010	0.6729	0.6035	0.5401
			Hurricane	1.0000	0.4688	0.3617	0.3075	0.5105	0.3660	1.0000	0.6278	0.4711	0.4118	0.4330	0.3354	1.0000	0.6657	0.3947	0.3680	0.4908	0.4037	1.0000	0.9447	0.5261	0.5007	0.4264	0.3725
		Wrap	None	1.0000	0.5777	0.5066	0.4366	0.6415	0.4553	1.0000	0.7991	0.6581	0.5802	0.6185	0.4927	1.0000	0.7507	0.5207	0.4859	0.5797	0.4647	1.0000	1.0000	0.7039	0.6745	0.6002	0.5324
			Hurricane	1.0000	0.4202	0.3511	0.2920	0.4634	0.2991	1.0000	0.6119	0.4706	0.4067	0.4232	0.3199	1.0000	0.6224	0.3927	0.3662	0.4423	0.3448	1.0000	0.9288	0.5216	0.4969	0.4174	0.3605
	C	TN	None	1.0000	0.8765	0.5659	0.5190	1.0000	0.9049	1.0000	0.9122	0.6913	0.6363	0.7197	0.6351	1.0000	1.0000	0.5781	0.5507	0.9887	0.9141	1.0000	1.0000	0.7124	0.6825	0.7310	0.6774
			Hurricane	1.0000	0.7242	0.4038	0.3602	0.8571	0.7678	1.0000	0.7052	0.4874	0.4372	0.5228	0.4421	1.0000	0.8841	0.4393	0.4167	0.8135	0.7475	1.0000	1.0000	0.5368	0.5124	0.5287	0.4816
		Clip	None	1.0000	0.6351	0.5201	0.4606	0.6847	0.5261	1.0000	0.8207	0.6618	0.5883	0.6370	0.5257	1.0000	0.8125	0.5256	0.4930	0.6497	0.5511	1.0000	1.0000	0.6994	0.6696	0.6007	0.5370
			Hurricane	1.0000	0.4669	0.3617	0.3079	0.5141	0.3689	1.0000	0.6234	0.4712	0.4090	0.4338	0.3378	1.0000	0.6653	0.3981	0.3719	0.4895	0.4041	1.0000	0.9391	0.5228	0.4965	0.4227	0.3704
		Wrap	None	1.0000	0.5750	0.5026	0.4321	0.6456	0.4545	1.0000	0.8004	0.6592	0.5797	0.6139	0.4903	1.0000	0.7537	0.5158	0.4816	0.5805	0.4651	1.0000	1.0000	0.6950	0.6662	0.5954	0.5295
			Hurricane	1.0000	0.4168	0.3516	0.2904	0.4611	0.2978	1.0000	0.6080	0.4692	0.4042	0.4236	0.3187	1.0000	0.6247	0.3888	0.3585	0.4423	0.3451	1.0000	0.9321	0.5208	0.4961	0.4231	0.3660
FBC Old (Shingle > 13 yr // Tile or Metal > 20 yr)	A	TN	None	1.0000	0.7919	0.6229	0.5784	1.0000	0.9262	1.0000	0.7896	0.7716	0.7212	0.7923	0.7036	1.0000	0.8392	0.5987	0.5723	0.9873	0.9127	1.0000	0.8444	0.7374	0.7112	0.7461	0.6890
			Hurricane	0.8576	0.6433	0.4709	0.4284	0.8747	0.7833	0.8374	0.5857	0.5816	0.5281	0.5983	0.5124	0.8070	0.6671	0.4653	0.4420	0.8158	0.7469	0.7762	0.6286	0.5624	0.5382	0.5439	0.4924
		Clip	None	0.8889	0.6013	0.5969	0.5488	0.7475	0.5923	1.0000	0.7627	0.7679	0.7151	0.7493	0.6569	0.8193	0.6281	0.5709	0.5434	0.6732	0.5716	0.9783	0.7887	0.7415	0.7131	0.6556	0.5940
			Hurricane	0.6897	0.4377	0.4477	0.4001	0.5847	0.4389	0.8168	0.5581	0.5815	0.5262	0.5574	0.4653	0.6527	0.4871	0.4411	0.4178	0.5182	0.4259	0.7442	0.5889	0.5614	0.5370	0.4772	0.4217
		Wrap	None	0.8824	0.5829	0.5971	0.5494	0.7332	0.5680	1.0000	0.7670	0.7679	0.7151	0.7585	0.6624	0.8095	0.6146	0.5686	0.5421	0.6464	0.5384	0.9760	0.7852	0.7411	0.7131	0.6608	0.5985
			Hurricane	0.6878	0.4253	0.4497	0.4020	0.5739	0.4171	0.8179	0.5591	0.5815	0.5261	0.5601	0.4642	0.6361	0.4677	0.4422	0.4173	0.5022	0.4062	0.7435	0.5874	0.5623	0.5379	0.4760	0.4206
	B	TN	None	0.9984	0.7613	0.5666	0.5199	0.9999	0.9048	1.0000	0.7110	0.6940	0.6366	0.7158	0.6342	1.0000	0.8401	0.5800	0.5516	0.9834	0.9111	0.9997	0.8148	0.7140	0.6867	0.7317	0.6777
			Hurricane	0.8114	0.6035	0.4055	0.3618	0.8571	0.7678	0.7445	0.4995	0.4939	0.4398	0.5226	0.4430	0.7965	0.6642	0.4375	0.4156	0.8135	0.7475	0.7579	0.6134	0.5357	0.5110	0.5276	0.4830
		Clip	None	0.8128	0.5184	0.5219	0.4599	0.6879	0.5295	0.9380	0.6214	0.6622	0.5879	0.6333	0.5278	0.7864	0.5906	0.5218	0.4920	0.6429	0.5453	0.9250	0.7241	0.7010	0.6729	0.6035	0.5401
			Hurricane	0.6041	0.3506	0.3617	0.3075	0.5105	0.3660	0.6981	0.4292	0.4711	0.4118	0.4330	0.3354	0.6086	0.4458	0.3947	0.3680	0.4908	0.4037	0.6996	0.5342	0.5261	0.5007	0.4264	0.3725
		Wrap	None	0.7802	0.4603	0.5066	0.4366	0.6415	0.4553	0.9268	0.5956	0.6581	0.5802	0.6185	0.4927	0.7509	0.5381	0.5207	0.4859	0.5797	0.4647	0.9209	0.7200	0.7039	0.6745	0.6002	0.5324
			Hurricane	0.5745	0.3033	0.3511	0.2920	0.4634	0.2991	0.6884	0.4093	0.4706	0.4067	0.4232	0.3199	0.5775	0.4009	0.3927	0.3662	0.4423	0.3448	0.6919	0.5326	0.5216	0.4969	0.4174	0.3605
	C	TN	None	0.9993	0.7617	0.5659	0.5190	1.0000	0.9049	1.0000	0.7142	0.6913	0.6363	0.7197	0.6351	1.0000	0.8419	0.5781	0.5507	0.9887	0.9141	1.0000	0.8157	0.7124	0.6825	0.7310	0.6774
			Hurricane	0.8116	0.6033	0.4038	0.3602	0.8571	0.7678	0.7445	0.4984	0.4874	0.4372	0.5228	0.4421	0.7965	0.6642	0.4393	0.4167	0.8135	0.7475	0.7575	0.6148	0.5368	0.5124	0.5287	0.4816
		Clip	None	0.8141	0.5187	0.5201	0.4606	0.6847	0.5261	0.9354	0.6201	0.6618	0.5883	0.6370	0.5257	0.7865	0.5909	0.5256	0.4930	0.6497	0.5511	0.9254	0.7206	0.6994	0.6696	0.6007	0.5370
			Hurricane	0.6065	0.3522	0.3617	0.3079	0.5141	0.3689	0.7005	0.4293	0.4712	0.4090	0.4338	0.3378	0.6087	0.4450	0.3981	0.3719	0.4895	0.4041	0.7001	0.5355	0.5228	0.4965	0.4227	0.3704
		Wrap	None	0.7743	0.4598	0.5026	0.4321	0.6456	0.4545	0.9256	0.5900	0.6592	0.5797	0.6139	0.4903	0.7457	0.5338	0.5158	0.4816	0.5805	0.4651	0.9208	0.7176	0.6950	0.6662	0.5954	0.5295
			Hurricane	0.5760	0.3032	0.3516	0.2904	0.4611	0.2978	0.6885	0.4106	0.4692	0.4042	0.4236	0.3187	0.5765	0.4026	0.3888	0.3585	0.4423	0.3451	0.6957	0.5318	0.5208	0.4961	0.4231	0.3660
FBC Mid Range (Shingle = 6-13 yr // Tile or Metal = 6-20 yr)	A	TN	None	0.9048	0.7752	0.5542	0.5296	0.9575	0.8978	0.9091	0.7588	0.6750	0.6476	0.7280	0.6786	0.8908	0.8019	0.5237	0.5077	0.9251	0.8713	0.8671	0.7830	0.6306	0.6169	0.6924	0.6565
			Hurricane	0.7450	0.6283	0.4028	0.3797	0.8152	0.7599	0.6800	0.5503	0.4845	0.4560	0.5352	0.4870	0.7079	0.6327	0.3890	0.3755	0.7534	0.7034	0.6496	0.5772	0.4559	0.4428	0.4879	0.4562
		Clip	None	0.7405	0.5790	0.5231	0.4968	0.6517	0.5607	0.8859	0.7301	0.6702	0.6409	0.6822	0.6310	0.6966	0.5944	0.4879	0.4723	0.5841	0.5232	0.8152	0.7264	0.6282	0.6133	0.5900	0.5562
			Hurricane	0.5570	0.4150	0.3757	0.3500	0.4922	0.4069	0.6602	0.5246	0.4815	0.4519	0.4876	0.4355	0.5289	0.4479	0.3612	0.3487	0.4365	0.3809	0.6076	0.5330	0.4458	0.4321	0.4146	0.3833
		Wrap	None	0.7303	0.5620	0.5235	0.4967	0.6307	0.5347	0.8846	0.7287	0.6703	0.6410	0.6894	0.6352	0.6709	0.5706	0.4863	0.4718	0.5507	0.4883	0.8200	0.7274	0.6279	0.6133	0.5930	0.5582
			Hurricane	0.5511	0.4030	0.3756	0.3492	0.4738	0.3821	0.6594	0.5238	0.4815	0.4519	0.4877	0.4347	0.5169	0.4320	0.3622	0.3484	0.4143	0.3578	0.6084	0.5329	0.4465	0.4330	0.4119	0.3813
	B	TN	None	0.8743	0.7469	0.5042	0.4782	0.9365	0.8799	0.8236	0.6773	0.6026	0.5714	0.6571	0.6111	0.8864	0.7982	0.5079	0.4904	0.9237	0.8702	0.8524	0.7615	0.6062	0.5899	0.6752	0.6415
			Hurricane	0.7097	0.5967	0.3450	0.3213	0.7922	0.7387	0.5949	0.4690	0.4055	0.3759	0.4590	0.4148	0.6976	0.6275	0.3668	0.3537	0.7565	0.7079	0.6267	0.5595	0.4323	0.4191	0.4735	0.4452
		Clip	None	0.6634	0.4982	0.4509	0.4173	0.5888	0.4954	0.7586	0.5903	0.5643	0.5245	0.5598	0.4993	0.6575	0.5533	0.4439	0.4270	0.5563	0.4981	0.7673	0.6695	0.5908	0.5754	0.5360	0.4997
			Hurricane	0.4745	0.3313	0.2956	0.2658	0.4191	0.3331	0.5445	0.3975	0.3809	0.3484	0.3635	0.3079	0.4944	0.4092	0.3208	0.3064	0.4109	0.3586	0.5588	0.4850	0.4192	0.4058	0.3631	0.3330
		Wrap	None	0.6219	0.4415	0.4329	0.3936	0.5340	0.4207	0.7473	0.5629	0.5592	0.5162	0.5360	0.4623	0.6102	0.4975	0.4401	0.4212	0.4853	0.4164	0.7625	0.6663	0.5938	0.5771	0.5310	0.4925
			Hurricane	0.4388	0.2848	0.2839	0.2511	0.3654	0.2647	0.5282	0.3779	0.3786	0.3435	0.3506	0.2910	0.4595	0.3709	0.3143	0.2998	0.3563	0.2970	0.5548	0.4793	0.4158	0.4031	0.3563	0.3237
	C	TN	None	0.8739	0.7464	0.5037	0.4774	0.9346	0.8780	0.8235	0.6770	0.6011	0.5715	0.6577	0.6106	0.8864	0.7982	0.5074	0.4906	0.9264	0.8717	0.8530	0.7622	0.6058	0.5895	0.6763	0.6421
			Hurricane	0.7100	0.5947	0.3427	0.3191	0.7936	0.7404	0.5967	0.4694	0.4018	0.3752	0.4600	0.4142	0.6975	0.6275	0.3676	0.3540	0.7565	0.7079	0.6270	0.5595	0.4329	0.4196	0.4756	0.4457
		Clip	None	0.6623	0.4972	0.4506	0.4177	0.5855	0.4928	0.7589	0.5913	0.5651	0.5253	0.5609	0.4980	0.6587	0.5541	0.4459	0.4278	0.5611	0.5015	0.7733	0.6764	0.5903	0.5748	0.5332	0.4969
			Hurricane	0.4763	0.3341	0.2954	0.2657	0.4204	0.3348	0.5395	0.3947	0.3813	0.3471	0.3634	0.3082	0.4944	0.4082	0.3221	0.3076	0.4079	0.3564	0.5581	0.4821	0.4174	0.4035	0.3625	0.3317
		Wrap	None	0.6208	0.4401	0.4298	0.3904	0.5362	0.4207	0.7431	0.5626	0.5587	0.5147	0.5347	0.4612	0.6130	0.4988	0.4361	0.4172	0.4866	0.4180	0.7670	0.6687	0.5868	0.5719	0.5290	0.4911
			Hurricane	0.4421	0.2849	0.2828	0.2496	0.3651	0.2651	0.5277	0.3761	0.3765	0.3294	0.3509	0.2900	0.4592	0.3667	0.3144	0.2972	0.3555	0.2969	0.5542	0.4801	0.4166	0.3921	0.3574	0.3253
FBC New (0-5 yr, all types)	A	TN	None	0.7424	0.7346	0.4854	0.4809	0.8889	0.8694	0.6886	0.6853	0.5784	0.5740	0.6637	0.6536	0.7385	0.7178	0.4487	0.4431	0.8629	0.8299	0.6720	0.6665	0.5238	0.5225	0.6387	0.6241
			Hurricane	0.5883	0.5821	0.3348	0.3310	0.7558	0.7365	0.4857	0.4800	0.3873	0.3840	0.4721	0.4615	0.5684	0.5527	0.3127	0.3090	0.6909	0.6598	0.4734	0.4675	0.3494	0.3473	0.4319	0.4200
		Clip	None	0.5335	0.5289	0.4493	0.4447	0.5559	0.5290	0.6571	0.6524	0.5726	0.5667	0.6150	0.6051	0.5109	0.5055	0.4048	0.4012	0.4950	0.4749	0.6172	0.6137	0.5149	0.5134	0.5244	0.5183
			Hurricane	0.3721	0.3682	0.3037	0.2999	0.3997	0.3749	0.4572	0.4521	0.3816	0.3776	0.4178	0.4057	0.3679	0.3626	0.2813	0.2797	0.3549	0.3360	0.4231	0.4214	0.3302	0.3271	0.3520	0.3449
		Wrap	None	0.5168	0.5123	0.4499	0.4439	0.5282	0.5014	0.6567	0.6526	0.5726	0.5669	0.6203	0.6080	0.4908	0.4876	0.4041	0.4016	0.4550	0.4383	0.6142	0.6150	0.5148	0.5135	0.5253	0.5180
			Hurricane	0.3566	0.3525	0.3015	0.2964	0.3736	0.3470	0.4570	0.4519	0.3816	0.3776	0.4152	0.4052	0.3483	0.3463	0.2823	0.2795	0.3263	0.3093	0.4233	0.4212	0.3307	0.3281	0.3478	0.3420
	B	TN	None	0.7153	0.7069	0.4418	0.4365	0.8731	0.8549	0.6172	0.6119	0.5112	0.5061	0.5984	0.5880	0.7442	0.7241	0.4357	0.4292	0.8640	0.8293	0.6613	0.6544	0.4984	0.4931	0.6188	0.6053
			Hurricane	0.5570	0.5504	0.2846	0.2808	0.7274	0.7096	0.4024	0.3988	0.3170	0.3120	0.3953	0.3865	0.5665	0.5490	0.2961	0.2917	0.6994	0.6683	0.4555	0.4488	0.3288	0.3272	0.4194	0.4073
		Clip	None	0.4606	0.4558	0.3800	0.3747	0.4897	0.4612	0.5341	0.5244	0.4664	0.4612	0.4864	0.4708	0.4810	0.4756	0.3659	0.3619	0.4697	0.4509	0.5640	0.5600	0.4807	0.4780	0.4684	0.4594
			Hurricane	0.2959	0.2899	0.2295	0.2242	0.3277	0.3003	0.3302	0.3262	0.2907	0.2850	0.2941	0.2804	0.3344	0.3279	0.2468	0.2449	0.3310	0.3136	0.3779	0.3745	0.3123	0.3109	0.2998	0.2934
		Wrap	None	0.4103	0.4011	0.3592	0.3506	0.4264	0.3860	0.5100	0.4954	0.4603	0.4521	0.4534	0.4320	0.4250	0.4185	0.3596	0.3565	0.3909	0.3682	0.5593	0.5525	0.4837	0.4798	0.4619	0.4527
			Hurricane	0.2517	0.2432	0.2168	0.2101	0.2674	0.2303	0.3224	0.3108	0.2865	0.2803	0.2780	0.2620	0.2931	0.2863	0.2359	0.2334	0.2704	0.2493	0.3736	0.3708	0.3101	0.3093	0.2951	0.2869
	C	TN	None	0.7155	0.7068	0.4414	0.4357	0.8693	0.8510	0.6192	0.6146	0.5110	0.5068	0.5957	0.5861	0.7442	0.7241	0.4368	0.4304	0.8640	0.8293	0.6608	0.6543	0.4993	0.4966	0.6216	0.6068
			Hurricane	0.5571	0.5504	0.2817	0.2781	0.7302	0.7129	0.4048	0.3996	0.3162	0.3131	0.3972	0.3863	0.5665	0.5490	0.2959	0.2912	0.6994	0.6683	0.4583	0.4527	0.3290	0.3268	0.4224	0.4098
		Clip	None	0.4626	0.4576	0.3811	0.3747	0.4863	0.4595	0.5321	0.5225	0.4685	0.4623	0.4849	0.4702	0.4815	0.4758	0.3662	0.3627	0.4726	0.4519	0.5679	0.5633	0.4811	0.4800	0.4658	0.4568
			Hurricane	0.2961	0.2912	0.2291	0.2235	0.3268	0.3007	0.3310	0.3236	0.2913	0.2853	0.2929	0.2786	0.3338	0.3269	0.2462	0.2433	0.3262	0.3087	0.3832	0.3777	0.3121	0.3105	0.3024	0.2929
		Wrap	None	0.4110	0.4015	0.3569	0.3488	0.4269	0.3868	0.5093	0.4948	0.4582	0.4497	0.4555	0.4321	0.4224	0.4176	0.3563	0.3528	0.3928	0.3710	0.5617	0.5580	0.4787	0.4776	0.4625	0.4527
			Hurricane	0.2520	0.2434	0.2140	0.2088	0.2691	0.2325	0.3194	0.3087	0.2839	0.2546	0.2782	0.2614	0.2920	0.2866	0.2400	0.2360	0.2687	0.2486	0.3745	0.3695	0.3125	0.2882	0.2917	0.2846

Table 4-9. Single-Family, Pre-FBC, Region 3, Terrain A Loss Relativity Table

Roof Cover Strength	Roof Deck	RWC	Opening Protection	Low Slope (<=6:12)																							
				2-Story												1-Story											
				Other						Hip						Other						Hip					
				Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel	
				NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR
Non-FBC	A	TN	None	1.0000	1.0000	0.6814	0.6535	1.0000	0.9770	1.0000	1.0000	0.5375	0.5242	0.6644	0.5227	1.0000	1.0000	0.5490	0.5389	0.7334	0.6734	1.0000	1.0000	0.6241	0.6263	0.6019	0.5882
			Hurricane	1.0000	1.0000	0.6487	0.6223	1.0000	0.9484	1.0000	1.0000	0.5047	0.4885	0.6222	0.4895	1.0000	1.0000	0.5305	0.5218	0.7300	0.6643	1.0000	1.0000	0.5868	0.5925	0.5811	0.5631
		Clip	None	1.0000	1.0000	0.6724	0.6403	1.0000	0.8393	1.0000	1.0000	0.5364	0.5187	0.6644	0.5144	1.0000	1.0000	0.5456	0.5409	0.7414	0.6821	1.0000	1.0000	0.6205	0.6212	0.6076	0.5854
			Hurricane	1.0000	1.0000	0.6493	0.6227	1.0000	0.8030	1.0000	1.0000	0.5068	0.4849	0.6255	0.4820	1.0000	1.0000	0.5288	0.5272	0.7207	0.6590	1.0000	1.0000	0.5976	0.6019	0.5897	0.5746
		Wrap	None	1.0000	1.0000	0.6642	0.6361	1.0000	0.8287	1.0000	1.0000	0.5364	0.5187	0.6629	0.5130	1.0000	1.0000	0.5392	0.5382	0.7378	0.6811	1.0000	1.0000	0.6184	0.6263	0.6026	0.5825
			Hurricane	1.0000	1.0000	0.6460	0.6212	1.0000	0.8036	1.0000	1.0000	0.5068	0.4849	0.6258	0.4823	1.0000	1.0000	0.5241	0.5235	0.7230	0.6636	1.0000	1.0000	0.5875	0.5947	0.5933	0.5746
	B	TN	None	1.0000	1.0000	0.3587	0.3416	0.8607	0.7585	1.0000	1.0000	0.4874	0.4733	0.5840	0.4632	1.0000	1.0000	0.4222	0.4225	0.5550	0.5205	1.0000	1.0000	0.6248	0.6191	0.6076	0.5940
			Hurricane	1.0000	1.0000	0.3396	0.3230	0.8266	0.7321	1.0000	1.0000	0.4488	0.4322	0.5415	0.4333	1.0000	1.0000	0.4061	0.4071	0.5406	0.5047	1.0000	1.0000	0.5882	0.5947	0.5897	0.5595
		Clip	None	1.0000	1.0000	0.3396	0.3212	0.5721	0.4441	1.0000	1.0000	0.4820	0.4712	0.5595	0.4200	1.0000	1.0000	0.4111	0.4088	0.5510	0.5101	1.0000	1.0000	0.6212	0.6270	0.5990	0.5868
			Hurricane	1.0000	1.0000	0.3183	0.3006	0.5382	0.4200	1.0000	1.0000	0.4492	0.4293	0.5029	0.3836	1.0000	1.0000	0.4004	0.3997	0.5372	0.5020	1.0000	1.0000	0.6011	0.5947	0.5775	0.5660
		Wrap	None	1.0000	1.0000	0.3420	0.3252	0.5557	0.4231	1.0000	1.0000	0.4841	0.4679	0.5461	0.4146	1.0000	1.0000	0.4095	0.4105	0.5523	0.5127	1.0000	1.0000	0.6162	0.6263	0.5947	0.5846
			Hurricane	1.0000	1.0000	0.3152	0.3004	0.5274	0.4047	1.0000	1.0000	0.4477	0.4344	0.5133	0.3908	1.0000	1.0000	0.4011	0.4064	0.5248	0.4993	1.0000	1.0000	0.5933	0.5911	0.5696	0.5696
	C	TN	None	1.0000	1.0000	0.3562	0.3403	0.8621	0.7625	1.0000	1.0000	0.4867	0.4751	0.5941	0.4585	1.0000	1.0000	0.4212	0.4239	0.5510	0.5228	1.0000	1.0000	0.6248	0.6184	0.6090	0.5925
			Hurricane	1.0000	1.0000	0.3316	0.3186	0.8395	0.7430	1.0000	1.0000	0.4448	0.4308	0.5379	0.4283	1.0000	1.0000	0.4074	0.4061	0.5419	0.5107	1.0000	1.0000	0.5875	0.5990	0.5839	0.5574
		Clip	None	1.0000	1.0000	0.3358	0.3184	0.5698	0.4445	1.0000	1.0000	0.4877	0.4751	0.5512	0.4200	1.0000	1.0000	0.4125	0.4165	0.5409	0.5084	1.0000	1.0000	0.6241	0.6198	0.6112	0.5890
			Hurricane	1.0000	1.0000	0.3097	0.2987	0.5431	0.4222	1.0000	1.0000	0.4466	0.4384	0.5068	0.3857	1.0000	1.0000	0.4048	0.4011	0.5319	0.5027	1.0000	1.0000	0.5997	0.5933	0.5746	0.5667
		Wrap	None	1.0000	1.0000	0.3385	0.3195	0.5550	0.4213	1.0000	1.0000	0.4885	0.4726	0.5494	0.4171	1.0000	1.0000	0.4175	0.4168	0.5483	0.5141	1.0000	1.0000	0.6205	0.6291	0.6098	0.5846
			Hurricane	1.0000	1.0000	0.3060	0.2942	0.5185	0.3967	1.0000	1.0000	0.4463	0.4322	0.5123	0.3868	1.0000	1.0000	0.4031	0.3994	0.5339	0.4970	1.0000	1.0000	0.6011	0.5976	0.5689	0.5588
FBC Old (Shingle > 13 yr // Tile or Metal > 20 yr)	A	TN	None	1.0000	1.0000	0.6814	0.6535	1.0000	0.9770	1.0000	0.7938	0.5375	0.5242	0.6644	0.5227	1.0000	1.0000	0.5490	0.5389	0.7334	0.6734	1.0000	0.9440	0.6241	0.6263	0.6019	0.5882
			Hurricane	1.0000	1.0000	0.6487	0.6223	1.0000	0.9484	1.0000	0.7527	0.5047	0.4885	0.6222	0.4895	1.0000	1.0000	0.5305	0.5218	0.7300	0.6643	0.9756	0.9175	0.5868	0.5925	0.5811	0.5631
		Clip	None	1.0000	0.9705	0.6724	0.6403	1.0000	0.8393	1.0000	0.7797	0.5364	0.5187	0.6644	0.5144	1.0000	1.0000	0.5456	0.5409	0.7414	0.6821	1.0000	0.9469	0.6205	0.6212	0.6076	0.5854
			Hurricane	1.0000	0.9418	0.6493	0.6227	1.0000	0.8030	1.0000	0.7495	0.5068	0.4849	0.6255	0.4820	1.0000	1.0000	0.5288	0.5272	0.7207	0.6590	0.9849	0.9154	0.5976	0.6019	0.5897	0.5746
		Wrap	None	1.0000	0.9761	0.6642	0.6361	1.0000	0.8287	1.0000	0.7797	0.5364	0.5187	0.6629	0.5130	1.0000	1.0000	0.5392	0.5382	0.7378	0.6811	1.0000	0.9390	0.6184	0.6263	0.6026	0.5825
			Hurricane	1.0000	0.9378	0.6460	0.6212	1.0000	0.8036	1.0000	0.7495	0.5068	0.4849	0.6258	0.4823	1.0000	1.0000	0.5241	0.5235	0.7230	0.6636	0.9835	0.9118	0.5875	0.5947	0.5933	0.5746
	B	TN	None	0.9907	0.7675	0.3587	0.3416	0.8607	0.7585	1.0000	0.7138	0.4874	0.4733	0.5840	0.4632	0.9863	0.9148	0.4222	0.4225	0.5550	0.5205	0.9957	0.9505	0.6248	0.6191	0.6076	0.5940
			Hurricane	0.9555	0.7343	0.3396	0.3230	0.8266	0.7321	0.9589	0.6929	0.4488	0.4322	0.5415	0.4333	0.9571	0.8773	0.4061	0.4071	0.5406	0.5047	0.9663	0.9139	0.5882	0.5947	0.5897	0.5595
		Clip	None	0.8315	0.5785	0.3396	0.3212	0.5721	0.4441	0.9859	0.6957	0.4820	0.4712	0.5595	0.4200	0.9816	0.8893	0.4111	0.4088	0.5510	0.5101	0.9971	0.9412	0.6212	0.6270	0.5990	0.5868
			Hurricane	0.7941	0.5597	0.3183	0.3006	0.5382	0.4200	0.9225	0.6629	0.4492	0.4293	0.5029	0.3836	0.9588	0.8685	0.4004	0.3997	0.5372	0.5020	0.9598	0.9175	0.6011	0.5947	0.5775	0.5660
		Wrap	None	0.8216	0.5588	0.3420	0.3252	0.5557	0.4231	0.9950	0.7048	0.4841	0.4679	0.5461	0.4146	0.9933	0.9007	0.4095	0.4105	0.5523	0.5127	0.9849	0.9340	0.6162	0.6263	0.5947	0.5846
			Hurricane	0.7753	0.5462	0.3152	0.3004	0.5274	0.4047	0.9301	0.6662	0.4477	0.4344	0.5133	0.3908	0.9909	0.8960	0.4011	0.4064	0.5248	0.4993	0.9663	0.9089	0.5933	0.5911	0.5696	0.5696
	C	TN	None	1.0000	0.7647	0.3562	0.3403	0.8621	0.7625	1.0000	0.7149	0.4867	0.4751	0.5941	0.4585	0.9920	0.9125	0.4212	0.4239	0.5510	0.5228	0.9943	0.9469	0.6248	0.6184	0.6090	0.5925
			Hurricane	0.9615	0.7459	0.3316	0.3186	0.8395	0.7430	0.9578	0.6853	0.4448	0.4308	0.5379	0.4283	0.9893	0.8944	0.4074	0.4061	0.5419	0.5107	0.9663	0.9139	0.5875	0.5990	0.5839	0.5574
		Clip	None	0.8293	0.5789	0.3358	0.3184	0.5698	0.4445	0.9960	0.7087	0.4877	0.4751	0.5512	0.4200	1.0000	0.9215	0.4125	0.4165	0.5409	0.5084	0.9849	0.9362	0.6241	0.6198	0.6112	0.5890
			Hurricane	0.7987	0.5608	0.3097	0.2987	0.5431	0.4222	0.9315	0.6622	0.4466	0.4384	0.5068	0.3857	0.9554	0.8749	0.4048	0.4011	0.5319	0.5027	0.9684	0.9146	0.5997	0.5933	0.5746	0.5667
		Wrap	None	0.8193	0.5628	0.3385	0.3195	0.5550	0.4213	0.9975	0.7033	0.4885	0.4726	0.5494	0.4171	0.9980	0.9188	0.4175	0.4168	0.5483	0.5141	1.0000	0.9519	0.6205	0.6291	0.6098	0.5846
			Hurricane	0.7844	0.5506	0.3060	0.2942	0.5185	0.3967	0.9322	0.6593	0.4463	0.4322	0.5123	0.3868	0.9792	0.9014	0.4031	0.3994	0.5339	0.4970	0.9605	0.9175	0.6011	0.5976	0.5689	0.5588
FBC Mid Range (Shingle = 6-13 yr // Tile or Metal = 6-20 yr)	A	TN	None	1.0000	0.9280	0.5725	0.5591	0.9833	0.8830	0.8421	0.6929	0.4434	0.4353	0.5476	0.4697	0.9504	0.8907	0.4556	0.4502	0.6009	0.5691	0.8494	0.8278	0.5714	0.5660	0.5552	0.5527
			Hurricane	1.0000	0.9030	0.5463	0.5327	0.9574	0.8604	0.7902	0.6521	0.4104	0.4036	0.5087	0.4342	0.9282	0.8682	0.4385	0.4343	0.5897	0.5525	0.8242	0.8020	0.5362	0.5395	0.5301	0.5233
		Clip	None	1.0000	0.8577	0.5616	0.5446	0.8628	0.7438	0.8428	0.6792	0.4447	0.4357	0.5411	0.4578	0.9319	0.8833	0.4534	0.4494	0.6055	0.5736	0.8393	0.8271	0.5642	0.5617	0.5606	0.5481
			Hurricane	1.0000	0.8353	0.5422	0.5286	0.8295	0.7115	0.7956	0.6442	0.4126	0.3996	0.5070	0.4266	0.9232	0.8592	0.4378	0.4366	0.5884	0.5543	0.8192	0.7956	0.5423	0.5438	0.5373	0.5323
		Wrap	None	1.0000	0.8625	0.5610	0.5464	0.8555	0.7366	0.8432	0.6792	0.4447	0.4357	0.5418	0.4587	0.9319	0.8769	0.4502	0.4495	0.6026	0.5709	0.8393	0.8286	0.5610	0.5678	0.5581	0.5463
			Hurricane	1.0000	0.8437	0.5407	0.5277	0.8294	0.7109	0.7960	0.6438	0.4126	0.3996	0.5065	0.4259	0.9232	0.8736	0.4366	0.4365	0.5874	0.5578	0.8156	0.7920	0.5423	0.5420	0.5380	0.5330
	B	TN	None	0.7862	0.6677	0.2869	0.2781	0.7317	0.6731	0.7740	0.6348	0.4032	0.3951	0.4740	0.4083	0.7733	0.7341	0.3462	0.3451	0.4316	0.4136	0.8472	0.8207	0.5703	0.5667	0.5635	0.5542
			Hurricane	0.7554	0.6491	0.2647	0.2566	0.6969	0.6414	0.7217	0.5934	0.3657	0.3569	0.4328	0.3769	0.7569	0.7156	0.3337	0.3308	0.4153	0.3987	0.8221	0.7984	0.5326	0.5402	0.5359	0.5276
		Clip	None	0.6004	0.4762	0.2660	0.2571	0.4231	0.3506	0.7534	0.6179	0.4007	0.3976	0.4420	0.3648	0.7622	0.7378	0.3374	0.3340	0.4274	0.4049	0.8407	0.8300	0.5664	0.5699	0.5581	0.5470
			Hurricane	0.5882	0.4591	0.2450	0.2346	0.3949	0.3291	0.7087	0.5681	0.3655	0.3560	0.3955	0.3313	0.7572	0.7082	0.3255	0.3260	0.4130	0.3939	0.8235	0.7862	0.5409	0.5369	0.5294	0.5230
		Wrap	None	0.5984	0.4718	0.2667	0.2574	0.4059	0.3300	0.7473	0.6092	0.4014	0.3940	0.4357	0.3650	0.7596	0.7287	0.3328	0.3352	0.4259	0.4068	0.8436	0.8199	0.5653	0.5714	0.5588	0.5456
			Hurricane	0.5692	0.4452	0.2428	0.2336	0.3805	0.3094	0.7022	0.5717	0.3646	0.3580	0.4007	0.3344	0.7505	0.7173	0.3253	0.3280	0.4076	0.3922	0.8242	0.7956	0.5384	0.5341	0.5319	0.5226
	C	TN	None	0.7704	0.6589	0.2864	0.2766	0.7253	0.6674	0.7657	0.6312	0.4027	0.3971	0.4784	0.4056	0.7622	0.7290	0.3459	0.3484	0.4299	0.4145	0.8508	0.8278	0.5703	0.5664	0.5653	0.5542
			Hurricane	0.7410	0.6321	0.2610	0.2543	0.7086	0.6533	0.7231	0.5919	0.3630	0.3572	0.4320	0.3756	0.7458	0.7156	0.3303	0.3310	0.4172	0.4001	0.8242	0.8020	0.5323	0.5423	0.5330	0.5287
		Clip	None	0.6040	0.4795	0.2618	0.2526	0.4216	0.3513	0.7588	0.6085	0.4039	0.3965	0.4385	0.3664	0.7666	0.7290	0.3399	0.3405	0.4224	0.4039	0.8451	0.8286	0.5681	0.5664	0.5621	0.5499
			Hurricane	0.5780	0.4596	0.2375	0.2320	0.3953	0.3284	0.7152	0.5681	0.3634	0.3609	0.3978	0.3327	0.7522	0.7146	0.3271	0.3248	0.4091	0.3939	0.8178	0.7963	0.5456	0.5405	0.5344	0.5201
		Wrap	None	0.5951	0.4611	0.2634	0.2531	0.4010	0.3258	0.7516	0.6139	0.4036	0.3942	0.4378	0.3641	0.7579	0.7220	0.3394	0.3380	0.4256	0.4078	0.8458	0.8271	0.5649	0.5685	0.5631	0.5466
			Hurricane	0.5648	0.4443	0.2355	0.2285	0.3721	0.3031	0.7012	0.5692	0.3648	0.3560	0.3994	0.3302	0.7559	0.7126	0.3265	0.3248	0.4098	0.3915	0.8257	0.7934	0.5427	0.5420	0.5247	0.5176
FBC New (0-5 yr, all types)	A	TN	None	0.7087	0.7022	0.4636	0.4647	0.8154	0.7890	0.4831	0.4895	0.3493	0.3464	0.4308	0.4167	0.5144	0.5181	0.3622	0.3615	0.4685	0.4648	0.5983	0.5911	0.5187	0.5057	0.5086	0.5172
			Hurricane	0.6788	0.6785	0.4439	0.4432	0.7923	0.7724	0.4517	0.4528	0.3161	0.3187	0.3951	0.3789	0.5077	0.5091	0.3464	0.3467	0.4494	0.4406	0.5638	0.5466	0.4857	0.4864	0.4792	0.4835
		Clip	None	0.6323	0.6290	0.4508	0.4488	0.6712	0.6482	0.4831	0.4805	0.3529	0.3526	0.4178	0.4012	0.5211	0.5235	0.3612	0.3578	0.4695	0.4651	0.5983	0.5861	0.5079	0.5022	0.5136	0.5108
			Hurricane	0.6128	0.6121	0.4352	0.4346	0.6478	0.6199	0.4423	0.4420	0.3183	0.3143	0.3886	0.3713	0.5040	0.5047	0.3467	0.3461	0.4561	0.4497	0.5681	0.5624	0.4871	0.4857	0.4849	0.4900
		Wrap	None	0.6447	0.6427	0.4578	0.4567	0.6735	0.6445	0.4809	0.4841	0.3529	0.3526	0.4207	0.4045	0.5228	0.5215	0.3612	0.3608	0.4675	0.4608	0.5983	0.5875	0.5036	0.5093	0.5136	0.5100
			Hurricane	0.6119	0.6082	0.4353	0.4343	0.6491	0.6183	0.4438	0.4438	0.3183	0.3143	0.3872	0.3695	0.5007	0.5034	0.3491	0.3494	0.4517	0.4520	0.5696	0.5638	0.4971	0.4892	0.4828	0.4914
	B	TN	None	0.4631	0.4567	0.2150	0.2147	0.6028	0.5876	0.4366	0.4398	0.3190	0.3169	0.3641	0.3533	0.3779	0.3729	0.2703	0.2676	0.3082	0.3068	0.5911	0.5911	0.5158	0.5143	0.5194	0.5143
			Hurricane	0.4281	0.4246	0.1899	0.1902	0.5672	0.5508	0.3998	0.3976	0.2826	0.2815	0.3241	0.3205	0.3568	0.3679	0.2612	0.2545	0.2901	0.2928	0.5739	0.5667	0.4770	0.4857	0.4821	0.4957
		Clip	None	0.2734	0.2732	0.1924	0.1930	0.2741	0.2572	0.4117	0.4146	0.3194	0.3241	0.3244	0.3097	0.3699	0.3662	0.2636	0.2592	0.3038	0.2998	0.5997	0.5925	0.5115	0.5129	0.5172	0.5072
			Hurricane	0.2510	0.2475	0.1718	0.1687	0.2517	0.2382	0.3774	0.3727	0.2819	0.2826	0.2880	0.2790	0.3511	0.3498	0.2505	0.2522	0.2887	0.2857	0.5595	0.5638	0.4806	0.4792	0.4813	0.4799
		Wrap	None	0.2632	0.2641	0.1915	0.1897	0.2561	0.2369	0.4110	0.4084	0.3187	0.3201	0.3252	0.3154	0.3719	0.3669	0.2562	0.2599	0.2995	0.3008	0.5897	0.5904	0.5143	0.5165	0.5230	0.5065
			Hurricane	0.2344	0.2369	0.1703	0.1669	0.2336	0.2141	0.3756	0.3745	0.2815	0.2815	0.2880	0.2779	0.3494	0.3551	0.2495	0.2495	0.2904	0.2850	0.5746	0.5581	0.4835	0.4770	0.4943	0.4756
	C	TN	None	0.4634	0.4583	0.2167	0.2128	0.5885	0.5723	0.4333	0.4333	0.3187	0.3190	0.3627	0.3526	0.3783	0.3796	0.2706	0.2730	0.3089	0.3062	0.5882	0.5925	0.5158	0.5143	0.5215	0.5158
			Hurricane	0.4390	0.4299	0.1904	0.1900	0.5776	0.5636	0.4001	0.3854	0.2812	0.2837	0.3262	0.3230	0.3568	0.3598	0.2532	0.2559	0.2924	0.2894	0.5732	0.5660	0.4770	0.4857	0.4821	0.5000
		Clip	None	0.2679	0.2703	0.1879	0.1868	0.2734	0.2581	0.4106	0.4149	0.3201	0.3180	0.3259	0.3129	0.3739	0.3675	0.2673	0.2646	0.3038	0.2995	0.5940	0.5976	0.5122	0.5129	0.5129	0.5108
			Hurricane	0.2451	0.2453	0.1652	0.1652	0.2475	0.2345	0.3720	0.3756	0.2801	0.2833	0.2888	0.2797	0.3571	0.3548	0.2495	0.2485	0.2864	0.2850	0.5660	0.5603	0.4914	0.4878	0.4943	0.4735
		Wrap	None	0.2575	0.2577	0.1882	0.1866	0.2469	0.2303	0.4200	0.4156	0.3187	0.3158	0.3262	0.3111	0.3685	0.3689	0.2612	0.2592	0.3028	0.3015	0.5925	0.5933	0.5093	0.5079	0.5165	0.5086
			Hurricane	0.2371	0.2340	0.1651	0.1629	0.2256	0.2096	0.3764	0.3796	0.2833	0.2797	0.2866	0.2736	0.3514	0.3524	0.2498	0.2502	0.2857	0.2860	0.5739	0.5624	0.4842	0.4864	0.4806	0.4763

Table 4-9. Single-Family, Pre-FBC, Region 3, Terrain A Loss Relativity Table (Continued)

Roof Cover Strength	Roof Deck	RWC	Opening Protection	High Slope (> 6:12)																							
				2-Story												1-Story											
				Other						Hip						Other						Hip					
				Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel	
				NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR
Non-FBC	A	TN	None	1.0000	1.0000	0.5085	0.4929	0.7995	0.7154	1.0000	1.0000	0.6403	0.6290	0.5838	0.5560	1.0000	1.0000	0.5689	0.5657	0.7156	0.6785	1.0000	1.0000	0.7105	0.7153	0.6327	0.6319
			Hurricane	1.0000	1.0000	0.4512	0.4339	0.7385	0.6596	1.0000	1.0000	0.5694	0.5447	0.5113	0.4794	1.0000	1.0000	0.5344	0.5318	0.6494	0.6298	1.0000	1.0000	0.6712	0.6760	0.6047	0.5998
		Clip	None	1.0000	1.0000	0.5132	0.4905	0.6382	0.5356	1.0000	1.0000	0.6393	0.6336	0.5750	0.5416	1.0000	1.0000	0.5620	0.5625	0.6065	0.5742	1.0000	1.0000	0.7129	0.7081	0.6311	0.6287
			Hurricane	1.0000	1.0000	0.4434	0.4363	0.5742	0.4800	1.0000	1.0000	0.5730	0.5586	0.5087	0.4774	1.0000	1.0000	0.5360	0.5281	0.5794	0.5450	1.0000	1.0000	0.6664	0.6704	0.5998	0.5990
		Wrap	None	1.0000	1.0000	0.5085	0.4919	0.6399	0.5274	1.0000	1.0000	0.6398	0.6336	0.5745	0.5396	1.0000	1.0000	0.5556	0.5524	0.5975	0.5736	1.0000	1.0000	0.7129	0.7081	0.6343	0.6335
			Hurricane	1.0000	1.0000	0.4417	0.4299	0.5769	0.4695	1.0000	1.0000	0.5730	0.5586	0.5098	0.4774	1.0000	1.0000	0.5339	0.5334	0.5646	0.5461	1.0000	1.0000	0.6680	0.6720	0.5998	0.5942
	B	TN	None	1.0000	1.0000	0.4898	0.4793	0.7988	0.7087	1.0000	1.0000	0.6274	0.6223	0.5647	0.5406	1.0000	1.0000	0.5593	0.5577	0.7044	0.6796	1.0000	1.0000	0.7065	0.7249	0.6464	0.6407
			Hurricane	1.0000	1.0000	0.4251	0.4214	0.7243	0.6507	1.0000	1.0000	0.5601	0.5540	0.4872	0.4640	1.0000	1.0000	0.5376	0.5355	0.6472	0.6224	1.0000	1.0000	0.6736	0.6704	0.6055	0.5982
		Clip	None	1.0000	1.0000	0.4841	0.4759	0.6020	0.5037	1.0000	1.0000	0.6202	0.6208	0.5529	0.5288	1.0000	1.0000	0.5535	0.5514	0.6107	0.5779	1.0000	1.0000	0.7169	0.7145	0.6383	0.6343
			Hurricane	1.0000	1.0000	0.4295	0.4112	0.5322	0.4488	1.0000	1.0000	0.5622	0.5462	0.4897	0.4584	1.0000	1.0000	0.5254	0.5334	0.5731	0.5519	1.0000	1.0000	0.6728	0.6632	0.6006	0.5974
		Wrap	None	1.0000	1.0000	0.4834	0.4699	0.6026	0.5014	1.0000	1.0000	0.6218	0.6213	0.5570	0.5360	1.0000	1.0000	0.5551	0.5540	0.5990	0.5752	1.0000	1.0000	0.7097	0.7081	0.6383	0.6407
			Hurricane	1.0000	1.0000	0.4245	0.4112	0.5332	0.4502	1.0000	1.0000	0.5637	0.5488	0.4856	0.4563	1.0000	1.0000	0.5254	0.5281	0.5662	0.5397	1.0000	1.0000	0.6640	0.6704	0.5990	0.6006
	C	TN	None	1.0000	1.0000	0.4878	0.4776	0.7947	0.7043	1.0000	1.0000	0.6233	0.6192	0.5632	0.5298	1.0000	1.0000	0.5599	0.5604	0.7044	0.6790	1.0000	1.0000	0.7081	0.7241	0.6447	0.6391
			Hurricane	1.0000	1.0000	0.4319	0.4180	0.7249	0.6514	1.0000	1.0000	0.5524	0.5457	0.4866	0.4609	1.0000	1.0000	0.5482	0.5313	0.6472	0.6224	1.0000	1.0000	0.6752	0.6696	0.6038	0.5974
		Clip	None	1.0000	1.0000	0.4875	0.4756	0.6064	0.5068	1.0000	1.0000	0.6197	0.6213	0.5570	0.5319	1.0000	1.0000	0.5519	0.5503	0.6107	0.5784	1.0000	1.0000	0.7097	0.7145	0.6399	0.6407
			Hurricane	1.0000	1.0000	0.4211	0.4119	0.5346	0.4485	1.0000	1.0000	0.5591	0.5483	0.4933	0.4635	1.0000	1.0000	0.5318	0.5281	0.5689	0.5487	1.0000	1.0000	0.6720	0.6672	0.6030	0.5998
		Wrap	None	1.0000	1.0000	0.4871	0.4726	0.6114	0.5058	1.0000	1.0000	0.6213	0.6151	0.5519	0.5293	1.0000	1.0000	0.5535	0.5519	0.6038	0.5784	1.0000	1.0000	0.7145	0.7089	0.6415	0.6335
			Hurricane	1.0000	1.0000	0.4245	0.4112	0.5301	0.4390	1.0000	1.0000	0.5627	0.5601	0.4902	0.4563	1.0000	1.0000	0.5339	0.5365	0.5747	0.5429	1.0000	1.0000	0.6688	0.6648	0.5974	0.5974
FBC Old (Shingle > 13 yr // Tile or Metal > 20 yr)	A	TN	None	1.0000	0.7510	0.5085	0.4929	0.7995	0.7154	1.0000	0.8376	0.6403	0.6290	0.5838	0.5560	1.0000	0.9253	0.5689	0.5657	0.7156	0.6785	1.0000	0.9551	0.7105	0.7153	0.6327	0.6319
			Hurricane	0.9282	0.6846	0.4512	0.4339	0.7385	0.6596	0.9460	0.7775	0.5694	0.5447	0.5113	0.4794	0.9544	0.8787	0.5344	0.5318	0.6494	0.6298	0.9455	0.9126	0.6712	0.6760	0.6047	0.5998
		Clip	None	0.9404	0.6731	0.5132	0.4905	0.6382	0.5356	1.0000	0.8469	0.6393	0.6336	0.5750	0.5416	0.9539	0.8755	0.5620	0.5625	0.6065	0.5742	1.0000	0.9495	0.7129	0.7081	0.6311	0.6287
			Hurricane	0.8550	0.6108	0.4434	0.4363	0.5742	0.4800	0.9399	0.7698	0.5730	0.5586	0.5087	0.4774	0.9184	0.8443	0.5360	0.5281	0.5794	0.5450	0.9407	0.9110	0.6664	0.6704	0.5998	0.5990
		Wrap	None	0.9492	0.6697	0.5085	0.4919	0.6399	0.5274	1.0000	0.8484	0.6398	0.6336	0.5745	0.5396	0.9587	0.8808	0.5556	0.5524	0.5975	0.5736	0.9992	0.9575	0.7129	0.7081	0.6343	0.6335
			Hurricane	0.8540	0.5972	0.4417	0.4299	0.5769	0.4695	0.9399	0.7703	0.5730	0.5586	0.5098	0.4774	0.9227	0.8453	0.5339	0.5334	0.5646	0.5461	0.9407	0.9086	0.6680	0.6720	0.5998	0.5942
	B	TN	None	1.0000	0.7446	0.4898	0.4793	0.7988	0.7087	0.9882	0.8217	0.6274	0.6223	0.5647	0.5406	1.0000	0.9227	0.5593	0.5577	0.7044	0.6796	1.0000	0.9591	0.7065	0.7249	0.6464	0.6407
			Hurricane	0.9116	0.6806	0.4251	0.4214	0.7243	0.6507	0.9229	0.7590	0.5601	0.5540	0.4872	0.4640	0.9391	0.8543	0.5376	0.5355	0.6472	0.6224	0.9503	0.9158	0.6736	0.6704	0.6055	0.5982
		Clip	None	0.9099	0.6589	0.4841	0.4759	0.6020	0.5037	1.0000	0.8273	0.6202	0.6208	0.5529	0.5288	0.9380	0.8761	0.5535	0.5514	0.6107	0.5779	0.9936	0.9551	0.7169	0.7145	0.6383	0.6343
			Hurricane	0.8266	0.5874	0.4295	0.4112	0.5322	0.4488	0.9013	0.7513	0.5622	0.5462	0.4897	0.4584	0.9285	0.8533	0.5254	0.5334	0.5731	0.5519	0.9423	0.9134	0.6728	0.6632	0.6006	0.5974
		Wrap	None	0.8980	0.6477	0.4834	0.4699	0.6026	0.5014	1.0000	0.8320	0.6218	0.6213	0.5570	0.5360	0.9401	0.8708	0.5551	0.5540	0.5990	0.5752	0.9888	0.9463	0.7097	0.7081	0.6383	0.6407
			Hurricane	0.8225	0.5793	0.4245	0.4112	0.5332	0.4502	0.9024	0.7513	0.5637	0.5488	0.4856	0.4563	0.9200	0.8485	0.5254	0.5281	0.5662	0.5397	0.9423	0.9166	0.6640	0.6704	0.5990	0.6006
	C	TN	None	1.0000	0.7449	0.4878	0.4776	0.7947	0.7043	1.0000	0.8201	0.6233	0.6192	0.5632	0.5298	1.0000	0.9227	0.5599	0.5604	0.7044	0.6790	0.9976	0.9551	0.7081	0.7241	0.6447	0.6391
			Hurricane	0.9126	0.6758	0.4319	0.4180	0.7249	0.6514	0.9173	0.7795	0.5524	0.5457	0.4866	0.4609	0.9391	0.8543	0.5482	0.5313	0.6472	0.6224	0.9487	0.9142	0.6752	0.6696	0.6038	0.5974
		Clip	None	0.9211	0.6575	0.4875	0.4756	0.6064	0.5068	0.9959	0.8345	0.6197	0.6213	0.5570	0.5319	0.9534	0.8761	0.5519	0.5503	0.6107	0.5784	1.0000	0.9567	0.7097	0.7145	0.6399	0.6407
			Hurricane	0.8283	0.5850	0.4211	0.4119	0.5346	0.4485	0.9039	0.7492	0.5591	0.5483	0.4933	0.4635	0.9333	0.8517	0.5318	0.5281	0.5689	0.5487	0.9294	0.9182	0.6720	0.6672	0.6030	0.5998
		Wrap	None	0.9011	0.6467	0.4871	0.4726	0.6114	0.5058	0.9872	0.8263	0.6213	0.6151	0.5519	0.5293	0.9550	0.8734	0.5535	0.5519	0.6038	0.5784	0.9864	0.9543	0.7145	0.7089	0.6415	0.6335
			Hurricane	0.8327	0.5860	0.4245	0.4112	0.5301	0.4390	0.9162	0.7605	0.5627	0.5601	0.4902	0.4563	0.9163	0.8485	0.5339	0.5365	0.5747	0.5429	0.9399	0.9150	0.6688	0.6648	0.5974	0.5974
FBC Mid Range (Shingle = 6-13 yr // Tile or Metal = 6-20 yr)	A	TN	None	0.8018	0.6701	0.4331	0.4253	0.6966	0.6489	0.8212	0.7338	0.5570	0.5519	0.5344	0.5188	0.8385	0.7982	0.5037	0.4987	0.6380	0.6149	0.8669	0.8557	0.6480	0.6520	0.6159	0.6119
			Hurricane	0.7246	0.6152	0.3748	0.3655	0.6347	0.5920	0.7456	0.6701	0.4874	0.4769	0.4633	0.4463	0.7918	0.7643	0.4677	0.4656	0.5742	0.5646	0.8260	0.8059	0.6159	0.6151	0.5754	0.5758
		Clip	None	0.7314	0.5993	0.4356	0.4219	0.5202	0.4624	0.8243	0.7487	0.5573	0.5560	0.5277	0.5126	0.8035	0.7627	0.4981	0.4952	0.5310	0.5117	0.8549	0.8468	0.6516	0.6472	0.6143	0.6127
			Hurricane	0.6514	0.5291	0.3687	0.3659	0.4538	0.4011	0.7472	0.6835	0.4918	0.4810	0.4615	0.4437	0.7564	0.7219	0.4685	0.4688	0.4992	0.4833	0.8308	0.8091	0.6111	0.6143	0.5782	0.5762
		Wrap	None	0.7202	0.5874	0.4363	0.4250	0.5180	0.4544	0.8171	0.7420	0.5576	0.5560	0.5270	0.5113	0.7786	0.7442	0.4981	0.4931	0.5201	0.5082	0.8524	0.8516	0.6520	0.6480	0.6119	0.6147
			Hurricane	0.6467	0.5251	0.3653	0.3598	0.4556	0.3980	0.7467	0.6824	0.4915	0.4807	0.4612	0.4422	0.7585	0.7267	0.4672	0.4682	0.4913	0.4841	0.8268	0.7939	0.6119	0.6151	0.5758	0.5770
	B	TN	None	0.7876	0.6687	0.4189	0.4118	0.6922	0.6401	0.8083	0.7261	0.5483	0.5473	0.5211	0.5069	0.8400	0.8136	0.4989	0.5000	0.6274	0.6160	0.8597	0.8500	0.6443	0.6552	0.6199	0.6199
			Hurricane	0.7046	0.5996	0.3545	0.3562	0.6211	0.5813	0.7282	0.6675	0.4787	0.4758	0.4414	0.4314	0.7823	0.7595	0.4703	0.4690	0.5787	0.5601	0.8260	0.8140	0.6127	0.6119	0.5778	0.5754
		Clip	None	0.6975	0.5678	0.4124	0.4096	0.4895	0.4338	0.8037	0.7220	0.5437	0.5475	0.5123	0.4985	0.7860	0.7611	0.4968	0.4942	0.5297	0.5146	0.8757	0.8428	0.6528	0.6500	0.6155	0.6159
			Hurricane	0.6189	0.5024	0.3564	0.3471	0.4219	0.3760	0.7215	0.6567	0.4841	0.4710	0.4365	0.4224	0.7553	0.7182	0.4624	0.4674	0.4955	0.4836	0.8148	0.8180	0.6143	0.6087	0.5766	0.5730
		Wrap	None	0.6975	0.5745	0.4148	0.4065	0.4885	0.4329	0.7980	0.7240	0.5496	0.5465	0.5092	0.4982	0.7834	0.7574	0.4915	0.4976	0.5204	0.5045	0.8621	0.8396	0.6496	0.6472	0.6123	0.6151
			Hurricane	0.6145	0.5020	0.3528	0.3465	0.4221	0.3730	0.7230	0.6526	0.4810	0.4740	0.4388	0.4206	0.7479	0.7188	0.4653	0.4658	0.4897	0.4772	0.8140	0.8043	0.6063	0.6151	0.5778	0.5802
	C	TN	None	0.7879	0.6687	0.4207	0.4111	0.6905	0.6379	0.8052	0.7328	0.5457	0.5478	0.5170	0.4979	0.8400	0.8130	0.4989	0.5005	0.6266	0.6147	0.8661	0.8532	0.6476	0.6520	0.6187	0.6199
			Hurricane	0.7121	0.6013	0.3608	0.3503	0.6209	0.5813	0.7230	0.6603	0.4728	0.4715	0.4412	0.4283	0.7823	0.7595	0.4762	0.4669	0.5779	0.5609	0.8228	0.8123	0.6163	0.6135	0.5786	0.5750
		Clip	None	0.6988	0.5691	0.4165	0.4101	0.4912	0.4377	0.8027	0.7256	0.5439	0.5478	0.5118	0.5013	0.7850	0.7558	0.4934	0.4913	0.5297	0.5148	0.8605	0.8428	0.6480	0.6500	0.6175	0.6167
			Hurricane	0.6169	0.5000	0.3503	0.3465	0.4217	0.3747	0.7215	0.6521	0.4774	0.4740	0.4399	0.4239	0.7537	0.7203	0.4677	0.4658	0.4939	0.4823	0.8115	0.7963	0.6147	0.6123	0.5750	0.5730
		Wrap	None	0.6978	0.5681	0.4143	0.4101	0.4939	0.4360	0.8011	0.7354	0.5480	0.5437	0.5100	0.4985	0.7818	0.7558	0.4907	0.4905	0.5233	0.5072	0.8581	0.8404	0.6504	0.6468	0.6159	0.6107
			Hurricane	0.6155	0.5014	0.3513	0.3455	0.4175	0.3667	0.7323	0.6562	0.4779	0.4761	0.4388	0.4224	0.7579	0.7177	0.4703	0.4672	0.4952	0.4804	0.8340	0.8059	0.6091	0.6135	0.5762	0.5746
FBC New (0-5 yr, all types)	A	TN	None	0.5237	0.5190	0.3577	0.3577	0.5938	0.5823	0.5581	0.5524	0.4738	0.4748	0.4851	0.4815	0.5773	0.5768	0.4386	0.4317	0.5604	0.5514	0.6696	0.6688	0.5854	0.5886	0.5990	0.5918
			Hurricane	0.4593	0.4617	0.2984	0.2971	0.5308	0.5244	0.4846	0.4856	0.4054	0.4090	0.4152	0.4132	0.5307	0.5281	0.4010	0.3994	0.4989	0.4995	0.6271	0.6151	0.5605	0.5541	0.5461	0.5517
		Clip	None	0.4387	0.4333	0.3581	0.3533	0.4021	0.3892	0.5586	0.5514	0.4753	0.4784	0.4805	0.4836	0.5270	0.5260	0.4343	0.4280	0.4555	0.4492	0.6528	0.6520	0.5902	0.5862	0.5974	0.5966
			Hurricane	0.3686	0.3747	0.2940	0.2954	0.3333	0.3222	0.4836	0.4830	0.4106	0.4034	0.4142	0.4101	0.4947	0.4963	0.4010	0.4094	0.4190	0.4216	0.6143	0.6239	0.5557	0.5581	0.5565	0.5533
		Wrap	None	0.4390	0.4380	0.3642	0.3581	0.3960	0.3814	0.5565	0.5524	0.4753	0.4784	0.4794	0.4830	0.5313	0.5307	0.4407	0.4338	0.4428	0.4428	0.6472	0.6480	0.5910	0.5878	0.5894	0.5958
			Hurricane	0.3726	0.3689	0.2890	0.2896	0.3343	0.3266	0.4815	0.4872	0.4101	0.4029	0.4126	0.4070	0.4984	0.4947	0.4004	0.4031	0.4179	0.4221	0.6143	0.6223	0.5557	0.5581	0.5517	0.5597
	B	TN	None	0.5122	0.5142	0.3479	0.3442	0.5857	0.5715	0.5488	0.5462	0.4692	0.4723	0.4774	0.4733	0.5779	0.5736	0.4386	0.4423	0.5503	0.5524	0.6560	0.6624	0.5822	0.5854	0.5934	0.5990
			Hurricane	0.4478	0.4461	0.2839	0.2910	0.5180	0.5119	0.4748	0.4738	0.3972	0.3977	0.3957	0.3988	0.5260	0.5318	0.4031	0.4025	0.5101	0.4979	0.6239	0.6143	0.5517	0.5533	0.5501	0.5525
		Clip	None	0.4234	0.4211	0.3408	0.3432	0.3770	0.3638	0.5478	0.5427	0.4671	0.4743	0.4717	0.4681	0.5392	0.5397	0.4401	0.4370	0.4486	0.4513	0.6568	0.6608	0.5886	0.5854	0.5926	0.5974
			Hurricane	0.3496	0.3530	0.2832	0.2829	0.3117	0.3032	0.4702	0.4681	0.4060	0.3957	0.3834	0.3864	0.4926	0.4915	0.3994	0.4015	0.4179	0.4153	0.6391	0.6359	0.5557	0.5541	0.5525	0.5485
		Wrap	None	0.4228	0.4180	0.3462	0.3432	0.3743	0.3645	0.5565	0.5447	0.4774	0.4717	0.4615	0.4604	0.5244	0.5222	0.4280	0.4412	0.4417	0.4338	0.6568	0.6544	0.5894	0.5862	0.5862	0.5894
			Hurricane	0.3479	0.3499	0.2812	0.2818	0.3110	0.2957	0.4712	0.4661	0.3983	0.3993	0.3921	0.3849	0.4905	0.4942	0.4052	0.4036	0.4131	0.4147	0.6271	0.6472	0.5485	0.5597	0.5565	0.5597
	C	TN	None	0.5180	0.5176	0.3537	0.3445	0.5864	0.5715	0.5488	0.5468	0.4681	0.4764	0.4707	0.4661	0.5779	0.5736	0.4380	0.4407	0.5487	0.5503	0.6560	0.6560	0.5870	0.5798	0.5926	0.6006
			Hurricane	0.4472	0.4465	0.2896	0.2825	0.5169	0.5112	0.4728	0.4764	0.3931	0.3972	0.3957	0.3957	0.5260	0.5318	0.4041	0.4025	0.5085	0.4995	0.6231	0.6263	0.5573	0.5573	0.5533	0.5525
		Clip	None	0.4221	0.4238	0.3455	0.3445	0.3760	0.3686	0.5473	0.5442	0.4681	0.4743	0.4666	0.4707	0.5323	0.5318	0.4349	0.4322	0.4486	0.4513	0.6616	0.6584	0.5862	0.5854	0.5950	0.5926
			Hurricane	0.3482	0.3479	0.2795	0.2812	0.3089	0.3008	0.4687	0.4681	0.3957	0.3998	0.3864	0.3844	0.4931	0.4926	0.4036	0.4036	0.4190	0.4158	0.6367	0.6375	0.5573	0.5573	0.5469	0.5461
		Wrap	None	0.4167	0.4194	0.3415	0.3476	0.3764	0.3662	0.5447	0.5488	0.4748	0.4723	0.4681	0.4676	0.5265	0.5281	0.4280	0.4290	0.4428	0.4359	0.6616	0.6624	0.5862	0.5846	0.5902	0.5878
			Hurricane	0.3499	0.3482	0.2781	0.2798	0.3049	0.2944	0.4635	0.4661	0.3931	0.3921	0.3875	0.3885	0.4936	0.4968	0.4068	0.3978	0.4158	0.4179	0.6311	0.6207	0.5493	0.5621	0.5549	0.5517

Table 4-10. Single-Family, Pre-FBC, Region 3, Terrain B Loss Relativity Table

Roof Cover Strength	Roof Deck	RWC	Opening Protection	Low Slope (<=6:12)																							
				2-Story												1-Story											
				Other						Hip						Other						Hip					
				Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel	
				NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR
Non-FBC	A	TN	None	1.0000	1.0000	0.7216	0.6879	1.0000	1.0000	1.0000	1.0000	0.5273	0.5000	0.7183	0.5256	1.0000	1.0000	0.6004	0.5924	0.8728	0.7647	1.0000	1.0000	0.5374	0.5227	0.5342	0.4939
			Hurricane	1.0000	1.0000	0.6947	0.6629	1.0000	1.0000	1.0000	1.0000	0.4590	0.4347	0.6239	0.4444	1.0000	1.0000	0.5603	0.5548	0.8161	0.7149	1.0000	1.0000	0.4447	0.4434	0.4357	0.3948
		Clip	None	1.0000	1.0000	0.7204	0.6860	1.0000	0.8735	1.0000	1.0000	0.5223	0.4989	0.7021	0.5047	1.0000	1.0000	0.5951	0.5857	0.8631	0.7613	1.0000	1.0000	0.5285	0.5163	0.5176	0.4779
			Hurricane	1.0000	1.0000	0.7012	0.6681	1.0000	0.8376	1.0000	1.0000	0.4675	0.4358	0.6134	0.4312	1.0000	1.0000	0.5636	0.5578	0.8089	0.7174	1.0000	1.0000	0.4479	0.4274	0.4491	0.4107
		Wrap	None	1.0000	1.0000	0.7223	0.6874	1.0000	0.8842	1.0000	1.0000	0.4989	0.4989	0.7021	0.5047	1.0000	1.0000	0.6015	0.5921	0.8518	0.7500	1.0000	1.0000	0.5189	0.5131	0.5202	0.4798
			Hurricane	1.0000	1.0000	0.6894	0.6564	1.0000	0.8478	1.0000	1.0000	0.4557	0.4306	0.6066	0.4248	1.0000	1.0000	0.5581	0.5531	0.8144	0.7149	1.0000	1.0000	0.4453	0.4466	0.4459	0.4082
	B	TN	None	1.0000	1.0000	0.3470	0.3298	0.8961	0.7855	1.0000	1.0000	0.4477	0.4254	0.5873	0.4287	1.0000	1.0000	0.4040	0.3935	0.5476	0.4889	1.0000	1.0000	0.5342	0.5202	0.5106	0.4773
			Hurricane	1.0000	1.0000	0.3072	0.2882	0.8688	0.7593	1.0000	1.0000	0.3747	0.3541	0.5184	0.3678	1.0000	1.0000	0.3496	0.3432	0.5141	0.4508	1.0000	1.0000	0.4517	0.4459	0.4325	0.3903
		Clip	None	1.0000	0.8904	0.3195	0.2940	0.5731	0.4134	1.0000	1.0000	0.4455	0.4213	0.5564	0.3720	1.0000	1.0000	0.3758	0.3742	0.5390	0.4757	1.0000	1.0000	0.5221	0.5246	0.4933	0.4664
			Hurricane	1.0000	0.8428	0.2780	0.2569	0.5148	0.3759	1.0000	1.0000	0.3744	0.3519	0.4568	0.3009	1.0000	1.0000	0.3454	0.3371	0.4953	0.4353	1.0000	1.0000	0.4447	0.4408	0.4191	0.3845
		Wrap	None	1.0000	0.8704	0.3165	0.2929	0.5466	0.3808	1.0000	1.0000	0.4524	0.4246	0.5460	0.3736	1.0000	1.0000	0.3728	0.3769	0.5379	0.4732	1.0000	1.0000	0.5234	0.5189	0.4971	0.4690
			Hurricane	1.0000	0.8263	0.2782	0.2544	0.4955	0.3411	1.0000	1.0000	0.3042	0.2883	0.4590	0.2996	1.0000	1.0000	0.3435	0.3355	0.4972	0.4361	1.0000	1.0000	0.4498	0.4472	0.4159	0.3807
	C	TN	None	1.0000	1.0000	0.3462	0.3221	0.9119	0.8017	1.0000	1.0000	0.4455	0.4265	0.5917	0.4284	1.0000	1.0000	0.3980	0.3913	0.5503	0.4892	1.0000	1.0000	0.5419	0.5304	0.5074	0.4786
			Hurricane	1.0000	1.0000	0.2980	0.2796	0.8561	0.7486	1.0000	1.0000	0.3805	0.3549	0.5234	0.3678	1.0000	1.0000	0.3509	0.3485	0.5075	0.4519	1.0000	1.0000	0.4466	0.4440	0.4331	0.3896
		Clip	None	1.0000	0.8783	0.3098	0.2905	0.5652	0.4102	1.0000	1.0000	0.4557	0.4229	0.5559	0.3698	1.0000	1.0000	0.3756	0.3703	0.5401	0.4704	1.0000	1.0000	0.5214	0.5253	0.4997	0.4581
			Hurricane	1.0000	0.8315	0.2698	0.2502	0.5105	0.3704	1.0000	1.0000	0.3064	0.2872	0.4565	0.3001	1.0000	1.0000	0.3426	0.3476	0.4942	0.4356	1.0000	1.0000	0.4363	0.4408	0.4165	0.3858
		Wrap	None	1.0000	0.8606	0.3128	0.2875	0.5389	0.3710	1.0000	1.0000	0.4469	0.4229	0.5586	0.3747	1.0000	1.0000	0.3805	0.3709	0.5434	0.4779	1.0000	1.0000	0.5234	0.5182	0.4920	0.4645
			Hurricane	1.0000	0.8215	0.2684	0.2499	0.4809	0.3358	1.0000	1.0000	0.3122	0.2896	0.4562	0.2971	1.0000	1.0000	0.3407	0.3377	0.4942	0.4356	1.0000	1.0000	0.4376	0.4485	0.4229	0.3845
FBC Old (Shingle > 13 yr // Tile or Metal > 20 yr)	A	TN	None	1.0000	1.0000	0.7216	0.6879	1.0000	1.0000	1.0000	0.7563	0.5273	0.5000	0.7183	0.5256	1.0000	1.0000	0.6004	0.5924	0.8728	0.7647	1.0000	0.9091	0.5374	0.5227	0.5342	0.4939
			Hurricane	1.0000	1.0000	0.6947	0.6629	1.0000	1.0000	1.0000	0.6746	0.4590	0.4347	0.6239	0.4444	1.0000	1.0000	0.5603	0.5548	0.8161	0.7149	0.9181	0.8074	0.4447	0.4434	0.4357	0.3948
		Clip	None	1.0000	0.9892	0.7204	0.6860	1.0000	0.8735	1.0000	0.7417	0.5223	0.4989	0.7021	0.5047	1.0000	1.0000	0.5951	0.5857	0.8631	0.7613	1.0000	0.8900	0.5285	0.5163	0.5176	0.4779
			Hurricane	1.0000	0.9532	0.7012	0.6681	1.0000	0.8376	1.0000	0.6685	0.4675	0.4358	0.6134	0.4312	1.0000	1.0000	0.5636	0.5578	0.8089	0.7174	0.9219	0.8298	0.4479	0.4274	0.4491	0.4107
		Wrap	None	1.0000	0.9902	0.7223	0.6874	1.0000	0.8842	1.0000	0.7404	0.4989	0.4989	0.7021	0.5047	1.0000	1.0000	0.6015	0.5921	0.8518	0.7500	1.0000	0.8951	0.5189	0.5131	0.5202	0.4798
			Hurricane	1.0000	0.9532	0.6894	0.6564	1.0000	0.8478	1.0000	0.6685	0.4557	0.4306	0.6066	0.4248	1.0000	1.0000	0.5581	0.5531	0.8144	0.7149	0.9207	0.8292	0.4453	0.4466	0.4459	0.4082
	B	TN	None	1.0000	0.7423	0.3470	0.3298	0.8961	0.7855	0.9997	0.6583	0.4477	0.4254	0.5873	0.4287	1.0000	0.8783	0.4040	0.3935	0.5476	0.4889	1.0000	0.8868	0.5342	0.5202	0.5106	0.4773
			Hurricane	0.9503	0.7053	0.3072	0.2882	0.8688	0.7593	0.9058	0.5823	0.3747	0.3541	0.5184	0.3678	0.9345	0.8236	0.3496	0.3432	0.5141	0.4508	0.9008	0.8049	0.4517	0.4459	0.4325	0.3903
		Clip	None	0.7946	0.5098	0.3195	0.2940	0.5731	0.4134	0.9805	0.6228	0.4455	0.4213	0.5564	0.3720	0.9873	0.8562	0.3758	0.3742	0.5390	0.4757	0.9891	0.8848	0.5221	0.5246	0.4933	0.4664
			Hurricane	0.7396	0.4751	0.2780	0.2569	0.5148	0.3759	0.8656	0.5405	0.3744	0.3519	0.4568	0.3009	0.9472	0.8186	0.3454	0.3371	0.4953	0.4353	0.9149	0.8234	0.4447	0.4408	0.4191	0.3845
		Wrap	None	0.7848	0.4948	0.3165	0.2929	0.5466	0.3808	0.9854	0.6256	0.4524	0.4246	0.5460	0.3736	0.9735	0.8366	0.3728	0.3769	0.5379	0.4732	0.9904	0.8842	0.5234	0.5189	0.4971	0.4690
			Hurricane	0.7216	0.4558	0.2782	0.2544	0.4955	0.3411	0.8772	0.5432	0.3042	0.2883	0.4590	0.2996	0.9248	0.8100	0.3435	0.3355	0.4972	0.4361	0.9111	0.8042	0.4498	0.4472	0.4159	0.3807
	C	TN	None	1.0000	0.7385	0.3462	0.3221	0.9119	0.8017	1.0000	0.6558	0.4455	0.4265	0.5917	0.4284	1.0000	0.8957	0.3980	0.3913	0.5503	0.4892	1.0000	0.8944	0.5419	0.5304	0.5074	0.4786
			Hurricane	0.9443	0.7056	0.2980	0.2796	0.8561	0.7486	0.9133	0.5851	0.3805	0.3549	0.5234	0.3678	0.9461	0.8119	0.3509	0.3485	0.5075	0.4519	0.9098	0.8100	0.4466	0.4440	0.4331	0.3896
		Clip	None	0.7912	0.5101	0.3098	0.2905	0.5652	0.4102	0.9747	0.6247	0.4557	0.4229	0.5559	0.3698	0.9721	0.8476	0.3756	0.3703	0.5401	0.4704	0.9891	0.8836	0.5214	0.5253	0.4997	0.4581
			Hurricane	0.7228	0.4635	0.2698	0.2502	0.5105	0.3704	0.8736	0.5471	0.3064	0.2872	0.4565	0.3001	0.9275	0.8122	0.3426	0.3476	0.4942	0.4356	0.9123	0.8241	0.4363	0.4408	0.4165	0.3858
		Wrap	None	0.7811	0.4854	0.3128	0.2875	0.5389	0.3710	0.9686	0.6162	0.4469	0.4229	0.5586	0.3747	0.9770	0.8628	0.3805	0.3709	0.5434	0.4779	0.9782	0.8765	0.5234	0.5182	0.4920	0.4645
			Hurricane	0.7092	0.4423	0.2684	0.2499	0.4809	0.3358	0.8802	0.5498	0.3122	0.2896	0.4562	0.2971	0.9425	0.8106	0.3407	0.3377	0.4942	0.4356	0.9047	0.8157	0.4376	0.4485	0.4229	0.3845
FBC Mid Range (Shingle = 6-13 yr // Tile or Metal = 6-20 yr)	A	TN	None	1.0000	0.9788	0.6114	0.5939	1.0000	0.9690	0.8596	0.6638	0.4246	0.4093	0.5724	0.4663	1.0000	0.9585	0.4871	0.4829	0.7016	0.6428	0.8093	0.7716	0.4562	0.4511	0.4591	0.4344
			Hurricane	1.0000	0.9390	0.5856	0.5696	1.0000	0.9341	0.7632	0.5798	0.3527	0.3429	0.4872	0.3895	1.0000	0.9154	0.4483	0.4433	0.6546	0.6001	0.7159	0.6679	0.3631	0.3615	0.3618	0.3426
		Clip	None	1.0000	0.8821	0.6093	0.5903	0.9299	0.7916	0.8431	0.6481	0.4181	0.4079	0.5608	0.4496	1.0000	0.9447	0.4788	0.4748	0.6972	0.6423	0.8260	0.7825	0.4475	0.4427	0.4443	0.4283
			Hurricane	1.0000	0.8562	0.5874	0.5702	0.8871	0.7566	0.7657	0.5768	0.3578	0.3426	0.4781	0.3758	1.0000	0.9234	0.4473	0.4444	0.6477	0.5973	0.7089	0.6718	0.3708	0.3624	0.3669	0.3525
		Wrap	None	1.0000	0.8918	0.6112	0.5960	0.9293	0.7924	0.8392	0.6514	0.4063	0.4079	0.5606	0.4495	1.0000	0.9499	0.4863	0.4808	0.6872	0.6314	0.8093	0.7716	0.4411	0.4360	0.4463	0.4283
			Hurricane	1.0000	0.8477	0.5815	0.5637	0.8899	0.7555	0.7657	0.5768	0.3523	0.3404	0.4740	0.3720	0.9881	0.9054	0.4436	0.4392	0.6556	0.6009	0.7115	0.6775	0.3615	0.3701	0.3656	0.3516
	B	TN	None	0.7893	0.6698	0.2740	0.2650	0.7746	0.7100	0.7643	0.5818	0.3577	0.3443	0.4646	0.3751	0.7660	0.7024	0.3068	0.3016	0.4024	0.3711	0.7850	0.7460	0.4523	0.4408	0.4367	0.4194
			Hurricane	0.7345	0.6145	0.2334	0.2234	0.7363	0.6709	0.6666	0.5069	0.2841	0.2730	0.3932	0.3110	0.7060	0.6485	0.2604	0.2543	0.3641	0.3314	0.7102	0.6654	0.3692	0.3660	0.3570	0.3343
		Clip	None	0.5834	0.4250	0.2450	0.2322	0.4195	0.3279	0.7164	0.5240	0.3523	0.3414	0.4163	0.3155	0.7431	0.6892	0.2811	0.2808	0.3883	0.3541	0.7850	0.7396	0.4421	0.4405	0.4213	0.4063
			Hurricane	0.5221	0.3844	0.2026	0.1911	0.3699	0.2894	0.6267	0.4502	0.2825	0.2713	0.3287	0.2435	0.6858	0.6394	0.2506	0.2465	0.3479	0.3155	0.7063	0.6526	0.3615	0.3599	0.3455	0.3295
		Wrap	None	0.5629	0.4117	0.2420	0.2288	0.3924	0.2949	0.7106	0.5229	0.3577	0.3413	0.4112	0.3133	0.7445	0.6853	0.2814	0.2822	0.3892	0.3526	0.7889	0.7460	0.4431	0.4389	0.4235	0.4072
			Hurricane	0.5146	0.3710	0.2019	0.1894	0.3462	0.2554	0.6256	0.4543	0.2466	0.2400	0.3305	0.2415	0.6963	0.6380	0.2508	0.2478	0.3508	0.3180	0.7134	0.6737	0.3644	0.3647	0.3464	0.3279
	C	TN	None	0.7912	0.6583	0.2739	0.2612	0.7905	0.7262	0.7522	0.5735	0.3544	0.3440	0.4641	0.3753	0.7467	0.6864	0.3052	0.3021	0.4058	0.3695	0.8061	0.7518	0.4546	0.4437	0.4338	0.4191
			Hurricane	0.7367	0.6112	0.2268	0.2173	0.7334	0.6722	0.6652	0.5006	0.2854	0.2720	0.3970	0.3122	0.7080	0.6405	0.2608	0.2591	0.3626	0.3327	0.7102	0.6679	0.3656	0.3647	0.3589	0.3349
		Clip	None	0.5741	0.4274	0.2365	0.2272	0.4121	0.3247	0.7208	0.5267	0.3578	0.3402	0.4155	0.3121	0.7282	0.6814	0.2826	0.2817	0.3898	0.3540	0.8010	0.7383	0.4418	0.4434	0.4264	0.4066
			Hurricane	0.5182	0.3825	0.1954	0.1852	0.3646	0.2844	0.6305	0.4656	0.2482	0.2368	0.3303	0.2431	0.6928	0.6305	0.2492	0.2499	0.3473	0.3165	0.7038	0.6699	0.3548	0.3589	0.3506	0.3349
		Wrap	None	0.5553	0.4035	0.2373	0.2253	0.3832	0.2867	0.7148	0.5303	0.3537	0.3422	0.4144	0.3139	0.7337	0.6778	0.2858	0.2801	0.3917	0.3559	0.7921	0.7370	0.4379	0.4392	0.4239	0.4095
			Hurricane	0.4993	0.3576	0.1921	0.1842	0.3340	0.2491	0.6261	0.4551	0.2525	0.2400	0.3279	0.2404	0.6994	0.6474	0.2501	0.2452	0.3475	0.3168	0.7127	0.6827	0.3596	0.3656	0.3554	0.3317
FBC New (0-5 yr, all types)	A	TN	None	0.7732	0.7668	0.5011	0.5000	0.9142	0.8891	0.4661	0.4656	0.3219	0.3186	0.4265	0.4069	0.5733	0.5702	0.3739	0.3733	0.5304	0.5210	0.4952	0.4869	0.3749	0.3794	0.3839	0.3749
			Hurricane	0.7359	0.7328	0.4764	0.4762	0.8782	0.8478	0.3929	0.3940	0.2464	0.2511	0.3505	0.3345	0.5274	0.5257	0.3363	0.3319	0.4931	0.4853	0.4037	0.4018	0.2815	0.2796	0.2879	0.2905
		Clip	None	0.6820	0.6808	0.4982	0.4947	0.7453	0.7096	0.4587	0.4617	0.3139	0.3169	0.4196	0.3945	0.5694	0.5694	0.3626	0.3639	0.5313	0.5232	0.4722	0.4830	0.3666	0.3692	0.3711	0.3788
			Hurricane	0.6496	0.6510	0.4736	0.4722	0.7091	0.6756	0.3805	0.3808	0.2481	0.2494	0.3428	0.3205	0.5202	0.5268	0.3310	0.3310	0.4864	0.4773	0.3973	0.3916	0.2937	0.2975	0.2847	0.2943
		Wrap	None	0.6853	0.6834	0.5001	0.5046	0.7356	0.7007	0.4573	0.4598	0.3136	0.3169	0.4191	0.3943	0.5661	0.5639	0.3711	0.3695	0.5227	0.5127	0.4754	0.4862	0.3634	0.3589	0.3724	0.3768
			Hurricane	0.6466	0.6431	0.4737	0.4710	0.6948	0.6632	0.3802	0.3808	0.2489	0.2503	0.3414	0.3191	0.5144	0.5160	0.3291	0.3252	0.4967	0.4870	0.3948	0.3948	0.2777	0.2937	0.2853	0.2949
	B	TN	None	0.4906	0.4804	0.2009	0.2002	0.6530	0.6346	0.3899	0.3937	0.2676	0.2632	0.3420	0.3216	0.3266	0.3266	0.2096	0.2096	0.2572	0.2533	0.4779	0.4754	0.3704	0.3615	0.3628	0.3615
			Hurricane	0.4455	0.4382	0.1595	0.1586	0.6039	0.5825	0.3144	0.3150	0.1936	0.1919	0.2679	0.2541	0.2837	0.2862	0.1712	0.1654	0.2140	0.2121	0.3954	0.3916	0.2866	0.2860	0.2815	0.2783
		Clip	None	0.2501	0.2471	0.1704	0.1703	0.2660	0.2424	0.3499	0.3546	0.2591	0.2616	0.2762	0.2591	0.3106	0.3045	0.1864	0.1875	0.2376	0.2326	0.4562	0.4581	0.3621	0.3564	0.3493	0.3461
			Hurricane	0.2058	0.2064	0.1271	0.1254	0.2250	0.2030	0.2742	0.2742	0.1905	0.1908	0.2007	0.1861	0.2680	0.2710	0.1557	0.1560	0.2005	0.1958	0.3871	0.3832	0.2783	0.2790	0.2719	0.2745
		Wrap	None	0.2303	0.2299	0.1676	0.1646	0.2382	0.2090	0.3453	0.3433	0.2629	0.2580	0.2764	0.2530	0.3075	0.3053	0.1900	0.1875	0.2406	0.2320	0.4645	0.4690	0.3628	0.3589	0.3500	0.3455
			Hurricane	0.1913	0.1869	0.1256	0.1244	0.1970	0.1698	0.2762	0.2715	0.1889	0.1916	0.2021	0.1834	0.2680	0.2746	0.1582	0.1601	0.2044	0.1999	0.3826	0.3909	0.2790	0.2821	0.2770	0.2751
	C	TN	None	0.4886	0.4820	0.2016	0.2004	0.6691	0.6507	0.3907	0.3948	0.2632	0.2616	0.3365	0.3221	0.3249	0.3283	0.2124	0.2129	0.2613	0.2497	0.4754	0.4734	0.3672	0.3570	0.3602	0.3596
			Hurricane	0.4417	0.4359	0.1556	0.1551	0.6107	0.5958	0.3208	0.3150	0.1903	0.1892	0.2706	0.2566	0.2813	0.2785	0.1706	0.1698	0.2176	0.2135	0.3916	0.3711	0.2847	0.2853	0.2847	0.2802
		Clip	None	0.2501	0.2457	0.1632	0.1639	0.2591	0.2392	0.3541	0.3524	0.2599	0.2574	0.2751	0.2544	0.3053	0.3025	0.1897	0.1930	0.2395	0.2376	0.4715	0.4664	0.3621	0.3615	0.3532	0.3551
			Hurricane	0.2008	0.1973	0.1210	0.1202	0.2186	0.1985	0.2762	0.2792	0.1900	0.1864	0.2040	0.1861	0.2674	0.2718	0.1557	0.1521	0.2005	0.1975	0.3890	0.3948	0.2732	0.2770	0.2847	0.2841
		Wrap	None	0.2233	0.2228	0.1619	0.1631	0.2275	0.2024	0.3513	0.3450	0.2605	0.2616	0.2701	0.2530	0.3037	0.3037	0.1911	0.1894	0.2400	0.2340	0.4715	0.4626	0.3525	0.3602	0.3557	0.3544
			Hurricane	0.1805	0.1789	0.1158	0.1184	0.1870	0.1624	0.2781	0.2632	0.1927	0.1903	0.1996	0.1836	0.2713	0.2660	0.1596	0.1527	0.2008	0.1980	0.3852	0.3896	0.2815	0.2828	0.2879	0.2790

Table 4-10. Single-Family, Pre-FBC, Region 3, Terrain B Loss Relativity Table (Continued)

Roof Cover Strength	Roof Deck	RWC	Opening Protection	High Slope (> 6:12)																							
				2-Story												1-Story											
				Other						Hip						Other						Hip					
				Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel	
				NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR
Non-FBC	A	TN	None	1.0000	1.0000	0.4906	0.4675	0.8450	0.7428	1.0000	1.0000	0.6091	0.5895	0.5584	0.4992	1.0000	1.0000	0.5017	0.4934	0.7150	0.6711	1.0000	1.0000	0.6187	0.6327	0.5280	0.5206
			Hurricane	1.0000	1.0000	0.3862	0.3609	0.7279	0.6409	1.0000	1.0000	0.4784	0.4632	0.4237	0.3757	1.0000	1.0000	0.4101	0.4060	0.5990	0.5588	1.0000	1.0000	0.5273	0.5236	0.4196	0.4130
		Clip	None	1.0000	1.0000	0.4864	0.4606	0.6270	0.4968	1.0000	1.0000	0.6031	0.5867	0.5452	0.4888	1.0000	1.0000	0.4855	0.4822	0.5443	0.4950	1.0000	1.0000	0.6283	0.6298	0.5125	0.5088
			Hurricane	1.0000	1.0000	0.3772	0.3522	0.5094	0.3881	1.0000	1.0000	0.4828	0.4708	0.4121	0.3669	1.0000	1.0000	0.4068	0.4089	0.4747	0.4188	1.0000	1.0000	0.5221	0.5258	0.4122	0.4004
		Wrap	None	1.0000	1.0000	0.4883	0.4640	0.6171	0.4821	1.0000	1.0000	0.6027	0.5863	0.5428	0.4900	1.0000	1.0000	0.4884	0.4801	0.5472	0.4963	1.0000	1.0000	0.6283	0.6298	0.5302	0.5059
			Hurricane	1.0000	1.0000	0.3819	0.3599	0.5082	0.3810	1.0000	1.0000	0.4828	0.4708	0.4193	0.3705	1.0000	1.0000	0.4151	0.4027	0.4598	0.4126	1.0000	1.0000	0.5221	0.5258	0.4204	0.4019
	B	TN	None	1.0000	1.0000	0.4591	0.4400	0.8115	0.7192	1.0000	1.0000	0.5727	0.5580	0.5216	0.4784	1.0000	1.0000	0.4946	0.4921	0.7204	0.6694	1.0000	1.0000	0.6114	0.6276	0.5391	0.5317
			Hurricane	1.0000	1.0000	0.3509	0.3383	0.7106	0.6210	1.0000	1.0000	0.4532	0.4408	0.3949	0.3501	1.0000	1.0000	0.4188	0.4118	0.5957	0.5563	1.0000	1.0000	0.5170	0.5155	0.4240	0.4159
		Clip	None	1.0000	1.0000	0.4566	0.4385	0.5779	0.4603	1.0000	1.0000	0.5795	0.5635	0.5020	0.4584	1.0000	1.0000	0.4756	0.4838	0.5398	0.4896	1.0000	1.0000	0.6158	0.6136	0.5369	0.4985
			Hurricane	1.0000	1.0000	0.3527	0.3336	0.4668	0.3569	1.0000	1.0000	0.4564	0.4440	0.3757	0.3325	1.0000	1.0000	0.4118	0.4027	0.4532	0.4105	1.0000	1.0000	0.5280	0.5243	0.4100	0.4004
		Wrap	None	1.0000	1.0000	0.4529	0.4315	0.5751	0.4484	1.0000	1.0000	0.5819	0.5635	0.5016	0.4532	1.0000	1.0000	0.4814	0.4706	0.5191	0.4747	1.0000	1.0000	0.6283	0.6239	0.5236	0.5022
			Hurricane	1.0000	1.0000	0.3445	0.3269	0.4630	0.3480	1.0000	1.0000	0.4556	0.4432	0.3805	0.3377	1.0000	1.0000	0.4126	0.4080	0.4519	0.4068	1.0000	1.0000	0.5162	0.5258	0.4145	0.4041
	C	TN	None	1.0000	1.0000	0.4613	0.4373	0.8132	0.7205	1.0000	1.0000	0.5779	0.5663	0.5180	0.4756	1.0000	1.0000	0.4921	0.4921	0.7204	0.6694	1.0000	1.0000	0.6224	0.6276	0.5406	0.5324
			Hurricane	1.0000	1.0000	0.3514	0.3356	0.7091	0.6208	1.0000	1.0000	0.4588	0.4436	0.3913	0.3505	1.0000	1.0000	0.4163	0.4114	0.5957	0.5563	1.0000	1.0000	0.5118	0.5236	0.4218	0.4130
		Clip	None	1.0000	1.0000	0.4484	0.4291	0.5846	0.4601	1.0000	1.0000	0.5787	0.5687	0.4968	0.4500	1.0000	1.0000	0.4834	0.4822	0.5377	0.4876	1.0000	1.0000	0.6150	0.6173	0.5206	0.5214
			Hurricane	1.0000	1.0000	0.3405	0.3249	0.4683	0.3557	1.0000	1.0000	0.4520	0.4476	0.3757	0.3353	1.0000	1.0000	0.4188	0.4093	0.4623	0.4138	1.0000	1.0000	0.5206	0.5258	0.4159	0.3982
		Wrap	None	1.0000	1.0000	0.4544	0.4313	0.5724	0.4501	1.0000	1.0000	0.5703	0.5580	0.5048	0.4536	1.0000	1.0000	0.4834	0.4722	0.5232	0.4760	1.0000	1.0000	0.6187	0.6254	0.5133	0.5029
			Hurricane	1.0000	1.0000	0.3450	0.3254	0.4596	0.3480	1.0000	1.0000	0.4516	0.4440	0.3749	0.3329	1.0000	1.0000	0.4176	0.4047	0.4511	0.4080	1.0000	1.0000	0.5273	0.5177	0.4196	0.4012
FBC Old (Shingle > 13 yr // Tile or Metal > 20 yr)	A	TN	None	1.0000	0.7299	0.4906	0.4675	0.8450	0.7428	1.0000	0.7870	0.6091	0.5895	0.5584	0.4992	0.9917	0.8786	0.5017	0.4934	0.7150	0.6711	0.9919	0.9174	0.6187	0.6327	0.5280	0.5206
			Hurricane	0.8941	0.6166	0.3862	0.3609	0.7279	0.6409	0.8673	0.6559	0.4784	0.4632	0.4237	0.3757	0.8832	0.7730	0.4101	0.4060	0.5990	0.5588	0.8746	0.8186	0.5273	0.5236	0.4196	0.4130
		Clip	None	0.9110	0.5955	0.4864	0.4606	0.6270	0.4968	1.0000	0.7762	0.6031	0.5867	0.5452	0.4888	0.9209	0.7920	0.4855	0.4822	0.5443	0.4950	0.9889	0.9115	0.6283	0.6298	0.5125	0.5088
			Hurricane	0.7815	0.4988	0.3772	0.3522	0.5094	0.3881	0.8689	0.6483	0.4828	0.4708	0.4121	0.3669	0.8186	0.7080	0.4068	0.4089	0.4747	0.4188	0.8776	0.8001	0.5221	0.5258	0.4122	0.4004
		Wrap	None	0.9137	0.6049	0.4883	0.4640	0.6171	0.4821	1.0000	0.7738	0.6027	0.5863	0.5428	0.4900	0.9089	0.7821	0.4884	0.4801	0.5472	0.4963	0.9838	0.9108	0.6283	0.6298	0.5302	0.5059
			Hurricane	0.7944	0.4973	0.3819	0.3599	0.5082	0.3810	0.8657	0.6495	0.4828	0.4708	0.4193	0.3705	0.8210	0.7055	0.4151	0.4027	0.4598	0.4126	0.8709	0.7942	0.5221	0.5258	0.4204	0.4019
	B	TN	None	0.9998	0.7133	0.4591	0.4400	0.8115	0.7192	0.9872	0.7550	0.5727	0.5580	0.5216	0.4784	1.0000	0.8699	0.4946	0.4921	0.7204	0.6694	0.9941	0.9263	0.6114	0.6276	0.5391	0.5317
			Hurricane	0.8730	0.6054	0.3509	0.3383	0.7106	0.6210	0.8281	0.6279	0.4532	0.4408	0.3949	0.3501	0.8774	0.7697	0.4188	0.4118	0.5957	0.5563	0.8724	0.8068	0.5170	0.5155	0.4240	0.4159
		Clip	None	0.8800	0.5727	0.4566	0.4385	0.5779	0.4603	0.9852	0.7478	0.5795	0.5635	0.5020	0.4584	0.9068	0.7817	0.4756	0.4838	0.5398	0.4896	0.9897	0.9034	0.6158	0.6136	0.5369	0.4985
			Hurricane	0.7490	0.4645	0.3527	0.3336	0.4668	0.3569	0.8273	0.6207	0.4564	0.4440	0.3757	0.3325	0.8103	0.6980	0.4118	0.4027	0.4532	0.4105	0.8761	0.8186	0.5280	0.5243	0.4100	0.4004
		Wrap	None	0.8676	0.5630	0.4529	0.4315	0.5751	0.4484	0.9664	0.7458	0.5819	0.5635	0.5016	0.4532	0.8832	0.7543	0.4814	0.4706	0.5191	0.4747	0.9830	0.9049	0.6283	0.6239	0.5236	0.5022
			Hurricane	0.7453	0.4635	0.3445	0.3269	0.4630	0.3480	0.8193	0.6151	0.4556	0.4432	0.3805	0.3377	0.8268	0.7022	0.4126	0.4080	0.4519	0.4068	0.8518	0.7839	0.5162	0.5258	0.4145	0.4041
	C	TN	None	1.0000	0.7143	0.4613	0.4373	0.8132	0.7205	0.9940	0.7602	0.5779	0.5663	0.5180	0.4756	1.0000	0.8699	0.4921	0.4921	0.7204	0.6694	1.0000	0.9167	0.6224	0.6276	0.5406	0.5324
			Hurricane	0.8695	0.6049	0.3514	0.3356	0.7091	0.6208	0.8313	0.6299	0.4588	0.4436	0.3913	0.3505	0.8774	0.7697	0.4163	0.4114	0.5957	0.5563	0.8827	0.8075	0.5118	0.5236	0.4218	0.4130
		Clip	None	0.8872	0.5692	0.4484	0.4291	0.5846	0.4601	1.0000	0.7634	0.5787	0.5687	0.4968	0.4500	0.9068	0.7734	0.4834	0.4822	0.5377	0.4876	0.9875	0.8990	0.6150	0.6173	0.5206	0.5214
			Hurricane	0.7408	0.4603	0.3405	0.3249	0.4683	0.3557	0.8369	0.6175	0.4520	0.4476	0.3757	0.3353	0.8099	0.6964	0.4188	0.4093	0.4623	0.4138	0.8628	0.8127	0.5206	0.5258	0.4159	0.3982
		Wrap	None	0.8832	0.5613	0.4544	0.4313	0.5724	0.4501	0.9800	0.7506	0.5703	0.5580	0.5048	0.4536	0.8981	0.7647	0.4834	0.4722	0.5232	0.4760	0.9897	0.9130	0.6187	0.6254	0.5133	0.5029
			Hurricane	0.7329	0.4556	0.3450	0.3254	0.4596	0.3480	0.8301	0.6199	0.4516	0.4440	0.3749	0.3329	0.8099	0.6930	0.4176	0.4047	0.4511	0.4080	0.8695	0.8046	0.5273	0.5177	0.4196	0.4012
FBC Mid Range (Shingle = 6-13 yr // Tile or Metal = 6-20 yr)	A	TN	None	0.8105	0.6600	0.4087	0.3976	0.7412	0.6812	0.8002	0.6898	0.5108	0.5004	0.4914	0.4662	0.8094	0.7643	0.4246	0.4209	0.6284	0.5992	0.8178	0.7987	0.5295	0.5387	0.4956	0.4878
			Hurricane	0.6761	0.5451	0.3073	0.2910	0.6240	0.5730	0.6735	0.5671	0.3837	0.3791	0.3671	0.3409	0.6889	0.6450	0.3326	0.3324	0.5118	0.4861	0.6999	0.6807	0.4310	0.4285	0.3802	0.3846
		Clip	None	0.6905	0.5330	0.4044	0.3922	0.5025	0.4296	0.7902	0.6795	0.5070	0.5008	0.4850	0.4522	0.7287	0.6740	0.4068	0.4045	0.4499	0.4221	0.8230	0.7810	0.5339	0.5347	0.4816	0.4805
			Hurricane	0.5801	0.4313	0.2976	0.2860	0.3895	0.3219	0.6571	0.5540	0.3879	0.3817	0.3555	0.3321	0.6425	0.6023	0.3293	0.3289	0.3763	0.3482	0.7006	0.6792	0.4310	0.4329	0.3754	0.3669
		Wrap	None	0.6875	0.5260	0.4082	0.3950	0.4943	0.4170	0.8074	0.6819	0.5062	0.5002	0.4858	0.4564	0.7266	0.6727	0.4101	0.4039	0.4486	0.4198	0.8193	0.7765	0.5343	0.5354	0.4900	0.4786
			Hurricane	0.5719	0.4246	0.3000	0.2896	0.3885	0.3146	0.6583	0.5560	0.3879	0.3817	0.3593	0.3345	0.6321	0.5816	0.3351	0.3266	0.3647	0.3413	0.6984	0.6726	0.4299	0.4336	0.3791	0.3717
	B	TN	None	0.7793	0.6419	0.3855	0.3755	0.7109	0.6574	0.7702	0.6611	0.4832	0.4764	0.4662	0.4438	0.8049	0.7477	0.4155	0.4136	0.6353	0.6042	0.8171	0.7810	0.5321	0.5420	0.5011	0.4996
			Hurricane	0.6637	0.5360	0.2853	0.2774	0.6063	0.5547	0.6239	0.5711	0.3661	0.3599	0.3439	0.3149	0.6993	0.6574	0.3370	0.3337	0.5054	0.4818	0.6969	0.6652	0.4266	0.4259	0.3831	0.3897
		Clip	None	0.6510	0.5040	0.3771	0.3692	0.4594	0.3940	0.7590	0.6539	0.4882	0.4782	0.4460	0.4245	0.7254	0.6756	0.4000	0.4045	0.4466	0.4211	0.7950	0.7788	0.5354	0.5299	0.5052	0.4801
			Hurricane	0.5315	0.3998	0.2732	0.2649	0.3508	0.2893	0.5256	0.4373	0.3691	0.3581	0.3195	0.2972	0.6297	0.5845	0.3300	0.3227	0.3674	0.3413	0.6962	0.6748	0.4373	0.4340	0.3746	0.3728
		Wrap	None	0.6555	0.4985	0.3756	0.3667	0.4514	0.3817	0.7582	0.6615	0.4888	0.4792	0.4442	0.4171	0.7154	0.6611	0.4002	0.3940	0.4252	0.4020	0.8193	0.7847	0.5450	0.5350	0.4871	0.4812
			Hurricane	0.5367	0.3961	0.2741	0.2630	0.3419	0.2793	0.5308	0.4480	0.3667	0.3595	0.3225	0.2990	0.6396	0.5833	0.3304	0.3289	0.3598	0.3339	0.6976	0.6726	0.4251	0.4333	0.3798	0.3721
	C	TN	None	0.7805	0.6431	0.3869	0.3739	0.7140	0.6611	0.7710	0.6627	0.4876	0.4818	0.4638	0.4402	0.8049	0.7477	0.4153	0.4147	0.6353	0.6042	0.8230	0.7935	0.5369	0.5395	0.5000	0.4959
			Hurricane	0.6652	0.5342	0.2789	0.2719	0.6095	0.5584	0.6331	0.5276	0.3677	0.3583	0.3357	0.3163	0.6993	0.6574	0.3366	0.3339	0.5054	0.4818	0.6991	0.6689	0.4233	0.4307	0.3824	0.3886
		Clip	None	0.6572	0.4993	0.3741	0.3631	0.4632	0.3941	0.7594	0.6515	0.4900	0.4816	0.4424	0.4157	0.7162	0.6607	0.3995	0.4029	0.4451	0.4198	0.8156	0.7928	0.5302	0.5339	0.4882	0.4893
			Hurricane	0.5332	0.4000	0.2682	0.2599	0.3521	0.2903	0.6243	0.5352	0.3661	0.3601	0.3191	0.3072	0.6280	0.5837	0.3366	0.3310	0.3720	0.3432	0.6932	0.6799	0.4325	0.4377	0.3750	0.3732
		Wrap	None	0.6570	0.5010	0.3785	0.3652	0.4504	0.3845	0.7666	0.6535	0.4856	0.4776	0.4448	0.4167	0.7146	0.6591	0.4014	0.3966	0.4277	0.4033	0.8105	0.7788	0.5395	0.5395	0.4827	0.4794
			Hurricane	0.5295	0.3946	0.2708	0.2600	0.3409	0.2821	0.6227	0.5320	0.3647	0.3581	0.3201	0.2978	0.6284	0.5824	0.3318	0.3277	0.3577	0.3345	0.6954	0.6615	0.4325	0.4318	0.3805	0.3687
FBC New (0-5 yr, all types)	A	TN	None	0.5295	0.5283	0.3269	0.3276	0.6374	0.6195	0.5084	0.5056	0.4125	0.4113	0.4245	0.4333	0.5290	0.5278	0.3476	0.3484	0.5418	0.5273	0.5892	0.5951	0.4403	0.4447	0.4631	0.4550
			Hurricane	0.4154	0.4117	0.2284	0.2212	0.5201	0.5052	0.3817	0.3845	0.2890	0.2950	0.3106	0.3062	0.4196	0.4184	0.2552	0.2589	0.4246	0.4134	0.4336	0.4344	0.3348	0.3333	0.3407	0.3562
		Clip	None	0.4110	0.4025	0.3224	0.3239	0.3780	0.3624	0.5140	0.5156	0.4109	0.4149	0.4249	0.4157	0.4470	0.4470	0.3281	0.3268	0.3554	0.3492	0.5642	0.5664	0.4395	0.4395	0.4506	0.4521
			Hurricane	0.2961	0.2934	0.2180	0.2197	0.2696	0.2557	0.3705	0.3817	0.2930	0.2926	0.2990	0.2974	0.3621	0.3558	0.2519	0.2490	0.2780	0.2775	0.4572	0.4388	0.3400	0.3400	0.3385	0.3333
		Wrap	None	0.4053	0.4050	0.3281	0.3259	0.3715	0.3519	0.5088	0.5096	0.4097	0.4141	0.4289	0.4229	0.4395	0.4420	0.3318	0.3277	0.3500	0.3434	0.5619	0.5693	0.4403	0.4410	0.4499	0.4513
			Hurricane	0.2924	0.2971	0.2180	0.2192	0.2688	0.2483	0.3713	0.3821	0.2930	0.2926	0.2994	0.2986	0.3567	0.3521	0.2552	0.2506	0.2697	0.2701	0.4484	0.4336	0.3378	0.3414	0.3378	0.3414
	B	TN	None	0.5248	0.5131	0.3120	0.3110	0.6104	0.5955	0.4856	0.4884	0.3937	0.3949	0.4109	0.4093	0.5447	0.5360	0.3364	0.3351	0.5501	0.5389	0.5686	0.5737	0.4528	0.4565	0.4631	0.4676
			Hurricane	0.4005	0.3968	0.2197	0.2165	0.5020	0.4883	0.3537	0.3521	0.2790	0.2790	0.2930	0.2798	0.4209	0.4147	0.2552	0.2556	0.4151	0.4072	0.4521	0.4476	0.3363	0.3363	0.3422	0.3636
		Clip	None	0.3740	0.3748	0.2976	0.2999	0.3410	0.3276	0.4780	0.4812	0.3969	0.3929	0.3901	0.3905	0.4383	0.4341	0.3244	0.3252	0.3534	0.3525	0.5678	0.5656	0.4550	0.4462	0.4735	0.4617
			Hurricane	0.2636	0.2666	0.1937	0.1962	0.2349	0.2217	0.3509	0.3489	0.2818	0.2722	0.2634	0.2618	0.3563	0.3513	0.2481	0.2428	0.2817	0.2722	0.4358	0.4358	0.3466	0.3437	0.3392	0.3451
		Wrap	None	0.3626	0.3604	0.2984	0.3018	0.3276	0.3150	0.4732	0.4800	0.3957	0.3949	0.3869	0.3809	0.4238	0.4209	0.3190	0.3173	0.3314	0.3293	0.5642	0.5590	0.4617	0.4462	0.4506	0.4602
			Hurricane	0.2552	0.2569	0.2036	0.1992	0.2207	0.2106	0.3469	0.3449	0.2778	0.2758	0.2646	0.2602	0.3467	0.3521	0.2481	0.2498	0.2676	0.2610	0.3636	0.3739	0.3341	0.3407	0.3451	0.3400
	C	TN	None	0.5231	0.5107	0.3125	0.3105	0.6148	0.6017	0.4932	0.4912	0.3973	0.3973	0.4097	0.4049	0.5447	0.5360	0.3384	0.3372	0.5501	0.5389	0.5708	0.5752	0.4513	0.4513	0.4594	0.4594
			Hurricane	0.3998	0.3986	0.2063	0.2083	0.5099	0.4960	0.3589	0.3525	0.2766	0.2730	0.2802	0.2822	0.4209	0.4147	0.2568	0.2564	0.4151	0.4072	0.4491	0.4447	0.3348	0.3378	0.3429	0.3643
		Clip	None	0.3708	0.3710	0.2999	0.2971	0.3418	0.3281	0.4676	0.4772	0.4013	0.3945	0.3881	0.3813	0.4312	0.4337	0.3157	0.3235	0.3525	0.3521	0.5575	0.5553	0.4454	0.4506	0.4558	0.4572
			Hurricane	0.2617	0.2654	0.1959	0.1949	0.2359	0.2250	0.3465	0.3437	0.2802	0.2726	0.2626	0.2790	0.3505	0.3484	0.2543	0.2527	0.2817	0.2726	0.4344	0.4432	0.3444	0.3496	0.3341	0.3481
		Wrap	None	0.3681	0.3700	0.3026	0.2991	0.3284	0.3189	0.4772	0.4796	0.4009	0.3973	0.3849	0.3797	0.4267	0.4213	0.3194	0.3210	0.3322	0.3306	0.5737	0.5671	0.4602	0.4535	0.4521	0.4558
			Hurricane	0.2577	0.2594	0.1967	0.1947	0.2222	0.2163	0.3425	0.3393	0.2778	0.2722	0.2654	0.2626	0.3592	0.3554	0.2461	0.2506	0.2643	0.2610	0.3732	0.3636	0.3378	0.3459	0.3414	0.3363

Table 4-11. Single-Family, Pre-FBC, Region 3, Terrain C Loss Relativity Table

Roof Cover Strength	Roof Deck	RWC	Opening Protection	Low Slope (<=6:12)																							
				2-Story												1-Story											
				Other						Hip						Other						Hip					
				Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel	
				NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR
Non-FBC	A	TN	None	1.0000	1.0000	0.8194	0.7807	1.0000	1.0000	1.0000	1.0000	0.6282	0.5860	0.8679	0.8840	1.0000	1.0000	0.8562	0.8301	1.0000	0.9842	1.0000	1.0000	0.5989	0.5820	0.6457	0.5471
			Hurricane	1.0000	1.0000	0.7660	0.7236	1.0000	1.0000	1.0000	1.0000	0.5041	0.4641	0.7257	0.5120	1.0000	1.0000	0.7834	0.7618	1.0000	0.9110	1.0000	1.0000	0.4742	0.4602	0.5065	0.4162
		Clip	None	1.0000	1.0000	0.8141	0.7743	1.0000	0.9302	1.0000	1.0000	0.6285	0.5874	0.8530	0.6230	1.0000	1.0000	0.8196	0.7985	1.0000	0.9658	1.0000	1.0000	0.5783	0.5618	0.6294	0.5304
			Hurricane	1.0000	1.0000	0.7537	0.7115	1.0000	0.8564	1.0000	1.0000	0.4995	0.4597	0.7062	0.4875	1.0000	1.0000	0.7697	0.7476	1.0000	0.9000	1.0000	1.0000	0.4607	0.4476	0.4969	0.4052
		Wrap	None	1.0000	1.0000	0.8113	0.7711	1.0000	0.9128	1.0000	1.0000	0.6285	0.5874	0.8579	0.6256	1.0000	1.0000	0.8308	0.8108	1.0000	0.9743	1.0000	1.0000	0.5730	0.5561	0.6269	0.5274
			Hurricane	1.0000	1.0000	0.7554	0.7146	1.0000	0.8517	1.0000	1.0000	0.4995	0.4597	0.7063	0.4881	1.0000	1.0000	0.7637	0.7414	1.0000	0.8973	1.0000	1.0000	0.4575	0.4435	0.4976	0.4086
	B	TN	None	1.0000	0.9313	0.3993	0.3673	1.0000	0.8842	1.0000	1.0000	0.4886	0.4349	0.7148	0.5076	1.0000	1.0000	0.5186	0.4994	0.6950	0.5722	1.0000	1.0000	0.5742	0.5659	0.5960	0.5047
			Hurricane	1.0000	0.8653	0.3250	0.2946	0.9275	0.8143	1.0000	0.8957	0.3569	0.3230	0.5806	0.3988	1.0000	1.0000	0.4356	0.4191	0.6075	0.4989	1.0000	1.0000	0.4618	0.4522	0.4705	0.3903
		Clip	None	1.0000	0.6323	0.3535	0.3097	0.6083	0.4220	1.0000	0.9248	0.4728	0.4161	0.6307	0.3698	1.0000	1.0000	0.4513	0.4243	0.6357	0.4987	1.0000	1.0000	0.5430	0.5295	0.5618	0.4604
			Hurricane	1.0000	0.5518	0.2772	0.2379	0.5166	0.3561	1.0000	0.7893	0.3440	0.2993	0.4712	0.2532	1.0000	1.0000	0.3779	0.3613	0.5472	0.4295	1.0000	1.0000	0.4201	0.4100	0.4377	0.3467
		Wrap	None	1.0000	0.5924	0.3505	0.3008	0.5734	0.3614	1.0000	0.9035	0.4712	0.4157	0.6335	0.3616	1.0000	1.0000	0.4443	0.4224	0.6284	0.4946	1.0000	1.0000	0.5396	0.5299	0.5584	0.4669
			Hurricane	1.0000	0.5206	0.2720	0.2330	0.4762	0.2905	1.0000	0.7966	0.3430	0.2975	0.4769	0.2490	1.0000	1.0000	0.3725	0.3574	0.5469	0.4297	1.0000	1.0000	0.4148	0.4059	0.4320	0.3440
	C	TN	None	1.0000	0.9280	0.3920	0.3575	1.0000	0.8775	1.0000	1.0000	0.4847	0.4366	0.7133	0.5083	1.0000	1.0000	0.5187	0.4989	0.6865	0.5692	1.0000	1.0000	0.5760	0.5662	0.5944	0.5024
			Hurricane	1.0000	0.8545	0.3154	0.2885	0.9310	0.8204	1.0000	0.8980	0.3585	0.3179	0.5805	0.3950	1.0000	1.0000	0.4336	0.4207	0.5922	0.4926	1.0000	1.0000	0.4641	0.4549	0.4671	0.3866
		Clip	None	1.0000	0.6171	0.3381	0.2951	0.6043	0.4197	1.0000	0.9283	0.4726	0.4150	0.6298	0.3754	1.0000	1.0000	0.4392	0.4198	0.6263	0.4898	1.0000	1.0000	0.5418	0.5288	0.5579	0.4584
			Hurricane	1.0000	0.5501	0.2553	0.2182	0.5056	0.3403	1.0000	0.7918	0.3454	0.3005	0.4798	0.2587	1.0000	1.0000	0.3717	0.3548	0.5510	0.4327	1.0000	1.0000	0.4178	0.4100	0.4350	0.3506
		Wrap	None	1.0000	0.5722	0.3297	0.2813	0.5579	0.3428	1.0000	0.9103	0.4662	0.4088	0.6286	0.3637	1.0000	1.0000	0.4344	0.4113	0.6189	0.4845	1.0000	1.0000	0.5483	0.5292	0.5554	0.4614
			Hurricane	1.0000	0.4937	0.2496	0.2086	0.4499	0.2707	1.0000	0.7917	0.3428	0.2949	0.4804	0.2514	1.0000	1.0000	0.3649	0.3501	0.5341	0.4183	1.0000	1.0000	0.4192	0.4086	0.4322	0.3483
FBC Old (Shingle > 13 yr // Tile or Metal > 20 yr)	A	TN	None	1.0000	1.0000	0.8194	0.7807	1.0000	1.0000	1.0000	0.7682	0.6282	0.5860	0.8679	0.8840	1.0000	1.0000	0.8562	0.8301	1.0000	0.9842	1.0000	0.8255	0.5989	0.5820	0.6457	0.5471
			Hurricane	1.0000	1.0000	0.7660	0.7236	1.0000	1.0000	0.9818	0.6333	0.5041	0.4641	0.7257	0.5120	1.0000	1.0000	0.7834	0.7618	1.0000	0.9110	0.8785	0.7024	0.4742	0.4602	0.5065	0.4162
		Clip	None	1.0000	0.9670	0.8141	0.7743	1.0000	0.9302	1.0000	0.7557	0.6285	0.5874	0.8530	0.6230	1.0000	1.0000	0.8196	0.7985	1.0000	0.9658	1.0000	0.8188	0.5783	0.5618	0.6294	0.5304
			Hurricane	1.0000	0.9065	0.7537	0.7115	1.0000	0.8564	0.9692	0.6196	0.4995	0.4597	0.7062	0.4875	1.0000	1.0000	0.7697	0.7476	1.0000	0.9000	0.8652	0.6854	0.4607	0.4476	0.4969	0.4052
		Wrap	None	1.0000	0.9705	0.8113	0.7711	1.0000	0.9128	1.0000	0.7589	0.6285	0.5874	0.8579	0.6256	1.0000	1.0000	0.8308	0.8108	1.0000	0.9743	1.0000	0.8214	0.5730	0.5561	0.6269	0.5274
			Hurricane	1.0000	0.9010	0.7554	0.7146	1.0000	0.8517	0.9691	0.6199	0.4995	0.4597	0.7063	0.4881	1.0000	1.0000	0.7637	0.7414	1.0000	0.8973	0.8741	0.6879	0.4575	0.4435	0.4976	0.4086
	B	TN	None	0.9844	0.7464	0.3993	0.3673	1.0000	0.8842	0.9991	0.6146	0.4886	0.4349	0.7148	0.5076	0.9926	0.7976	0.5186	0.4994	0.6950	0.5722	0.9991	0.7968	0.5742	0.5659	0.5960	0.5047
			Hurricane	0.9004	0.6747	0.3250	0.2946	0.9275	0.8143	0.8272	0.4933	0.3569	0.3230	0.5806	0.3988	0.8896	0.7153	0.4356	0.4191	0.6075	0.4989	0.8358	0.6723	0.4618	0.4522	0.4705	0.3903
		Clip	None	0.7474	0.4484	0.3535	0.3097	0.6083	0.4220	0.9323	0.5170	0.4728	0.4161	0.6307	0.3698	0.9285	0.7158	0.4513	0.4243	0.6357	0.4987	0.9704	0.7569	0.5430	0.5295	0.5618	0.4604
			Hurricane	0.6377	0.3718	0.2772	0.2379	0.5166	0.3561	0.7454	0.3887	0.3440	0.2993	0.4712	0.2532	0.8277	0.6476	0.3779	0.3613	0.5472	0.4295	0.8152	0.6214	0.4201	0.4100	0.4377	0.3467
		Wrap	None	0.7198	0.4020	0.3505	0.3008	0.5734	0.3614	0.9298	0.5087	0.4712	0.4157	0.6335	0.3616	0.9250	0.7050	0.4443	0.4224	0.6284	0.4946	0.9725	0.7585	0.5396	0.5299	0.5584	0.4669
			Hurricane	0.6112	0.3278	0.2720	0.2330	0.4762	0.2905	0.7537	0.3916	0.3430	0.2975	0.4769	0.2490	0.8379	0.6437	0.3725	0.3574	0.5469	0.4297	0.8106	0.6368	0.4148	0.4059	0.4320	0.3440
	C	TN	None	0.9902	0.7430	0.3920	0.3575	1.0000	0.8775	1.0000	0.6078	0.4847	0.4366	0.7133	0.5083	1.0000	0.8009	0.5187	0.4989	0.6865	0.5692	1.0000	0.7964	0.5760	0.5662	0.5944	0.5024
			Hurricane	0.8978	0.6767	0.3154	0.2885	0.9310	0.8204	0.8221	0.4884	0.3585	0.3179	0.5805	0.3950	0.8834	0.7139	0.4336	0.4207	0.5922	0.4926	0.8342	0.6716	0.4641	0.4549	0.4671	0.3866
		Clip	None	0.7306	0.4342	0.3381	0.2951	0.6043	0.4197	0.9215	0.5084	0.4726	0.4150	0.6298	0.3754	0.9210	0.7168	0.4392	0.4198	0.6263	0.4898	0.9768	0.7567	0.5418	0.5288	0.5579	0.4584
			Hurricane	0.6173	0.3558	0.2553	0.2182	0.5056	0.3403	0.7514	0.3936	0.3454	0.3005	0.4798	0.2587	0.8268	0.6396	0.3717	0.3548	0.5510	0.4327	0.8019	0.6161	0.4178	0.4100	0.4350	0.3506
		Wrap	None	0.7001	0.3858	0.3297	0.2813	0.5579	0.3428	0.9361	0.5072	0.4662	0.4088	0.6286	0.3637	0.9249	0.7088	0.4344	0.4113	0.6189	0.4845	0.9713	0.7601	0.5483	0.5292	0.5554	0.4614
			Hurricane	0.5845	0.3108	0.2496	0.2086	0.4499	0.2707	0.7530	0.3907	0.3428	0.2949	0.4804	0.2514	0.8195	0.6304	0.3649	0.3501	0.5341	0.4183	0.8186	0.6391	0.4192	0.4086	0.4322	0.3483
FBC Mid Range (Shingle = 6-13 yr // Tile or Metal = 6-20 yr)	A	TN	None	1.0000	1.0000	0.7225	0.7019	1.0000	1.0000	0.9220	0.7075	0.5198	0.4976	0.7185	0.7133	1.0000	1.0000	0.7160	0.7011	0.9733	0.8737	0.8397	0.7335	0.4912	0.4826	0.5357	0.4806
			Hurricane	1.0000	0.9448	0.6644	0.6403	1.0000	1.0000	0.7676	0.5724	0.3948	0.3753	0.5835	0.4625	1.0000	0.9948	0.6477	0.6351	0.8958	0.7947	0.6826	0.5923	0.3722	0.3631	0.4023	0.3521
		Clip	None	1.0000	0.9023	0.7094	0.6880	1.0000	0.8598	0.9091	0.6940	0.5182	0.4963	0.7029	0.5725	1.0000	1.0000	0.6885	0.6773	0.9558	0.8543	0.8136	0.7033	0.4670	0.4580	0.5141	0.4611
			Hurricane	1.0000	0.8418	0.6517	0.6297	0.9403	0.7987	0.7475	0.5595	0.3921	0.3711	0.5622	0.4368	1.0000	0.9982	0.6303	0.6196	0.8873	0.7850	0.6709	0.5749	0.3536	0.3443	0.3872	0.3370
		Wrap	None	1.0000	0.9035	0.7096	0.6881	0.9912	0.8492	0.9098	0.6946	0.5188	0.4966	0.7052	0.5744	1.0000	1.0000	0.6895	0.6786	0.9590	0.8567	0.8136	0.7035	0.4665	0.4583	0.5117	0.4575
			Hurricane	1.0000	0.8360	0.6529	0.6315	0.9319	0.7900	0.7476	0.5594	0.3920	0.3710	0.5610	0.4355	1.0000	0.9991	0.6282	0.6170	0.8812	0.7830	0.6638	0.5758	0.3487	0.3334	0.3881	0.3389
	B	TN	None	0.8362	0.6987	0.3319	0.3145	0.8980	0.8264	0.7744	0.5576	0.3938	0.3645	0.5785	0.4606	0.7767	0.6724	0.4151	0.4020	0.5344	0.4615	0.8060	0.6941	0.4747	0.4659	0.4830	0.4333
			Hurricane	0.7495	0.6301	0.2612	0.2449	0.8234	0.7545	0.6183	0.4327	0.2685	0.2492	0.4514	0.3478	0.6777	0.5854	0.3345	0.3232	0.4497	0.3858	0.6487	0.5623	0.3615	0.3577	0.3669	0.3233
		Clip	None	0.5715	0.3945	0.2796	0.2553	0.4713	0.3597	0.7058	0.4626	0.3748	0.3446	0.4763	0.3211	0.7079	0.5975	0.3413	0.3275	0.4675	0.3868	0.7535	0.6478	0.4373	0.4281	0.4468	0.3923
			Hurricane	0.4713	0.3199	0.2055	0.1846	0.3891	0.2916	0.5378	0.3347	0.2500	0.2269	0.3332	0.2032	0.6297	0.5238	0.2732	0.2630	0.3892	0.3195	0.6164	0.5240	0.3174	0.3130	0.3280	0.2786
		Wrap	None	0.5349	0.3552	0.2749	0.2475	0.4308	0.2995	0.7024	0.4590	0.3723	0.3432	0.4756	0.3118	0.7152	0.5935	0.3339	0.3222	0.4613	0.3805	0.7551	0.6501	0.4341	0.4282	0.4488	0.3969
			Hurricane	0.4401	0.2842	0.2003	0.1787	0.3436	0.2287	0.5345	0.3376	0.2495	0.2255	0.3358	0.1983	0.6269	0.5183	0.2654	0.2575	0.3883	0.3171	0.6134	0.5171	0.3152	0.3100	0.3242	0.2769
	C	TN	None	0.8308	0.6916	0.3242	0.3049	0.8920	0.8187	0.7760	0.5586	0.3918	0.3659	0.5784	0.4623	0.7719	0.6704	0.4165	0.4032	0.5306	0.4605	0.8051	0.6898	0.4763	0.4668	0.4835	0.4333
			Hurricane	0.7464	0.6199	0.2512	0.2365	0.8245	0.7570	0.6199	0.4333	0.2679	0.2469	0.4511	0.3455	0.6810	0.5882	0.3336	0.3250	0.4421	0.3828	0.6489	0.5627	0.3628	0.3593	0.3652	0.3202
		Clip	None	0.5554	0.3826	0.2657	0.2430	0.4650	0.3556	0.7011	0.4643	0.3730	0.3424	0.4765	0.3244	0.7011	0.5952	0.3335	0.3219	0.4607	0.3802	0.7553	0.6510	0.4364	0.4303	0.4463	0.3915
			Hurricane	0.4616	0.3109	0.1871	0.1668	0.3786	0.2800	0.5513	0.3437	0.2521	0.2280	0.3385	0.2063	0.6157	0.5187	0.2671	0.2577	0.3882	0.3172	0.6203	0.5285	0.3174	0.3135	0.3294	0.2824
		Wrap	None	0.5186	0.3335	0.2551	0.2290	0.4141	0.2816	0.6977	0.4560	0.3689	0.3386	0.4738	0.3121	0.7090	0.5837	0.3259	0.3131	0.4529	0.3718	0.7599	0.6492	0.4404	0.4287	0.4440	0.3918
			Hurricane	0.4136	0.2587	0.1788	0.1567	0.3204	0.2098	0.5369	0.3331	0.2500	0.2247	0.3376	0.1995	0.6127	0.5160	0.2600	0.2518	0.3772	0.3104	0.6125	0.5263	0.3168	0.3121	0.3263	0.2804
FBC New (0-5 yr, all types)	A	TN	None	0.8984	0.8923	0.6256	0.6230	1.0000	1.0000	0.5727	0.5681	0.4114	0.4093	0.5690	0.5427	0.7904	0.7871	0.5758	0.5720	0.7887	0.7632	0.5196	0.5102	0.3834	0.3832	0.4256	0.4141
			Hurricane	0.8363	0.8298	0.5629	0.5569	0.9904	0.9573	0.4374	0.4318	0.2854	0.2866	0.4413	0.4130	0.7180	0.7167	0.5119	0.5084	0.7038	0.6784	0.3845	0.3547	0.2701	0.2660	0.2981	0.2880
		Clip	None	0.7746	0.7713	0.6047	0.6017	0.8289	0.7895	0.5637	0.5595	0.4079	0.4053	0.5529	0.5220	0.7741	0.7734	0.5575	0.5562	0.7702	0.7427	0.4907	0.4898	0.3557	0.3543	0.3988	0.3919
			Hurricane	0.7190	0.7159	0.5497	0.5479	0.7803	0.7409	0.4249	0.4241	0.2846	0.2825	0.4182	0.3862	0.7106	0.7102	0.4909	0.4916	0.6959	0.6700	0.3600	0.3612	0.2465	0.2410	0.2775	0.2687
		Wrap	None	0.7712	0.7657	0.6080	0.6050	0.8239	0.7857	0.5627	0.5583	0.4090	0.4057	0.5526	0.5232	0.7771	0.7738	0.5482	0.5465	0.7628	0.7391	0.4898	0.4882	0.3600	0.3605	0.3965	0.3875
			Hurricane	0.7195	0.7135	0.5503	0.5483	0.7681	0.7283	0.4250	0.4241	0.2845	0.2824	0.4156	0.3829	0.7094	0.7081	0.4928	0.4926	0.6946	0.6688	0.3625	0.3596	0.2399	0.2233	0.2786	0.2692
	B	TN	None	0.6013	0.5927	0.2645	0.2616	0.7925	0.7686	0.4437	0.4409	0.2990	0.2941	0.4423	0.4137	0.4090	0.4045	0.3115	0.3046	0.3738	0.3508	0.4799	0.4788	0.3751	0.3660	0.3701	0.3618
			Hurricane	0.5207	0.5144	0.1973	0.1952	0.7192	0.6947	0.3167	0.3111	0.1800	0.1755	0.3223	0.2968	0.3299	0.3202	0.2334	0.2272	0.2919	0.2726	0.3602	0.3568	0.2612	0.2632	0.2632	0.2564
		Clip	None	0.2864	0.2797	0.2058	0.2009	0.3344	0.2975	0.3502	0.3431	0.2768	0.2731	0.3219	0.2724	0.3309	0.3301	0.2313	0.2307	0.2992	0.2749	0.4343	0.4322	0.3316	0.3268	0.3318	0.3242
			Hurricane	0.2108	0.2067	0.1339	0.1314	0.2617	0.2272	0.2238	0.2181	0.1561	0.1545	0.1952	0.1532	0.2569	0.2589	0.1686	0.1647	0.2313	0.2094	0.3162	0.3141	0.2146	0.2160	0.2183	0.2105
		Wrap	None	0.2492	0.2454	0.1993	0.1942	0.2883	0.2376	0.3429	0.3352	0.2733	0.2707	0.3177	0.2619	0.3227	0.3245	0.2235	0.2220	0.2943	0.2665	0.4396	0.4407	0.3286	0.3265	0.3391	0.3270
			Hurricane	0.1772	0.1720	0.1286	0.1244	0.2110	0.1669	0.2216	0.2170	0.1561	0.1535	0.1947	0.1476	0.2524	0.2516	0.1582	0.1576	0.2296	0.2045	0.3116	0.3107	0.2155	0.2142	0.2165	0.2098
	C	TN	None	0.5919	0.5842	0.2563	0.2523	0.7841	0.7599	0.4405	0.4397	0.2989	0.2953	0.4435	0.4164	0.4113	0.4079	0.3143	0.3075	0.3748	0.3519	0.4820	0.4820	0.3765	0.3673	0.3726	0.3641
			Hurricane	0.5220	0.5098	0.1870	0.1844	0.7181	0.6936	0.3189	0.3136	0.1773	0.1760	0.3218	0.2961	0.3249	0.3231	0.2336	0.2294	0.2919	0.2731	0.3600	0.3570	0.2614	0.2637	0.2632	0.2538
		Clip	None	0.2770	0.2725	0.1932	0.1910	0.3256	0.2916	0.3474	0.3417	0.2733	0.2697	0.3233	0.2733	0.3237	0.3210	0.2278	0.2239	0.2952	0.2706	0.4382	0.4309	0.3309	0.3318	0.3348	0.3247
			Hurricane	0.2001	0.1965	0.1189	0.1154	0.2516	0.2197	0.2224	0.2024	0.1588	0.1556	0.1972	0.1538	0.2521	0.2511	0.1626	0.1607	0.2253	0.2016	0.3178	0.3114	0.2169	0.2169	0.2238	0.2142
		Wrap	None	0.2319	0.2248	0.1806	0.1767	0.2702	0.2204	0.3380	0.3327	0.2715	0.2685	0.3190	0.2605	0.3148	0.3146	0.2174	0.2148	0.2868	0.2592	0.4357	0.4348	0.3325	0.3281	0.3327	0.3222
			Hurricane	0.1502	0.1486	0.1079	0.1047	0.1908	0.1489	0.2181	0.2167	0.1572	0.1545	0.1948	0.1476	0.2463	0.2454	0.1552	0.1536	0.2203	0.2025	0.3119	0.3139	0.2144	0.2155	0.2204	0.2126

Table 4-11. Single-Family, Pre-FBC, Region 3, Terrain C Loss Relativity Table (Continued)

Roof Cover Strength	Roof Deck	RWC	Opening Protection	High Slope (> 6:12)																							
				2-Story												1-Story											
				Other						Hip						Other						Hip					
				Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel	
				NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	YeSWR
Non-FBC	A	TN	None	1.0000	1.0000	0.5424	0.5080	0.9389	0.8303	1.0000	1.0000	0.6648	0.6346	0.6502	0.5752	1.0000	1.0000	0.5185	0.5037	0.8606	0.7949	1.0000	1.0000	0.6473	0.6406	0.6029	0.5670
			Hurricane	1.0000	0.8857	0.3822	0.3516	0.7731	0.6778	1.0000	1.0000	0.4760	0.4427	0.4535	0.3841	1.0000	1.0000	0.3981	0.3876	0.6866	0.6272	1.0000	1.0000	0.4941	0.4876	0.4169	0.3862
		Clip	None	1.0000	0.8858	0.5238	0.4878	0.6764	0.5236	1.0000	1.0000	0.6660	0.6323	0.6214	0.5467	1.0000	1.0000	0.5030	0.4905	0.5895	0.5099	1.0000	1.0000	0.6603	0.6507	0.5404	0.5056
			Hurricane	1.0000	0.7221	0.3682	0.3344	0.5066	0.3658	1.0000	1.0000	0.4757	0.4409	0.4292	0.3561	1.0000	1.0000	0.3841	0.3748	0.4457	0.3742	1.0000	1.0000	0.4988	0.4905	0.3875	0.3553
		Wrap	None	1.0000	0.8768	0.5252	0.4919	0.6710	0.5115	1.0000	1.0000	0.6660	0.6323	0.6309	0.5526	1.0000	1.0000	0.5015	0.4881	0.5710	0.4897	1.0000	1.0000	0.6601	0.6507	0.5480	0.5129
			Hurricane	1.0000	0.7127	0.3714	0.3361	0.5033	0.3568	1.0000	1.0000	0.4757	0.4409	0.4313	0.3551	1.0000	1.0000	0.3896	0.3751	0.4393	0.3670	1.0000	1.0000	0.4996	0.4923	0.3862	0.3553
	B	TN	None	1.0000	1.0000	0.4974	0.4631	0.9117	0.8099	1.0000	1.0000	0.6153	0.5821	0.5869	0.5200	1.0000	1.0000	0.5122	0.4961	0.8575	0.7918	1.0000	1.0000	0.6512	0.6421	0.5974	0.5607
			Hurricane	1.0000	0.8609	0.3338	0.3038	0.7586	0.6638	1.0000	1.0000	0.4282	0.3938	0.3975	0.3332	1.0000	1.0000	0.3829	0.3732	0.6856	0.6279	1.0000	1.0000	0.4897	0.4806	0.4044	0.3795
		Clip	None	1.0000	0.8121	0.4722	0.4307	0.6262	0.4755	1.0000	1.0000	0.6043	0.5652	0.5452	0.4672	1.0000	1.0000	0.4753	0.4659	0.5692	0.4916	1.0000	1.0000	0.6460	0.6421	0.5238	0.4892
			Hurricane	1.0000	0.6534	0.3123	0.2787	0.4467	0.3114	1.0000	0.9676	0.4119	0.3844	0.3477	0.2787	1.0000	1.0000	0.3631	0.3522	0.4302	0.3613	1.0000	1.0000	0.4926	0.4871	0.3631	0.3360
		Wrap	None	1.0000	0.7910	0.4664	0.4264	0.5995	0.4335	1.0000	1.0000	0.6006	0.5646	0.5430	0.4581	1.0000	1.0000	0.4826	0.4670	0.5305	0.4453	1.0000	1.0000	0.6507	0.6442	0.5248	0.4861
			Hurricane	1.0000	0.6292	0.3084	0.2761	0.4196	0.2781	1.0000	0.9649	0.4134	0.3854	0.3485	0.2835	1.0000	1.0000	0.3656	0.3606	0.4070	0.3389	1.0000	1.0000	0.4843	0.4798	0.3581	0.3287
	C	TN	None	1.0000	1.0000	0.4984	0.4615	0.9118	0.8099	1.0000	1.0000	0.6127	0.5827	0.5921	0.5219	1.0000	1.0000	0.5101	0.4956	0.8636	0.7953	1.0000	1.0000	0.6492	0.6359	0.5945	0.5594
			Hurricane	1.0000	0.8606	0.3342	0.3044	0.7586	0.6638	1.0000	1.0000	0.4160	0.3901	0.3971	0.3319	1.0000	1.0000	0.3836	0.3728	0.6856	0.6279	1.0000	1.0000	0.4910	0.4824	0.4073	0.3797
		Clip	None	1.0000	0.8210	0.4708	0.4328	0.6231	0.4714	1.0000	1.0000	0.6011	0.5668	0.5486	0.4633	1.0000	1.0000	0.4823	0.4663	0.5752	0.4978	1.0000	1.0000	0.6419	0.6349	0.5220	0.4856
			Hurricane	1.0000	0.6492	0.3133	0.2797	0.4495	0.3135	1.0000	0.9570	0.4145	0.3828	0.3505	0.2817	1.0000	1.0000	0.3669	0.3580	0.4302	0.3629	1.0000	1.0000	0.4832	0.4772	0.3586	0.3358
		Wrap	None	1.0000	0.7829	0.4605	0.4195	0.6039	0.4325	1.0000	1.0000	0.6043	0.5658	0.5380	0.4577	1.0000	1.0000	0.4764	0.4630	0.5292	0.4449	1.0000	1.0000	0.6393	0.6333	0.5183	0.4830
			Hurricane	1.0000	0.6226	0.3093	0.2728	0.4195	0.2762	1.0000	0.9575	0.4145	0.3852	0.3496	0.2822	1.0000	1.0000	0.3618	0.3496	0.4070	0.3375	1.0000	1.0000	0.4845	0.4801	0.3675	0.3363
FBC Old (Shingle > 13 yr // Tile or Metal > 20 yr)	A	TN	None	1.0000	0.7414	0.5424	0.5080	0.9389	0.8303	1.0000	0.7621	0.6648	0.6346	0.6502	0.5752	0.9961	0.8335	0.5185	0.5037	0.8606	0.7949	1.0000	0.8746	0.6473	0.6406	0.6029	0.5670
			Hurricane	0.8405	0.5860	0.3822	0.3516	0.7731	0.6778	0.8097	0.5552	0.4760	0.4427	0.4535	0.3841	0.8033	0.6641	0.3981	0.3876	0.6866	0.6272	0.7912	0.6739	0.4941	0.4876	0.4169	0.3862
		Clip	None	0.9025	0.5813	0.5238	0.4878	0.6764	0.5236	1.0000	0.7458	0.6660	0.6323	0.6214	0.5467	0.8436	0.6663	0.5030	0.4905	0.5895	0.5099	0.9893	0.8356	0.6603	0.6507	0.5404	0.5056
			Hurricane	0.6937	0.4153	0.3682	0.3344	0.5066	0.3658	0.7922	0.5383	0.4757	0.4409	0.4292	0.3561	0.6970	0.5434	0.3841	0.3748	0.4457	0.3742	0.7769	0.6577	0.4988	0.4905	0.3875	0.3553
		Wrap	None	0.9045	0.5716	0.5252	0.4919	0.6710	0.5115	1.0000	0.7477	0.6660	0.6323	0.6309	0.5526	0.8409	0.6616	0.5015	0.4881	0.5710	0.4897	0.9870	0.8312	0.6601	0.6507	0.5480	0.5129
			Hurricane	0.7002	0.4079	0.3714	0.3361	0.5033	0.3568	0.7930	0.5390	0.4757	0.4409	0.4313	0.3551	0.6842	0.5275	0.3896	0.3751	0.4393	0.3670	0.7753	0.6554	0.4996	0.4923	0.3862	0.3553
	B	TN	None	0.9990	0.7149	0.4974	0.4631	0.9117	0.8099	0.9997	0.7052	0.6153	0.5821	0.5869	0.5200	0.9965	0.8354	0.5122	0.4961	0.8575	0.7918	0.9982	0.8450	0.6512	0.6421	0.5974	0.5607
			Hurricane	0.7951	0.5516	0.3338	0.3038	0.7586	0.6638	0.7420	0.4994	0.4282	0.3938	0.3975	0.3332	0.7878	0.6565	0.3829	0.3732	0.6856	0.6279	0.7834	0.6674	0.4897	0.4806	0.4044	0.3795
		Clip	None	0.8426	0.5179	0.4722	0.4307	0.6262	0.4755	0.9604	0.6611	0.6043	0.5652	0.5452	0.4672	0.8236	0.6490	0.4753	0.4659	0.5692	0.4916	0.9612	0.8047	0.6460	0.6421	0.5238	0.4892
			Hurricane	0.6258	0.3516	0.3123	0.2787	0.4467	0.3114	0.7268	0.4755	0.4119	0.3844	0.3477	0.2787	0.6665	0.5165	0.3631	0.3522	0.4302	0.3613	0.7620	0.6330	0.4926	0.4871	0.3631	0.3360
		Wrap	None	0.8230	0.4890	0.4664	0.4264	0.5995	0.4335	0.9602	0.6561	0.6006	0.5646	0.5430	0.4581	0.8057	0.6259	0.4826	0.4670	0.5305	0.4453	0.9553	0.8070	0.6507	0.6442	0.5248	0.4861
			Hurricane	0.6116	0.3319	0.3084	0.2761	0.4196	0.2781	0.7178	0.4646	0.4134	0.3854	0.3485	0.2835	0.6514	0.4947	0.3656	0.3606	0.4070	0.3389	0.7545	0.6380	0.4843	0.4798	0.3581	0.3287
	C	TN	None	1.0000	0.7154	0.4984	0.4615	0.9118	0.8099	1.0000	0.7101	0.6127	0.5827	0.5921	0.5219	1.0000	0.8409	0.5101	0.4956	0.8636	0.7953	1.0000	0.8479	0.6492	0.6359	0.5945	0.5594
			Hurricane	0.7954	0.5514	0.3342	0.3044	0.7586	0.6638	0.7391	0.4958	0.4160	0.3901	0.3971	0.3319	0.7878	0.6565	0.3836	0.3728	0.6856	0.6279	0.7831	0.6692	0.4910	0.4824	0.4073	0.3797
		Clip	None	0.8435	0.5196	0.4708	0.4328	0.6231	0.4714	0.9601	0.6603	0.6011	0.5668	0.5486	0.4633	0.8237	0.6493	0.4823	0.4663	0.5752	0.4978	0.9597	0.7984	0.6419	0.6349	0.5220	0.4856
			Hurricane	0.6276	0.3522	0.3133	0.2797	0.4495	0.3135	0.7276	0.4742	0.4145	0.3828	0.3505	0.2817	0.6687	0.5170	0.3669	0.3580	0.4302	0.3629	0.7615	0.6377	0.4832	0.4772	0.3586	0.3358
		Wrap	None	0.8181	0.4895	0.4605	0.4195	0.6039	0.4325	0.9554	0.6512	0.6043	0.5658	0.5380	0.4577	0.8015	0.6190	0.4764	0.4630	0.5292	0.4449	0.9553	0.8044	0.6393	0.6333	0.5183	0.4830
			Hurricane	0.6173	0.3315	0.3093	0.2728	0.4195	0.2762	0.7197	0.4680	0.4145	0.3852	0.3496	0.2822	0.6476	0.4978	0.3618	0.3496	0.4070	0.3375	0.7599	0.6372	0.4845	0.4801	0.3675	0.3363
FBC Mid Range (Shingle = 6-13 yr // Tile or Metal = 6-20 yr)	A	TN	None	0.8523	0.7041	0.4655	0.4475	0.8493	0.7860	0.8488	0.7035	0.5662	0.5500	0.5856	0.5449	0.8430	0.7601	0.4376	0.4294	0.7823	0.7375	0.8265	0.7662	0.5414	0.5403	0.5541	0.5320
			Hurricane	0.6835	0.5521	0.3086	0.2923	0.6946	0.6383	0.6099	0.4921	0.3761	0.3591	0.3896	0.3523	0.6616	0.5931	0.3158	0.3102	0.6076	0.5674	0.6330	0.5808	0.3861	0.3826	0.3651	0.3481
		Clip	None	0.7149	0.5422	0.4455	0.4265	0.5646	0.4771	0.8340	0.6866	0.5659	0.5471	0.5564	0.5167	0.6903	0.6017	0.4160	0.4083	0.4913	0.4452	0.7977	0.7308	0.5469	0.5420	0.4865	0.4684
			Hurricane	0.5215	0.3725	0.2927	0.2752	0.3986	0.3188	0.6048	0.4776	0.3752	0.3570	0.3625	0.3212	0.5348	0.4692	0.2997	0.2958	0.3550	0.3144	0.6130	0.5592	0.3804	0.3756	0.3330	0.3164
		Wrap	None	0.7117	0.5311	0.4479	0.4293	0.5533	0.4634	0.8326	0.6854	0.5660	0.5472	0.5637	0.5207	0.6693	0.5833	0.4156	0.4084	0.4678	0.4227	0.8039	0.7326	0.5467	0.5420	0.4905	0.4717
			Hurricane	0.5219	0.3667	0.2933	0.2746	0.3896	0.3057	0.6043	0.4773	0.3752	0.3570	0.3617	0.3203	0.5291	0.4564	0.3046	0.2965	0.3456	0.3044	0.6138	0.5592	0.3810	0.3769	0.3298	0.3143
	B	TN	None	0.8272	0.6825	0.4278	0.4086	0.8279	0.7691	0.7814	0.6455	0.5204	0.5031	0.5279	0.4923	0.8401	0.7542	0.4321	0.4228	0.7792	0.7342	0.8237	0.7521	0.5410	0.5336	0.5449	0.5229
			Hurricane	0.6505	0.5241	0.2667	0.2511	0.6744	0.6195	0.5554	0.4408	0.3326	0.3142	0.3345	0.3006	0.6483	0.5872	0.3037	0.2989	0.6114	0.5712	0.6203	0.5737	0.3821	0.3782	0.3533	0.3385
		Clip	None	0.6499	0.4771	0.3971	0.3759	0.5120	0.4253	0.7505	0.6038	0.5060	0.4876	0.4759	0.4337	0.6625	0.5741	0.3940	0.3881	0.4737	0.4293	0.7774	0.7111	0.5345	0.5322	0.4654	0.4469
			Hurricane	0.4579	0.3127	0.2421	0.2243	0.3405	0.2630	0.5393	0.4113	0.3214	0.3073	0.2845	0.2472	0.5136	0.4405	0.2840	0.2792	0.3411	0.3013	0.5906	0.5417	0.3811	0.3782	0.3086	0.2958
		Wrap	None	0.6253	0.4490	0.3916	0.3702	0.4801	0.3839	0.7479	0.5971	0.5047	0.4861	0.4697	0.4234	0.6356	0.5455	0.3985	0.3909	0.4304	0.3829	0.7753	0.7082	0.5397	0.5336	0.4659	0.4460
			Hurricane	0.4414	0.2932	0.2397	0.2223	0.3105	0.2281	0.5295	0.4044	0.3223	0.3079	0.2835	0.2486	0.5034	0.4363	0.2826	0.2802	0.3146	0.2757	0.5927	0.5433	0.3759	0.3746	0.3086	0.2932
	C	TN	None	0.8268	0.6820	0.4280	0.4078	0.8259	0.7670	0.7795	0.6431	0.5191	0.5039	0.5289	0.4920	0.8401	0.7542	0.4320	0.4236	0.7823	0.7360	0.8244	0.7534	0.5404	0.5334	0.5453	0.5233
			Hurricane	0.6521	0.5216	0.2663	0.2510	0.6753	0.6207	0.5551	0.4400	0.3257	0.3131	0.3360	0.3005	0.6483	0.5872	0.3047	0.2985	0.6114	0.5712	0.6192	0.5735	0.3831	0.3791	0.3568	0.3401
		Clip	None	0.6475	0.4754	0.3976	0.3776	0.5086	0.4231	0.7461	0.6038	0.5070	0.4900	0.4779	0.4327	0.6641	0.5750	0.3977	0.3894	0.4777	0.4324	0.7854	0.7183	0.5339	0.5304	0.4628	0.4429
			Hurricane	0.4601	0.3155	0.2429	0.2245	0.3417	0.2643	0.5362	0.4090	0.3232	0.3067	0.2848	0.2477	0.5130	0.4387	0.2852	0.2804	0.3395	0.2999	0.5951	0.5394	0.3762	0.3731	0.3078	0.2939
		Wrap	None	0.6250	0.4491	0.3880	0.3656	0.4825	0.3841	0.7482	0.5972	0.5064	0.4868	0.4701	0.4250	0.6378	0.5484	0.3943	0.3874	0.4316	0.3849	0.7828	0.7189	0.5298	0.5280	0.4636	0.4440
			Hurricane	0.4478	0.2944	0.2382	0.2206	0.3115	0.2288	0.5304	0.4037	0.3221	0.2966	0.2842	0.2492	0.5018	0.4290	0.2838	0.2762	0.3141	0.2750	0.5914	0.5464	0.3774	0.3657	0.3094	0.2949
FBC New (0-5 yr, all types)	A	TN	None	0.6319	0.6259	0.3886	0.3870	0.7597	0.7418	0.5747	0.5769	0.4676	0.4654	0.5209	0.5146	0.6196	0.6055	0.3566	0.3551	0.7039	0.6801	0.5771	0.5735	0.4354	0.4401	0.5053	0.4970
			Hurricane	0.4664	0.4631	0.2350	0.2330	0.6162	0.5989	0.3696	0.3665	0.2762	0.2756	0.3257	0.3205	0.4545	0.4473	0.2334	0.2327	0.5286	0.5075	0.3977	0.3969	0.2780	0.2775	0.3134	0.3100
		Clip	None	0.4536	0.4510	0.3672	0.3651	0.4528	0.4305	0.5554	0.5526	0.4659	0.4618	0.4915	0.4866	0.4461	0.4422	0.3289	0.3262	0.3931	0.3804	0.5493	0.5490	0.4336	0.4333	0.4325	0.4312
			Hurricane	0.2888	0.2868	0.2171	0.2160	0.2906	0.2718	0.3553	0.3556	0.2748	0.2730	0.2959	0.2864	0.3163	0.3123	0.2154	0.2168	0.2643	0.2547	0.3748	0.3758	0.2619	0.2606	0.2785	0.2775
		Wrap	None	0.4452	0.4426	0.3706	0.3667	0.4355	0.4152	0.5549	0.5536	0.4660	0.4620	0.4965	0.4887	0.4332	0.4314	0.3297	0.3287	0.3645	0.3558	0.5446	0.5495	0.4333	0.4333	0.4330	0.4304
			Hurricane	0.2791	0.2781	0.2152	0.2130	0.2758	0.2546	0.3551	0.3556	0.2748	0.2730	0.2922	0.2854	0.3038	0.3048	0.2196	0.2179	0.2519	0.2419	0.3753	0.3758	0.2624	0.2614	0.2733	0.2733
	B	TN	None	0.6070	0.6002	0.3581	0.3540	0.7441	0.7284	0.5248	0.5217	0.4256	0.4240	0.4689	0.4646	0.6269	0.6158	0.3521	0.3494	0.7010	0.6766	0.5763	0.5756	0.4307	0.4250	0.4923	0.4850
			Hurricane	0.4408	0.4358	0.1996	0.1985	0.5902	0.5753	0.3133	0.3137	0.2370	0.2345	0.2716	0.2680	0.4525	0.4439	0.2244	0.2246	0.5372	0.5144	0.3875	0.3860	0.2744	0.2757	0.3022	0.2975
		Clip	None	0.3975	0.3959	0.3220	0.3210	0.3978	0.3752	0.4842	0.4796	0.4078	0.4100	0.4066	0.4002	0.4281	0.4262	0.3127	0.3103	0.3783	0.3670	0.5259	0.5277	0.4229	0.4224	0.4070	0.4047
			Hurricane	0.2330	0.2303	0.1718	0.1699	0.2342	0.2145	0.2803	0.2856	0.2308	0.2302	0.2213	0.2157	0.2965	0.2920	0.2050	0.2063	0.2520	0.2413	0.3568	0.3589	0.2697	0.2692	0.2541	0.2557
		Wrap	None	0.3732	0.3702	0.3167	0.3141	0.3608	0.3343	0.4778	0.4739	0.4087	0.4076	0.3965	0.3886	0.4008	0.3995	0.3144	0.3148	0.3303	0.3206	0.5274	0.5225	0.4286	0.4229	0.4070	0.4060
			Hurricane	0.2136	0.2111	0.1710	0.1685	0.2014	0.1782	0.2854	0.2814	0.2312	0.2304	0.2184	0.2138	0.2802	0.2771	0.1996	0.1999	0.2222	0.2124	0.3576	0.3592	0.2676	0.2694	0.2590	0.2577
	C	TN	None	0.6072	0.6001	0.3575	0.3540	0.7401	0.7241	0.5282	0.5275	0.4255	0.4251	0.4657	0.4622	0.6269	0.6158	0.3539	0.3515	0.7010	0.6766	0.5758	0.5756	0.4317	0.4309	0.4960	0.4871
			Hurricane	0.4410	0.4359	0.1985	0.1976	0.5920	0.5776	0.3158	0.3131	0.2355	0.2362	0.2750	0.2690	0.4525	0.4439	0.2258	0.2243	0.5372	0.5144	0.3901	0.3891	0.2752	0.2757	0.3064	0.3004
		Clip	None	0.3988	0.3972	0.3245	0.3223	0.3941	0.3748	0.4813	0.4779	0.4129	0.4132	0.4073	0.4021	0.4280	0.4259	0.3131	0.3125	0.3801	0.3670	0.5324	0.5326	0.4260	0.4260	0.4036	0.4003
			Hurricane	0.2329	0.2320	0.1725	0.1693	0.2340	0.2151	0.2824	0.2830	0.2320	0.2307	0.2191	0.2136	0.2952	0.2904	0.2036	0.2027	0.2488	0.2369	0.3672	0.3654	0.2692	0.2689	0.2570	0.2520
		Wrap	None	0.3732	0.3705	0.3154	0.3116	0.3612	0.3357	0.4791	0.4767	0.4086	0.4078	0.4021	0.3923	0.3966	0.3994	0.3121	0.3117	0.3341	0.3249	0.5274	0.5298	0.4203	0.4226	0.4088	0.4049
			Hurricane	0.2147	0.2115	0.1672	0.1684	0.2035	0.1813	0.2830	0.2812	0.2297	0.2080	0.2188	0.2162	0.2776	0.2771	0.2057	0.2029	0.2212	0.2124	0.3602	0.3599	0.2702	0.2512	0.2512	0.2536

4.2.4. Secondary Mitigation Factors

The analysis of secondary factors follows the work that was done in 2002 and 2008. We employ the majority of the factors from the 2002 and 2008 studies. We have performed new analysis on secondary factors for three features: (1) prevention of water intrusion through tracks of sliding glass doors; (2) aging effects on asphalt shingles; and (3) metal tile and panel roof coverings.

Table 4-12 provides a summary of the secondary factors that should be used with single family residences. Discussion of the development of these factors can be found in the 2008 study.

These factors should be applied to the appropriate loss relativity from the primary tables according to:

$$R' = R * K^{(1-R)} \qquad \textbf{15}$$

$$K = \prod_{i=1}^{n} K_i \qquad \textbf{16}$$

where *R´* = updated relativity due to secondary factors, K_i = secondary adjustment factors given in Table 4-15, *K* = aggregate product of all secondary factors, and *R* = relativity for the basic house features from Table 4-3 through Table 4-11. If an interpolation for opening protection is needed, then such interpolation should be completed to determine *R* (using Equation 16) prior to the use of Equation 15. Equation 15 is valid for relativities normalized to the weakest house. It is the same formula for secondary factors presented in the 2008 study in which the final *K* factor is raised to the *(1-R)* power. The exponent form in Equation 15 provides more consistency with the fact that the stronger houses are more sensitive to secondary factors whereas the weaker houses have so many other problems that the secondary factor effects are less important. For *R = 1* (the weakest house), the effect of secondary factors is null and as $R \to 0$, $R' \to 0$. Equation 15 is a simple way to achieve the desired effect without overcomplicating the application of secondary factors. No capping is needed for Equation 15 as the resulting *R'* is bounded by [0, 1] for *R* bounded by [0, 1] and positive *K*.

Table 4-12. Single-Family Secondary Factors (K_i)

No.	Secondary Factor Description	Applies to Post-FBC Era?	Loss Relativity Multiplier (K_i)	Comments
1	Dimensional Lumber Deck	Yes	0.96	Based on 2002 Study Applies to Deck C
2	Unreinforced Masonry Walls	No	0.98	Based o n 2002 Srudy
3	Reinforced Masonry Walls	Yes	0.95	Based on 2002 Study (Factors 2 and 3 are mutually exclusive)
4	Opening Coverage – All Openings	Yes (except for HVHZ)	0.98	Based on 2002 study. Applies to Hurricane Protection Level; does not apply to other levels.
5	Unbraced Gable End	No	1.02	Based on 2002 Study
6	Foundation Restraint	No	Ter A/B 1.38; Ter C 1.54	Based on 2002 Study
7	Reinforced Concrete Roof Deck Integral with Concrete or Reinforced Masonry Walls	Yes	See Concrete Roof Deck Table	Base on 2008 Study. Factors 1, 2, 3, 5, 6, 8, 10, and 11 do not apply for reinforced concrete roof deck integrated with reinforced concrete or masonry walls
8	Enhanced Roof Deck (≥ 5/8" plywood with 2.5" screws or 8d ring-shank nails)	Yes	0.96	Factors 1 and 8 are mutually exclusive. Applies to Deck C
9	Shutter Interpolation Between None and Hurricane	Yes	Type / Ter A/B / Ter C Ordinary S=0.72 S=0.56 OSB S=0.72 S=0.56 Plywood S=0.48 S=0.46 Basic S-0.23 S=0.19	Based on2003-2004 DCA Shutter Impact Tests for OSB and Plywood. Values given are shutter interpotaion factors (s) (See text)
10	Vinyl Siding	Yes	1.02	Based on HSRS Study
11	Double Wrap Roof-Wall Connection	No	Opening Prot. / Ter A/B / Ter C All Others 0.98 0.93 Basic, Hurricane 0.99 0.97	Based on 2008 Study,. Does not apply to post-FBC construction.
12	Partially-Enclosed Designs	Yes	0.98	Applies to post-FBC era, partially-enclosed designs in WBD region. Apply to Opening Protection = None

Table 4-13 shows the loss relativities for reinforced concrete roof deck houses. These loss relativities were originally developed for the 2008 study and were not updated in the 2024 study.

Table 4-13. Loss Relativities for Reinforced Concrete Roof Decks Integrally Tied to Reinforced Concrete or Masonry walls

Terrain	Roof Cover	Opening Prot.	Painted Roof		Tile Roof			
					Two-Story		One Story	
			Two-Story	One-Story	Other	Hip	Other	Hip
B	Non-FBC	None	0.2079	0.1484	0.4409	0.3594	0.3598	0.2749
		Hurricane	0.1791	0.1373	0.4018	0.3422	0.3348	0.2674
	FBC	None	0.1838	0.1264	0.3111	0.2755	0.2264	0.1821
		Hurricane	0.1577	0.1173	0.2752	0.2480	0.2166	0.1739
C	Non-FBC	None	0.1788	0.1171	0.3127	0.2948	0.2597	0.2179
		Hurricane	0.1066	0.0904	0.2436	0.2260	0.2166	0.1961
	FBC	None[2]	0.1672	0.1026	0.2450	0.2217	0.1776	0.1467
		Hurricane	0.0949	0.0790	0.1718	0.1550	0.1499	0.1258

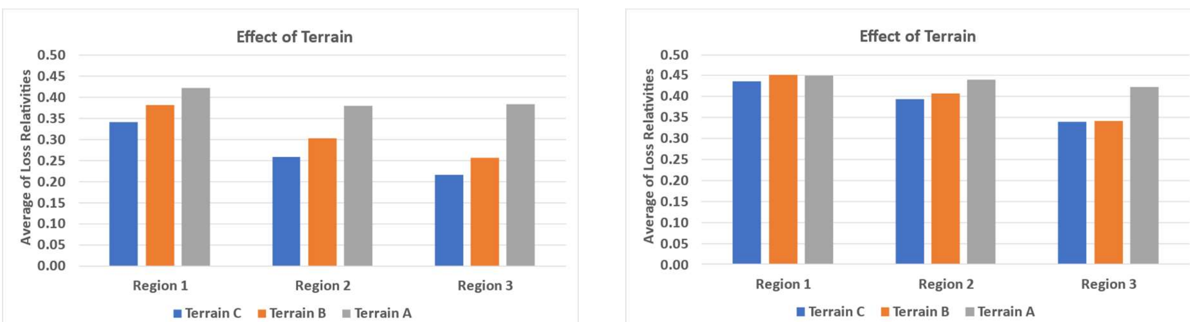
4.2.5. Comparison of Loss Relativities Across Terrains and Regions

The 2002 and 2008 loss relativities for existing construction included a single table of relativities for use statewide. Section 4.2.3 of the 2008 Loss Mitigation Study included a discussion of the effect of location on resulting loss relativities. In general, this showed that the range of relativities increased with decreasing hurricane wind hazard. In other words, the strongest house in a lower wind hazard areas (such as Lake County) would have a lower relativity than the same house built in a higher hurricane hazard area (such as Broward County). Ultimately, the 2008 study presented a single set of loss relativities that were produced for a location with a moderately high hurricane hazard (Sarasota County) to be used for the entire state. This resulted in conservative application of relativities for most of the State.

This study has produced loss relativities for the three regions identified in Section 2.3. The loss relativities by hurricane wind hazard regions are compared in this section to visualize the effect of terrain, roof cover type, roof shape, and roof cover age.

The values plotted on the vertical axes of Figure 4-3 through Figure 4-6 are the averages of the loss relativities for buildings with a new FBC roof cover, a C roof deck, and single wrap roof-to-wall connections (i.e., strong building) divided by the corresponding relativities of buildings with a non-FBC Roof cover, an A roof deck, and toe-nail roof-to-wall connections (i.e., weak building). Separate comparisons are made for: (i) homes with opening protection and (ii) homes without opening protection.

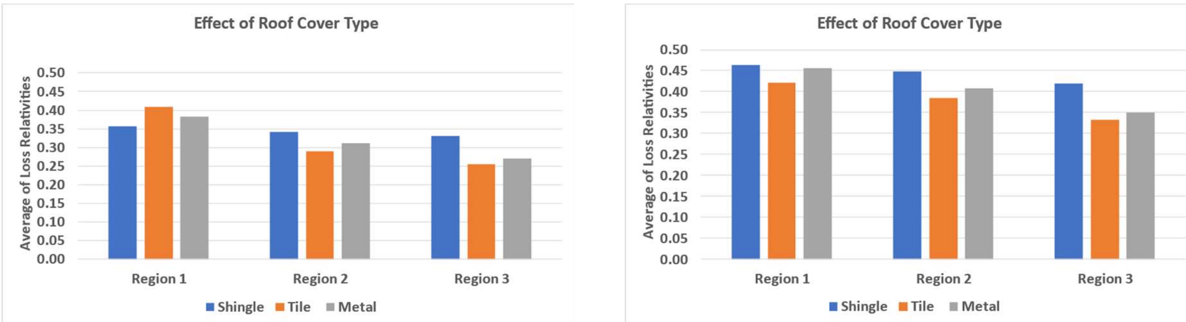
Figure 4-3 illustrates the varying effects of terrain on loss ratios by region. For buildings with opening protection, the effect of terrain on the spread between strong and weak houses is most pronounced in Region 3 (lowest wind hazard). In rough terrain (Terrain A), the spread of the relativities is smaller than in smooth terrain (Terrain C). For buildings without opening protection, the trends are similar, but less pronounced.



(i) Opening Protection *(ii) No Opening Protection*

Figure 4-3. Comparison of Effect of Terrain on Loss Relativity by Analysis Region

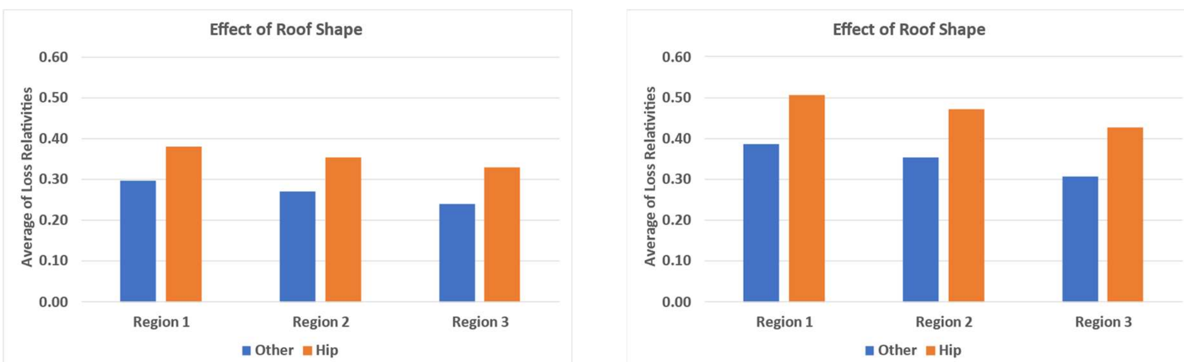
Figure 4-4 investigates the impact of roof cover type on loss relativities by region. We observe that for high hazard regions (e.g., Region 1), asphalt shingle and metal roofs exhibit comparable relativities. However, in Regions 2 and 3, asphalt shingle roofs produce higher loss relativities compared to tile or metal roofs. Similar trends are evident for the no opening protection case.



(i) Opening Protection *(ii) No Opening Protection*

Figure 4-4. Comparison of Effect of Roof Cover Type on Loss Relativity by Analysis Region

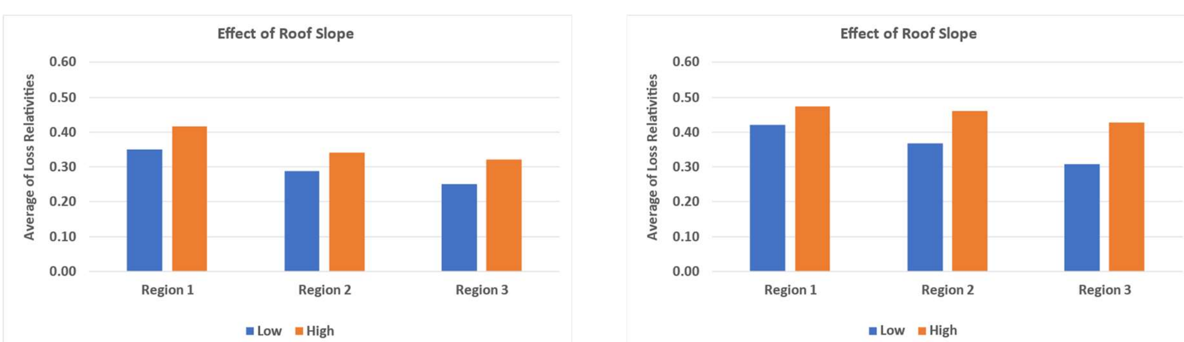
Figure 4-5 demonstrates the effect of roof shape on loss relativities. For buildings with opening protection, relativities are lower in low hazard regions compared to high hazard regions. Non-hip or other roof shapes demonstrate a greater benefit from upgrading to stronger structural features compared to similar upgrades in houses with hip roofs. This observation holds true for the no opening protection scenario as well, although the relativities are generally higher than those with opening protection.



(i) Opening Protection *(ii) No Opening Protection*

Figure 4-5. Comparison of Effect of Roof Shape on Loss Relativity by Analysis Region

Figure 4-6 shows the effect of roof slope on loss relativities. A slight decreasing trend in loss relativities is observed in regions with decreasing hazard levels. Loss relativities are lower for buildings with low roof slopes that have opening protection.



(i) Opening Protection *(ii) No Opening Protection*

Figure 4-6. Comparison of Effect of Roof Covering on Loss Relativity by Analysis Region

Figure 4-7 compares the percentage reduction in loss relativity for homes with a new FBC asphalt roof cover (0-5 years old) versus an old FBC asphalt roof cover (>13 years old) for otherwise strong homes with C roof decks and clip or wrap roof-wall connections. The percentage reduction in loss relativity increases with decreasing wind hazard, with Region 1 exhibiting the lowest mean reduction across all regions and terrains. Generally, the mean reduction in loss increases with terrain roughness, indicating a greater benefit from a new roof in rougher terrain. The figure also presents the maximum and minimum reduction values observed within each terrain group and across the three regions.

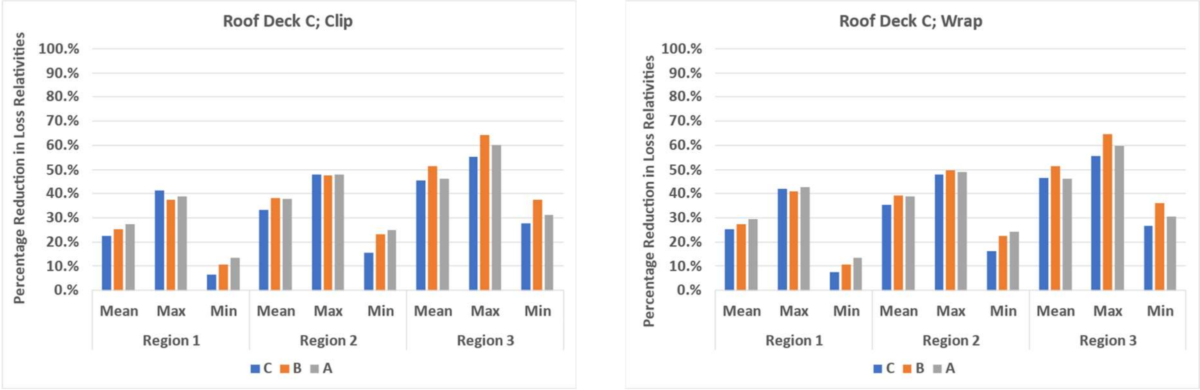


Figure 4-7. Comparison of Effect of Asphalt Shingle Age on Loss Relativity by Region and Terrain

4.3. Post-FBC Construction

Wind loading provisions of the Florida Building Code (FBC) and effective dates of FBC code changes are discussed in Section 2.2.1. Two FBC construction eras were identified for the purposes of developing loss relativities for wind mitigation features:

- FBC 2001 & 2004 includes permit application dates of March 1, 2002 through December 7, 2006, or year built between 2003 and 2007.
- FBC 2006 & onward includes permit applications on or after December 8, 2006, or year built of 2008 or later.

There are several methods by which the FBC Era can be determined, and these are discussed in Section 2.2.1.4.1. There are many code amendments between these dates. The FBC 2006 date is significant since ring shank nails, soffit loads, Panhandle WBD region, and 150 mph shingles were all introduced at that time. We designed buildings to the 2006 FBC (and beyond) and used our previous designs from the 2002 loss relativity study for the FBC 2001 designs. Appendix D summarizes design calculations for FBC revisions after FBC 2006.

Section 4.3.1 contains the 2006 and onward FBC loss relativities and Section 0 contains the 2001 & 2004 FBC loss relativities.

4.3.1. FBC 2006 & Beyond Loss Relativities

We developed new designs for each FBC 2006 and beyond wind zone from 120 to 180 mph, including the HVHZ locations. We used a single point in each wind zone to perform the design calculations. The resulting loss relativities for Post-FBC 2006 homes were developed using the same normalizing values used for the weakest reasonable Pre-FBC house. This preserves consistency between the loss relativities presented in this section with those presented in Sections 4.2.3 (Pre-FBC), and 4.3.2 (FBC 2001 & 2004).

The following tables present the single-family, FBC 2006 and beyond loss relativities by analysis terrain.

- Table 4-14. Single-Family, FBC06 and Beyond, Terrain A Loss Relativities for All Regions
- Table 4-15. Single-Family, FBC06 and Beyond, Terrain B Loss Relativities for All Regions
- Table 4-16. Single-Family, FBC06 and Beyond, Terrain C Loss Relativities for All Regions

Table 4-14. Single-Family, FBC06 and Beyond, Terrain A Loss Relativities for All Regions

Roof Cover	Region	Opening Protection	Low Roof Slope (≤6:12)																							
			Two-Story Other						Two-Story Hip						One-Story Other						One-Story Hip					
			Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel	
			No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR
FBC Old (Shingle > 13 yr // Tile or Metal > 20 yr)	Region 3	None	0.9794	0.7538	0.3319	0.3184	0.8439	0.7439	0.9607	0.6849	0.4524	0.4434	0.5339	0.4297	0.9638	0.8991	0.4061	0.4088	0.5315	0.5040	0.9735	0.9039	0.5918	0.5904	0.5703	0.5567
		Hurricane	0.9438	0.7246	0.3268	0.3173	0.8147	0.7122	0.9239	0.6745	0.4420	0.4293	0.5270	0.4128	0.9410	0.8799	0.3960	0.3970	0.5231	0.4943	0.9397	0.8895	0.5653	0.5696	0.5481	0.5352
	Region 2	None	0.6609	0.4287	0.3317	0.3004	0.5664	0.4293	0.8418	0.5394	0.4844	0.4418	0.5852	0.4047	0.9060	0.7674	0.5056	0.4968	0.6431	0.5671	0.8995	0.7880	0.6125	0.6034	0.6090	0.5580
		Hurricane	0.6360	0.4071	0.3114	0.2833	0.5415	0.4070	0.7931	0.5116	0.4516	0.4141	0.5506	0.3794	0.8711	0.7415	0.4745	0.4698	0.6184	0.5422	0.8491	0.7658	0.5795	0.5751	0.5659	0.5240
	Region 1	Hurricane	0.4321	0.2400	0.2726	0.2220	0.4272	0.2696	0.6501	0.3590	0.4456	0.3702	0.5655	0.3398	0.6976	0.5269	0.5049	0.4789	0.6355	0.5071	0.7261	0.5916	0.5693	0.5515	0.5817	0.4971
FBC Mid Range (Shingle = 6-13 yr // Tile or Metal = 6-20 yr)	Region 3	None	0.7529	0.6445	0.2622	0.2552	0.7029	0.6467	0.7170	0.5908	0.3693	0.3630	0.4353	0.3769	0.7562	0.7190	0.3315	0.3320	0.4138	0.3989	0.8207	0.8020	0.5387	0.5405	0.5308	0.5183
		Hurricane	0.7266	0.6208	0.2545	0.2501	0.6809	0.6214	0.7066	0.5768	0.3554	0.3515	0.4202	0.3583	0.7388	0.6972	0.3182	0.3176	0.4024	0.3875	0.7834	0.7704	0.5104	0.5133	0.5036	0.4935
	Region 2	None	0.5096	0.3876	0.2648	0.2483	0.4498	0.3685	0.6527	0.4886	0.3924	0.3700	0.4599	0.3524	0.7135	0.6539	0.4122	0.4081	0.5066	0.4627	0.7605	0.7187	0.5377	0.5316	0.5400	0.5110
		Hurricane	0.4805	0.3611	0.2450	0.2300	0.4247	0.3446	0.6109	0.4584	0.3621	0.3420	0.4264	0.3264	0.6811	0.6228	0.3819	0.3783	0.4811	0.4366	0.7217	0.6879	0.5047	0.5007	0.4961	0.4730
	Region 1	Hurricane	0.3364	0.2241	0.2197	0.1911	0.3426	0.2403	0.5058	0.3371	0.3576	0.3150	0.4446	0.2987	0.5628	0.4763	0.4118	0.3969	0.5101	0.4301	0.6124	0.5451	0.4824	0.4722	0.4911	0.4417
FBC New (0-5 yr, all types)	Region 3	None	0.4437	0.4384	0.1924	0.1920	0.5619	0.5495	0.4005	0.3983	0.2862	0.2826	0.3367	0.3241	0.3622	0.3635	0.2569	0.2552	0.2961	0.2938	0.5646	0.5631	0.4857	0.4907	0.4914	0.4799
		Hurricane	0.4193	0.4147	0.1822	0.1829	0.5471	0.5305	0.3832	0.3825	0.2689	0.2736	0.3133	0.3039	0.3498	0.3454	0.2404	0.2381	0.2817	0.2807	0.5258	0.5352	0.4555	0.4570	0.4591	0.4519
	Region 2	None	0.2788	0.2755	0.1980	0.1961	0.3331	0.3077	0.3755	0.3692	0.3004	0.2981	0.3346	0.3001	0.4068	0.4043	0.3189	0.3194	0.3701	0.3582	0.5342	0.5400	0.4629	0.4597	0.4709	0.4641
		Hurricane	0.2592	0.2556	0.1785	0.1767	0.3080	0.2822	0.3413	0.3402	0.2725	0.2699	0.3021	0.2735	0.3729	0.3716	0.2894	0.2867	0.3437	0.3311	0.4996	0.4985	0.4300	0.4264	0.4264	0.4220
	Region 1	Hurricane	0.1978	0.1889	0.1669	0.1601	0.2581	0.2111	0.2986	0.2842	0.2697	0.2598	0.3236	0.2577	0.3575	0.3541	0.3187	0.3149	0.3847	0.3531	0.4417	0.4375	0.3954	0.3929	0.4004	0.3864

Roof Cover	Region	Opening Protection	Other Roof Slope (≥6:12)																							
			Two-Story Other						Two-Story Hip						One-Story Other						One-Story Hip					
			Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel	
			No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR
FBC Old (Shingle > 13 yr // Tile or Metal > 20 yr)	Region 3	None	0.8926	0.6734	0.4146	0.4075	0.7124	0.6446	0.8941	0.7503	0.5462	0.5411	0.4830	0.4666	0.9364	0.8713	0.4968	0.5021	0.6176	0.5922	0.9326	0.8982	0.6560	0.6592	0.5862	0.5846
		Hurricane	0.8621	0.6426	0.4051	0.3936	0.6741	0.6006	0.8767	0.7328	0.5262	0.5277	0.4630	0.4378	0.8718	0.8104	0.4852	0.4820	0.5456	0.5196	0.8933	0.8709	0.6271	0.6239	0.5702	0.5549
	Region 2	None	0.7072	0.4774	0.4210	0.3875	0.5579	0.4494	0.8286	0.6318	0.5765	0.5415	0.5089	0.4518	0.7657	0.6650	0.4974	0.4898	0.5655	0.5169	0.8615	0.7956	0.6667	0.6539	0.5706	0.5553
		Hurricane	0.6647	0.4394	0.3860	0.3561	0.5114	0.4079	0.7724	0.5809	0.5298	0.5038	0.4645	0.4114	0.7099	0.6148	0.4629	0.4568	0.5035	0.4615	0.8069	0.7500	0.6208	0.6160	0.5261	0.5096
	Region 1	Hurricane	0.4835	0.2879	0.3378	0.2876	0.4299	0.3018	0.6440	0.4298	0.5103	0.4523	0.4518	0.3657	0.5132	0.4046	0.4181	0.4002	0.4375	0.3719	0.6781	0.5890	0.5938	0.5806	0.4936	0.4623
FBC Mid Range (Shingle = 6-13 yr // Tile or Metal = 6-20 yr)	Region 3	None	0.7107	0.6067	0.3450	0.3399	0.6113	0.5728	0.7225	0.6536	0.4676	0.4656	0.4368	0.4350	0.7627	0.7394	0.4338	0.4349	0.5495	0.5307	0.8083	0.8035	0.5954	0.5982	0.5638	0.5613
		Hurricane	0.6731	0.5644	0.3323	0.3281	0.5713	0.5312	0.6948	0.6398	0.4471	0.4478	0.4157	0.4049	0.6944	0.6695	0.4190	0.4195	0.4688	0.4576	0.7731	0.7474	0.5706	0.5678	0.5393	0.5317
	Region 2	None	0.5580	0.4388	0.3495	0.3314	0.4619	0.3988	0.6654	0.5724	0.4848	0.4668	0.4522	0.4182	0.6325	0.5866	0.4249	0.4209	0.4859	0.4570	0.7461	0.7157	0.5870	0.5803	0.5341	0.5230
		Hurricane	0.5171	0.3970	0.3159	0.2999	0.4146	0.3551	0.6079	0.5243	0.4397	0.4258	0.4040	0.3758	0.5832	0.5419	0.3901	0.3871	0.4251	0.4009	0.6918	0.6766	0.5395	0.5369	0.4868	0.4789
	Region 1	Hurricane	0.3811	0.2725	0.2767	0.2491	0.3498	0.2706	0.5110	0.4039	0.4192	0.3864	0.3849	0.3347	0.4268	0.3763	0.3508	0.3414	0.3658	0.3271	0.5804	0.5453	0.5019	0.4951	0.4422	0.4243
FBC New (0-5 yr, all types)	Region 3	None	0.4475	0.4458	0.2754	0.2724	0.5102	0.5010	0.4717	0.4697	0.3890	0.3900	0.3905	0.4034	0.5207	0.5069	0.3708	0.3676	0.4815	0.4693	0.6055	0.6022	0.5349	0.5373	0.5413	0.5381
		Hurricane	0.4133	0.4112	0.2595	0.2625	0.4685	0.4617	0.4419	0.4378	0.3679	0.3679	0.3684	0.3720	0.4534	0.4571	0.3528	0.3570	0.3919	0.3957	0.5782	0.5734	0.5140	0.5116	0.5084	0.5084
	Region 2	None	0.3538	0.3519	0.2780	0.2753	0.3658	0.3481	0.4523	0.4485	0.3930	0.3922	0.3954	0.3845	0.4469	0.4468	0.3524	0.3521	0.4064	0.3971	0.5615	0.5640	0.5074	0.5068	0.4976	0.4907
		Hurricane	0.3123	0.3095	0.2459	0.2438	0.3179	0.3024	0.4004	0.3976	0.3497	0.3479	0.3436	0.3402	0.3904	0.3939	0.3172	0.3174	0.3467	0.3402	0.5173	0.5220	0.4582	0.4579	0.4475	0.4483
	Region 1	Hurricane	0.2440	0.2374	0.2155	0.2106	0.2697	0.2395	0.3507	0.3401	0.3282	0.3205	0.3179	0.3036	0.3058	0.3043	0.2836	0.2827	0.2941	0.2822	0.4458	0.4444	0.4100	0.4095	0.3907	0.3864

Table 4-15. Single-Family, FBC06 and Beyond, Terrain B Loss Relativities for All Regions

Roof Cover	Region	Opening Protection	Low Roof Slope (≤6:12)																							
			Two-Story Other						Two-Story Hip						One-Story Other						One-Story Hip					
			Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel	
			No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR
FBC Old (Shingle > 13 yr // Tile or Metal > 20 yr)	Region 3	None	0.9669	0.7298	0.3132	0.2889	0.8848	0.7806	0.9196	0.6074	0.3778	0.3610	0.5319	0.3868	0.9458	0.8327	0.3703	0.3659	0.5166	0.4676	0.9072	0.8125	0.4536	0.4581	0.4415	0.4107
		Hurricane	0.9032	0.6781	0.2882	0.2699	0.8289	0.7272	0.8519	0.5562	0.3502	0.3298	0.4816	0.3466	0.8991	0.8048	0.3236	0.3258	0.4735	0.4204	0.8496	0.7652	0.3871	0.3852	0.3788	0.3461
	Region 2	None	0.6117	0.3811	0.3119	0.2739	0.5466	0.4030	0.7986	0.4627	0.4499	0.3918	0.5745	0.3651	0.8337	0.6610	0.4552	0.4387	0.6166	0.5112	0.8267	0.6883	0.5175	0.5028	0.5325	0.4632
		Hurricane	0.5685	0.3445	0.2724	0.2393	0.5010	0.3587	0.7235	0.4126	0.3937	0.3493	0.5085	0.3153	0.7735	0.6174	0.4068	0.3927	0.5513	0.4551	0.7312	0.6047	0.4491	0.4390	0.4440	0.3853
	Region 1	Hurricane	0.4103	0.2216	0.2619	0.2071	0.4143	0.2561	0.5900	0.3011	0.4028	0.3207	0.5270	0.3002	0.5991	0.4169	0.4371	0.4026	0.5668	0.4252	0.6112	0.4546	0.4732	0.4450	0.4990	0.3983
FBC Mid Range (Shingle = 6-13 yr // Tile or Metal = 6-20 yr)	Region 3	None	0.7642	0.6421	0.2431	0.2290	0.7588	0.6971	0.6864	0.5223	0.2887	0.2801	0.4096	0.3309	0.7069	0.6723	0.2788	0.2789	0.3751	0.3478	0.7166	0.6750	0.3781	0.3804	0.3682	0.3535
		Hurricane	0.7111	0.5900	0.2169	0.2079	0.7035	0.6423	0.6300	0.4818	0.2621	0.2508	0.3627	0.2895	0.6709	0.6244	0.2338	0.2320	0.3317	0.3025	0.6539	0.6142	0.3122	0.3093	0.3029	0.2876
	Region 2	None	0.4797	0.3490	0.2468	0.2259	0.4372	0.3512	0.6173	0.4241	0.3579	0.3258	0.4456	0.3186	0.6482	0.5647	0.3613	0.3527	0.4691	0.4079	0.6665	0.5911	0.4324	0.4250	0.6895	0.6548
		Hurricane	0.4328	0.3097	0.2108	0.1926	0.3930	0.3073	0.5375	0.3653	0.3027	0.2793	0.3817	0.2662	0.5845	0.5096	0.3088	0.3018	0.4098	0.3540	0.5831	0.5217	0.3617	0.3563	0.3599	0.3270
	Region 1	Hurricane	0.3278	0.2106	0.2116	0.1803	0.3359	0.2321	0.4621	0.2859	0.3213	0.2742	0.4153	0.2654	0.4789	0.3777	0.3516	0.3326	0.4482	0.3587	0.4967	0.4190	0.3881	0.3742	0.4070	0.3460
FBC New (0-5 yr, all types)	Region 3	None	0.4622	0.4596	0.1730	0.1692	0.6329	0.6137	0.3389	0.3389	0.1996	0.1993	0.2872	0.2751	0.2981	0.2976	0.1872	0.1919	0.2337	0.2279	0.4114	0.4120	0.3026	0.3026	0.2949	0.2962
		Hurricane	0.4106	0.4136	0.1455	0.1458	0.5781	0.5573	0.2971	0.2968	0.1740	0.1718	0.2439	0.2324	0.2525	0.2580	0.1441	0.1383	0.1900	0.1847	0.3301	0.3365	0.2374	0.2335	0.2271	0.2290
	Region 2	None	0.2705	0.2654	0.1817	0.1778	0.3278	0.2995	0.3278	0.3203	0.2658	0.2599	0.3167	0.2720	0.3397	0.3384	0.2673	0.2667	0.3217	0.3045	0.4280	0.4246	0.3473	0.3472	0.8465	0.8465
		Hurricane	0.2277	0.2223	0.1493	0.1460	0.2850	0.2559	0.2723	0.2694	0.2117	0.2092	0.2548	0.2171	0.2901	0.2869	0.2107	0.2109	0.2684	0.2530	0.3438	0.3471	0.2743	0.2737	0.2757	0.2687
	Region 1	Hurricane	0.1919	0.1828	0.1614	0.1536	0.2574	0.2081	0.2645	0.2467	0.2398	0.2277	0.3036	0.2306	0.2939	0.2881	0.2660	0.2626	0.3296	0.2922	0.3392	0.3364	0.3029	0.3034	0.3149	0.2937

Roof Cover	Region	Opening Protection	Other Roof Slope (≥6:12)																							
			Two-Story Other						Two-Story Hip						One-Story Other						One-Story Hip					
			Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel	
			No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR
FBC Old (Shingle > 13 yr // Tile or Metal > 20 yr)	Region 3	None	0.8750	0.6213	0.3562	0.3450	0.7396	0.6585	0.8133	0.6231	0.4568	0.4404	0.3877	0.3625	0.8766	0.7755	0.4006	0.3956	0.6118	0.5791	0.8739	0.8142	0.5022	0.4919	0.4351	0.4189
		Hurricane	0.7855	0.5484	0.3165	0.2979	0.6468	0.5595	0.7510	0.5691	0.4029	0.3905	0.3433	0.3038	0.7523	0.6595	0.3488	0.3409	0.4362	0.3981	0.7684	0.7176	0.4440	0.4425	0.3282	0.3319
	Region 2	None	0.6832	0.4370	0.3972	0.3554	0.5486	0.4281	0.7795	0.5476	0.5333	0.4871	0.4738	0.4034	0.6868	0.5575	0.4281	0.4147	0.5144	0.4574	0.7828	0.6898	0.5694	0.5589	0.4699	0.4439
		Hurricane	0.5940	0.3608	0.3326	0.2977	0.4606	0.3471	0.6664	0.4614	0.4440	0.4121	0.3828	0.3200	0.5884	0.4756	0.3630	0.3540	0.4121	0.3588	0.6693	0.5876	0.4861	0.4788	0.3771	0.3547
	Region 1	Hurricane	0.4528	0.2589	0.3142	0.2616	0.4054	0.2782	0.5681	0.3535	0.4485	0.3828	0.4053	0.3121	0.4383	0.3231	0.3520	0.3324	0.3757	0.3070	0.5706	0.4608	0.4997	0.4794	0.4047	0.3625
FBC Mid Range (Shingle = 6-13 yr // Tile or Metal = 6-20 yr)	Region 3	None	0.6845	0.5595	0.2816	0.2748	0.6360	0.5905	0.6239	0.5300	0.3629	0.3555	0.3365	0.3219	0.7042	0.6516	0.3136	0.3128	0.5340	0.5066	0.7013	0.6785	0.4270	0.4207	0.4004	0.3872
		Hurricane	0.6052	0.4866	0.2428	0.2341	0.5404	0.4918	0.5651	0.4764	0.3139	0.3080	0.2894	0.2686	0.5650	0.5249	0.2630	0.2597	0.3424	0.3225	0.6091	0.5892	0.3536	0.3610	0.2965	0.2987
	Region 2	None	0.5268	0.4046	0.3263	0.3040	0.4540	0.3843	0.6163	0.4985	0.4376	0.4126	0.4082	0.3680	0.5674	0.5085	0.3493	0.3434	0.4361	0.4031	0.6394	0.6008	0.4782	0.4724	0.4273	0.4111
		Hurricane	0.4485	0.3265	0.2649	0.2457	0.3674	0.3016	0.5151	0.4164	0.3556	0.3376	0.3211	0.2868	0.4661	0.4156	0.2875	0.2823	0.3309	0.2995	0.5412	0.5077	0.3913	0.3860	0.3310	0.3188
	Region 1	Hurricane	0.3562	0.2468	0.2576	0.2281	0.3320	0.2523	0.4505	0.3348	0.3665	0.3286	0.3410	0.2850	0.3529	0.2988	0.2907	0.2799	0.3104	0.2692	0.4707	0.4266	0.4076	0.3970	0.3514	0.3281
FBC New (0-5 yr, all types)	Region 3	None	0.4291	0.4348	0.2071	0.2046	0.5325	0.5226	0.3517	0.3501	0.2690	0.2706	0.2854	0.2814	0.4445	0.4445	0.2266	0.2299	0.4561	0.4341	0.4469	0.4351	0.3518	0.3496	0.3658	0.3555
		Hurricane	0.3507	0.3507	0.1691	0.1704	0.4340	0.4241	0.3022	0.2982	0.2250	0.2254	0.2354	0.2334	0.3012	0.3012	0.1773	0.1785	0.2486	0.2469	0.3496	0.3510	0.2633	0.2795	0.2647	0.2655
	Region 2	None	0.3364	0.3307	0.2554	0.2525	0.3595	0.3405	0.3925	0.3863	0.3419	0.3381	0.3425	0.3325	0.3826	0.3753	0.2706	0.2720	0.3578	0.3487	0.4539	0.4510	0.3869	0.3858	0.3847	0.3783
		Hurricane	0.2606	0.2557	0.1972	0.1938	0.2742	0.2561	0.3106	0.3051	0.2672	0.2631	0.2594	0.2536	0.2878	0.2854	0.2120	0.2106	0.2497	0.2402	0.3594	0.3583	0.2965	0.2932	0.2850	0.2830
	Region 1	Hurricane	0.2302	0.2223	0.2009	0.1946	0.2586	0.2265	0.2994	0.2883	0.2845	0.2744	0.2767	0.2579	0.2513	0.2484	0.2294	0.2274	0.2450	0.2315	0.3492	0.3464	0.3155	0.3145	0.2981	0.2937

Table 4-16. Single-Family, FBC06 and Beyond, Terrain C Loss Relativities for All Regions

Low Roof Slope (≤6:12)

Roof Cover	Region	Opening Protection	Two-Story Other						Two-Story Hip					
			Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel	
			No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR
FBC Old (Shingle > 13 yr // Tile or Metal > 20 yr)	Region 3	None	0.9313	0.7286	0.3346	0.3100	0.9766	0.8764	0.8334	0.5368	0.3679	0.3307	0.6137	0.4591
		Hurricane	0.8317	0.6216	0.2770	0.2537	0.8604	0.7543	0.7172	0.4259	0.2871	0.2581	0.4889	0.3344
	Region 2	None	0.5525	0.3529	0.2957	0.2503	0.5381	0.4058	0.6933	0.3657	0.4177	0.3351	0.5676	0.3343
		Hurricane	0.4598	0.2702	0.2263	0.1885	0.4483	0.3188	0.5518	0.2666	0.3055	0.2456	0.4279	0.2324
	Region 1	Hurricane	0.3552	0.1928	0.2357	0.1751	0.3776	0.2330	0.4480	0.2003	0.3144	0.2196	0.4333	0.2181
	HVHZ	Hurricane	0.2925	0.1847	0.2357	0.1751	0.3776	0.2330	0.3422	0.1842	0.5648	0.2196	0.4333	0.2181
FBC Mid Range (Shingle = 6-13 yr // Tile or Metal = 6-20 yr)	Region 3	None	0.7981	0.6823	0.2729	0.2587	0.8676	0.8060	0.6454	0.4828	0.2781	0.2587	0.4959	0.4081
		Hurricane	0.6857	0.5739	0.2138	0.2016	0.7668	0.7026	0.5297	0.3727	0.2023	0.1870	0.3759	0.2886
	Region 2	None	0.4498	0.3336	0.2415	0.2161	0.4520	0.3722	0.5406	0.3426	0.3253	0.2790	0.4398	0.2936
		Hurricane	0.3600	0.2501	0.1749	0.1540	0.3637	0.2837	0.4077	0.2404	0.2229	0.1897	0.3139	0.1922
	Region 1	Hurricane	0.2926	0.1874	0.1908	0.1558	0.3145	0.2160	0.3517	0.1921	0.2421	0.1856	0.3404	0.1925
	HVHZ	Hurricane	0.2419	0.1777	0.1772	0.1458	0.2363	0.1622	0.2733	0.1770	0.3441	0.1699	0.3404	0.1925
FBC New (0-5 yr, all types)	Region 3	None	0.5691	0.5575	0.2112	0.2073	0.7586	0.7356	0.3641	0.3613	0.1884	0.1867	0.3782	0.3570
		Hurricane	0.4772	0.4675	0.1506	0.1494	0.6733	0.6509	0.2544	0.2543	0.1174	0.1160	0.2630	0.2429
	Region 2	None	0.2922	0.2871	0.1873	0.1820	0.3659	0.3386	0.2918	0.2815	0.2329	0.2229	0.3120	0.2529
		Hurricane	0.2060	0.2007	0.1234	0.1195	0.2790	0.2486	0.1855	0.1780	0.1403	0.1337	0.1998	0.1519
	Region 1	Hurricane	0.1821	0.1705	0.1460	0.1365	0.2513	0.1991	0.1918	0.1682	0.1699	0.1515	0.2475	0.1670
	HVHZ	Hurricane	0.1675	0.1638	0.1186	0.1165	0.0949	0.0913	0.1618	0.1557	0.1235	0.1201	0.2475	0.1670

Roof Cover	Region	Opening Protection	One-Story Other						One-Story Hip					
			Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel	
			No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR
FBC Old (Shingle > 13 yr // Tile or Metal > 20 yr)	Region 3	None	0.8380	0.6843	0.4000	0.3884	0.5484	0.4599	0.7579	0.6109	0.3997	0.3903	0.3919	0.3293
		Hurricane	0.7761	0.6167	0.3435	0.3373	0.4956	0.4087	0.6799	0.5423	0.3355	0.3302	0.3330	0.2704
	Region 2	None	0.6807	0.4885	0.4286	0.4034	0.5647	0.4332	0.6275	0.4463	0.4189	0.3932	0.4413	0.3369
		Hurricane	0.5900	0.4098	0.3512	0.3254	0.4952	0.3674	0.5431	0.3836	0.3428	0.3222	0.3597	0.2660
	Region 1	Hurricane	0.4160	0.2434	0.3182	0.2711	0.4298	0.2786	0.4067	0.2436	0.3200	0.2802	0.3625	0.2425
	HVHZ	Hurricane	0.3200	0.2117	0.3182	0.2711	0.4298	0.2786	0.2946	0.2058	0.3200	0.2802	0.3625	0.2425
FBC Mid Range (Shingle = 6-13 yr // Tile or Metal = 6-20 yr)	Region 3	None	0.6355	0.5549	0.3024	0.2939	0.4045	0.3527	0.5772	0.5095	0.3035	0.2953	0.2967	0.2613
		Hurricane	0.5811	0.4981	0.2431	0.2402	0.3462	0.2956	0.5049	0.4368	0.2368	0.2346	0.2353	0.2000
	Region 2	None	0.5308	0.4259	0.3336	0.3181	0.4330	0.3518	0.4950	0.3962	0.3190	0.3058	0.3361	0.2738
		Hurricane	0.4510	0.3555	0.2601	0.2458	0.3634	0.2851	0.4088	0.3265	0.2476	0.2358	0.2607	0.2054
	Region 1	Hurricane	0.3251	0.2217	0.2467	0.2195	0.3338	0.2330	0.3161	0.2214	0.2421	0.2196	0.2729	0.1965
	HVHZ	Hurricane	0.2531	0.1946	0.2219	0.1972	0.3338	0.2330	0.2369	0.1899	0.2188	0.1981	0.2729	0.1965
FBC New (0-5 yr, all types)	Region 3	None	0.2949	0.2881	0.2049	0.1993	0.2606	0.2456	0.3066	0.3041	0.2073	0.2004	0.2016	0.1933
		Hurricane	0.2361	0.2324	0.1427	0.1431	0.1967	0.1824	0.2263	0.2259	0.1380	0.1390	0.1376	0.1296
	Region 2	None	0.2898	0.2841	0.2386	0.2328	0.3012	0.2704	0.2954	0.2901	0.2190	0.2183	0.2309	0.2107
		Hurricane	0.2171	0.2144	0.1689	0.1663	0.2315	0.2027	0.2048	0.2034	0.1523	0.1494	0.1617	0.1448
	Region 1	Hurricane	0.1811	0.1684	0.1752	0.1680	0.2379	0.1874	0.1784	0.1703	0.1643	0.1591	0.1833	0.1505
	HVHZ	Hurricane	0.1549	0.1500	0.1256	0.1234	0.2379	0.1874	0.1495	0.1474	0.1176	0.1161	0.1833	0.1505

Other Roof Slope (≥6:12)

Roof Cover	Region	Opening Protection	Two-Story Other						Two-Story Hip					
			Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel	
			No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR
FBC Old (Shingle > 13 yr // Tile or Metal > 20 yr)	Region 3	None	0.8574	0.6450	0.3509	0.3259	0.8598	0.7782	0.7254	0.5155	0.4021	0.3744	0.4202	0.3714
		Hurricane	0.6721	0.4657	0.2437	0.2211	0.6347	0.5540	0.5782	0.3859	0.3002	0.2767	0.2735	0.2291
	Region 2	None	0.6210	0.4031	0.3704	0.3205	0.5420	0.4323	0.6707	0.4262	0.4680	0.3996	0.4347	0.3449
		Hurricane	0.4644	0.2642	0.2540	0.2150	0.3893	0.2821	0.4904	0.2886	0.3225	0.2784	0.2817	0.2125
	Region 1	Hurricane	0.3678	0.2079	0.2597	0.2032	0.3514	0.2348	0.4219	0.2238	0.3362	0.2524	0.3125	0.2128
	HVHZ	Hurricane	0.2946	0.1953	0.2597	0.2032	0.3514	0.2348	0.3199	0.2023	0.3362	0.2524	0.3125	0.2128
FBC Mid Range (Shingle = 6-13 yr // Tile or Metal = 6-20 yr)	Region 3	None	0.7062	0.6032	0.2857	0.2719	0.7734	0.7240	0.5639	0.4573	0.3125	0.2971	0.3677	0.3397
		Hurricane	0.5410	0.4311	0.1805	0.1686	0.5541	0.5060	0.4156	0.3279	0.2119	0.1993	0.2225	0.1967
	Region 2	None	0.5004	0.3809	0.3069	0.2798	0.4647	0.3997	0.5309	0.3942	0.3747	0.3373	0.3689	0.3168
		Hurricane	0.3525	0.2446	0.1957	0.1740	0.3120	0.2482	0.3586	0.2580	0.2402	0.2158	0.2223	0.1826
	Region 1	Hurricane	0.2955	0.2004	0.2112	0.1788	0.2904	0.2159	0.3275	0.2113	0.2603	0.2111	0.2516	0.1906
	HVHZ	Hurricane	0.2443	0.1898	0.1972	0.1681	0.2904	0.2159	0.2555	0.1916	0.2366	0.1931	0.2516	0.1906
FBC New (0-5 yr, all types)	Region 3	None	0.5326	0.5237	0.2206	0.2179	0.6869	0.6699	0.3353	0.3302	0.2228	0.2197	0.3152	0.3081
		Hurricane	0.3500	0.3447	0.1173	0.1162	0.4735	0.4581	0.2028	0.2017	0.1236	0.1219	0.1714	0.1644
	Region 2	None	0.3466	0.3416	0.2434	0.2390	0.3875	0.3671	0.3345	0.3272	0.2815	0.2750	0.3030	0.2886
		Hurricane	0.2033	0.1995	0.1373	0.1329	0.2347	0.2144	0.1925	0.1879	0.1579	0.1532	0.1629	0.1526
	Region 1	Hurricane	0.1933	0.1838	0.1627	0.1543	0.2294	0.1971	0.2012	0.1826	0.1844	0.1698	0.1907	0.1685
	HVHZ	Hurricane	0.1789	0.1759	0.1347	0.1330	0.2294	0.1971	0.1733	0.1678	0.1371	0.1337	0.1907	0.1685

Roof Cover	Region	Opening Protection	One-Story Other						One-Story Hip					
			Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel	
			No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR
FBC Old (Shingle > 13 yr // Tile or Metal > 20 yr)	Region 3	None	0.7181	0.5989	0.3211	0.3137	0.5714	0.5233	0.6637	0.5709	0.3932	0.3867	0.3391	0.3139
		Hurricane	0.5755	0.4697	0.2613	0.2531	0.4328	0.3845	0.5953	0.5014	0.3397	0.3368	0.2138	0.2138
	Region 2	None	0.5344	0.4114	0.3382	0.3173	0.4457	0.3829	0.5818	0.4551	0.4321	0.4121	0.3483	0.3050
		Hurricane	0.4176	0.3043	0.2616	0.2443	0.3309	0.2677	0.4708	0.3631	0.3524	0.3374	0.2514	0.2149
	Region 1	Hurricane	0.2964	0.1887	0.2415	0.2135	0.2764	0.2006	0.3699	0.2542	0.3357	0.3025	0.2656	0.2115
	HVHZ	Hurricane	0.2283	0.1656	0.2415	0.2135	0.2764	0.2006	0.2735	0.2118	0.3357	0.3025	0.2656	0.2115
FBC Mid Range (Shingle = 6-13 yr // Tile or Metal = 6-20 yr)	Region 3	None	0.5820	0.5247	0.2428	0.2374	0.5019	0.4683	0.5163	0.4856	0.2874	0.2847	0.2930	0.2779
		Hurricane	0.4435	0.3939	0.1832	0.1786	0.3546	0.3244	0.4369	0.4026	0.2358	0.2343	0.1739	0.1733
	Region 2	None	0.4356	0.3737	0.2670	0.2549	0.3769	0.3379	0.4623	0.4042	0.3302	0.3187	0.2921	0.2679
		Hurricane	0.3212	0.2640	0.1932	0.1839	0.2564	0.2186	0.3588	0.3131	0.2549	0.2463	0.1941	0.1770
	Region 1	Hurricane	0.2328	0.1755	0.1877	0.1713	0.2194	0.1715	0.2868	0.2294	0.2530	0.2347	0.2100	0.1774
	HVHZ	Hurricane	0.1875	0.1563	0.1695	0.1549	0.2194	0.1715	0.2210	0.1940	0.2279	0.2110	0.2100	0.1774
FBC New (0-5 yr, all types)	Region 3	None	0.3911	0.3796	0.1644	0.1612	0.4324	0.4133	0.3053	0.2999	0.1815	0.1826	0.2468	0.2419
		Hurricane	0.2592	0.2514	0.1052	0.1040	0.2765	0.2643	0.2200	0.2211	0.1319	0.1319	0.1339	0.1329
	Region 2	None	0.3028	0.2962	0.1958	0.1924	0.3082	0.2928	0.2970	0.2949	0.2283	0.2253	0.2358	0.2308
		Hurricane	0.1867	0.1844	0.1247	0.1235	0.1818	0.1696	0.2052	0.2003	0.1574	0.1552	0.1368	0.1390
	Region 1	Hurricane	0.1522	0.1464	0.1339	0.1292	0.1625	0.1425	0.1834	0.1748	0.1703	0.1670	0.1545	0.1433
	HVHZ	Hurricane	0.1333	0.1303	0.0976	0.0964	0.1625	0.1425	0.1563	0.1537	0.1201	0.1194	0.1545	0.1433

4.3.2. FBC 2001 & 2004 Loss Relativities

We developed new designs for each FBC 2001 & 2004 wind zone from 100 to 150 mph, including the HVHZ locations. The resulting loss relativities for FBC 2001 & 2004 homes were developed using the same normalizing values used for the weakest reasonable Pre-FBC house. This preserves consistency between the loss relativities presented in this section with those presented in Sections 4.2.3 (Pre-FBC), and 4.3.1 (FBC 2006 & beyond).

The following tables present the single-family, FBC 2006 and beyond loss relativities by analysis terrain.

- Table 4-17. Single-Family, FBC 2001 & 2004, Terrain A Loss Relativities for All Regions
- Table 4-18. Single-Family, FBC 2001 & 2004, Terrain B Loss Relativities for All Regions
- Table 4-19. Single-Family, FBC 2001 & 2004, Terrain C Loss Relativities for All Regions

Table 4-17. Single-Family, FBC 2001 & 2004, Terrain A Loss Relativities for All Regions

Roof Cover	Region	Opening Protection	Low Roof Slope (≤5:12)																							
			Two-Story Other						Two-Story Hip						One-Story Other						One-Story Hip					
			Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel	
			No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR
FBC Old (Shingle > 13 yr // Tile or Metal > 20 yr)	Region 3	None	0.9699	0.7472	0.3398	0.3268	0.8242	0.7290	0.9463	0.6921	0.4506	0.4384	0.5314	0.4268	0.9836	0.8937	0.4135	0.4095	0.5359	0.5060	0.9735	0.9046	0.5940	0.5947	0.5703	0.5617
		Hurricane	0.9413	0.7261	0.3254	0.3177	0.8147	0.7202	0.9423	0.6817	0.4348	0.4207	0.5184	0.4095	0.9427	0.8793	0.3981	0.3913	0.5221	0.4909	0.9448	0.8902	0.5674	0.5674	0.5488	0.5373
	Region 2	None	0.6636	0.4371	0.3488	0.3138	0.5744	0.4339	0.8450	0.5401	0.4836	0.4396	0.5845	0.4038	0.9101	0.7777	0.5133	0.5005	0.6609	0.5765	0.8945	0.7959	0.6150	0.6075	0.6094	0.5633
		Hurricane	0.6479	0.4185	0.3337	0.3026	0.5542	0.4138	0.8019	0.5101	0.4564	0.4175	0.5516	0.3788	0.8829	0.7555	0.4883	0.4758	0.6310	0.5557	0.8546	0.7645	0.5763	0.5698	0.5694	0.5250
	Region 1	None	0.5474	0.3748	0.3265	0.2848	0.5647	0.4349	0.7224	0.4359	0.4862	0.4139	0.6384	0.4257	0.7925	0.6226	0.5960	0.5707	0.7238	0.5977	0.7991	0.6542	0.6270	0.6089	0.6408	0.5537
		Hurricane	0.5020	0.3236	0.2975	0.2529	0.5166	0.3813	0.6739	0.3928	0.4545	0.3834	0.5928	0.3811	0.7088	0.5442	0.5217	0.4943	0.6519	0.5253	0.7340	0.6003	0.5755	0.5585	0.5900	0.5058
FBC Mid Range (Shingle = 6-13 yr // Tile or Metal = 6-20 yr)	Region 3	None	0.7620	0.6573	0.2671	0.2596	0.6992	0.6430	0.7127	0.5941	0.3681	0.3607	0.4348	0.3771	0.7445	0.7176	0.3364	0.3338	0.4157	0.3999	0.8228	0.8042	0.5395	0.5412	0.5312	0.5215
		Hurricane	0.7266	0.6247	0.2544	0.2497	0.6823	0.6271	0.7069	0.5797	0.3517	0.3448	0.4191	0.3587	0.7421	0.6995	0.3191	0.3141	0.4024	0.3845	0.7862	0.7661	0.5111	0.5115	0.5043	0.4953
	Region 2	None	0.5161	0.3929	0.2791	0.2597	0.4559	0.3725	0.6471	0.4893	0.3927	0.3700	0.4604	0.3534	0.7202	0.6609	0.4183	0.4101	0.5207	0.4704	0.7601	0.7184	0.5386	0.5357	0.5392	0.5126
		Hurricane	0.4943	0.3718	0.2644	0.2476	0.4370	0.3527	0.6071	0.4564	0.3654	0.3440	0.4280	0.3266	0.6887	0.6291	0.3924	0.3859	0.4924	0.4478	0.7250	0.6803	0.5021	0.4980	0.4992	0.4755
	Region 1	None	0.4598	0.3611	0.2771	0.2542	0.4881	0.4077	0.5844	0.4168	0.4003	0.3600	0.5186	0.3859	0.6525	0.5667	0.5049	0.4890	0.5973	0.5209	0.6780	0.6066	0.5419	0.5322	0.5514	0.5005
		Hurricane	0.4121	0.3099	0.2464	0.2211	0.4376	0.3530	0.5351	0.3711	0.3684	0.3292	0.4729	0.3393	0.5781	0.4938	0.4285	0.4140	0.5257	0.4474	0.6202	0.5532	0.4888	0.4800	0.4984	0.4496
FBC New (0-5 yr, all types)	Region 3	None	0.4401	0.4355	0.1944	0.1924	0.5741	0.5570	0.4023	0.3969	0.2855	0.2830	0.3381	0.3273	0.3605	0.3581	0.2592	0.2582	0.2954	0.2938	0.5681	0.5660	0.4849	0.4878	0.4921	0.4813
		Hurricane	0.4242	0.4156	0.1835	0.1817	0.5499	0.5340	0.3814	0.3825	0.2686	0.2689	0.3198	0.3079	0.3474	0.3434	0.2401	0.2368	0.2827	0.2780	0.5280	0.5359	0.4548	0.4555	0.4598	0.4534
	Region 2	None	0.2892	0.2845	0.2094	0.2056	0.3375	0.3112	0.3722	0.3686	0.3017	0.3004	0.3362	0.3029	0.4113	0.4060	0.3234	0.3197	0.3806	0.3644	0.5345	0.5390	0.4622	0.4638	0.4689	0.4620
		Hurricane	0.2710	0.2677	0.1951	0.1925	0.3199	0.2916	0.3438	0.3382	0.2744	0.2704	0.3044	0.2744	0.3827	0.3834	0.2964	0.2959	0.3538	0.3399	0.4997	0.4925	0.4280	0.4261	0.4290	0.4259
	Region 1	None	0.3284	0.3229	0.2278	0.2235	0.4116	0.3805	0.3717	0.3616	0.3144	0.3061	0.3988	0.3460	0.4561	0.4509	0.4137	0.4074	0.4708	0.4441	0.5026	0.5012	0.4569	0.4555	0.4621	0.4473
		Hurricane	0.2813	0.2743	0.1954	0.1892	0.3587	0.3247	0.3259	0.3168	0.2823	0.2749	0.3530	0.2975	0.3777	0.3728	0.3354	0.3337	0.3996	0.3694	0.4475	0.4435	0.4022	0.4015	0.4068	0.3935

Roof Cover	Region	Opening Protection	Other Roof Slope (≥6:12)																							
			Two-Story Other						Two-Story Hip						One-Story Other						One-Story Hip					
			Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel	
			No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR
FBC Old (Shingle > 13 yr // Tile or Metal > 20 yr)	Region 3	None	0.8919	0.6741	0.4190	0.4062	0.7148	0.6440	0.8905	0.7461	0.5483	0.5385	0.4846	0.4635	0.9364	0.8713	0.4995	0.5037	0.6176	0.5922	0.9294	0.8941	0.6544	0.6656	0.5918	0.5894
		Hurricane	0.8642	0.6514	0.4058	0.3946	0.6711	0.6023	0.8700	0.7312	0.5277	0.5072	0.4573	0.4388	0.8708	0.8099	0.4868	0.4788	0.5418	0.5175	0.8998	0.8813	0.6287	0.6311	0.5694	0.5533
	Region 2	None	0.7142	0.4807	0.4211	0.3884	0.5596	0.4514	0.8229	0.6251	0.5787	0.5478	0.5102	0.4543	0.7691	0.6674	0.4984	0.4905	0.5631	0.5176	0.8569	0.7983	0.6638	0.6555	0.5725	0.5550
		Hurricane	0.6621	0.4377	0.3888	0.3588	0.5153	0.4099	0.7673	0.5851	0.5338	0.5070	0.4637	0.4112	0.7126	0.6148	0.4649	0.4608	0.5054	0.4633	0.8097	0.7478	0.6203	0.6138	0.5283	0.5127
	Region 1	None	0.6012	0.4203	0.3933	0.3476	0.5720	0.4643	0.7088	0.4947	0.5516	0.4926	0.5254	0.4399	0.6448	0.5366	0.4649	0.4470	0.5917	0.5329	0.7618	0.6653	0.6480	0.6302	0.5723	0.5381
		Hurricane	0.5359	0.3487	0.3520	0.3060	0.4988	0.3839	0.6544	0.4504	0.5163	0.4601	0.4741	0.3950	0.5379	0.4315	0.4271	0.4111	0.4718	0.4089	0.6862	0.6012	0.5987	0.5851	0.5004	0.4688
FBC Mid Range (Shingle = 6-13 yr // Tile or Metal = 6-20 yr)	Region 3	None	0.7060	0.6084	0.3457	0.3389	0.6128	0.5723	0.7235	0.6583	0.4681	0.4651	0.4365	0.4311	0.7627	0.7394	0.4354	0.4372	0.5495	0.5307	0.8059	0.8019	0.5950	0.6018	0.5682	0.5638
		Hurricane	0.6670	0.5661	0.3340	0.3316	0.5683	0.5312	0.6968	0.6382	0.4481	0.4373	0.4155	0.4042	0.6944	0.6695	0.4195	0.4139	0.4669	0.4566	0.7715	0.7618	0.5718	0.5722	0.5357	0.5313
	Region 2	None	0.5546	0.4431	0.3497	0.3317	0.4612	0.3991	0.6655	0.5734	0.4855	0.4705	0.4513	0.4201	0.6342	0.5870	0.4275	0.4229	0.4843	0.4573	0.7410	0.7143	0.5846	0.5816	0.5359	0.5253
		Hurricane	0.5114	0.3988	0.3163	0.3010	0.4157	0.3559	0.6118	0.5230	0.4413	0.4270	0.4035	0.3758	0.5795	0.5421	0.3911	0.3905	0.4253	0.4014	0.6884	0.6703	0.5386	0.5353	0.4877	0.4798
	Region 1	None	0.5029	0.4079	0.3338	0.3086	0.5005	0.4363	0.5768	0.4704	0.4604	0.4278	0.4590	0.4093	0.5601	0.5116	0.3998	0.3890	0.5246	0.4874	0.6579	0.6322	0.5567	0.5463	0.5233	0.5040
		Hurricane	0.4328	0.3325	0.2934	0.2675	0.4221	0.3537	0.5265	0.4246	0.4259	0.3954	0.4084	0.3630	0.4477	0.4000	0.3563	0.3477	0.4012	0.3636	0.5851	0.5524	0.5061	0.4987	0.4496	0.4330
FBC New (0-5 yr, all types)	Region 3	None	0.4522	0.4505	0.2724	0.2717	0.5108	0.5007	0.4723	0.4717	0.3880	0.3916	0.3885	0.3988	0.5207	0.5069	0.3713	0.3708	0.4815	0.4693	0.6047	0.6030	0.5357	0.5381	0.5445	0.5381
		Hurricane	0.4146	0.4143	0.2622	0.2686	0.4654	0.4600	0.4460	0.4424	0.3684	0.3674	0.3736	0.3695	0.4534	0.4571	0.3522	0.3490	0.3919	0.3957	0.5758	0.5750	0.5148	0.5132	0.5020	0.5092
	Region 2	None	0.3530	0.3524	0.2784	0.2750	0.3628	0.3468	0.4552	0.4481	0.3923	0.3933	0.3925	0.3859	0.4484	0.4481	0.3567	0.3554	0.4055	0.3971	0.5612	0.5616	0.5053	0.5077	0.4994	0.4956
		Hurricane	0.3131	0.3099	0.2438	0.2432	0.3161	0.3019	0.4011	0.4014	0.3489	0.3471	0.3434	0.3404	0.3882	0.3931	0.3173	0.3201	0.3453	0.3394	0.5134	0.5197	0.4569	0.4568	0.4470	0.4469
	Region 1	None	0.3787	0.3747	0.2743	0.2697	0.4289	0.4084	0.4164	0.4090	0.3691	0.3629	0.3926	0.3787	0.4449	0.4381	0.3347	0.3311	0.4575	0.4419	0.5211	0.5189	0.4654	0.4623	0.4742	0.4699
		Hurricane	0.3030	0.2990	0.2349	0.2291	0.3454	0.3234	0.3667	0.3595	0.3355	0.3307	0.3426	0.3311	0.3326	0.3297	0.2856	0.2843	0.3306	0.3183	0.4538	0.4513	0.4135	0.4123	0.3989	0.3973

Table 4-18. Single-Family, FBC 2001 & 2004, Terrain B Loss Relativities for All Regions

Roof Cover	Region	Opening Protection	Low Roof Slope (≤5:12)																							
			Two-Story Other						Two-Story Hip						One-Story Other						One-Story Hip					
			Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel	
			No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR
FBC Old (Shingle > 13 yr // Tile or Metal > 20 yr)	Region 3	None	0.9543	0.7321	0.3150	0.2962	0.8808	0.7785	0.9251	0.6101	0.3816	0.3599	0.5319	0.3912	0.9668	0.8440	0.3645	0.3620	0.5152	0.4652	0.9066	0.8157	0.4523	0.4491	0.4351	0.4210
		Hurricane	0.9155	0.6865	0.2943	0.2761	0.8266	0.7228	0.8678	0.5584	0.3505	0.3276	0.4816	0.3433	0.9126	0.8131	0.3222	0.3225	0.4679	0.4187	0.8516	0.7614	0.3935	0.3941	0.3762	0.3461
	Region 2	None	0.6319	0.3948	0.3292	0.2883	0.5559	0.4101	0.8049	0.4650	0.4514	0.3965	0.5760	0.3670	0.8449	0.6756	0.4739	0.4551	0.6248	0.5156	0.8209	0.6797	0.5158	0.5061	0.5326	0.4607
		Hurricane	0.5850	0.3530	0.3016	0.2646	0.5167	0.3707	0.7153	0.4111	0.3923	0.3477	0.5053	0.3148	0.7907	0.6303	0.4272	0.4111	0.5780	0.4718	0.7269	0.6027	0.4475	0.4376	0.4487	0.3826
	Region 1	None	0.5611	0.3933	0.3367	0.2911	0.5833	0.4584	0.6962	0.4107	0.4707	0.3893	0.6351	0.4211	0.7505	0.5644	0.5734	0.5419	0.6922	0.5562	0.7322	0.5623	0.5715	0.5466	0.6032	0.4992
		Hurricane	0.4919	0.3177	0.2918	0.2435	0.5100	0.3768	0.6195	0.3456	0.4149	0.3410	0.5632	0.3488	0.6270	0.4500	0.4666	0.4353	0.5865	0.4526	0.6193	0.4713	0.4804	0.4604	0.5014	0.4095
FBC Mid Range (Shingle = 6-13 yr // Tile or Metal = 6-20 yr)	Region 3	None	0.7589	0.6418	0.2434	0.2322	0.7610	0.6997	0.6768	0.5165	0.2898	0.2803	0.4112	0.3343	0.7196	0.6657	0.2774	0.2746	0.3726	0.3444	0.7230	0.6833	0.3775	0.3775	0.3628	0.3586
		Hurricane	0.7181	0.6014	0.2223	0.2100	0.6977	0.6376	0.6341	0.4796	0.2617	0.2517	0.3629	0.2870	0.6828	0.6358	0.2335	0.2331	0.3281	0.3013	0.6558	0.6148	0.3154	0.3129	0.3039	0.2901
	Region 2	None	0.4904	0.3578	0.2631	0.2407	0.4460	0.3583	0.6154	0.4303	0.3586	0.3289	0.4467	0.3195	0.6672	0.5780	0.3729	0.3621	0.4804	0.4146	0.6573	0.5924	0.4325	0.4277	0.4484	0.4097
		Hurricane	0.4473	0.3200	0.2353	0.2154	0.4069	0.3188	0.5404	0.3682	0.3044	0.2798	0.3808	0.2658	0.6085	0.5292	0.3254	0.3169	0.4346	0.3708	0.5806	0.5196	0.3601	0.3581	0.3643	0.3266
	Region 1	None	0.4839	0.3837	0.2907	0.2655	0.5129	0.4355	0.5676	0.3972	0.3877	0.3419	0.5201	0.3857	0.6222	0.5240	0.4926	0.4733	0.5805	0.4963	0.6120	0.5218	0.4874	0.4729	0.5091	0.4465
		Hurricane	0.4109	0.3070	0.2436	0.2163	0.4389	0.3543	0.4933	0.3280	0.3360	0.2949	0.4519	0.3149	0.5027	0.4086	0.3810	0.3629	0.4707	0.3880	0.5120	0.4331	0.3989	0.3872	0.4138	0.3585
FBC New (0-5 yr, all types)	Region 3	None	0.4722	0.4634	0.1718	0.1683	0.6412	0.6209	0.3409	0.3398	0.1980	0.2007	0.2905	0.2773	0.2948	0.2954	0.1903	0.1872	0.2301	0.2237	0.4095	0.4133	0.3026	0.3058	0.2905	0.2962
		Hurricane	0.4175	0.4123	0.1503	0.1440	0.5689	0.5523	0.2968	0.2957	0.1729	0.1757	0.2442	0.2307	0.2591	0.2555	0.1449	0.1438	0.1883	0.1839	0.3321	0.3372	0.2374	0.2316	0.2316	0.2342
	Region 2	None	0.2790	0.2750	0.1971	0.1931	0.3360	0.3065	0.3292	0.3222	0.2658	0.2612	0.3173	0.2720	0.3492	0.3479	0.2719	0.2691	0.3359	0.3136	0.4270	0.4223	0.3491	0.3493	0.3641	0.3588
		Hurricane	0.2425	0.2387	0.1691	0.1662	0.2971	0.2670	0.2750	0.2672	0.2166	0.2119	0.2562	0.2168	0.3045	0.3029	0.2236	0.2227	0.2912	0.2697	0.3455	0.3479	0.2727	0.2785	0.2799	0.2706
	Region 1	None	0.3591	0.3535	0.2447	0.2399	0.4426	0.4126	0.3673	0.3579	0.3047	0.2945	0.4051	0.3503	0.4438	0.4347	0.4119	0.4046	0.4687	0.4363	0.4477	0.4438	0.4033	0.3993	0.4150	0.3938
		Hurricane	0.2854	0.2787	0.1955	0.1891	0.3679	0.3318	0.3019	0.2905	0.2571	0.2488	0.3407	0.2810	0.3239	0.3187	0.2954	0.2906	0.3550	0.3234	0.3524	0.3496	0.3175	0.3141	0.3262	0.3075

Roof Cover	Region	Opening Protection	Other Roof Slope (≥6:12)																							
			Two-Story Other						Two-Story Hip						One-Story Other						One-Story Hip					
			Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel	
			No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR
FBC Old (Shingle > 13 yr // Tile or Metal > 20 yr)	Region 3	None	0.8750	0.6248	0.3529	0.3440	0.7371	0.6553	0.8193	0.6295	0.4520	0.4384	0.3929	0.3625	0.8766	0.7755	0.4006	0.3973	0.6118	0.5791	0.8820	0.8186	0.5074	0.4978	0.4366	0.4218
		Hurricane	0.7875	0.5516	0.3167	0.3016	0.6441	0.5583	0.7606	0.5755	0.4109	0.3909	0.3461	0.3118	0.7523	0.6595	0.3430	0.3413	0.4362	0.3973	0.7640	0.7190	0.4447	0.4462	0.3282	0.3355
	Region 2	None	0.6809	0.4359	0.3982	0.3578	0.5468	0.4287	0.7738	0.5432	0.5327	0.4886	0.4734	0.4030	0.6837	0.5576	0.4289	0.4176	0.5180	0.4584	0.7851	0.6932	0.5690	0.5595	0.4736	0.4406
		Hurricane	0.5919	0.3597	0.3304	0.2974	0.4638	0.3497	0.6642	0.4572	0.4455	0.4100	0.3831	0.3230	0.5923	0.4780	0.3653	0.3519	0.4165	0.3619	0.6720	0.5871	0.4870	0.4825	0.3782	0.3560
	Region 1	None	0.6114	0.4364	0.3928	0.3450	0.5925	0.4910	0.6710	0.4507	0.5179	0.4484	0.5056	0.4215	0.6117	0.5026	0.4342	0.4135	0.5820	0.5212	0.7033	0.5858	0.5823	0.5578	0.5251	0.4849
		Hurricane	0.5094	0.3279	0.3320	0.2843	0.4841	0.3725	0.5849	0.3822	0.4561	0.3958	0.4298	0.3499	0.4667	0.3585	0.3624	0.3434	0.4214	0.3563	0.5785	0.4777	0.5032	0.4819	0.4166	0.3787
FBC Mid Range (Shingle = 6-13 yr // Tile or Metal = 6-20 yr)	Region 3	None	0.6818	0.5583	0.2815	0.2749	0.6350	0.5889	0.6291	0.5416	0.3621	0.3533	0.3365	0.3219	0.7042	0.6516	0.3155	0.3140	0.5340	0.5066	0.6903	0.6652	0.4310	0.4211	0.4012	0.3879
		Hurricane	0.6084	0.4821	0.2423	0.2335	0.5381	0.4896	0.5604	0.4800	0.3157	0.3106	0.2888	0.2716	0.5650	0.5249	0.2614	0.2599	0.3424	0.3221	0.6150	0.5944	0.3547	0.3647	0.2957	0.2998
	Region 2	None	0.5308	0.4024	0.3266	0.3056	0.4528	0.3846	0.6145	0.4967	0.4383	0.4134	0.4064	0.3675	0.5662	0.5089	0.3512	0.3451	0.4384	0.4039	0.6437	0.6053	0.4773	0.4725	0.4279	0.4090
		Hurricane	0.4503	0.3268	0.2636	0.2455	0.3683	0.3028	0.5120	0.4117	0.3560	0.3373	0.3221	0.2895	0.4604	0.4122	0.2881	0.2812	0.3320	0.3017	0.5388	0.5127	0.3911	0.3884	0.3324	0.3193
	Region 1	None	0.5205	0.4236	0.3386	0.3121	0.5263	0.4653	0.5487	0.4305	0.4319	0.3940	0.4436	0.3948	0.5425	0.4847	0.3737	0.3611	0.5259	0.4869	0.5978	0.5503	0.4912	0.4781	0.4775	0.4536
		Hurricane	0.4196	0.3190	0.2791	0.2525	0.4150	0.3478	0.4740	0.3642	0.3746	0.3412	0.3688	0.3219	0.3897	0.3357	0.3010	0.2905	0.3589	0.3197	0.4804	0.4373	0.4127	0.4010	0.3661	0.3441
FBC New (0-5 yr, all types)	Region 3	None	0.4281	0.4313	0.2101	0.2059	0.5330	0.5226	0.3573	0.3581	0.2722	0.2682	0.2802	0.2814	0.4441	0.4445	0.2303	0.2307	0.4561	0.4341	0.4425	0.4292	0.3547	0.3444	0.3658	0.3540
		Hurricane	0.3519	0.3529	0.1679	0.1654	0.4320	0.4209	0.2978	0.3030	0.2206	0.2302	0.2314	0.2314	0.3012	0.3012	0.1798	0.1785	0.2486	0.2469	0.3488	0.3459	0.2647	0.2832	0.2633	0.2640
	Region 2	None	0.3356	0.3331	0.2550	0.2534	0.3587	0.3406	0.3958	0.3897	0.3440	0.3383	0.3393	0.3319	0.3858	0.3760	0.2736	0.2725	0.3589	0.3494	0.4515	0.4528	0.3855	0.3855	0.3821	0.3773
		Hurricane	0.2610	0.2591	0.1969	0.1935	0.2728	0.2560	0.3113	0.3083	0.2665	0.2646	0.2611	0.2560	0.2882	0.2867	0.2110	0.2106	0.2475	0.2415	0.3600	0.3581	0.2953	0.2942	0.2866	0.2826
	Region 1	None	0.4014	0.3969	0.2844	0.2793	0.4601	0.4397	0.3893	0.3823	0.3460	0.3396	0.3816	0.3680	0.4410	0.4310	0.3132	0.3086	0.4698	0.4526	0.4732	0.4683	0.4001	0.3983	0.4298	0.4224
		Hurricane	0.2974	0.2914	0.2262	0.2206	0.3460	0.3232	0.3263	0.3167	0.2931	0.2866	0.3078	0.2939	0.2887	0.2846	0.2396	0.2377	0.2965	0.2830	0.3619	0.3583	0.3222	0.3201	0.3157	0.3096

Table 4-19. Single-Family, FBC 2001 & 2004, Terrain C Loss Relativities for All Regions

Roof Cover	Region	Opening Protection	Low Roof Slope (≤5:12)																							
			Two-Story Other						Two-Story Hip						One-Story Other						One-Story Hip					
			Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel	
			No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR
FBC Old (Shingle > 13 yr // Tile or Metal > 20 yr)	Region 3	None	0.9367	0.7309	0.3438	0.3159	0.9591	0.8584	0.8331	0.5370	0.3636	0.3231	0.6131	0.4569	0.8471	0.6828	0.4106	0.3967	0.5669	0.4741	0.7597	0.6113	0.4004	0.3894	0.3926	0.3339
		Hurricane	0.8309	0.6262	0.2883	0.2667	0.8795	0.7700	0.7180	0.4229	0.2890	0.2564	0.4918	0.3373	0.7873	0.6343	0.3552	0.3424	0.5093	0.4161	0.6792	0.5416	0.3387	0.3307	0.3302	0.2678
	Region 2	None	0.5669	0.3644	0.3249	0.2744	0.5474	0.4131	0.6943	0.3702	0.4186	0.3384	0.5670	0.3352	0.7138	0.5128	0.4537	0.4192	0.6007	0.4539	0.6315	0.4504	0.4175	0.3915	0.4389	0.3348
		Hurricane	0.4827	0.2913	0.2640	0.2213	0.4688	0.3334	0.5589	0.2722	0.3079	0.2472	0.4365	0.2340	0.6356	0.4441	0.3957	0.3631	0.5400	0.3971	0.5361	0.3808	0.3412	0.3412	0.1774	0.1513
	Region 1	None	0.3868	0.2199	0.2527	0.1916	0.4058	0.2611	0.4821	0.2201	0.3384	0.2350	0.4677	0.2402	0.4664	0.2819	0.3634	0.3127	0.4774	0.3180	0.4625	0.2862	0.3643	0.3199	0.4040	0.2742
		Hurricane	0.3552	0.1928	0.2357	0.1751	0.3776	0.2330	0.4480	0.2003	0.3144	0.2196	0.4333	0.2181	0.4160	0.2434	0.3182	0.2711	0.4298	0.2786	0.4067	0.2436	0.3200	0.2802	0.3625	0.2425
	HVHZ	Hurricane	0.2925	0.1847	0.2357	0.1751	0.3776	0.2330	0.3422	0.1842	0.3144	0.2196	0.4333	0.2181	0.3200	0.2117	0.3182	0.2711	0.4298	0.2786	0.2946	0.2058	0.3200	0.2802	0.3625	0.2425
FBC Mid Range (Shingle = 6-13 yr // Tile or Metal = 6-20 yr)	Region 3	None	0.7854	0.6765	0.2793	0.2638	0.8658	0.8041	0.6470	0.4843	0.2781	0.2536	0.4958	0.4080	0.6393	0.5595	0.3113	0.3013	0.4176	0.3633	0.5813	0.5026	0.3026	0.2939	0.2976	0.2634
		Hurricane	0.6908	0.5756	0.2257	0.2138	0.7761	0.7094	0.5356	0.3748	0.2031	0.1870	0.3747	0.2881	0.5843	0.5110	0.2511	0.2439	0.3589	0.3044	0.5097	0.4396	0.2382	0.2343	0.2341	0.1992
	Region 2	None	0.4634	0.3444	0.2665	0.2380	0.4618	0.3787	0.5428	0.3434	0.3263	0.2820	0.4407	0.2949	0.5629	0.4486	0.3547	0.3341	0.4656	0.3727	0.4964	0.3984	0.3191	0.3051	0.3349	0.2730
		Hurricane	0.3866	0.2724	0.2091	0.1850	0.3823	0.2988	0.4103	0.2434	0.2258	0.1919	0.3195	0.1936	0.4898	0.3880	0.2961	0.2776	0.4062	0.3151	0.4078	0.3226	0.2464	0.2462	0.1707	0.1475
	Region 1	None	0.3172	0.2118	0.2080	0.1724	0.3411	0.2432	0.3797	0.2085	0.2634	0.2014	0.3703	0.2127	0.3776	0.2642	0.2890	0.2596	0.3795	0.2732	0.3709	0.2663	0.2837	0.2591	0.3119	0.2283
		Hurricane	0.2926	0.1874	0.1908	0.1558	0.3145	0.2160	0.3517	0.1921	0.2421	0.1856	0.3404	0.1925	0.3251	0.2217	0.2467	0.2195	0.3338	0.2330	0.3161	0.2214	0.2421	0.2196	0.2729	0.1965
	HVHZ	Hurricane	0.2419	0.1777	0.1772	0.1458	0.3145	0.2160	0.2733	0.1770	0.2190	0.1699	0.3404	0.1925	0.2531	0.1946	0.2219	0.1972	0.3338	0.2330	0.2369	0.1899	0.2188	0.1981	0.2729	0.1965
FBC New (0-5 yr, all types)	Region 3	None	0.5709	0.5607	0.2148	0.2118	0.7725	0.7498	0.3662	0.3638	0.1926	0.1842	0.3784	0.3592	0.3037	0.2995	0.2120	0.2060	0.2683	0.2525	0.3045	0.3045	0.2048	0.1983	0.2027	0.1928
		Hurricane	0.4833	0.4737	0.1632	0.1609	0.6727	0.6487	0.2566	0.2518	0.1172	0.1177	0.2576	0.2389	0.2434	0.2413	0.1470	0.1454	0.2084	0.1927	0.2282	0.2259	0.1378	0.1380	0.1380	0.1305
	Region 2	None	0.3036	0.2981	0.2080	0.2016	0.3762	0.3443	0.2905	0.2818	0.2340	0.2257	0.3144	0.2547	0.3140	0.3047	0.2557	0.2490	0.3305	0.2916	0.2922	0.2882	0.2208	0.2187	0.2310	0.2112
		Hurricane	0.2312	0.2246	0.1542	0.1488	0.2958	0.2642	0.1882	0.1774	0.1436	0.1365	0.2025	0.1532	0.2504	0.2427	0.1965	0.1921	0.2725	0.2331	0.2043	0.2024	0.1515	0.1511	0.1641	0.1438
	Region 1	None	0.2077	0.1955	0.1634	0.1531	0.2764	0.2253	0.2118	0.1866	0.1883	0.1679	0.2728	0.1852	0.2239	0.2115	0.2147	0.2064	0.2817	0.2284	0.2191	0.2102	0.2031	0.1983	0.2197	0.1825
		Hurricane	0.1821	0.1705	0.1460	0.1365	0.2513	0.1991	0.1918	0.1682	0.1699	0.1515	0.2475	0.1670	0.1811	0.1684	0.1752	0.1680	0.2379	0.1874	0.1784	0.1703	0.1643	0.1591	0.1833	0.1505
	HVHZ	Hurricane	0.1675	0.1638	0.1186	0.1165	0.2513	0.1991	0.1618	0.1557	0.1235	0.1201	0.2475	0.1670	0.1549	0.1500	0.1256	0.1234	0.2379	0.1874	0.1495	0.1474	0.1176	0.1161	0.1833	0.1505

Roof Cover	Region	Opening Protection	Other Roof Slope (≥6:12)																							
			Two-Story Other						Two-Story Hip						One-Story Other						One-Story Hip					
			Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel		Shingle		Tile		Metal Panel	
			No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR
FBC Old (Shingle > 13 yr // Tile or Metal > 20 yr)	Region 3	None	0.8565	0.6450	0.3489	0.3232	0.8598	0.7782	0.7368	0.5192	0.4002	0.3725	0.4250	0.3756	0.7181	0.5989	0.3218	0.3078	0.5714	0.5233	0.6627	0.5719	0.3948	0.3906	0.3436	0.3170
		Hurricane	0.6741	0.4673	0.2455	0.2230	0.6462	0.5644	0.5826	0.3854	0.2991	0.2811	0.2740	0.2255	0.5755	0.4697	0.2600	0.2534	0.4328	0.3845	0.5930	0.5009	0.3428	0.3339	0.2320	0.2138
	Region 2	None	0.6192	0.4029	0.3704	0.3204	0.5477	0.4360	0.6796	0.4264	0.4670	0.4004	0.4381	0.3465	0.5342	0.4112	0.3358	0.3164	0.4460	0.3824	0.5846	0.4568	0.4330	0.4140	0.3492	0.3054
		Hurricane	0.4631	0.2640	0.2549	0.2150	0.3905	0.2834	0.4898	0.2878	0.3253	0.2792	0.2793	0.2103	0.4185	0.3028	0.2604	0.2462	0.3343	0.2693	0.4653	0.3636	0.3542	0.3384	0.2487	0.2147
	Region 1	None	0.4015	0.2353	0.2810	0.2196	0.3807	0.2661	0.4612	0.2463	0.3662	0.2728	0.3374	0.2317	0.3449	0.2309	0.2685	0.2383	0.3191	0.2423	0.4268	0.2960	0.3737	0.3369	0.3114	0.2537
		Hurricane	0.3678	0.2079	0.2597	0.2032	0.3514	0.2348	0.4219	0.2238	0.3362	0.2524	0.3125	0.2128	0.2964	0.1887	0.2415	0.2135	0.2764	0.2006	0.3699	0.2542	0.3357	0.3025	0.2656	0.2115
	HVHZ	Hurricane	0.2946	0.1953	0.2597	0.2032	0.3514	0.2348	0.3199	0.2023	0.3362	0.2524	0.3125	0.2128	0.2283	0.1656	0.2415	0.2135	0.2764	0.2006	0.2735	0.2118	0.3357	0.3025	0.2656	0.2115
FBC Mid Range (Shingle = 6-13 yr // Tile or Metal = 6-20 yr)	Region 3	None	0.7067	0.6036	0.2838	0.2715	0.7756	0.7261	0.5655	0.4532	0.3088	0.2964	0.3712	0.3439	0.5820	0.5247	0.2435	0.2339	0.5012	0.4674	0.5178	0.4866	0.2908	0.2852	0.2969	0.2802
		Hurricane	0.5422	0.4322	0.1812	0.1698	0.5606	0.5122	0.4158	0.3242	0.2107	0.2013	0.2216	0.1949	0.4435	0.3939	0.1827	0.1780	0.3579	0.3267	0.4351	0.3992	0.2385	0.2332	0.1844	0.1728
	Region 2	None	0.5016	0.3833	0.3070	0.2795	0.4691	0.4031	0.5364	0.3974	0.3742	0.3374	0.3700	0.3177	0.4371	0.3754	0.2662	0.2544	0.3772	0.3377	0.4605	0.4034	0.3323	0.3213	0.2929	0.2665
		Hurricane	0.3485	0.2433	0.1957	0.1741	0.3134	0.2497	0.3592	0.2593	0.2414	0.2163	0.2222	0.1827	0.3219	0.2648	0.1922	0.1843	0.2580	0.2192	0.3566	0.3132	0.2559	0.2479	0.1944	0.1757
	Region 1	None	0.3270	0.2280	0.2309	0.1951	0.3195	0.2461	0.3634	0.2336	0.2862	0.2312	0.2749	0.2094	0.2812	0.2202	0.2143	0.1970	0.2620	0.2134	0.3432	0.2770	0.2892	0.2686	0.2528	0.2183
		Hurricane	0.2955	0.2004	0.2112	0.1788	0.2904	0.2159	0.3275	0.2113	0.2603	0.2111	0.2516	0.1906	0.2328	0.1755	0.1877	0.1713	0.2194	0.1715	0.2868	0.2294	0.2530	0.2347	0.2100	0.1774
	HVHZ	Hurricane	0.2443	0.1898	0.1972	0.1681	0.2904	0.2159	0.2555	0.1916	0.2366	0.1931	0.2516	0.1906	0.1875	0.1563	0.1695	0.1549	0.2194	0.1715	0.2210	0.1940	0.2279	0.2110	0.2100	0.1774
FBC New (0-5 yr, all types)	Region 3	None	0.5316	0.5229	0.2186	0.2198	0.6914	0.6740	0.3393	0.3358	0.2173	0.2202	0.3175	0.3121	0.3959	0.3841	0.1651	0.1601	0.4309	0.4115	0.3056	0.3004	0.1867	0.1797	0.2502	0.2434
		Hurricane	0.3500	0.3438	0.1169	0.1166	0.4751	0.4600	0.1999	0.1893	0.1223	0.1215	0.1692	0.1642	0.2593	0.2516	0.1053	0.1025	0.2831	0.2689	0.2198	0.2237	0.1342	0.1324	0.1368	0.1319
	Region 2	None	0.3459	0.3403	0.2436	0.2385	0.3904	0.3702	0.3380	0.3291	0.2814	0.2744	0.3020	0.2889	0.3014	0.2947	0.1966	0.1924	0.3083	0.2930	0.2962	0.2958	0.2317	0.2286	0.2366	0.2277
		Hurricane	0.2032	0.2000	0.1366	0.1332	0.2363	0.2161	0.1948	0.1891	0.1576	0.1534	0.1650	0.1550	0.1874	0.1856	0.1240	0.1223	0.1816	0.1691	0.2039	0.2020	0.1577	0.1574	0.1401	0.1366
	Region 1	None	0.2215	0.2115	0.1808	0.1706	0.2582	0.2262	0.2268	0.2053	0.2061	0.1896	0.2123	0.1871	0.1937	0.1865	0.1602	0.1556	0.2049	0.1845	0.2208	0.2139	0.2047	0.2003	0.1942	0.1829
		Hurricane	0.1933	0.1838	0.1627	0.1543	0.2294	0.1971	0.2012	0.1826	0.1844	0.1698	0.1907	0.1685	0.1522	0.1464	0.1339	0.1292	0.1625	0.1425	0.1834	0.1748	0.1703	0.1670	0.1545	0.1433
	HVHZ	Hurricane	0.1789	0.1759	0.1347	0.1330	0.2294	0.1971	0.1733	0.1678	0.1371	0.1337	0.1907	0.1685	0.1333	0.1303	0.0976	0.0964	0.1625	0.1425	0.1563	0.1537	0.1201	0.1194	0.1545	0.1433

5. Loss Relativities for Multi-Family Residences

This section presents the analysis of key wind mitigation features that influence physical damage and loss for multi-family (MF) residential buildings in a hurricane. The key construction features for MF residential buildings that influence hurricane losses were introduced in Section 1.4. As discussed in Section 2.4.2, MF residences are divided into three groups. The first group includes lowrise buildings (less than 60 feet high) with wood roof decks. These buildings typically have construction features very similar to single-family (SF) homes. The second group includes lowrise buildings (less than 60 feet high) with roof decks other than wood (typically metal or concrete). The third group includes all buildings above 60 feet high. Table 5-1 summarizes the construction characteristics of Groups I, II, and III. Refer to decision tree in Section 2.4.2 for a simple approach to classify multi-family residences.

Table 5-1. Building Construction Groups for Multi-Family Residential Buildings

Group	Height	Roof Deck Material	Typical Frame Construction	Model Building Height
I	≤60 feet	Wood	Masonry or Wood Frame	2 stories
II	≤60 feet	Not wood	Steel or Reinforced Concrete	5 stories
III	>60 feet	Any	Steel or Reinforced Concrete	8 stories

This section is organized into three main sections: Group I buildings, Group II buildings, and Group III buildings. The analysis of each group is further divided into building code eras. Definitions of the wind-resistive features for MF residential buildings are given in Appendix A.

5.1. Minimal Conditions

The main qualifications of the MF loss relativities are:

1. Loss relativities are based on the reductions in total insured loss due to the presence of hurricane windstorm mitigation features. Losses include covered wind damage to the building and contents as well as covered costs incurred due to loss of use of the building. For condominium buildings, it is assumed that any differentials in windstorm premiums will be shared by the condominium association, the condominium unit owners, and, potentially, condominium unit renters in direct proportion to their respective windstorm premiums. Similarly, for apartment buildings, it is assumed that any differentials in windstorm premiums will be shared by the building owner and the apartment renters in direct proportion to their respective windstorm premiums. A more rigorous allocation of rate differentials is possible, but such an analysis was not possible within the schedule and resources available for this project.
2. The relativities are based on 2% deductible. As discussed and illustrated in the 2002 report, the relativities are dependent on the deductible and the effect is nonlinear over the range from weak to strong buildings.
3. Rate differentials derived from the loss relativities are applicable only to the portion of the wind premium associated with the loss costs for the dwelling, its contents, and additional living expenses resulting from damage to the dwelling. The loss relativities

should not be applied to any portion of the wind premium that is associated with the loss costs for attached or detached structures[6].

4. The building is in reasonably good condition. In particular, the roof cover and windows/openings are not in a state of neglect and disrepair. Our suggestion is that buildings that are in a state of disrepair should not qualify for mitigation rate differentials until such components are brought back into good condition. Also, the roof deck strength for wood roof decks must be at least deck strength A for the building to qualify for wind mitigation rate differentials.

5.2. Group I Buildings

The analysis of Group I MF residential buildings is divided into two major building code eras: pre-FBC and post-FBC. Pre-FBC construction refers to all site-built MF buildings built before the implementation of the 2001 Florida Building Code (permitted prior to March 1, 2002). Post-FBC construction refers to any Florida building permitted on or after March 1, 2002 and includes two sub-eras (FBC 2001-2004 and FBC 2006 and onward). This separation recognizes the changes brought about by the FBC and the fact that the methods used to verify the construction features may be different for existing and new construction.

5.2.1. Pre-FBC Construction

The development of loss relativities for Group I MF residential buildings built prior to the FBC follows the same approach used in Section 4.2 for pre-FBC single-family homes. For Group I buildings, the determination of the presence or absence of wind mitigation features for houses built prior to the FBC is made from an inspection/verification process. That is, since Group I buildings permitted before March 1, 2002 were built to different standards in different parts of the state, it was concluded that the determination of wind mitigation features should be accomplished though visual inspection on a building- by-building basis. In other words, it was not practical to evaluate and develop loss relativities for all the possible year-built construction eras on a statewide basis. Hence, the concept of verifiable wind mitigation features through an inspection process has driven the development of rate differentials for Group I buildings permitted prior to March 1, 2002.

The mitigation features for Group I construction follow from the single-family residence features discussed in Section 4 (see Table 4-1) with the following changes:

- A flat roof shape with a built-up roof is added as a roof shape feature.
- Group I buildings are modeled as 2 story buildings and number of stories is not considered as a rating factor.
- Metal roof coverings are not modeled for Group I buildings.

Loss relativities for multi-family Group I homes in this study are developed by normalizing loss costs for first by architectural features and then by strength features. This is the same approach

[6] As shown in Table 2-20, we used 0% for appurtenant structures (generally referred to as Coverage B) in the modeled results. Equally important, we did not include any attached structures (such as pool and patio screen enclosures, which are often covered as part of Coverage A) in the modeling of the dwelling losses.

used for single-family homes. Discussion of the normalization first by architectural features, and then by strength features can be found in Section 4.2.3.

Table 5-2 presents loss relativities between the four unique combinations of architectural features for Group I buildings and nine unique combinations of region and terrain.

Table 5-2. Loss Relativities between Weakest Reasonable Strength Group I Buildings by Combination of Architectural Features, Analysis Region, and Terrain Category

Region	Terrain	Flat	Low Slope (<=6:12)		High Slope (> 6:12)	
			Other	Hip	Other	Hip
Region 1	A	0.4172	0.7661	0.6641	1.0000	0.7098
	B	0.4733	0.7958	0.6988	1.0000	0.7310
	C	0.4797	0.8226	0.7360	1.0000	0.7691
Region 2	A	0.4177	0.8323	0.6599	1.0000	0.6302
	B	0.4352	0.8582	0.6974	1.0000	0.6459
	C	0.4134	0.8970	0.7535	1.0000	0.6832
Region 3	A	0.4773	0.9384	0.6639	1.0000	0.5615
	B	0.3980	0.9439	0.6929	1.0000	0.5706
	C	0.3650	0.9773	0.7657	1.0000	0.6162

The following tables present the MF Group I, Pre-FBC loss relativities by analysis region and terrain.

- Table 5-3. MF Group I, Pre-FBC, Region 1, Terrain A Loss Relativities
- Table 5-4. MF Group I, Pre-FBC, Region 1, Terrain B Loss Relativities
- Table 5-5. MF Group I, Pre-FBC, Region 1, Terrain C Loss Relativities
- Table 5-6. MF Group I, Pre-FBC, Region 2, Terrain A Loss Relativities
- Table 5-7. MF Group I, Pre-FBC, Region 2, Terrain B Loss Relativities
- Table 5-8. MF Group I, Pre-FBC, Region 2, Terrain C Loss Relativities
- Table 5-9. MF Group I, Pre-FBC, Region 3, Terrain A Loss Relativities
- Table 5-10. MF Group I, Pre-FBC, Region 3, Terrain B Loss Relativities
- Table 5-11. MF Group I, Pre-FBC, Region 3, Terrain C Loss Relativities

There are several minor reversals[7].in the loss relativity tables that occur when the change in the feature is not a significant feature for the particular combination of building, region, and terrain. These reversals represent less than 1% difference in relativity and generally occur at locations and terrains with lower hurricane wind hazard curves.

[7] i.e., relativity greater for home with “C” roof deck than “B” roof deck

Table 5-3. MF Group I, Pre-FBC, Region 1, Terrain A Loss Relativities

Roof Cover Strength	Roof Deck	RWC	Opening Protection	Low Slope (<=6:12)										High Slope (> 6:12)							
				Flat		Other Roof Shape				Hip				Other Roof Shape				Hip			
				BUR		Shingles		Tiles		Shingles		Tiles		Shingles		Tiles		Shingles		Tiles	
				NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR
Non-FBC	A	TN	None	1.0000	0.8107	1.0000	0.8504	0.6424	0.6019	1.0000	0.8941	0.6350	0.6095	1.0000	0.8929	0.4796	0.4499	1.0000	1.0000	0.5179	0.4931
			Hurricane	1.0000	0.7350	1.0000	0.6695	0.5451	0.4999	1.0000	0.6844	0.5211	0.4929	1.0000	0.8328	0.4424	0.4123	1.0000	0.7939	0.4849	0.4588
		Clip	None	1.0000	0.7149	1.0000	0.6672	0.5548	0.5096	1.0000	0.6398	0.5256	0.4951	0.9628	0.4908	0.4137	0.3787	0.9933	0.5271	0.4408	0.4113
			Hurricane	1.0000	0.6019	1.0000	0.5588	0.5147	0.4669	0.9435	0.5331	0.4733	0.4422	0.9229	0.4527	0.3895	0.3541	0.9549	0.4898	0.4172	0.3860
		Wrap	None	1.0000	0.6320	1.0000	0.5720	0.5395	0.4919	1.0000	0.5766	0.5111	0.4815	0.9171	0.4180	0.4000	0.3646	0.9529	0.4667	0.4329	0.4026
			Hurricane	0.9846	0.5747	1.0000	0.5264	0.5075	0.4580	0.9274	0.5077	0.4667	0.4345	0.8885	0.3915	0.3756	0.3415	0.9203	0.4367	0.4076	0.3752
	B	TN	None	1.0000	0.8223	1.0000	0.8944	0.5683	0.5299	1.0000	0.9461	0.6358	0.6164	1.0000	0.9065	0.4430	0.4164	1.0000	0.9497	0.5077	0.4859
			Hurricane	0.9853	0.6782	1.0000	0.7044	0.4502	0.4064	1.0000	0.7428	0.5200	0.4974	1.0000	0.8244	0.4091	0.3825	1.0000	0.8387	0.4786	0.4570
		Clip	None	0.8989	0.5410	0.9774	0.5782	0.4285	0.3765	0.9911	0.6282	0.4477	0.4154	0.9128	0.4725	0.3470	0.3078	0.9660	0.5191	0.3896	0.3566
			Hurricane	0.8250	0.4492	0.8546	0.4399	0.3689	0.3139	0.8943	0.5198	0.4073	0.3732	0.8741	0.4310	0.3219	0.2834	0.9215	0.4886	0.3668	0.3347
		Wrap	None	0.8261	0.4612	0.8596	0.3992	0.3839	0.3196	0.8515	0.4268	0.3805	0.3348	0.8295	0.3396	0.3060	0.2563	0.8735	0.3814	0.3496	0.3080
			Hurricane	0.7611	0.3806	0.7811	0.3354	0.3461	0.2825	0.8041	0.3890	0.3505	0.3067	0.7950	0.3096	0.2822	0.2343	0.8403	0.3598	0.3290	0.2886
	C	TN	None	1.0000	0.8157	1.0000	0.9017	0.5745	0.5381	1.0000	0.9412	0.6418	0.6226	1.0000	0.9112	0.4417	0.4154	1.0000	0.9486	0.5156	0.5157
			Hurricane	0.9865	0.6823	1.0000	0.7164	0.4564	0.4152	1.0000	0.7415	0.5242	0.5019	1.0000	0.8253	0.4067	0.3792	1.0000	0.8370	0.4756	0.4537
		Clip	None	0.8692	0.5296	0.9830	0.5869	0.4299	0.3791	0.9935	0.6340	0.4487	0.4162	0.9144	0.4665	0.3485	0.3094	0.9668	0.5217	0.3897	0.3571
			Hurricane	0.7882	0.4340	0.8597	0.4511	0.3695	0.3152	0.8926	0.5207	0.4057	0.3725	0.8769	0.4314	0.3202	0.2812	0.9264	0.4908	0.3653	0.3318
		Wrap	None	0.6320	0.5067	0.8524	0.3999	0.3791	0.3133	0.8552	0.4276	0.3810	0.3341	0.8200	0.3368	0.3045	0.2559	0.8717	0.3808	0.3499	0.3068
			Hurricane	0.5570	0.4258	0.7830	0.3364	0.3388	0.2752	0.8072	0.3901	0.3506	0.3075	0.7868	0.3072	0.2799	0.2322	0.8368	0.3595	0.3288	0.2878
FBC Old (Shingle > 13 yr // Tile or Metal > 20 yr)	A	TN	None	1.0000	0.8107	1.0000	0.8175	0.6424	0.6019	0.9709	0.8496	0.6350	0.6095	1.0000	0.8693	0.4796	0.4499	0.9783	0.8627	0.5179	0.4931
			Hurricane	1.0000	0.7350	0.8388	0.6340	0.5451	0.4999	0.7776	0.6392	0.5211	0.4929	0.9454	0.8017	0.4424	0.4123	0.8612	0.7406	0.4849	0.4588
		Clip	None	1.0000	0.7149	0.8380	0.6188	0.5548	0.5096	0.7537	0.5860	0.5256	0.4951	0.6610	0.4615	0.4137	0.3787	0.6371	0.4746	0.4408	0.4113
			Hurricane	1.0000	0.6019	0.7482	0.5143	0.5147	0.4669	0.6569	0.4836	0.4733	0.4422	0.6227	0.4194	0.3895	0.3541	0.6029	0.4396	0.4172	0.3860
		Wrap	None	1.0000	0.6320	0.7668	0.5254	0.5395	0.4919	0.7030	0.5174	0.5111	0.4815	0.5985	0.3829	0.4000	0.3646	0.5882	0.4117	0.4329	0.4026
			Hurricane	0.9846	0.5747	0.7288	0.4833	0.5075	0.4580	0.6338	0.4544	0.4667	0.4345	0.5707	0.3556	0.3756	0.3415	0.5589	0.3825	0.4076	0.3752
	B	TN	None	1.0000	0.8223	1.0000	0.8581	0.5683	0.5299	1.0000	0.9015	0.6358	0.6164	0.9945	0.8661	0.4430	0.4164	0.9979	0.8952	0.5077	0.4859
			Hurricane	0.9853	0.6782	0.8295	0.6751	0.4502	0.4064	0.8105	0.6954	0.5200	0.4974	0.9312	0.7992	0.4091	0.3825	0.8957	0.7884	0.4786	0.4570
		Clip	None	0.8989	0.5410	0.7292	0.5434	0.4285	0.3765	0.7251	0.5836	0.4477	0.4154	0.6168	0.4355	0.3470	0.3078	0.6211	0.4715	0.3896	0.3566
			Hurricane	0.8250	0.4492	0.6019	0.4031	0.3689	0.3139	0.6197	0.4696	0.4073	0.3732	0.5784	0.3989	0.3219	0.2834	0.5908	0.4425	0.3668	0.3347
		Wrap	None	0.8261	0.4612	0.5875	0.3623	0.3839	0.3196	0.5648	0.3807	0.3805	0.3348	0.5190	0.3068	0.3060	0.2563	0.5081	0.3309	0.3496	0.3080
			Hurricane	0.7611	0.3806	0.5217	0.2965	0.3461	0.2825	0.5214	0.3416	0.3505	0.3067	0.4833	0.2775	0.2822	0.2343	0.4823	0.3082	0.3290	0.2886
	C	TN	None	1.0000	0.8157	1.0000	0.8583	0.5745	0.5381	1.0000	0.8998	0.6418	0.6226	1.0000	0.8701	0.4417	0.4154	1.0000	0.8974	0.5156	0.5157
			Hurricane	0.9865	0.6823	0.8352	0.6826	0.4564	0.4152	0.8123	0.6982	0.5242	0.5019	0.9366	0.8034	0.4067	0.3792	0.8911	0.7807	0.4756	0.4537
		Clip	None	0.8692	0.5296	0.7333	0.5485	0.4299	0.3791	0.7287	0.5855	0.4487	0.4162	0.6191	0.4374	0.3485	0.3094	0.6186	0.4697	0.3897	0.3571
			Hurricane	0.7882	0.4340	0.6054	0.4141	0.3695	0.3152	0.6218	0.4730	0.4057	0.3725	0.5815	0.3989	0.3202	0.2812	0.5879	0.4406	0.3653	0.3318
		Wrap	None	0.6320	0.5067	0.5856	0.3623	0.3791	0.3133	0.5643	0.3803	0.3810	0.3341	0.5194	0.3059	0.3045	0.2559	0.5085	0.3311	0.3499	0.3068
			Hurricane	0.5570	0.4258	0.5219	0.2984	0.3388	0.2752	0.5192	0.3413	0.3506	0.3075	0.4818	0.2761	0.2799	0.2322	0.4842	0.3102	0.3288	0.2878
FBC Mid Range (Shingle = 6-13 yr // Tile or Metal = 6-20 yr)	A	TN	None	0.9946	0.7950	0.9156	0.8016	0.5894	0.5666	0.9087	0.8379	0.5935	0.5790	0.9336	0.8615	0.4411	0.4254	0.9004	0.8500	0.4780	0.4650
			Hurricane	0.9358	0.7277	0.7484	0.6231	0.4879	0.4629	0.7028	0.6220	0.4765	0.4612	0.8717	0.7969	0.4044	0.3888	0.7944	0.7414	0.4427	0.4291
		Clip	None	1.0000	0.6761	0.7393	0.6067	0.4954	0.4708	0.6693	0.5723	0.4727	0.4564	0.5609	0.4535	0.3697	0.3512	0.5388	0.4634	0.3930	0.3771
			Hurricane	0.8617	0.5988	0.6441	0.5004	0.4520	0.4257	0.5707	0.4698	0.4211	0.4046	0.5211	0.4132	0.3452	0.3269	0.5090	0.4312	0.3692	0.3527
		Wrap	None	0.8766	0.6161	0.6577	0.5127	0.4758	0.4502	0.6060	0.5015	0.4576	0.4422	0.4896	0.3716	0.3546	0.3357	0.4850	0.4011	0.3832	0.3678
			Hurricane	0.8327	0.5707	0.6121	0.4666	0.4437	0.4164	0.5429	0.4400	0.4126	0.3950	0.4673	0.3491	0.3298	0.3118	0.4548	0.3700	0.3577	0.3405
	B	TN	None	0.9180	0.7705	0.9369	0.8509	0.5281	0.5054	0.9427	0.8850	0.6019	0.5901	0.9353	0.8709	0.4105	0.3966	0.9275	0.8836	0.4731	0.4619
			Hurricane	0.8483	0.6634	0.7580	0.6646	0.4058	0.3805	0.7478	0.6836	0.4835	0.4707	0.8692	0.8037	0.3778	0.3639	0.8355	0.7867	0.4411	0.4301
		Clip	None	0.7446	0.5215	0.6473	0.5350	0.3796	0.3501	0.6549	0.5740	0.4065	0.3889	0.5237	0.4275	0.3099	0.2887	0.5344	0.4639	0.3463	0.3286
			Hurricane	0.6745	0.4374	0.5159	0.3940	0.3183	0.2873	0.5481	0.4641	0.3633	0.3447	0.4871	0.3917	0.2832	0.2627	0.5014	0.4346	0.3239	0.3065
		Wrap	None	0.6792	0.4441	0.4959	0.3523	0.3289	0.2927	0.4800	0.3713	0.3307	0.3058	0.4144	0.2998	0.2636	0.2363	0.4094	0.3216	0.3032	0.2806
			Hurricane	0.6214	0.3745	0.4278	0.2872	0.2906	0.2548	0.4377	0.3303	0.3024	0.2781	0.3846	0.2708	0.2403	0.2137	0.3841	0.2990	0.2834	0.2611
	C	TN	None	0.8650	0.7711	0.9369	0.8514	0.5332	0.5120	0.9458	0.8880	0.6084	0.5967	0.9361	0.8704	0.4114	0.3976	0.9320	0.8894	0.4782	0.4779
			Hurricane	0.8570	0.6729	0.7601	0.6670	0.4136	0.3901	0.7482	0.6821	0.4878	0.4750	0.8616	0.7975	0.3759	0.3611	0.8308	0.7834	0.4402	0.4289
		Clip	None	0.7281	0.5156	0.6520	0.5419	0.3807	0.3525	0.6551	0.5753	0.4074	0.3896	0.5296	0.4340	0.3108	0.2896	0.5338	0.4621	0.3462	0.3293
			Hurricane	0.6526	0.4277	0.5234	0.4044	0.3186	0.2882	0.5495	0.4629	0.3621	0.3447	0.4890	0.3934	0.2831	0.2618	0.5001	0.4296	0.3241	0.3060
		Wrap	None	0.5784	0.4637	0.4957	0.3552	0.3238	0.2866	0.4842	0.3730	0.3315	0.3053	0.4104	0.2973	0.2622	0.2357	0.4088	0.3230	0.3030	0.2796
			Hurricane	0.5155	0.3941	0.4270	0.2905	0.2848	0.2486	0.4359	0.3317	0.3020	0.2784	0.3820	0.2683	0.2386	0.2122	0.3856	0.3004	0.2825	0.2602
FBC New (0-5 yr, all types)	A	TN	None	0.8566	0.7794	0.7881	0.7781	0.5365	0.5314	0.8297	0.8212	0.5520	0.5484	0.8460	0.8456	0.4025	0.4008	0.8358	0.8356	0.4381	0.4370
			Hurricane	0.8011	0.7204	0.6018	0.5942	0.4306	0.4258	0.6145	0.6088	0.4319	0.4295	0.7778	0.7768	0.3665	0.3652	0.7206	0.7215	0.4005	0.3994
		Clip	None	1.0000	0.6374	0.5844	0.5776	0.4361	0.4320	0.5549	0.5510	0.4197	0.4178	0.4398	0.4376	0.3258	0.3237	0.4460	0.4444	0.3451	0.3430
			Hurricane	0.7078	0.5958	0.4778	0.4703	0.3894	0.3846	0.4420	0.4383	0.3689	0.3670	0.4012	0.3990	0.3010	0.2996	0.4091	0.4071	0.3211	0.3194
		Wrap	None	0.7157	0.6001	0.4871	0.4811	0.4122	0.4084	0.4702	0.4678	0.4042	0.4030	0.3581	0.3553	0.3091	0.3068	0.3759	0.3749	0.3335	0.3330
			Hurricane	0.6808	0.5667	0.4413	0.4350	0.3800	0.3747	0.4123	0.4085	0.3584	0.3555	0.3319	0.3292	0.2839	0.2821	0.3491	0.3476	0.3078	0.3058
	B	TN	None	0.7216	0.7188	0.8358	0.8232	0.4880	0.4808	0.8714	0.8607	0.5680	0.5638	0.8611	0.8607	0.3780	0.3768	0.8761	0.8757	0.4386	0.4380
			Hurricane	0.7113	0.6485	0.6498	0.6402	0.3614	0.3547	0.6704	0.6637	0.4471	0.4441	0.7895	0.7884	0.3466	0.3452	0.7635	0.7631	0.4037	0.4032
		Clip	None	0.5903	0.5020	0.5172	0.5090	0.3307	0.3238	0.5500	0.5436	0.3653	0.3624	0.4200	0.4177	0.2729	0.2697	0.4477	0.4468	0.3031	0.3006
			Hurricane	0.5240	0.4256	0.3769	0.3672	0.2676	0.2607	0.4379	0.4345	0.3192	0.3161	0.3814	0.3791	0.2445	0.2420	0.4135	0.4114	0.2811	0.2782
		Wrap	None	0.5324	0.4270	0.3416	0.3314	0.2739	0.2659	0.3519	0.3479	0.2810	0.2769	0.2913	0.2858	0.2212	0.2163	0.3071	0.3031	0.2569	0.2533
			Hurricane	0.4817	0.3683	0.2783	0.2653	0.2350	0.2271	0.3131	0.3079	0.2544	0.2494	0.2633	0.2575	0.1985	0.1931	0.2828	0.2788	0.2378	0.2335
	C	TN	None	0.7299	0.7264	0.8400	0.8268	0.4919	0.4860	0.8728	0.8627	0.5751	0.5709	0.8503	0.8493	0.3812	0.3798	0.8756	0.8757	0.4407	0.4400
			Hurricane	0.7274	0.6635	0.6513	0.6416	0.3708	0.3650	0.6729	0.6650	0.4513	0.4481	0.7837	0.7832	0.3451	0.3430	0.7640	0.7641	0.4047	0.4040
		Clip	None	0.5869	0.5016	0.5227	0.5146	0.3314	0.3258	0.5560	0.5515	0.3661	0.3630	0.4200	0.4178	0.2731	0.2699	0.4474	0.4464	0.3028	0.3015
			Hurricane	0.5170	0.4213	0.3908	0.3833	0.2677	0.2612	0.4415	0.4380	0.3186	0.3168	0.3796	0.3772	0.2460	0.2424	0.4146	0.4128	0.2829	0.2801
		Wrap	None	0.5247	0.4207	0.3423	0.3330	0.2684	0.2600	0.3511	0.3473	0.2820	0.2766	0.2912	0.2856	0.2199	0.2154	0.3067	0.3034	0.2561	0.2525
			Hurricane	0.4741	0.3625	0.2785	0.2686	0.2309	0.2219	0.3134	0.3089	0.2534	0.2493	0.2609	0.2552	0.1974	0.1923	0.2846	0.2815	0.2363	0.2325

Table 5-4. MF Group I, Pre-FBC, Region 1, Terrain B Loss Relativities

Roof Cover Strength	Roof Deck	RWC	Opening Protection			Low Slope (<=6:12)								High Slope (> 6:12)							
				Flat		Other Roof Shape				Hip				Other Roof Shape				Hip			
				BUR		Shingles		Tiles		Shingles		Tiles		Shingles		Tiles		Shingles		Tiles	
				NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR
Non-FBC	A	TN	None	1.0000	0.8342	1.0000	0.8556	0.6438	0.6056	1.0000	0.8956	0.6376	0.6139	1.0000	0.9066	0.5058	0.4762	1.0000	0.8998	0.5258	0.5010
			Hurricane	0.9764	0.6779	1.0000	0.6465	0.5323	0.4899	0.9797	0.6565	0.5131	0.4846	1.0000	0.8225	0.4576	0.4272	1.0000	0.7784	0.4800	0.4530
		Clip	None	1.0000	0.6793	1.0000	0.6598	0.5598	0.5185	0.9912	0.6259	0.5249	0.4956	0.9482	0.5094	0.4367	0.4016	0.9626	0.5264	0.4532	0.4219
			Hurricane	0.8984	0.5359	0.9598	0.5352	0.5037	0.4569	0.8817	0.5073	0.4627	0.4310	0.8954	0.4589	0.4045	0.3682	0.9085	0.4782	0.4179	0.3862
		Wrap	None	0.9782	0.6229	1.0000	0.5663	0.5404	0.4962	0.9600	0.5640	0.5125	0.4841	0.9052	0.4365	0.4238	0.3879	0.9300	0.4686	0.4463	0.4144
			Hurricane	0.9004	0.5303	0.9407	0.5051	0.4942	0.4472	0.8709	0.4821	0.4527	0.4206	0.8562	0.3970	0.3921	0.3559	0.8828	0.4261	0.4116	0.3779
	B	TN	None	1.0000	0.7606	1.0000	0.8956	0.5825	0.5453	1.0000	0.9417	0.6338	0.6148	1.0000	0.9066	0.4659	0.4376	1.0000	0.9421	0.5160	0.4925
			Hurricane	0.8777	0.6050	0.9919	0.6785	0.4407	0.3955	1.0000	0.7125	0.5064	0.4828	1.0000	0.8293	0.4187	0.3893	1.0000	0.8222	0.4711	0.4466
		Clip	None	0.8309	0.5325	0.9410	0.5782	0.4412	0.3853	0.9517	0.6180	0.4495	0.4126	0.9002	0.4870	0.3650	0.3221	0.9327	0.5129	0.3948	0.3558
			Hurricane	0.7085	0.3864	0.8011	0.4159	0.3578	0.2994	0.8368	0.4925	0.3891	0.3521	0.8470	0.4318	0.3293	0.2851	0.8860	0.4686	0.3599	0.3236
		Wrap	None	0.7960	0.4562	0.8203	0.3937	0.3885	0.3210	0.8170	0.4101	0.3824	0.3323	0.8115	0.3439	0.3222	0.2659	0.8381	0.3674	0.3549	0.3075
			Hurricane	0.6722	0.3242	0.7305	0.3091	0.3326	0.2656	0.7453	0.3546	0.3344	0.2863	0.7586	0.3054	0.2876	0.2347	0.7921	0.3370	0.3249	0.2781
	C	TN	None	1.0000	0.7579	1.0000	0.9026	0.5859	0.5491	1.0000	0.9450	0.6394	0.6198	1.0000	0.9040	0.4627	0.4342	1.0000	0.9359	0.5128	0.4888
			Hurricane	0.8778	0.6053	0.9963	0.6840	0.4467	0.4055	1.0000	0.7133	0.5088	0.4865	1.0000	0.8273	0.4186	0.3896	1.0000	0.8214	0.4692	0.4452
		Clip	None	0.8242	0.5262	0.9503	0.5878	0.4376	0.3848	0.9522	0.6196	0.4515	0.4180	0.9020	0.4850	0.3641	0.3212	0.9341	0.5108	0.3929	0.3563
			Hurricane	0.7047	0.3807	0.8081	0.4336	0.3602	0.3033	0.8381	0.4893	0.3883	0.3525	0.8418	0.4308	0.3250	0.2826	0.8771	0.4671	0.3606	0.3237
		Wrap	None	0.7677	0.4432	0.8226	0.3974	0.3855	0.3151	0.8175	0.4130	0.3808	0.3304	0.8108	0.3436	0.3179	0.2626	0.8376	0.3706	0.3531	0.3050
			Hurricane	0.6620	0.3177	0.7295	0.3119	0.3264	0.2589	0.7455	0.3545	0.3343	0.2870	0.7576	0.3039	0.2847	0.2321	0.7890	0.3370	0.3221	0.2767
FBC Old (Shingle > 13 yr // Tile or Metal > 20 yr)	A	TN	None	1.0000	0.8342	0.9954	0.8317	0.6438	0.6056	0.9742	0.8662	0.6376	0.6139	1.0000	0.8834	0.5058	0.4762	0.9761	0.8643	0.5258	0.5010
			Hurricane	0.9764	0.6779	0.8071	0.6174	0.5323	0.4899	0.7583	0.6241	0.5131	0.4846	0.9307	0.7964	0.4576	0.4272	0.8565	0.7435	0.4800	0.4530
		Clip	None	1.0000	0.6793	0.8261	0.6240	0.5598	0.5185	0.7429	0.5864	0.5249	0.4956	0.6763	0.4841	0.4367	0.4016	0.6475	0.4887	0.4532	0.4219
			Hurricane	0.8984	0.5359	0.7179	0.5017	0.5037	0.4569	0.6350	0.4716	0.4627	0.4310	0.6294	0.4342	0.4045	0.3682	0.5997	0.4390	0.4179	0.3862
		Wrap	None	0.9782	0.6229	0.7511	0.5288	0.5404	0.4962	0.6924	0.5178	0.5125	0.4841	0.6233	0.4089	0.4238	0.3879	0.5936	0.4231	0.4463	0.4144
			Hurricane	0.9004	0.5303	0.6932	0.4696	0.4942	0.4472	0.6130	0.4399	0.4527	0.4206	0.5806	0.3701	0.3921	0.3559	0.5571	0.3847	0.4116	0.3779
	B	TN	None	1.0000	0.7606	1.0000	0.8716	0.5825	0.5453	0.9979	0.9093	0.6338	0.6148	1.0000	0.8818	0.4659	0.4376	0.9995	0.9039	0.5160	0.4925
			Hurricane	0.8777	0.6050	0.8019	0.6555	0.4407	0.3955	0.7835	0.6747	0.5064	0.4828	0.9251	0.8021	0.4187	0.3893	0.8915	0.7880	0.4711	0.4466
		Clip	None	0.8309	0.5325	0.7276	0.5485	0.4412	0.3853	0.7219	0.5823	0.4495	0.4126	0.6424	0.4609	0.3650	0.3221	0.6259	0.4750	0.3948	0.3558
			Hurricane	0.7085	0.3864	0.5828	0.3882	0.3578	0.2994	0.6001	0.4550	0.3891	0.3521	0.5858	0.4084	0.3293	0.2851	0.5782	0.4291	0.3599	0.3236
		Wrap	None	0.7960	0.4562	0.5883	0.3663	0.3885	0.3210	0.5590	0.3749	0.3824	0.3323	0.5371	0.3219	0.3222	0.2659	0.5113	0.3292	0.3549	0.3075
			Hurricane	0.6722	0.3242	0.4996	0.2811	0.3326	0.2656	0.4993	0.3204	0.3344	0.2863	0.4870	0.2799	0.2876	0.2347	0.4739	0.2986	0.3249	0.2781
	C	TN	None	1.0000	0.7579	1.0000	0.8732	0.5859	0.5491	1.0000	0.9103	0.6394	0.6198	1.0000	0.8771	0.4627	0.4342	1.0000	0.9017	0.5128	0.4888
			Hurricane	0.8778	0.6053	0.8060	0.6637	0.4467	0.4055	0.7826	0.6718	0.5088	0.4865	0.9215	0.8010	0.4186	0.3896	0.8891	0.7885	0.4692	0.4452
		Clip	None	0.8242	0.5262	0.7338	0.5582	0.4376	0.3848	0.7160	0.5805	0.4515	0.4180	0.6407	0.4601	0.3641	0.3212	0.6272	0.4757	0.3929	0.3563
			Hurricane	0.7047	0.3807	0.5914	0.4024	0.3602	0.3033	0.6000	0.4554	0.3883	0.3525	0.5859	0.4074	0.3250	0.2826	0.5779	0.4303	0.3606	0.3237
		Wrap	None	0.7677	0.4432	0.5919	0.3698	0.3855	0.3151	0.5599	0.3758	0.3808	0.3304	0.5305	0.3193	0.3179	0.2626	0.5129	0.3296	0.3531	0.3050
			Hurricane	0.6620	0.3177	0.5020	0.2829	0.3264	0.2589	0.4973	0.3169	0.3343	0.2870	0.4831	0.2774	0.2847	0.2321	0.4695	0.2979	0.3221	0.2767
FBC Mid Range (Shingle = 6-13 yr // Tile or Metal = 6-20 yr)	A	TN	None	1.0000	0.8281	0.9237	0.8217	0.5968	0.5754	0.9208	0.8589	0.6034	0.5900	0.9489	0.8784	0.4682	0.4526	0.9114	0.8616	0.4886	0.4758
			Hurricane	0.8632	0.6784	0.7275	0.6117	0.4805	0.4570	0.6948	0.6185	0.4725	0.4564	0.8649	0.7932	0.4219	0.4057	0.7947	0.7416	0.4424	0.4283
		Clip	None	0.8829	0.6699	0.7353	0.6126	0.5045	0.4820	0.6757	0.5834	0.4774	0.4623	0.5866	0.4813	0.3940	0.3754	0.5547	0.4774	0.4067	0.3900
			Hurricane	0.7595	0.5282	0.6234	0.4885	0.4459	0.4202	0.5594	0.4616	0.4140	0.3967	0.5355	0.4278	0.3599	0.3410	0.5076	0.4288	0.3713	0.3550
		Wrap	None	0.8546	0.6266	0.6533	0.5163	0.4830	0.4591	0.6067	0.5039	0.4614	0.4464	0.5196	0.4006	0.3798	0.3606	0.4979	0.4135	0.3976	0.3805
			Hurricane	0.7678	0.5292	0.5952	0.4536	0.4357	0.4103	0.5293	0.4266	0.4036	0.3864	0.4777	0.3605	0.3461	0.3273	0.4569	0.3723	0.3622	0.3450
	B	TN	None	0.9135	0.7661	0.9499	0.8695	0.5455	0.5241	0.9475	0.8956	0.6095	0.5984	0.9383	0.8759	0.4370	0.4216	0.9456	0.9027	0.4816	0.4689
			Hurricane	0.7720	0.6061	0.7364	0.6474	0.4013	0.3754	0.7336	0.6712	0.4749	0.4616	0.8611	0.7971	0.3883	0.3723	0.8171	0.7701	0.4360	0.4235
		Clip	None	0.7326	0.5420	0.6548	0.5430	0.3933	0.3620	0.6527	0.5707	0.4084	0.3886	0.5531	0.4576	0.3285	0.3052	0.5415	0.4691	0.3527	0.3318
			Hurricane	0.5987	0.3909	0.5050	0.3836	0.3100	0.2769	0.5310	0.4433	0.3485	0.3285	0.4975	0.4013	0.2910	0.2672	0.4951	0.4243	0.3191	0.2999
		Wrap	None	0.6798	0.4601	0.5025	0.3597	0.3362	0.2981	0.4810	0.3690	0.3348	0.3067	0.4351	0.3160	0.2786	0.2478	0.4169	0.3236	0.3082	0.2820
			Hurricane	0.5591	0.3283	0.4140	0.2735	0.2812	0.2432	0.4211	0.3120	0.2883	0.2617	0.3921	0.2754	0.2461	0.2167	0.3826	0.2925	0.2785	0.2532
	C	TN	None	0.8994	0.7543	0.9453	0.8666	0.5500	0.5290	0.9515	0.8989	0.6126	0.6008	0.9416	0.8769	0.4338	0.4185	0.9449	0.9012	0.4795	0.4671
			Hurricane	0.7628	0.5979	0.7412	0.6539	0.4066	0.3835	0.7292	0.6679	0.4776	0.4654	0.8615	0.7975	0.3874	0.3721	0.8245	0.7782	0.4361	0.4238
		Clip	None	0.7265	0.5375	0.6620	0.5520	0.3925	0.3625	0.6594	0.5775	0.4106	0.3923	0.5523	0.4561	0.3271	0.3036	0.5425	0.4690	0.3517	0.3322
			Hurricane	0.5947	0.3850	0.5141	0.3980	0.3126	0.2805	0.5320	0.4477	0.3483	0.3288	0.4985	0.4033	0.2883	0.2653	0.4945	0.4220	0.3196	0.2997
		Wrap	None	0.6625	0.4512	0.5035	0.3615	0.3329	0.2927	0.4813	0.3697	0.3327	0.3051	0.4343	0.3144	0.2764	0.2455	0.4150	0.3217	0.3071	0.2805
			Hurricane	0.5419	0.3164	0.4157	0.2754	0.2755	0.2371	0.4216	0.3145	0.2879	0.2619	0.3906	0.2730	0.2437	0.2145	0.3796	0.2914	0.2768	0.2519
FBC New (0-5 yr, all types)	A	TN	None	0.8853	0.8221	0.8180	0.8083	0.5499	0.5451	0.8465	0.8393	0.5693	0.5662	0.8727	0.8715	0.4305	0.4289	0.8493	0.8477	0.4514	0.4507
			Hurricane	0.7500	0.6790	0.5954	0.5881	0.4287	0.4240	0.6064	0.6011	0.4320	0.4282	0.7884	0.7880	0.3861	0.3843	0.7214	0.7213	0.4047	0.4036
		Clip	None	0.7556	0.6605	0.5999	0.5940	0.4493	0.4455	0.5626	0.5588	0.4300	0.4291	0.4717	0.4693	0.3513	0.3491	0.4638	0.4628	0.3602	0.3581
			Hurricane	0.6206	0.5205	0.4724	0.4665	0.3881	0.3834	0.4398	0.4366	0.3653	0.3624	0.4190	0.4168	0.3153	0.3137	0.4130	0.4102	0.3246	0.3238
		Wrap	None	0.7310	0.6302	0.4949	0.4901	0.4257	0.4221	0.4799	0.4773	0.4103	0.4086	0.3857	0.3828	0.3357	0.3334	0.3946	0.3928	0.3488	0.3466
			Hurricane	0.6353	0.5281	0.4352	0.4285	0.3772	0.3734	0.4043	0.4012	0.3545	0.3522	0.3461	0.3435	0.3000	0.2987	0.3554	0.3534	0.3128	0.3120
	B	TN	None	0.8220	0.7716	0.8582	0.8475	0.5085	0.5030	0.8915	0.8824	0.5853	0.5819	0.8663	0.8664	0.4082	0.4057	0.8865	0.8860	0.4472	0.4453
			Hurricane	0.6663	0.6072	0.6431	0.6341	0.3620	0.3553	0.6594	0.6544	0.4434	0.4404	0.7850	0.7849	0.3580	0.3553	0.7546	0.7546	0.4010	0.4004
		Clip	None	0.6343	0.5515	0.5375	0.5306	0.3454	0.3387	0.5658	0.5612	0.3673	0.3645	0.4514	0.4493	0.2920	0.2883	0.4535	0.4520	0.3106	0.3077
			Hurricane	0.4889	0.3955	0.3766	0.3676	0.2622	0.2544	0.4348	0.4301	0.3078	0.3048	0.3929	0.3900	0.2527	0.2493	0.4122	0.4108	0.2784	0.2761
		Wrap	None	0.5635	0.4640	0.3547	0.3440	0.2840	0.2753	0.3536	0.3494	0.2872	0.2810	0.3107	0.3046	0.2350	0.2298	0.3128	0.3079	0.2614	0.2564
			Hurricane	0.4460	0.3324	0.2685	0.2556	0.2298	0.2207	0.3008	0.2961	0.2421	0.2371	0.2722	0.2646	0.2046	0.1987	0.2813	0.2760	0.2321	0.2283
	C	TN	None	0.7988	0.7508	0.8602	0.8502	0.5140	0.5089	0.8970	0.8885	0.5858	0.5818	0.8769	0.8764	0.4049	0.4029	0.8835	0.8831	0.4463	0.4454
			Hurricane	0.6478	0.5905	0.6420	0.6340	0.3665	0.3614	0.6580	0.6530	0.4463	0.4443	0.7902	0.7898	0.3562	0.3546	0.7607	0.7597	0.4031	0.4024
		Clip	None	0.6288	0.5489	0.5426	0.5351	0.3474	0.3402	0.5606	0.5568	0.3697	0.3667	0.4463	0.4443	0.2901	0.2860	0.4544	0.4517	0.3104	0.3080
			Hurricane	0.4848	0.3893	0.3856	0.3785	0.2650	0.2577	0.4334	0.4305	0.3084	0.3051	0.3956	0.3930	0.2517	0.2479	0.4124	0.4105	0.2786	0.2758
		Wrap	None	0.5573	0.4592	0.3540	0.3440	0.2803	0.2703	0.3570	0.3528	0.2847	0.2799	0.3089	0.3030	0.2348	0.2285	0.3133	0.3093	0.2611	0.2560
			Hurricane	0.4218	0.3152	0.2715	0.2601	0.2245	0.2154	0.3015	0.2964	0.2414	0.2367	0.2699	0.2640	0.2028	0.1969	0.2817	0.2759	0.2315	0.2271

Table 5-5. MF Group I, Pre-FBC, Region 1, Terrain C Loss Relativities

Roof Cover Strength	Roof Deck	RWC	Opening Protection			Low Slope (<=6:12)								High Slope (> 6:12)							
				Flat		Other Roof Shape				Hip				Other Roof Shape				Hip			
				BUR		Shingles		Tiles		Shingles		Tiles		Shingles		Tiles		Shingles		Tiles	
				NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR
Non-FBC	A	TN	None	1.0000	0.9076	1.0000	0.8852	0.6735	0.6424	1.0000	0.9232	0.6704	0.6481	1.0000	0.9167	0.5513	0.5224	1.0000	0.8976	0.5453	0.5173
			Hurricane	0.9140	0.6642	0.9086	0.6306	0.5285	0.4885	0.8851	0.6476	0.5157	0.4886	1.0000	0.8209	0.4859	0.4543	1.0000	0.7705	0.4854	0.4549
		Clip	None	1.0000	0.7566	0.9716	0.6776	0.5872	0.5499	0.9224	0.6416	0.5553	0.5278	0.9106	0.5529	0.4821	0.4463	0.9045	0.5311	0.4743	0.4383
			Hurricane	0.8313	0.5128	0.8399	0.5172	0.4924	0.4481	0.7851	0.4913	0.4582	0.4253	0.8410	0.4813	0.4307	0.3918	0.8297	0.4584	0.4209	0.3838
		Wrap	None	0.9982	0.7177	0.9174	0.5822	0.5727	0.5326	0.8899	0.5780	0.5424	0.5157	0.8632	0.4723	0.4691	0.4332	0.8686	0.4749	0.4699	0.4341
			Hurricane	0.8250	0.4965	0.8157	0.4756	0.4848	0.4375	0.7697	0.4557	0.4478	0.4152	0.8056	0.4136	0.4180	0.3776	0.8061	0.4131	0.4137	0.3763
	B	TN	None	1.0000	0.8293	1.0000	0.9280	0.6296	0.5953	1.0000	0.9641	0.6633	0.6436	1.0000	0.9255	0.5161	0.4845	1.0000	0.9294	0.5227	0.4942
			Hurricane	0.7005	0.5837	0.8858	0.6648	0.4430	0.3991	0.8985	0.6909	0.5048	0.4805	1.0000	0.8318	0.4468	0.4147	1.0000	0.8043	0.4617	0.4325
		Clip	None	0.8915	0.6449	0.8821	0.6124	0.4733	0.4189	0.8852	0.6260	0.4704	0.4299	0.8704	0.5256	0.3993	0.3487	0.8625	0.4993	0.3995	0.3501
			Hurricane	0.6438	0.3394	0.6989	0.4112	0.3492	0.2880	0.7368	0.4695	0.3741	0.3318	0.7909	0.4532	0.3445	0.2940	0.7923	0.4385	0.3488	0.3024
		Wrap	None	0.8080	0.5366	0.7635	0.4193	0.4183	0.3415	0.7522	0.4067	0.3983	0.3347	0.7728	0.3637	0.3493	0.2798	0.7721	0.3471	0.3610	0.2958
			Hurricane	0.5733	0.2500	0.6194	0.2819	0.3132	0.2398	0.6362	0.3134	0.3111	0.2538	0.6964	0.3061	0.2950	0.2309	0.6999	0.2967	0.3087	0.2478
	C	TN	None	1.0000	0.8211	1.0000	0.9293	0.6314	0.5990	1.0000	0.9669	0.6686	0.6498	1.0000	0.9251	0.5133	0.4818	1.0000	0.9276	0.5226	0.4952
			Hurricane	0.7853	0.5634	0.8890	0.6684	0.4524	0.4129	0.9007	0.6947	0.5043	0.4804	1.0000	0.8324	0.4464	0.4144	1.0000	0.8048	0.4638	0.4347
		Clip	None	0.8604	0.6235	0.8862	0.6222	0.4731	0.4187	0.8831	0.6222	0.4702	0.4307	0.8682	0.5254	0.3988	0.3479	0.8635	0.4989	0.3989	0.3503
			Hurricane	0.4640	0.3437	0.7089	0.4253	0.3511	0.2919	0.7372	0.4690	0.3752	0.3350	0.7892	0.4530	0.3442	0.2948	0.7945	0.4393	0.3475	0.3017
		Wrap	None	0.8260	0.5450	0.7633	0.4177	0.4117	0.3343	0.7517	0.4070	0.3962	0.3321	0.7703	0.3593	0.3459	0.2772	0.7698	0.3453	0.3594	0.2949
			Hurricane	0.5780	0.2474	0.6189	0.2867	0.3103	0.2345	0.6396	0.3171	0.3101	0.2522	0.6960	0.3042	0.2918	0.2284	0.7039	0.3001	0.3049	0.2456
FBC Old (Shingle > 13 yr // Tile or Metal > 20 yr)	A	TN	None	1.0000	0.9076	0.9866	0.8684	0.6735	0.6424	0.9881	0.9081	0.6704	0.6481	1.0000	0.9018	0.5513	0.5224	0.9713	0.8788	0.5453	0.5173
			Hurricane	0.9140	0.6642	0.7544	0.6104	0.5285	0.4885	0.7268	0.6228	0.5157	0.4886	0.9244	0.8149	0.4859	0.4543	0.8437	0.7413	0.4854	0.4549
		Clip	None	1.0000	0.7566	0.8059	0.6528	0.5872	0.5499	0.7504	0.6216	0.5553	0.5278	0.7017	0.5377	0.4821	0.4463	0.6515	0.4995	0.4743	0.4383
			Hurricane	0.8313	0.5128	0.6656	0.4918	0.4924	0.4481	0.6075	0.4656	0.4582	0.4253	0.6299	0.4610	0.4307	0.3918	0.5877	0.4363	0.4209	0.3838
		Wrap	None	0.9982	0.7177	0.7371	0.5603	0.5727	0.5326	0.6913	0.6832	0.5424	0.5157	0.6395	0.4503	0.4691	0.4332	0.6090	0.4454	0.4699	0.4341
			Hurricane	0.8250	0.4965	0.6346	0.4505	0.4848	0.4375	0.5780	0.4256	0.4478	0.4152	0.5816	0.3923	0.4180	0.3776	0.5448	0.3813	0.4137	0.3763
	B	TN	None	1.0000	0.8293	0.9994	0.9086	0.6296	0.5953	1.0000	0.9336	0.6633	0.6436	1.0000	0.9041	0.5161	0.4845	0.9962	0.9126	0.5227	0.4942
			Hurricane	0.7005	0.5837	0.7567	0.6478	0.4430	0.3991	0.7509	0.6681	0.5048	0.4805	0.9134	0.8165	0.4468	0.4147	0.8707	0.7799	0.4617	0.4325
		Clip	None	0.8915	0.6449	0.7354	0.5979	0.4733	0.4189	0.7182	0.6036	0.4704	0.4299	0.6686	0.5133	0.3993	0.3487	0.6212	0.4766	0.3995	0.3501
			Hurricane	0.6438	0.3394	0.5470	0.3921	0.3492	0.2880	0.5687	0.4457	0.3741	0.3318	0.5927	0.4389	0.3445	0.2940	0.5555	0.4141	0.3488	0.3024
		Wrap	None	0.8080	0.5366	0.5901	0.4018	0.4183	0.3415	0.5580	0.3866	0.3983	0.3347	0.5492	0.3476	0.3493	0.2798	0.5089	0.3212	0.3610	0.2958
			Hurricane	0.5733	0.2500	0.4533	0.2648	0.3132	0.2398	0.4538	0.2915	0.3111	0.2538	0.4829	0.2919	0.2950	0.2309	0.4477	0.2717	0.3087	0.2478
	C	TN	None	1.0000	0.8211	1.0000	0.9108	0.6314	0.5990	1.0000	0.9332	0.6686	0.6498	1.0000	0.9048	0.5133	0.4818	1.0000	0.9172	0.5226	0.4952
			Hurricane	0.7853	0.5634	0.7606	0.6527	0.4524	0.4129	0.7552	0.6703	0.5043	0.4804	0.9126	0.8145	0.4464	0.4144	0.8717	0.7817	0.4638	0.4347
		Clip	None	0.8604	0.6235	0.7395	0.6053	0.4731	0.4187	0.7167	0.6037	0.4702	0.4307	0.6682	0.5133	0.3988	0.3479	0.6221	0.4779	0.3989	0.3503
			Hurricane	0.4640	0.3437	0.5590	0.4102	0.3511	0.2919	0.5704	0.4469	0.3752	0.3350	0.5907	0.4361	0.3442	0.2948	0.5566	0.4139	0.3475	0.3017
		Wrap	None	0.8260	0.5450	0.5896	0.4024	0.4117	0.3343	0.5605	0.3881	0.3962	0.3321	0.5491	0.3460	0.3459	0.2772	0.5081	0.3220	0.3594	0.2949
			Hurricane	0.5780	0.2474	0.4571	0.2728	0.3103	0.2345	0.4578	0.2953	0.3101	0.2522	0.4784	0.2896	0.2918	0.2284	0.4477	0.2709	0.3049	0.2456
FBC Mid Range (Shingle = 6-13 yr // Tile or Metal = 6-20 yr)	A	TN	None	1.0000	0.8880	0.9400	0.8630	0.6366	0.6186	0.9483	0.8994	0.6416	0.6290	0.9578	0.9006	0.5180	0.5027	0.9200	0.8735	0.5078	0.4929
			Hurricane	0.8298	0.6718	0.6993	0.6075	0.4834	0.4610	0.6828	0.6201	0.4815	0.4662	0.8696	0.8090	0.4514	0.4348	0.7867	0.7365	0.4463	0.4304
		Clip	None	0.8731	0.7427	0.7409	0.6444	0.5417	0.5213	0.6893	0.6114	0.5133	0.4984	0.6292	0.5350	0.4406	0.4218	0.5678	0.4926	0.4282	0.4094
			Hurricane	0.7277	0.5187	0.5972	0.4853	0.4422	0.4175	0.5444	0.4588	0.4113	0.3937	0.5579	0.4594	0.3885	0.3679	0.5069	0.4299	0.3750	0.3554
		Wrap	None	0.8457	0.7049	0.6568	0.5477	0.5220	0.5001	0.6256	0.5375	0.4979	0.4835	0.5501	0.4413	0.4241	0.4051	0.5242	0.4360	0.4228	0.4037
			Hurricane	0.7240	0.5075	0.5584	0.4412	0.4303	0.4043	0.5127	0.4166	0.4011	0.3834	0.4944	0.3844	0.3733	0.3518	0.4607	0.3736	0.3653	0.3456
	B	TN	None	0.9180	0.8253	0.9674	0.9087	0.6004	0.5800	0.9755	0.9345	0.6401	0.6284	0.9562	0.9061	0.4880	0.4710	0.9413	0.9002	0.4894	0.4748
			Hurricane	0.6669	0.5794	0.7104	0.6412	0.4111	0.3852	0.7161	0.6644	0.4790	0.4648	0.8688	0.8164	0.4164	0.3992	0.8195	0.7767	0.4302	0.4149
		Clip	None	0.7573	0.6334	0.6798	0.5922	0.4335	0.4026	0.6677	0.5952	0.4339	0.4116	0.5976	0.5098	0.3620	0.3342	0.5459	0.4713	0.3560	0.3295
			Hurricane	0.5503	0.3475	0.4915	0.3891	0.3058	0.2705	0.5210	0.4452	0.3362	0.3129	0.5222	0.4338	0.3089	0.2811	0.4867	0.4107	0.3073	0.2821
		Wrap	None	0.7057	0.5268	0.5230	0.3978	0.3682	0.3238	0.4923	0.3833	0.3493	0.3137	0.4648	0.3448	0.3035	0.2641	0.4194	0.3154	0.3111	0.2746
			Hurricane	0.4853	0.2630	0.3883	0.2617	0.2657	0.2230	0.3922	0.2875	0.2655	0.2333	0.4020	0.2876	0.2528	0.2165	0.3671	0.2697	0.2606	0.2269
	C	TN	None	0.9110	0.8198	0.9671	0.9089	0.6033	0.5842	0.9741	0.9340	0.6434	0.6325	0.9563	0.9061	0.4844	0.4675	0.9433	0.9022	0.4913	0.4769
			Hurricane	0.7193	0.5787	0.7162	0.6461	0.4192	0.3962	0.7099	0.6594	0.4783	0.4646	0.8710	0.8191	0.4176	0.4008	0.8215	0.7791	0.4297	0.4142
		Clip	None	0.7415	0.6218	0.6865	0.6001	0.4342	0.4036	0.6659	0.5958	0.4322	0.4106	0.5963	0.5093	0.3614	0.3334	0.5468	0.4705	0.3552	0.3290
			Hurricane	0.4484	0.3396	0.5053	0.4062	0.3093	0.2752	0.5195	0.4439	0.3373	0.3151	0.5231	0.4347	0.3066	0.2794	0.4858	0.4107	0.3066	0.2816
		Wrap	None	0.6729	0.5317	0.5211	0.3982	0.3615	0.3169	0.4913	0.3817	0.3480	0.3121	0.4619	0.3427	0.3008	0.2617	0.4186	0.3181	0.3098	0.2738
			Hurricane	0.4747	0.2494	0.3921	0.2670	0.2617	0.2173	0.3918	0.2888	0.2639	0.2315	0.3979	0.2836	0.2492	0.2131	0.3644	0.2681	0.2582	0.2252
FBC New (0-5 yr, all types)	A	TN	None	0.8728	0.8684	0.8622	0.8512	0.5998	0.5947	0.9026	0.8928	0.6128	0.6098	0.8942	0.8934	0.4847	0.4830	0.8742	0.8738	0.4703	0.4685
			Hurricane	0.7456	0.6793	0.6044	0.5957	0.4384	0.4335	0.6137	0.6071	0.4473	0.4438	0.8071	0.8063	0.4170	0.4153	0.7335	0.7325	0.4072	0.4058
		Clip	None	0.7307	0.7287	0.6386	0.6316	0.4962	0.4927	0.5959	0.5916	0.4712	0.4690	0.5245	0.5223	0.3991	0.3972	0.4860	0.4843	0.3822	0.3806
			Hurricane	0.6241	0.5245	0.4769	0.4692	0.3920	0.3870	0.4508	0.4461	0.3643	0.3622	0.4539	0.4509	0.3462	0.3439	0.4201	0.4171	0.3291	0.3270
		Wrap	None	0.6931	0.6922	0.5353	0.5300	0.4712	0.4676	0.5147	0.5118	0.4534	0.4513	0.4332	0.4305	0.3790	0.3770	0.4229	0.4199	0.3757	0.3734
			Hurricane	0.6230	0.5186	0.4312	0.4238	0.3759	0.3711	0.4029	0.3989	0.3544	0.3516	0.3774	0.3742	0.3285	0.3261	0.3609	0.3573	0.3169	0.3148
	B	TN	None	0.8245	0.8213	0.9120	0.8983	0.5713	0.5647	0.9371	0.9271	0.6169	0.6132	0.9001	0.8997	0.4600	0.4575	0.8903	0.8900	0.4561	0.4555
			Hurricane	0.6334	0.5750	0.6452	0.6352	0.3791	0.3714	0.6607	0.6535	0.4533	0.4491	0.8090	0.8083	0.3860	0.3837	0.7702	0.7698	0.3987	0.3974
		Clip	None	0.6231	0.6219	0.5933	0.5852	0.3937	0.3863	0.5903	0.5865	0.3973	0.3934	0.5045	0.5015	0.3247	0.3196	0.4641	0.4613	0.3125	0.3088
			Hurricane	0.4569	0.3557	0.3914	0.3801	0.2624	0.2529	0.4340	0.4292	0.2983	0.2940	0.4323	0.4291	0.2733	0.2682	0.3988	0.3967	0.2658	0.2618
		Wrap	None	0.6033	0.5170	0.3974	0.3855	0.3181	0.3061	0.3753	0.3703	0.3003	0.2927	0.3468	0.3385	0.2577	0.2484	0.3151	0.3075	0.2611	0.2535
			Hurricane	0.3974	0.2760	0.2648	0.2490	0.2183	0.2062	0.2837	0.2763	0.2199	0.2128	0.2889	0.2802	0.2106	0.2020	0.2647	0.2575	0.2126	0.2060
	C	TN	None	0.8219	0.8185	0.9122	0.8990	0.5752	0.5694	0.9337	0.9243	0.6182	0.6151	0.8981	0.8973	0.4556	0.4532	0.8911	0.8909	0.4599	0.4585
			Hurricane	0.6532	0.5940	0.6522	0.6425	0.3861	0.3795	0.6616	0.6546	0.4523	0.4487	0.8100	0.8094	0.3889	0.3872	0.7712	0.7705	0.3956	0.3938
		Clip	None	0.6225	0.6201	0.6026	0.5940	0.3952	0.3884	0.5902	0.5858	0.3941	0.3906	0.5005	0.4972	0.3239	0.3189	0.4653	0.4627	0.3115	0.3077
			Hurricane	0.4327	0.3356	0.4014	0.3925	0.2675	0.2585	0.4342	0.4299	0.2993	0.2951	0.4322	0.4287	0.2690	0.2640	0.4000	0.3982	0.2657	0.2615
		Wrap	None	0.5198	0.5184	0.3974	0.3862	0.3113	0.2996	0.3765	0.3715	0.2998	0.2921	0.3449	0.3357	0.2556	0.2463	0.3155	0.3070	0.2603	0.2528
			Hurricane	0.3713	0.2513	0.2700	0.2555	0.2131	0.2001	0.2841	0.2768	0.2177	0.2108	0.2887	0.2805	0.2065	0.1978	0.2657	0.2588	0.2116	0.2047

Table 5-6. MF Group I, Pre-FBC, Region 2, Terrain A Loss Relativities

Roof Cover Strength	Roof Deck	RWC	Opening Protection	Flat		Low Slope (<=6:12)								High Slope (> 6:12)							
				Flat		Other Roof Shape				Hip				Other Roof Shape				Hip			
				BUR		Shingles		Tiles		Shingles		Tiles		Shingles		Tiles		Shingles		Tiles	
				NoSWR	YeSWR	NoSWR	YeSWR	NoSWR	YeSWR	NoSWR	YeSWR	NoSWR	YeSWR	NoSWR	YeSWR	NoSWR	YeSWR	NoSWR	YeSWR	NoSWR	YeSWR
Non-FBC	A	TN	None	1.0000	0.7325	1.0000	0.9019	0.5455	0.5159	1.0000	0.9953	0.5584	0.5413	1.0000	0.9178	0.3962	0.3747	1.0000	1.0000	0.4732	0.4571
			Hurricane	1.0000	0.6792	1.0000	0.7263	0.4670	0.4356	1.0000	0.7691	0.4575	0.4395	1.0000	0.8577	0.3655	0.3441	1.0000	0.8794	0.4473	0.4302
		Clip	None	1.0000	0.7610	1.0000	0.7192	0.4731	0.4406	1.0000	0.7300	0.4601	0.4404	1.0000	0.5060	0.3473	0.3227	1.0000	0.6406	0.4159	0.3987
			Hurricane	0.9921	0.5896	1.0000	0.6303	0.4465	0.4140	1.0000	0.6367	0.4182	0.3991	1.0000	0.4755	0.3289	0.3045	1.0000	0.6118	0.3963	0.3769
		Wrap	None	0.9898	0.5977	1.0000	0.6395	0.4643	0.4309	1.0000	0.6751	0.4487	0.4312	1.0000	0.4535	0.3383	0.3135	1.0000	0.5954	0.4109	0.3916
			Hurricane	0.9518	0.5634	1.0000	0.6084	0.4417	0.4075	1.0000	0.6155	0.4129	0.3931	1.0000	0.4326	0.3189	0.2966	1.0000	0.5726	0.3910	0.3704
	B	TN	None	1.0000	0.8254	1.0000	0.9329	0.4704	0.4432	1.0000	1.0000	0.5519	0.5394	1.0000	0.9270	0.3673	0.3492	1.0000	1.0000	0.4658	0.4509
			Hurricane	0.9424	0.6230	1.0000	0.7452	0.3817	0.3527	1.0000	0.8050	0.4510	0.4366	1.0000	0.8380	0.3417	0.3237	1.0000	0.9124	0.4423	0.4295
		Clip	None	0.8740	0.5204	1.0000	0.6224	0.3664	0.3339	1.0000	0.7084	0.3998	0.3802	1.0000	0.4876	0.3023	0.2778	1.0000	0.6300	0.3850	0.3660
			Hurricane	0.8328	0.4673	1.0000	0.5205	0.3290	0.2956	1.0000	0.6160	0.3725	0.3520	1.0000	0.4570	0.2848	0.2606	1.0000	0.6065	0.3660	0.3478
		Wrap	None	0.8117	0.4673	1.0000	0.4926	0.3402	0.3019	1.0000	0.5540	0.3592	0.3336	1.0000	0.4026	0.2793	0.2498	1.0000	0.5436	0.3633	0.3412
			Hurricane	0.7817	0.4300	1.0000	0.4574	0.3191	0.2825	1.0000	0.5313	0.3381	0.3145	1.0000	0.3817	0.2611	0.2323	1.0000	0.5256	0.3463	0.3248
	C	TN	None	1.0000	0.8160	1.0000	0.9391	0.4749	0.4491	1.0000	1.0000	0.5593	0.5463	1.0000	0.9353	0.3668	0.3485	1.0000	1.0000	0.4735	0.4738
			Hurricane	0.9439	0.6272	1.0000	0.7551	0.3831	0.3554	1.0000	0.8046	0.4550	0.4406	1.0000	0.8379	0.3395	0.3204	1.0000	0.9113	0.4390	0.4252
		Clip	None	0.8389	0.5071	1.0000	0.6289	0.3670	0.3348	1.0000	0.7110	0.4007	0.3813	1.0000	0.4833	0.3043	0.2796	1.0000	0.6325	0.3849	0.3660
			Hurricane	0.7903	0.4526	1.0000	0.5241	0.3292	0.2947	1.0000	0.6217	0.3708	0.3504	1.0000	0.4576	0.2840	0.2592	1.0000	0.6095	0.3635	0.3439
		Wrap	None	0.7084	0.6015	1.0000	0.4923	0.3388	0.2995	1.0000	0.5554	0.3597	0.3332	1.0000	0.3993	0.2791	0.2508	1.0000	0.5418	0.3645	0.3404
			Hurricane	0.6742	0.5639	1.0000	0.4573	0.3133	0.2758	1.0000	0.5312	0.3389	0.3167	1.0000	0.3789	0.2608	0.2322	1.0000	0.5244	0.3466	0.3243
FBC Old (Shingle > 13 yr // Tile or Metal > 20 yr)	A	TN	None	1.0000	0.7325	1.0000	0.7825	0.5455	0.5159	0.9834	0.8409	0.5584	0.5413	1.0000	0.8209	0.3962	0.3747	0.9864	0.8400	0.4732	0.4571
			Hurricane	1.0000	0.6792	0.8523	0.5993	0.4670	0.4356	0.7701	0.6131	0.4575	0.4395	0.9487	0.7497	0.3655	0.3441	0.8531	0.7023	0.4473	0.4302
		Clip	None	1.0000	0.7610	0.8425	0.5782	0.4731	0.4406	0.7431	0.5578	0.4601	0.4404	0.6490	0.4016	0.3473	0.3227	0.6485	0.4664	0.4159	0.3987
			Hurricane	0.9921	0.5896	0.7746	0.4975	0.4465	0.4140	0.6590	0.4745	0.4182	0.3991	0.6164	0.3669	0.3289	0.3045	0.6177	0.4391	0.3963	0.3769
		Wrap	None	0.9898	0.5977	0.7870	0.5038	0.4643	0.4309	0.6993	0.5007	0.4487	0.4312	0.6047	0.3460	0.3383	0.3135	0.6117	0.4213	0.4109	0.3916
			Hurricane	0.9518	0.5634	0.7604	0.4761	0.4417	0.4075	0.6372	0.4517	0.4129	0.3931	0.5808	0.3233	0.3189	0.2966	0.5867	0.3997	0.3910	0.3704
	B	TN	None	1.0000	0.8254	1.0000	0.8044	0.4704	0.4432	0.9986	0.8738	0.5519	0.5394	0.9944	0.8082	0.3673	0.3492	0.9962	0.8621	0.4658	0.4509
			Hurricane	0.9424	0.6230	0.8295	0.6264	0.3817	0.3527	0.7880	0.6467	0.4510	0.4366	0.9301	0.7395	0.3417	0.3237	0.8833	0.7439	0.4423	0.4295
		Clip	None	0.8740	0.5204	0.7230	0.4969	0.3664	0.3339	0.7090	0.5480	0.3998	0.3802	0.6077	0.3776	0.3023	0.2778	0.6328	0.4611	0.3850	0.3660
			Hurricane	0.8328	0.4673	0.6265	0.3926	0.3290	0.2956	0.6213	0.4552	0.3725	0.3520	0.5774	0.3501	0.2848	0.2606	0.6081	0.4389	0.3660	0.3478
		Wrap	None	0.8117	0.4673	0.6199	0.3678	0.3402	0.3019	0.5850	0.3963	0.3592	0.3336	0.5446	0.2932	0.2793	0.2498	0.5584	0.3723	0.3633	0.3412
			Hurricane	0.7817	0.4300	0.5756	0.3258	0.3191	0.2825	0.5556	0.3717	0.3381	0.3145	0.5157	0.2734	0.2611	0.2323	0.5363	0.3513	0.3463	0.3248
	C	TN	None	1.0000	0.8160	1.0000	0.8043	0.4749	0.4491	1.0000	0.8706	0.5593	0.5463	1.0000	0.8120	0.3668	0.3485	1.0000	0.8647	0.4735	0.4738
			Hurricane	0.9439	0.6272	0.8323	0.6310	0.3831	0.3554	0.7874	0.6481	0.4550	0.4406	0.9358	0.7441	0.3395	0.3204	0.8772	0.7334	0.4390	0.4252
		Clip	None	0.8389	0.5071	0.7272	0.4976	0.3670	0.3348	0.7136	0.5493	0.4007	0.3813	0.6073	0.3774	0.3043	0.2796	0.6293	0.4606	0.3849	0.3660
			Hurricane	0.7903	0.4526	0.6249	0.3983	0.3292	0.2947	0.6248	0.4588	0.3708	0.3504	0.5835	0.3494	0.2840	0.2592	0.6027	0.4373	0.3635	0.3439
		Wrap	None	0.7084	0.6015	0.6158	0.3640	0.3388	0.2995	0.5826	0.3931	0.3597	0.3332	0.5478	0.2939	0.2791	0.2508	0.5596	0.3711	0.3645	0.3404
			Hurricane	0.6742	0.5639	0.5776	0.3272	0.3133	0.2758	0.5509	0.3677	0.3389	0.3167	0.5155	0.2725	0.2608	0.2322	0.5396	0.3532	0.3466	0.3243
FBC Mid Range (Shingle = 6-13 yr // Tile or Metal = 6-20 yr)	A	TN	None	0.8987	0.7020	0.8884	0.7484	0.4851	0.4686	0.8884	0.8076	0.5107	0.5006	0.8977	0.8014	0.3541	0.3430	0.8710	0.8124	0.4279	0.4195
			Hurricane	0.8563	0.6539	0.7192	0.5721	0.4045	0.3876	0.6626	0.5774	0.4081	0.3988	0.8356	0.7374	0.3244	0.3136	0.7542	0.6928	0.3997	0.3908
		Clip	None	1.0000	0.6626	0.7022	0.5504	0.4089	0.3914	0.6332	0.5321	0.4044	0.3941	0.5095	0.3839	0.3024	0.2893	0.5211	0.4444	0.3659	0.3564
			Hurricane	0.8103	0.5682	0.6273	0.4666	0.3797	0.3622	0.5480	0.4476	0.3638	0.3540	0.4766	0.3524	0.2834	0.2711	0.4995	0.4185	0.3462	0.3356
		Wrap	None	0.8037	0.5659	0.6348	0.4740	0.3972	0.3795	0.5763	0.4708	0.3930	0.3843	0.4581	0.3259	0.2926	0.2795	0.4842	0.4000	0.3595	0.3500
			Hurricane	0.7754	0.5406	0.6017	0.4432	0.3748	0.3561	0.5222	0.4212	0.3578	0.3472	0.4413	0.3087	0.2730	0.2616	0.4600	0.3759	0.3392	0.3285
	B	TN	None	0.8578	0.7106	0.8934	0.7823	0.4223	0.4060	0.9116	0.8413	0.5096	0.5018	0.9018	0.8118	0.3297	0.3205	0.8912	0.8365	0.4237	0.4164
			Hurricane	0.7729	0.5893	0.7132	0.5987	0.3296	0.3132	0.6923	0.6184	0.4076	0.3994	0.8288	0.7406	0.3052	0.2961	0.7880	0.7268	0.3974	0.3913
		Clip	None	0.6917	0.4829	0.6000	0.4727	0.3122	0.2941	0.6116	0.5237	0.3542	0.3438	0.4773	0.3613	0.2632	0.2502	0.5183	0.4421	0.3380	0.3278
			Hurricane	0.6535	0.4367	0.4995	0.3660	0.2743	0.2559	0.5215	0.4362	0.3241	0.3132	0.4482	0.3340	0.2438	0.2314	0.4894	0.4199	0.3191	0.3088
		Wrap	None	0.6429	0.4348	0.4880	0.3407	0.2838	0.2630	0.4740	0.3702	0.3086	0.2951	0.4041	0.2785	0.2372	0.2215	0.4351	0.3485	0.3154	0.3035
			Hurricane	0.6167	0.4045	0.4431	0.3007	0.2614	0.2414	0.4443	0.3420	0.2889	0.2758	0.3825	0.2573	0.2193	0.2037	0.4133	0.3300	0.2985	0.2867
	C	TN	None	0.8048	0.7114	0.8877	0.7779	0.4244	0.4096	0.9166	0.8460	0.5171	0.5089	0.9018	0.8097	0.3311	0.3218	0.8958	0.8434	0.4284	0.4286
			Hurricane	0.7830	0.5999	0.7160	0.6000	0.3330	0.3174	0.6943	0.6176	0.4111	0.4029	0.8184	0.7308	0.3039	0.2936	0.7828	0.7247	0.3963	0.3895
		Clip	None	0.6727	0.4762	0.6011	0.4754	0.3120	0.2949	0.6089	0.5230	0.3545	0.3443	0.4815	0.3658	0.2644	0.2512	0.5171	0.4396	0.3374	0.3283
			Hurricane	0.6298	0.4278	0.5037	0.3699	0.2738	0.2551	0.5254	0.4330	0.3226	0.3126	0.4502	0.3345	0.2443	0.2309	0.4894	0.4156	0.3188	0.3079
		Wrap	None	0.5886	0.4998	0.4869	0.3395	0.2814	0.2599	0.4811	0.3741	0.3092	0.2946	0.3997	0.2761	0.2369	0.2220	0.4334	0.3506	0.3154	0.3026
			Hurricane	0.5613	0.4695	0.4407	0.3001	0.2574	0.2366	0.4426	0.3447	0.2885	0.2770	0.3827	0.2563	0.2189	0.2036	0.4147	0.3309	0.2978	0.2860
FBC New (0-5 yr, all types)	A	TN	None	0.7319	0.6716	0.6963	0.6875	0.4246	0.4212	0.7723	0.7632	0.4630	0.4600	0.7626	0.7629	0.3121	0.3112	0.7755	0.7762	0.3827	0.3819
			Hurricane	0.6909	0.6286	0.5118	0.5064	0.3420	0.3395	0.5381	0.5332	0.3587	0.3580	0.6953	0.6943	0.2833	0.2831	0.6445	0.6465	0.3520	0.3514
		Clip	None	1.0000	0.5643	0.4889	0.4847	0.3448	0.3423	0.4817	0.4792	0.3488	0.3478	0.3513	0.3500	0.2574	0.2558	0.3998	0.3993	0.3159	0.3142
			Hurricane	0.6284	0.5469	0.4048	0.4002	0.3129	0.3104	0.3868	0.3843	0.3093	0.3088	0.3204	0.3182	0.2379	0.2377	0.3699	0.3686	0.2961	0.2943
		Wrap	None	0.6176	0.5342	0.4106	0.4068	0.3302	0.3281	0.4091	0.4076	0.3372	0.3374	0.2918	0.2900	0.2468	0.2456	0.3493	0.3497	0.3080	0.3085
			Hurricane	0.5990	0.5177	0.3786	0.3755	0.3078	0.3048	0.3623	0.3594	0.3027	0.3013	0.2725	0.2714	0.2270	0.2265	0.3278	0.3280	0.2875	0.2865
	B	TN	None	0.5977	0.5958	0.7284	0.7159	0.3743	0.3688	0.7936	0.7823	0.4672	0.4642	0.7795	0.7798	0.2922	0.2918	0.8034	0.8033	0.3816	0.3819
			Hurricane	0.6034	0.5555	0.5440	0.5358	0.2774	0.2737	0.5741	0.5678	0.3642	0.3623	0.7073	0.7061	0.2687	0.2685	0.6796	0.6787	0.3525	0.3530
		Clip	None	0.5094	0.4453	0.4141	0.4103	0.2580	0.2542	0.4659	0.4601	0.3086	0.3073	0.3310	0.3293	0.2242	0.2226	0.3994	0.3991	0.2911	0.2897
			Hurricane	0.4741	0.4062	0.3089	0.3024	0.2196	0.2163	0.3760	0.3743	0.2756	0.2744	0.3015	0.3007	0.2029	0.2023	0.3717	0.3698	0.2722	0.2698
		Wrap	None	0.4740	0.4023	0.2856	0.2812	0.2274	0.2241	0.3168	0.3158	0.2581	0.2566	0.2475	0.2447	0.1951	0.1932	0.3069	0.3052	0.2674	0.2657
			Hurricane	0.4518	0.3791	0.2480	0.2417	0.2037	0.2004	0.2894	0.2873	0.2398	0.2371	0.2273	0.2248	0.1775	0.1751	0.2869	0.2848	0.2506	0.2485
	C	TN	None	0.6095	0.6068	0.7301	0.7166	0.3739	0.3700	0.7983	0.7867	0.4750	0.4714	0.7695	0.7687	0.2954	0.2950	0.8069	0.8076	0.3833	0.3835
			Hurricane	0.6222	0.5726	0.5428	0.5343	0.2828	0.2794	0.5736	0.5671	0.3672	0.3652	0.6976	0.6972	0.2683	0.2668	0.6790	0.6793	0.3536	0.3538
		Clip	None	0.5065	0.4453	0.4170	0.4112	0.2571	0.2549	0.4725	0.4690	0.3084	0.3073	0.3313	0.3303	0.2245	0.2228	0.3997	0.3998	0.2899	0.2906
			Hurricane	0.4692	0.4030	0.3155	0.3118	0.2185	0.2156	0.3783	0.3770	0.2743	0.2747	0.3011	0.2994	0.2045	0.2026	0.3728	0.3716	0.2741	0.2719
		Wrap	None	0.4689	0.3981	0.2843	0.2810	0.2240	0.2202	0.3157	0.3136	0.2587	0.2560	0.2476	0.2445	0.1946	0.1931	0.3053	0.3046	0.2662	0.2648
			Hurricane	0.4485	0.3751	0.2453	0.2421	0.2014	0.1975	0.2902	0.2884	0.2381	0.2373	0.2254	0.2230	0.1771	0.1751	0.2883	0.2883	0.2490	0.2476

Table 5-7. MF Group I, Pre-FBC, Region 2, Terrain B Loss Relativities

Roof Cover Strength	Roof Deck	RWC	Opening Protection			Low Slope (<=6:12)								High Slope (> 6:12)							
				Flat		Other Roof Shape				Hip				Other Roof Shape				Hip			
				BUR		Shingles		Tiles		Shingles		Tiles		Shingles		Tiles		Shingles		Tiles	
				NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR
Non-FBC	A	TN	None	1.0000	0.8658	1.0000	0.8824	0.5418	0.5110	1.0000	0.9620	0.5453	0.5287	1.0000	0.9105	0.4086	0.3859	1.0000	0.9605	0.4648	0.4477
			Hurricane	1.0000	0.6637	1.0000	0.6630	0.4477	0.4165	1.0000	0.6906	0.4340	0.4150	1.0000	0.8173	0.3677	0.3451	1.0000	0.8207	0.4230	0.4047
		Clip	None	1.0000	0.7222	1.0000	0.6678	0.4675	0.4369	1.0000	0.6565	0.4403	0.4195	1.0000	0.4852	0.3538	0.3285	1.0000	0.5839	0.4078	0.3865
			Hurricane	0.9468	0.5395	1.0000	0.5625	0.4275	0.3924	1.0000	0.5541	0.3908	0.3697	1.0000	0.4444	0.3291	0.3024	1.0000	0.5433	0.3765	0.3561
		Wrap	None	1.0000	0.6035	1.0000	0.5842	0.4543	0.4205	1.0000	0.6008	0.4311	0.4121	1.0000	0.4309	0.3453	0.3189	1.0000	0.5410	0.4023	0.3805
			Hurricane	0.9494	0.5382	1.0000	0.5413	0.4204	0.3855	1.0000	0.5324	0.3822	0.3609	1.0000	0.3996	0.3185	0.2928	1.0000	0.5035	0.3728	0.3505
	B	TN	None	1.0000	0.7069	1.0000	0.9104	0.4757	0.4485	1.0000	0.9943	0.5367	0.5228	1.0000	0.9020	0.3762	0.3549	1.0000	0.9937	0.4575	0.4411
			Hurricane	0.9016	0.5812	1.0000	0.6826	0.3622	0.3300	1.0000	0.7320	0.4233	0.4063	1.0000	0.8174	0.3358	0.3149	1.0000	0.8588	0.4174	0.4008
		Clip	None	0.8389	0.5001	1.0000	0.5741	0.3608	0.3226	1.0000	0.6391	0.3789	0.3532	1.0000	0.4654	0.3044	0.2756	1.0000	0.5683	0.3699	0.3444
			Hurricane	0.7533	0.4035	1.0000	0.4451	0.3031	0.2654	1.0000	0.5361	0.3352	0.3115	1.0000	0.4187	0.2770	0.2471	1.0000	0.5340	0.3390	0.3172
		Wrap	None	0.8273	0.4535	1.0000	0.4310	0.3260	0.2837	1.0000	0.4726	0.3366	0.3077	1.0000	0.3676	0.2802	0.2451	1.0000	0.4733	0.3485	0.3219
			Hurricane	0.7344	0.3674	0.9759	0.3797	0.2907	0.2494	0.9703	0.4345	0.3015	0.2739	1.0000	0.3361	0.2507	0.2184	1.0000	0.4469	0.3212	0.2938
	C	TN	None	1.0000	0.7042	1.0000	0.9193	0.4773	0.4489	1.0000	0.9998	0.5409	0.5266	1.0000	0.9001	0.3727	0.3517	1.0000	0.9889	0.4545	0.4365
			Hurricane	0.9047	0.5806	1.0000	0.6846	0.3631	0.3339	1.0000	0.7315	0.4268	0.4108	1.0000	0.8189	0.3367	0.3159	1.0000	0.8542	0.4148	0.3983
		Clip	None	0.8341	0.4949	1.0000	0.5803	0.3561	0.3196	1.0000	0.6380	0.3805	0.3591	1.0000	0.4631	0.3032	0.2754	1.0000	0.5657	0.3676	0.3455
			Hurricane	0.7512	0.3974	1.0000	0.4573	0.3046	0.2672	1.0000	0.5284	0.3339	0.3112	1.0000	0.4182	0.2731	0.2456	1.0000	0.5329	0.3407	0.3166
		Wrap	None	0.7886	0.4344	1.0000	0.4300	0.3258	0.2807	1.0000	0.4762	0.3355	0.3065	1.0000	0.3668	0.2773	0.2429	1.0000	0.4770	0.3465	0.3186
			Hurricane	0.7265	0.3633	0.9683	0.3778	0.2862	0.2447	0.9728	0.4351	0.3021	0.2744	1.0000	0.3356	0.2494	0.2173	1.0000	0.4472	0.3196	0.2934
FBC Old (Shingle > 13 yr // Tile or Metal > 20 yr)	A	TN	None	1.0000	0.8658	1.0000	0.7919	0.5418	0.5110	0.9852	0.8512	0.5453	0.5287	1.0000	0.8331	0.4086	0.3859	0.9805	0.8332	0.4648	0.4477
			Hurricane	1.0000	0.6637	0.8120	0.5667	0.4477	0.4165	0.7344	0.5758	0.4340	0.4150	0.9234	0.7325	0.3677	0.3451	0.8364	0.6921	0.4230	0.4047
		Clip	None	1.0000	0.7222	0.8201	0.5660	0.4675	0.4369	0.7125	0.5319	0.4403	0.4195	0.6493	0.4037	0.3538	0.3285	0.6351	0.4531	0.4078	0.3865
			Hurricane	0.9468	0.5395	0.7287	0.4640	0.4275	0.3924	0.6149	0.4345	0.3908	0.3697	0.6074	0.3624	0.3291	0.3024	0.5966	0.4117	0.3765	0.3561
		Wrap	None	1.0000	0.6035	0.7523	0.4815	0.4543	0.4205	0.6655	0.4716	0.4311	0.4121	0.6102	0.3481	0.3453	0.3189	0.5941	0.4038	0.4023	0.3805
			Hurricane	0.9494	0.5382	0.7080	0.4403	0.4204	0.3855	0.5935	0.4072	0.3822	0.3609	0.5734	0.3170	0.3185	0.2928	0.5620	0.3705	0.3728	0.3505
	B	TN	None	1.0000	0.7069	1.0000	0.8211	0.4757	0.4485	0.9982	0.8806	0.5367	0.5228	1.0000	0.8223	0.3762	0.3549	0.9960	0.8659	0.4575	0.4411
			Hurricane	0.9016	0.5812	0.7900	0.5920	0.3622	0.3300	0.7473	0.6085	0.4233	0.4063	0.9187	0.7388	0.3358	0.3149	0.8674	0.7286	0.4174	0.4008
		Clip	None	0.8389	0.5001	0.7040	0.4781	0.3608	0.3226	0.6858	0.5175	0.3789	0.3532	0.6183	0.3807	0.3044	0.2756	0.6187	0.4403	0.3699	0.3444
			Hurricane	0.7533	0.4035	0.5877	0.3510	0.3031	0.2654	0.5803	0.4137	0.3352	0.3115	0.5650	0.3377	0.2770	0.2471	0.5764	0.4016	0.3390	0.3172
		Wrap	None	0.8273	0.4535	0.5927	0.3376	0.3260	0.2837	0.5499	0.3544	0.3366	0.3077	0.5458	0.2880	0.2802	0.2451	0.5370	0.3408	0.3485	0.3219
			Hurricane	0.7344	0.3674	0.5280	0.2818	0.2907	0.2494	0.5068	0.3173	0.3015	0.2739	0.4989	0.2529	0.2507	0.2184	0.5046	0.3158	0.3212	0.2938
	C	TN	None	1.0000	0.7042	1.0000	0.8192	0.4773	0.4489	1.0000	0.8809	0.5409	0.5266	1.0000	0.8170	0.3727	0.3517	1.0000	0.8660	0.4545	0.4365
			Hurricane	0.9047	0.5806	0.7920	0.5986	0.3631	0.3339	0.7471	0.6047	0.4268	0.4108	0.9087	0.7313	0.3367	0.3159	0.8665	0.7313	0.4148	0.3983
		Clip	None	0.8341	0.4949	0.7078	0.4842	0.3561	0.3196	0.6771	0.5172	0.3805	0.3591	0.6139	0.3787	0.3032	0.2754	0.6209	0.4409	0.3676	0.3455
			Hurricane	0.7512	0.3974	0.5910	0.3599	0.3046	0.2672	0.5772	0.4121	0.3339	0.3112	0.5658	0.3367	0.2731	0.2456	0.5746	0.4035	0.3407	0.3166
		Wrap	None	0.7886	0.4344	0.5937	0.3374	0.3258	0.2807	0.5494	0.3545	0.3355	0.3065	0.5348	0.2841	0.2773	0.2429	0.5398	0.3422	0.3465	0.3186
			Hurricane	0.7265	0.3633	0.5294	0.2811	0.2862	0.2447	0.5049	0.3122	0.3021	0.2744	0.4993	0.2520	0.2494	0.2173	0.4992	0.3148	0.3196	0.2934
FBC Mid Range (Shingle = 6-13 yr // Tile or Metal = 6-20 yr)	A	TN	None	1.0000	0.8151	0.9028	0.7697	0.4871	0.4698	0.9043	0.8321	0.5072	0.4977	0.9151	0.8178	0.3672	0.3552	0.8853	0.8242	0.4208	0.4124
			Hurricane	0.8588	0.6500	0.6920	0.5502	0.3905	0.3734	0.6462	0.5606	0.3896	0.3785	0.8204	0.7223	0.3281	0.3160	0.7487	0.6836	0.3802	0.3709
		Clip	None	0.8819	0.6657	0.6882	0.5400	0.4068	0.3903	0.6207	0.5199	0.3897	0.3792	0.5217	0.3944	0.3104	0.2970	0.5151	0.4315	0.3590	0.3474
			Hurricane	0.7595	0.5133	0.5962	0.4377	0.3651	0.3462	0.5168	0.4140	0.3401	0.3283	0.4780	0.3483	0.2835	0.2698	0.4736	0.3900	0.3271	0.3171
		Wrap	None	0.8386	0.5932	0.6167	0.4584	0.3923	0.3744	0.5565	0.4471	0.3772	0.3674	0.4730	0.3331	0.3013	0.2873	0.4744	0.3864	0.3524	0.3405
			Hurricane	0.7740	0.5221	0.5742	0.4122	0.3586	0.3404	0.4906	0.3851	0.3316	0.3205	0.4344	0.3002	0.2727	0.2599	0.4380	0.3508	0.3219	0.3112
	B	TN	None	0.8743	0.7006	0.9187	0.8102	0.4300	0.4145	0.9166	0.8509	0.5061	0.4976	0.8975	0.8079	0.3419	0.3304	0.9149	0.8582	0.4159	0.4067
			Hurricane	0.7526	0.5660	0.6834	0.5707	0.3157	0.2976	0.6687	0.5934	0.3850	0.3755	0.8112	0.7227	0.3013	0.2899	0.7607	0.7004	0.3751	0.3670
		Clip	None	0.7054	0.4994	0.5960	0.4610	0.3086	0.2876	0.5905	0.4971	0.3341	0.3205	0.4880	0.3709	0.2660	0.2508	0.5044	0.4249	0.3243	0.3112
			Hurricane	0.6075	0.3956	0.4720	0.3345	0.2527	0.2318	0.4850	0.3904	0.2907	0.2784	0.4398	0.3232	0.2367	0.2212	0.4621	0.3863	0.2944	0.2832
		Wrap	None	0.6715	0.4442	0.4704	0.3174	0.2733	0.2500	0.4487	0.3377	0.2892	0.2729	0.4055	0.2738	0.2376	0.2191	0.4176	0.3261	0.3007	0.2862
			Hurricane	0.5861	0.3592	0.4081	0.2617	0.2384	0.2159	0.4039	0.2973	0.2551	0.2400	0.3709	0.2416	0.2102	0.1928	0.3898	0.3002	0.2733	0.2591
	C	TN	None	0.8553	0.6850	0.9112	0.8051	0.4322	0.4163	0.9221	0.8546	0.5072	0.4982	0.9045	0.8112	0.3388	0.3276	0.9131	0.8559	0.4132	0.4041
			Hurricane	0.7432	0.5564	0.6884	0.5763	0.3164	0.3003	0.6650	0.5906	0.3885	0.3802	0.8115	0.7221	0.3009	0.2902	0.7705	0.7110	0.3746	0.3665
		Clip	None	0.6994	0.4945	0.5998	0.4661	0.3066	0.2861	0.5970	0.5034	0.3360	0.3245	0.4866	0.3695	0.2649	0.2497	0.5061	0.4250	0.3227	0.3113
			Hurricane	0.6057	0.3897	0.4756	0.3420	0.2533	0.2329	0.4849	0.3939	0.2906	0.2785	0.4418	0.3259	0.2344	0.2197	0.4635	0.3850	0.2952	0.2825
		Wrap	None	0.6499	0.4323	0.4711	0.3165	0.2717	0.2467	0.4492	0.3377	0.2878	0.2723	0.4071	0.2719	0.2363	0.2178	0.4170	0.3247	0.2998	0.2845
			Hurricane	0.5689	0.3474	0.4099	0.2606	0.2341	0.2116	0.4048	0.2995	0.2552	0.2405	0.3703	0.2395	0.2091	0.1917	0.3858	0.2981	0.2728	0.2586
FBC New (0-5 yr, all types)	A	TN	None	0.8230	0.7644	0.7386	0.7297	0.4325	0.4286	0.7916	0.7835	0.4692	0.4666	0.7996	0.7984	0.3257	0.3246	0.7879	0.7857	0.3768	0.3772
			Hurricane	0.6998	0.6364	0.5016	0.4957	0.3333	0.3304	0.5221	0.5177	0.3452	0.3420	0.7039	0.7041	0.2884	0.2870	0.6375	0.6381	0.3374	0.3371
		Clip	None	0.6941	0.6092	0.4965	0.4930	0.3460	0.3437	0.4738	0.4708	0.3391	0.3389	0.3676	0.3660	0.2669	0.2655	0.3984	0.3988	0.3101	0.3083
			Hurricane	0.5721	0.4872	0.3911	0.3879	0.3027	0.3000	0.3666	0.3656	0.2895	0.2870	0.3234	0.3222	0.2379	0.2373	0.3539	0.3512	0.2777	0.2782
		Wrap	None	0.6706	0.5830	0.4043	0.4025	0.3302	0.3284	0.3989	0.3973	0.3234	0.3227	0.3022	0.3006	0.2573	0.2557	0.3457	0.3450	0.3024	0.3005
			Hurricane	0.5986	0.5060	0.3629	0.3592	0.2968	0.2953	0.3364	0.3348	0.2810	0.2801	0.2697	0.2688	0.2268	0.2270	0.3116	0.3112	0.2711	0.2719
	B	TN	None	0.7421	0.6944	0.7667	0.7555	0.3842	0.3805	0.8268	0.8163	0.4755	0.4724	0.7857	0.7863	0.3076	0.3058	0.8202	0.8203	0.3743	0.3722
			Hurricane	0.6036	0.5508	0.5368	0.5286	0.2692	0.2652	0.5576	0.5536	0.3467	0.3447	0.6909	0.6912	0.2669	0.2649	0.6628	0.6630	0.3328	0.3331
		Clip	None	0.5720	0.4987	0.4242	0.4198	0.2563	0.2527	0.4659	0.4628	0.2893	0.2878	0.3472	0.3468	0.2275	0.2259	0.3870	0.3858	0.2788	0.2779
			Hurricane	0.4617	0.3877	0.2948	0.2890	0.2023	0.1982	0.3551	0.3513	0.2461	0.2453	0.2993	0.2979	0.1965	0.1953	0.3533	0.3527	0.2498	0.2492
		Wrap	None	0.5156	0.4349	0.2780	0.2730	0.2205	0.2163	0.2952	0.2934	0.2418	0.2381	0.2499	0.2470	0.1949	0.1931	0.2903	0.2890	0.2529	0.2504
			Hurricane	0.4379	0.3511	0.2219	0.2154	0.1862	0.1823	0.2574	0.2570	0.2088	0.2062	0.2200	0.2154	0.1698	0.1673	0.2645	0.2614	0.2255	0.2244
	C	TN	None	0.7106	0.6659	0.7649	0.7545	0.3872	0.3837	0.8306	0.8210	0.4736	0.4699	0.7988	0.7986	0.3049	0.3035	0.8184	0.8179	0.3720	0.3717
			Hurricane	0.5817	0.5322	0.5355	0.5283	0.2696	0.2667	0.5551	0.5507	0.3502	0.3496	0.7005	0.7006	0.2650	0.2645	0.6698	0.6686	0.3344	0.3348
		Clip	None	0.5647	0.4941	0.4248	0.4196	0.2571	0.2526	0.4616	0.4585	0.2915	0.2898	0.3430	0.3424	0.2266	0.2240	0.3882	0.3852	0.2779	0.2772
			Hurricane	0.4603	0.3820	0.2971	0.2939	0.2020	0.1986	0.3543	0.3524	0.2474	0.2458	0.3011	0.2999	0.1957	0.1939	0.3539	0.3526	0.2497	0.2483
		Wrap	None	0.5112	0.4302	0.2756	0.2705	0.2176	0.2126	0.2981	0.2962	0.2401	0.2381	0.2487	0.2460	0.1954	0.1926	0.2921	0.2911	0.2532	0.2504
			Hurricane	0.4114	0.3314	0.2229	0.2175	0.1820	0.1785	0.2581	0.2561	0.2082	0.2065	0.2183	0.2163	0.1688	0.1662	0.2646	0.2607	0.2260	0.2239

Table 5-8. MF Group I, Pre-FBC, Region 2, Terrain C Loss Relativities

Roof Cover Strength	Roof Deck	RWC	Opening Protection	Flat		Low Slope (<=6:12)								High Slope (> 6:12)							
						Other Roof Shape				Hip				Other Roof Shape				Hip			
				BUR		Shingles		Tiles		Shingles		Tiles		Shingles		Tiles		Shingles		Tiles	
				NoSWR	YeSWR	NoSWR	YeSWR	NoSWR	YeSWR	NoSWR	YeSWR	NoSWR	YeSWR	NoSWR	YeSWR	NoSWR	YeSWR	NoSWR	YeSWR	NoSWR	YeSWR
Non-FBC	A	TN	None	1.0000	0.9106	1.0000	0.8787	0.5511	0.5243	1.0000	0.9473	0.5550	0.5378	1.0000	0.9007	0.4353	0.4110	1.0000	0.9115	0.4510	0.4302
			Hurricane	0.9806	0.6450	1.0000	0.5845	0.4245	0.3915	0.9812	0.6212	0.4093	0.3902	1.0000	0.7798	0.3700	0.3440	1.0000	0.7528	0.3911	0.3687
		Clip	None	1.0000	0.6943	1.0000	0.6136	0.4633	0.4316	1.0000	0.5887	0.4297	0.4095	1.0000	0.4760	0.3751	0.3455	1.0000	0.5033	0.3911	0.3639
			Hurricane	0.8887	0.4859	0.9561	0.4743	0.3930	0.3578	0.8720	0.4570	0.3530	0.3297	0.9699	0.4068	0.3257	0.2944	0.9829	0.4327	0.3382	0.3117
		Wrap	None	1.0000	0.6541	1.0000	0.5170	0.4531	0.4195	0.9696	0.5224	0.4190	0.4000	0.9995	0.4080	0.3650	0.3363	1.0000	0.4578	0.3879	0.3614
			Hurricane	0.8845	0.4722	0.9329	0.4362	0.3886	0.3506	0.8573	0.4206	0.3444	0.3223	0.9463	0.3534	0.3160	0.2839	0.9679	0.3979	0.3329	0.3066
	B	TN	None	1.0000	0.7530	1.0000	0.9207	0.4994	0.4706	1.0000	0.9844	0.5385	0.5222	1.0000	0.9065	0.4026	0.3769	1.0000	0.9422	0.4310	0.4094
			Hurricane	0.7023	0.5853	0.9835	0.6132	0.3364	0.3034	0.9872	0.6483	0.3932	0.3756	1.0000	0.7886	0.3370	0.3121	1.0000	0.7823	0.3707	0.3488
		Clip	None	0.8862	0.5558	0.9605	0.5336	0.3517	0.3118	0.9602	0.5631	0.3545	0.3261	1.0000	0.4480	0.3114	0.2750	1.0000	0.4716	0.3361	0.3032
			Hurricane	0.6877	0.3158	0.7859	0.3603	0.2642	0.2215	0.8170	0.4278	0.2845	0.2552	0.9186	0.3779	0.2599	0.2240	0.9507	0.4143	0.2860	0.2550
		Wrap	None	0.7967	0.4551	0.8480	0.3599	0.3131	0.2610	0.8331	0.3671	0.3036	0.2650	0.9239	0.3243	0.2787	0.2331	0.9508	0.3658	0.3161	0.2766
			Hurricane	0.6280	0.2539	0.7300	0.2666	0.2413	0.1932	0.7368	0.3033	0.2415	0.2071	0.8454	0.2722	0.2269	0.1852	0.8754	0.3150	0.2646	0.2273
	C	TN	None	1.0000	0.7438	1.0000	0.9229	0.4982	0.4706	1.0000	0.9888	0.5466	0.5310	1.0000	0.9056	0.4002	0.3748	1.0000	0.9376	0.4314	0.4116
			Hurricane	0.8095	0.5205	0.9872	0.6166	0.3414	0.3114	0.9874	0.6524	0.3921	0.3746	1.0000	0.7901	0.3374	0.3121	1.0000	0.7836	0.3724	0.3503
		Clip	None	0.8459	0.5319	0.9626	0.5413	0.3509	0.3096	0.9571	0.5587	0.3550	0.3269	0.9970	0.4462	0.3106	0.2738	1.0000	0.4714	0.3368	0.3047
			Hurricane	0.4911	0.3638	0.7944	0.3680	0.2633	0.2209	0.8169	0.4263	0.2837	0.2570	0.9129	0.3782	0.2610	0.2259	0.9510	0.4137	0.2855	0.2546
		Wrap	None	0.8242	0.4664	0.8493	0.3572	0.3083	0.2558	0.8332	0.3684	0.3024	0.2629	0.9233	0.3204	0.2766	0.2324	0.9494	0.3648	0.3153	0.2771
			Hurricane	0.6415	0.2552	0.7258	0.2661	0.2386	0.1883	0.7369	0.3055	0.2415	0.2062	0.8483	0.2708	0.2256	0.1843	0.8842	0.3181	0.2616	0.2265
FBC Old (Shingle > 13 yr // Tile or Metal > 20 yr)	A	TN	None	1.0000	0.9106	1.0000	0.8287	0.5511	0.5243	0.9992	0.8913	0.5550	0.5378	1.0000	0.8525	0.4353	0.4110	0.9709	0.8421	0.4510	0.4302
			Hurricane	0.9806	0.6450	0.7264	0.5312	0.4245	0.3915	0.6787	0.5501	0.4093	0.3902	0.9109	0.7477	0.3700	0.3440	0.8077	0.6692	0.3911	0.3687
		Clip	None	1.0000	0.6943	0.7586	0.5544	0.4633	0.4316	0.6798	0.5240	0.4297	0.4095	0.6468	0.4269	0.3751	0.3455	0.6013	0.4181	0.3911	0.3639
			Hurricane	0.8887	0.4859	0.6335	0.4134	0.3930	0.3578	0.5477	0.3852	0.3530	0.3297	0.5741	0.3539	0.3257	0.2944	0.5368	0.3576	0.3382	0.3117
		Wrap	None	1.0000	0.6541	0.6868	0.4613	0.4531	0.4195	0.6162	0.6106	0.4190	0.4000	0.5942	0.3536	0.3650	0.3363	0.5663	0.3757	0.3879	0.3614
			Hurricane	0.8845	0.4722	0.6066	0.3789	0.3886	0.3506	0.5167	0.3469	0.3444	0.3223	0.5339	0.2988	0.3160	0.2839	0.5010	0.3146	0.3329	0.3066
	B	TN	None	1.0000	0.7530	1.0000	0.8656	0.4994	0.4706	1.0000	0.9053	0.5385	0.5222	1.0000	0.8511	0.4026	0.3769	0.9959	0.8757	0.4310	0.4094
			Hurricane	0.7023	0.5853	0.7139	0.5618	0.3364	0.3034	0.6914	0.5804	0.3932	0.3756	0.8879	0.7389	0.3370	0.3121	0.8309	0.7026	0.3707	0.3488
		Clip	None	0.8862	0.5558	0.6680	0.4851	0.3517	0.3118	0.6392	0.4957	0.3545	0.3261	0.6097	0.4019	0.3114	0.2750	0.5728	0.3953	0.3361	0.3032
			Hurricane	0.6877	0.3158	0.4975	0.3064	0.2642	0.2215	0.5029	0.3574	0.2845	0.2552	0.5337	0.3307	0.2599	0.2240	0.5050	0.3360	0.2860	0.2550
		Wrap	None	0.7967	0.4551	0.5296	0.3086	0.3131	0.2610	0.4887	0.3022	0.3036	0.2650	0.5179	0.2751	0.2787	0.2331	0.4914	0.2868	0.3161	0.2766
			Hurricane	0.6280	0.2539	0.4267	0.2157	0.2413	0.1932	0.4099	0.2370	0.2415	0.2071	0.4528	0.2237	0.2269	0.1852	0.4280	0.2359	0.2646	0.2273
	C	TN	None	1.0000	0.7438	1.0000	0.8653	0.4982	0.4706	1.0000	0.9045	0.5466	0.5310	1.0000	0.8511	0.4002	0.3748	1.0000	0.8808	0.4314	0.4116
			Hurricane	0.8095	0.5205	0.7187	0.5674	0.3414	0.3114	0.6976	0.5838	0.3921	0.3746	0.8865	0.7360	0.3374	0.3121	0.8320	0.7048	0.3724	0.3503
		Clip	None	0.8459	0.5319	0.6707	0.4899	0.3509	0.3096	0.6364	0.4948	0.3550	0.3269	0.6090	0.4020	0.3106	0.2738	0.5725	0.3964	0.3368	0.3047
			Hurricane	0.4911	0.3638	0.5065	0.3192	0.2633	0.2209	0.5047	0.3587	0.2837	0.2570	0.5345	0.3284	0.2610	0.2259	0.5067	0.3353	0.2855	0.2546
		Wrap	None	0.8242	0.4664	0.5287	0.3071	0.3083	0.2558	0.4919	0.3033	0.3024	0.2629	0.5184	0.2743	0.2766	0.2324	0.4901	0.2881	0.3153	0.2771
			Hurricane	0.6415	0.2552	0.4270	0.2179	0.2386	0.1883	0.4132	0.2391	0.2415	0.2062	0.4476	0.2227	0.2256	0.1843	0.4284	0.2358	0.2616	0.2265
FBC Mid Range (Shingle = 6-13 yr // Tile or Metal = 6-20 yr)	A	TN	None	1.0000	0.8529	0.9216	0.8152	0.5058	0.4904	0.9350	0.8727	0.5195	0.5095	0.9303	0.8462	0.3971	0.3843	0.8919	0.8309	0.4077	0.3964
			Hurricane	0.8426	0.6406	0.6415	0.5239	0.3730	0.3551	0.6122	0.5391	0.3710	0.3602	0.8209	0.7355	0.3317	0.3182	0.7190	0.6552	0.3471	0.3356
		Clip	None	0.8418	0.6646	0.6605	0.5378	0.4113	0.3944	0.5976	0.5074	0.3841	0.3733	0.5394	0.4200	0.3314	0.3161	0.4901	0.4057	0.3420	0.3281
			Hurricane	0.7318	0.4814	0.5343	0.3992	0.3385	0.3195	0.4634	0.3700	0.3043	0.2923	0.4693	0.3476	0.2822	0.2657	0.4292	0.3448	0.2894	0.2757
		Wrap	None	0.8137	0.6259	0.5743	0.4419	0.3967	0.3788	0.5313	0.4322	0.3715	0.3614	0.4716	0.3408	0.3186	0.3036	0.4579	0.3606	0.3388	0.3247
			Hurricane	0.7298	0.4731	0.4985	0.3606	0.3301	0.3097	0.4340	0.3314	0.2963	0.2845	0.4169	0.2868	0.2703	0.2535	0.3927	0.2999	0.2829	0.2690
	B	TN	None	0.8693	0.7366	0.9443	0.8592	0.4626	0.4455	0.9583	0.9024	0.5095	0.4996	0.9224	0.8473	0.3702	0.3565	0.9063	0.8498	0.3914	0.3807
			Hurricane	0.6351	0.5472	0.6388	0.5480	0.2986	0.2796	0.6356	0.5700	0.3627	0.3521	0.8143	0.7374	0.3023	0.2894	0.7503	0.6934	0.3326	0.3213
		Clip	None	0.6948	0.5291	0.5810	0.4712	0.3076	0.2856	0.5669	0.4799	0.3152	0.2996	0.5061	0.3929	0.2730	0.2534	0.4684	0.3843	0.2908	0.2735
			Hurricane	0.5468	0.3144	0.4157	0.2969	0.2179	0.1941	0.4333	0.3499	0.2435	0.2278	0.4313	0.3203	0.2231	0.2039	0.4118	0.3256	0.2422	0.2258
		Wrap	None	0.6472	0.4342	0.4357	0.2972	0.2633	0.2339	0.4043	0.2924	0.2571	0.2359	0.4019	0.2679	0.2353	0.2103	0.3790	0.2741	0.2669	0.2455
			Hurricane	0.5156	0.2670	0.3362	0.2040	0.1940	0.1670	0.3285	0.2252	0.1972	0.1785	0.3429	0.2153	0.1865	0.1636	0.3250	0.2274	0.2169	0.1968
	C	TN	None	0.8594	0.7292	0.9428	0.8583	0.4633	0.4470	0.9556	0.9005	0.5143	0.5051	0.9234	0.8478	0.3669	0.3535	0.9118	0.8548	0.3930	0.3828
			Hurricane	0.7010	0.5269	0.6456	0.5518	0.3018	0.2846	0.6285	0.5653	0.3603	0.3503	0.8171	0.7412	0.3038	0.2909	0.7520	0.6956	0.3325	0.3209
		Clip	None	0.6748	0.5165	0.5862	0.4753	0.3071	0.2846	0.5640	0.4798	0.3135	0.2983	0.5037	0.3924	0.2727	0.2530	0.4698	0.3829	0.2908	0.2742
			Hurricane	0.4343	0.3263	0.4247	0.3074	0.2181	0.1943	0.4325	0.3487	0.2434	0.2290	0.4343	0.3231	0.2220	0.2032	0.4097	0.3251	0.2415	0.2250
		Wrap	None	0.6173	0.4379	0.4311	0.2955	0.2581	0.2290	0.4043	0.2914	0.2567	0.2348	0.4000	0.2664	0.2341	0.2098	0.3769	0.2770	0.2664	0.2459
			Hurricane	0.4886	0.2446	0.3385	0.2043	0.1902	0.1617	0.3281	0.2253	0.1964	0.1773	0.3390	0.2123	0.1848	0.1619	0.3212	0.2261	0.2150	0.1959
FBC New (0-5 yr, all types)	A	TN	None	0.8005	0.7951	0.7999	0.7862	0.4604	0.4566	0.8651	0.8524	0.4840	0.4813	0.8263	0.8258	0.3588	0.3576	0.8185	0.8186	0.3643	0.3627
			Hurricane	0.7045	0.6362	0.5016	0.4942	0.3214	0.3186	0.5185	0.5125	0.3327	0.3302	0.7203	0.7199	0.2935	0.2924	0.6386	0.6382	0.3031	0.3026
		Clip	None	0.6381	0.6350	0.5141	0.5081	0.3594	0.3572	0.4739	0.4700	0.3386	0.3370	0.3983	0.3971	0.2878	0.2867	0.3833	0.3829	0.2928	0.2922
			Hurricane	0.5749	0.4770	0.3708	0.3661	0.2839	0.2812	0.3465	0.3439	0.2556	0.2550	0.3315	0.3294	0.2386	0.2371	0.3198	0.3183	0.2406	0.2397
		Wrap	None	0.5981	0.5978	0.4100	0.4062	0.3403	0.3381	0.3922	0.3906	0.3240	0.3228	0.3233	0.3215	0.2723	0.2709	0.3337	0.3321	0.2898	0.2881
			Hurricane	0.5750	0.4739	0.3313	0.3271	0.2715	0.2688	0.3012	0.2995	0.2482	0.2467	0.2684	0.2668	0.2245	0.2231	0.2736	0.2717	0.2328	0.2315
	B	TN	None	0.7242	0.7202	0.8496	0.8329	0.4257	0.4204	0.8903	0.8778	0.4805	0.4770	0.8352	0.8350	0.3378	0.3361	0.8303	0.8302	0.3517	0.3519
			Hurricane	0.5679	0.5092	0.5351	0.5261	0.2608	0.2558	0.5524	0.5447	0.3321	0.3286	0.7188	0.7187	0.2675	0.2666	0.6741	0.6738	0.2944	0.2938
		Clip	None	0.5034	0.5025	0.4542	0.4476	0.2636	0.2594	0.4593	0.4559	0.2759	0.2730	0.3763	0.3739	0.2346	0.2319	0.3612	0.3594	0.2455	0.2439
			Hurricane	0.4060	0.3130	0.2786	0.2709	0.1717	0.1668	0.3233	0.3204	0.2024	0.2004	0.3079	0.3057	0.1862	0.1837	0.2983	0.2977	0.1983	0.1965
		Wrap	None	0.4978	0.4134	0.2747	0.2681	0.2134	0.2068	0.2672	0.2650	0.2106	0.2068	0.2556	0.2516	0.1919	0.1874	0.2560	0.2528	0.2178	0.2144
			Hurricane	0.4032	0.2800	0.1826	0.1746	0.1466	0.1407	0.2019	0.1987	0.1530	0.1500	0.2022	0.1976	0.1460	0.1419	0.2048	0.2016	0.1691	0.1664
	C	TN	None	0.7189	0.7146	0.8463	0.8302	0.4284	0.4233	0.8886	0.8761	0.4821	0.4791	0.8321	0.8317	0.3335	0.3321	0.8312	0.8309	0.3546	0.3540
			Hurricane	0.5924	0.5334	0.5410	0.5318	0.2621	0.2577	0.5539	0.5471	0.3285	0.3260	0.7202	0.7201	0.2702	0.2698	0.6755	0.6747	0.2925	0.2915
		Clip	None	0.5036	0.5011	0.4624	0.4553	0.2633	0.2596	0.4588	0.4548	0.2720	0.2697	0.3730	0.3710	0.2347	0.2321	0.3623	0.3606	0.2449	0.2436
			Hurricane	0.3775	0.2888	0.2828	0.2773	0.1729	0.1676	0.3233	0.3204	0.2030	0.2009	0.3077	0.3052	0.1830	0.1805	0.2997	0.2995	0.1975	0.1953
		Wrap	None	0.4105	0.4095	0.2733	0.2667	0.2079	0.2021	0.2685	0.2656	0.2110	0.2068	0.2548	0.2489	0.1915	0.1871	0.2566	0.2515	0.2175	0.2147
			Hurricane	0.3356	0.2340	0.1833	0.1753	0.1418	0.1352	0.2023	0.1987	0.1513	0.1484	0.2025	0.1983	0.1440	0.1395	0.2056	0.2027	0.1683	0.1652

Table 5-9. MF Group I, Pre-FBC, Region 3, Terrain A Loss Relativities

Roof Cover Strength	Roof Deck	RWC	Opening Protection	Low Slope (<=6:12)										High Slope (> 6:12)					
				Flat		Other Roof Shape				Hip				Other Roof Shape				Hip	
				BUR		Shingles		Tiles		Shingles		Tiles		Shingles		Tiles		Shingles		Tiles	
				NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR
Non-FBC	A	TN	None	0.8845	0.6053	1.0000	1.0000	0.4497	0.4307	1.0000	1.0000	0.4872	0.4781	1.0000	1.0000	0.3321	0.3193	1.0000	1.0000	0.4451	0.4388
			Hurricane	0.8599	0.5759	1.0000	0.9384	0.3932	0.3751	1.0000	1.0000	0.4064	0.3976	1.0000	0.9916	0.3088	0.2962	1.0000	1.0000	0.4287	0.4213
		Clip	None	1.0000	0.8059	1.0000	0.9317	0.3979	0.3778	1.0000	1.0000	0.4090	0.3989	1.0000	0.6602	0.3013	0.2875	1.0000	0.9649	0.4134	0.4101
			Hurricane	0.8581	0.5386	1.0000	0.8602	0.3827	0.3644	1.0000	0.9252	0.3787	0.3701	1.0000	0.6392	0.2889	0.2755	1.0000	0.9474	0.3993	0.3914
		Wrap	None	0.8388	0.5294	1.0000	0.8685	0.3941	0.3742	1.0000	0.9580	0.4008	0.3948	1.0000	0.6313	0.2975	0.2833	1.0000	0.9328	0.4116	0.4037
			Hurricane	0.8164	0.5153	1.0000	0.8526	0.3802	0.3601	1.0000	0.9104	0.3746	0.3660	1.0000	0.6124	0.2828	0.2722	1.0000	0.9224	0.3989	0.3903
	B	TN	None	1.0000	0.8278	1.0000	1.0000	0.3822	0.3657	1.0000	1.0000	0.4752	0.4695	1.0000	1.0000	0.3120	0.3025	1.0000	1.0000	0.4418	0.4347
			Hurricane	0.8015	0.5302	1.0000	0.9424	0.3248	0.3092	1.0000	1.0000	0.3963	0.3900	1.0000	0.9642	0.2950	0.2858	1.0000	1.0000	0.4246	0.4220
		Clip	None	0.7655	0.4771	1.0000	0.8346	0.3173	0.3014	1.0000	0.9735	0.3683	0.3604	1.0000	0.6432	0.2774	0.2663	1.0000	0.9455	0.4041	0.3981
			Hurricane	0.7475	0.4552	1.0000	0.7723	0.2981	0.2820	1.0000	0.8968	0.3541	0.3455	1.0000	0.6262	0.2669	0.2552	1.0000	0.9343	0.3881	0.3828
		Wrap	None	0.7150	0.4477	1.0000	0.7562	0.3059	0.2880	1.0000	0.8690	0.3525	0.3430	1.0000	0.6086	0.2694	0.2562	1.0000	0.9220	0.3985	0.3929
			Hurricane	0.7106	0.4425	1.0000	0.7453	0.2974	0.2820	1.0000	0.8646	0.3386	0.3313	1.0000	0.5963	0.2562	0.2426	1.0000	0.9034	0.3847	0.3799
	C	TN	None	1.0000	0.8173	1.0000	1.0000	0.3854	0.3702	1.0000	1.0000	0.4837	0.4778	1.0000	1.0000	0.3130	0.3025	1.0000	1.0000	0.4489	0.4493
			Hurricane	0.8024	0.5351	1.0000	0.9520	0.3228	0.3079	1.0000	1.0000	0.4004	0.3938	1.0000	0.9642	0.2933	0.2822	1.0000	1.0000	0.4213	0.4164
		Clip	None	0.7269	0.4618	1.0000	0.8446	0.3170	0.3012	1.0000	0.9703	0.3695	0.3616	1.0000	0.6438	0.2797	0.2682	1.0000	0.9507	0.4034	0.3974
			Hurricane	0.7067	0.4411	1.0000	0.7680	0.2981	0.2800	1.0000	0.9135	0.3518	0.3427	1.0000	0.6285	0.2667	0.2541	1.0000	0.9392	0.3851	0.3784
		Wrap	None	0.7733	0.7045	1.0000	0.7557	0.3072	0.2896	1.0000	0.8741	0.3528	0.3430	1.0000	0.6015	0.2696	0.2581	1.0000	0.9201	0.4000	0.3925
			Hurricane	0.7709	0.7023	1.0000	0.7486	0.2925	0.2753	1.0000	0.8618	0.3408	0.3354	1.0000	0.5910	0.2577	0.2443	1.0000	0.9000	0.3858	0.3802
FBC Old (Shingle > 13 yr // Tile or Metal > 20 yr)	A	TN	None	0.8845	0.6053	1.0000	0.7631	0.4497	0.4307	0.9931	0.8406	0.4872	0.4781	1.0000	0.7779	0.3321	0.3193	0.9974	0.8265	0.4451	0.4388
			Hurricane	0.8599	0.5759	0.8790	0.6013	0.3932	0.3751	0.7845	0.6204	0.4064	0.3976	0.9596	0.7115	0.3088	0.2962	0.8612	0.6862	0.4287	0.4213
		Clip	None	1.0000	0.8059	0.8636	0.5805	0.3979	0.3778	0.7554	0.5648	0.4090	0.3989	0.6692	0.3847	0.3013	0.2875	0.6974	0.5037	0.4134	0.4101
			Hurricane	0.8581	0.5386	0.8250	0.5262	0.3827	0.3644	0.6939	0.5084	0.3787	0.3701	0.6432	0.3574	0.2889	0.2755	0.6705	0.4866	0.3993	0.3914
		Wrap	None	0.8388	0.5294	0.8294	0.5296	0.3941	0.3742	0.7233	0.5241	0.4008	0.3948	0.6466	0.3532	0.2975	0.2833	0.6743	0.4802	0.4116	0.4037
			Hurricane	0.8164	0.5153	0.8131	0.5137	0.3802	0.3601	0.6737	0.4948	0.3746	0.3660	0.6260	0.3325	0.2828	0.2722	0.6563	0.4694	0.3989	0.3903
	B	TN	None	1.0000	0.8278	1.0000	0.7653	0.3822	0.3657	0.9943	0.8545	0.4752	0.4695	0.9952	0.7570	0.3120	0.3025	0.9963	0.8369	0.4418	0.4347
			Hurricane	0.8015	0.5302	0.8513	0.6158	0.3248	0.3092	0.7876	0.6305	0.3963	0.3900	0.9378	0.6929	0.2950	0.2858	0.8847	0.7190	0.4246	0.4220
		Clip	None	0.7655	0.4771	0.7504	0.5037	0.3173	0.3014	0.7220	0.5541	0.3683	0.3604	0.6346	0.3631	0.2774	0.2663	0.6828	0.4978	0.4041	0.3981
			Hurricane	0.7475	0.4552	0.6910	0.4360	0.2981	0.2820	0.6579	0.4875	0.3541	0.3455	0.6130	0.3457	0.2669	0.2552	0.6664	0.4836	0.3881	0.3828
		Wrap	None	0.7150	0.4477	0.6919	0.4293	0.3059	0.2880	0.6422	0.4620	0.3525	0.3430	0.6067	0.3214	0.2694	0.2562	0.6511	0.4657	0.3985	0.3929
			Hurricane	0.7106	0.4425	0.6626	0.4032	0.2974	0.2820	0.6245	0.4484	0.3386	0.3313	0.5831	0.3107	0.2562	0.2426	0.6336	0.4444	0.3847	0.3799
	C	TN	None	1.0000	0.8173	1.0000	0.7665	0.3854	0.3702	1.0000	0.8495	0.4837	0.4778	1.0000	0.7595	0.3130	0.3025	1.0000	0.8392	0.4489	0.4493
			Hurricane	0.8024	0.5351	0.8482	0.6162	0.3228	0.3079	0.7848	0.6314	0.4004	0.3938	0.9422	0.6979	0.2933	0.2822	0.8757	0.7052	0.4213	0.4164
		Clip	None	0.7269	0.4618	0.7591	0.5010	0.3170	0.3012	0.7280	0.5551	0.3695	0.3616	0.6296	0.3614	0.2797	0.2682	0.6772	0.4989	0.4034	0.3974
			Hurricane	0.7067	0.4411	0.6856	0.4416	0.2981	0.2800	0.6620	0.4904	0.3518	0.3427	0.6229	0.3451	0.2667	0.2541	0.6567	0.4828	0.3851	0.3784
		Wrap	None	0.7733	0.7045	0.6845	0.4211	0.3072	0.2896	0.6368	0.4535	0.3528	0.3430	0.6130	0.3243	0.2696	0.2581	0.6537	0.4612	0.4000	0.3925
			Hurricane	0.7709	0.7023	0.6696	0.4077	0.2925	0.2753	0.6172	0.4396	0.3408	0.3354	0.5843	0.3107	0.2577	0.2443	0.6384	0.4459	0.3858	0.3802
FBC Mid Range (Shingle = 6-13 yr // Tile or Metal = 6-20 yr)	A	TN	None	0.7194	0.5616	0.8522	0.6988	0.3864	0.3760	0.8615	0.7766	0.4358	0.4301	0.8582	0.7429	0.2880	0.2817	0.8384	0.7776	0.3963	0.3925
			Hurricane	0.6951	0.5344	0.7017	0.5483	0.3301	0.3207	0.6396	0.5570	0.3545	0.3506	0.8010	0.6849	0.2661	0.2600	0.7235	0.6571	0.3771	0.3733
		Clip	None	1.0000	0.6314	0.6792	0.5249	0.3333	0.3225	0.6191	0.5200	0.3531	0.3481	0.4871	0.3497	0.2568	0.2491	0.5373	0.4642	0.3627	0.3601
			Hurricane	0.6815	0.4995	0.6298	0.4651	0.3160	0.3065	0.5532	0.4591	0.3241	0.3200	0.4622	0.3281	0.2430	0.2369	0.5272	0.4470	0.3483	0.3429
		Wrap	None	0.6604	0.4835	0.6334	0.4704	0.3281	0.3178	0.5727	0.4727	0.3451	0.3429	0.4576	0.3164	0.2520	0.2448	0.5201	0.4414	0.3597	0.3563
			Hurricane	0.6466	0.4745	0.6120	0.4532	0.3142	0.3033	0.5301	0.4370	0.3204	0.3162	0.4463	0.3042	0.2376	0.2327	0.5034	0.4250	0.3457	0.3416
	B	TN	None	0.7814	0.6349	0.8435	0.7171	0.3300	0.3198	0.8741	0.7977	0.4273	0.4236	0.8638	0.7521	0.2707	0.2663	0.8511	0.7884	0.3933	0.3901
			Hurricane	0.6303	0.4804	0.6852	0.5591	0.2689	0.2604	0.6551	0.5787	0.3487	0.3449	0.7897	0.6830	0.2545	0.2502	0.7463	0.6765	0.3735	0.3731
		Clip	None	0.5858	0.4240	0.5814	0.4510	0.2610	0.2522	0.5951	0.5062	0.3203	0.3163	0.4647	0.3342	0.2371	0.2311	0.5369	0.4597	0.3535	0.3502
			Hurricane	0.5713	0.4080	0.5157	0.3813	0.2420	0.2335	0.5263	0.4459	0.3033	0.2988	0.4429	0.3149	0.2242	0.2186	0.5127	0.4448	0.3381	0.3341
		Wrap	None	0.5539	0.4025	0.5122	0.3735	0.2501	0.2409	0.4992	0.4071	0.3021	0.2974	0.4257	0.2927	0.2273	0.2207	0.4996	0.4168	0.3487	0.3455
			Hurricane	0.5493	0.3997	0.4872	0.3514	0.2396	0.2315	0.4825	0.3903	0.2895	0.2853	0.4125	0.2789	0.2141	0.2072	0.4821	0.4030	0.3343	0.3317
	C	TN	None	0.7280	0.6360	0.8312	0.7091	0.3302	0.3213	0.8814	0.8031	0.4355	0.4307	0.8634	0.7488	0.2728	0.2677	0.8549	0.7955	0.3972	0.3981
			Hurricane	0.6406	0.4918	0.6872	0.5608	0.2691	0.2610	0.6598	0.5784	0.3514	0.3479	0.7792	0.6715	0.2538	0.2476	0.7407	0.6757	0.3724	0.3705
		Clip	None	0.5654	0.4166	0.5800	0.4517	0.2599	0.2522	0.5869	0.5021	0.3204	0.3168	0.4657	0.3348	0.2383	0.2321	0.5351	0.4556	0.3524	0.3507
			Hurricane	0.5496	0.4003	0.5195	0.3809	0.2415	0.2322	0.5327	0.4396	0.3009	0.2971	0.4458	0.3138	0.2248	0.2182	0.5142	0.4414	0.3375	0.3330
		Wrap	None	0.5815	0.5298	0.5081	0.3657	0.2499	0.2407	0.5106	0.4153	0.3023	0.2973	0.4215	0.2914	0.2274	0.2219	0.4966	0.4205	0.3485	0.3448
			Hurricane	0.5803	0.5287	0.4863	0.3483	0.2367	0.2278	0.4790	0.3948	0.2894	0.2875	0.4144	0.2795	0.2149	0.2082	0.4840	0.4045	0.3341	0.3317
FBC New (0-5 yr, all types)	A	TN	None	0.5544	0.5180	0.5876	0.5803	0.3231	0.3213	0.6964	0.6882	0.3843	0.3821	0.6671	0.6681	0.2439	0.2441	0.7019	0.7034	0.3474	0.3463
			Hurricane	0.5302	0.4929	0.4271	0.4242	0.2670	0.2664	0.4695	0.4645	0.3026	0.3036	0.6082	0.6070	0.2233	0.2238	0.5668	0.5701	0.3254	0.3254
		Clip	None	0.9336	0.4569	0.4034	0.4017	0.2688	0.2672	0.4216	0.4206	0.2973	0.2973	0.2870	0.2862	0.2122	0.2108	0.3780	0.3784	0.3119	0.3101
			Hurricane	0.5048	0.4605	0.3447	0.3429	0.2494	0.2487	0.3496	0.3481	0.2695	0.2698	0.2657	0.2623	0.1972	0.1982	0.3571	0.3556	0.2974	0.2944
		Wrap	None	0.4820	0.4376	0.3494	0.3472	0.2621	0.2614	0.3673	0.3660	0.2894	0.2909	0.2512	0.2502	0.2066	0.2064	0.3507	0.3522	0.3078	0.3090
			Hurricane	0.4767	0.4337	0.3295	0.3289	0.2483	0.2465	0.3326	0.3298	0.2663	0.2663	0.2388	0.2399	0.1923	0.1932	0.3351	0.3366	0.2925	0.2929
	B	TN	None	0.4429	0.4420	0.6026	0.5908	0.2777	0.2739	0.7005	0.6895	0.3793	0.3777	0.6857	0.6866	0.2294	0.2300	0.7131	0.7138	0.3448	0.3455
			Hurricane	0.4591	0.4306	0.4436	0.4367	0.2130	0.2117	0.4856	0.4803	0.3010	0.2998	0.6214	0.6195	0.2139	0.2145	0.5910	0.5888	0.3224	0.3243
		Clip	None	0.4060	0.3709	0.3311	0.3318	0.2047	0.2029	0.3989	0.3941	0.2723	0.2723	0.2686	0.2673	0.1967	0.1959	0.3757	0.3757	0.3030	0.3022
			Hurricane	0.3950	0.3608	0.2641	0.2599	0.1860	0.1851	0.3364	0.3358	0.2524	0.2521	0.2491	0.2499	0.1814	0.1821	0.3560	0.3537	0.2881	0.2854
		Wrap	None	0.3929	0.3573	0.2527	0.2514	0.1942	0.1938	0.3048	0.3064	0.2518	0.2518	0.2292	0.2284	0.1852	0.1852	0.3351	0.3351	0.2989	0.2981
			Hurricane	0.3880	0.3569	0.2358	0.2329	0.1817	0.1811	0.2872	0.2875	0.2405	0.2392	0.2158	0.2156	0.1720	0.1718	0.3194	0.3187	0.2840	0.2836
	C	TN	None	0.4561	0.4547	0.6026	0.5903	0.2751	0.2724	0.7075	0.6952	0.3872	0.3837	0.6784	0.6782	0.2326	0.2328	0.7213	0.7228	0.3455	0.3470
			Hurricane	0.4789	0.4486	0.4416	0.4342	0.2154	0.2141	0.4815	0.4774	0.3023	0.3020	0.6082	0.6074	0.2143	0.2131	0.5884	0.5888	0.3235	0.3246
		Clip	None	0.4038	0.3713	0.3329	0.3289	0.2027	0.2032	0.4061	0.4036	0.2714	0.2720	0.2684	0.2686	0.1969	0.1961	0.3765	0.3772	0.3015	0.3041
			Hurricane	0.3924	0.3595	0.2648	0.2650	0.1849	0.1844	0.3373	0.3386	0.2499	0.2515	0.2499	0.2485	0.1829	0.1823	0.3567	0.3552	0.2899	0.2877
		Wrap	None	0.3898	0.3551	0.2503	0.2516	0.1927	0.1918	0.3039	0.3026	0.2518	0.2515	0.2298	0.2282	0.1852	0.1856	0.3325	0.3332	0.2970	0.2970
			Hurricane	0.3898	0.3551	0.2313	0.2340	0.1808	0.1804	0.2894	0.2891	0.2379	0.2395	0.2139	0.2143	0.1720	0.1720	0.3201	0.3220	0.2825	0.2832

Table 5-10. MF Group I, Pre-FBC, Region 3, Terrain B Loss Relativities

Roof Cover Strength	Roof Deck	RWC	Opening Protection			Low Slope (<=6:12)								High Slope (> 6:12)									
				Flat		Other Roof Shape				Hip				Other Roof Shape				Hip					
				BUR		Shingles		Tiles		Shingles		Tiles		Shingles		Tiles		Shingles		Tiles			
				NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR
Non-FBC	A	TN	None	1.0000	0.9897	1.0000	1.0000	0.4438	0.4206	1.0000	1.0000	0.4596	0.4495	1.0000	0.9953	0.3275	0.3119	1.0000	1.0000	0.4095	0.4000
			Hurricane	1.0000	0.6657	1.0000	0.8091	0.3704	0.3496	1.0000	0.8668	0.3660	0.3553	1.0000	0.8997	0.2947	0.2794	1.0000	1.0000	0.3729	0.3637
		Clip	None	1.0000	0.8649	1.0000	0.8096	0.3847	0.3643	1.0000	0.8338	0.3692	0.3551	1.0000	0.5715	0.2877	0.2718	1.0000	0.8018	0.3706	0.3591
			Hurricane	0.9982	0.5628	1.0000	0.7210	0.3582	0.3338	1.0000	0.7522	0.3313	0.3191	1.0000	0.5420	0.2705	0.2523	1.0000	0.7750	0.3448	0.3346
		Wrap	None	1.0000	0.6086	1.0000	0.7359	0.3774	0.3532	1.0000	0.7829	0.3631	0.3519	1.0000	0.5333	0.2836	0.2660	1.0000	0.7778	0.3665	0.3545
			Hurricane	1.0000	0.5657	1.0000	0.7112	0.3527	0.3291	1.0000	0.7345	0.3244	0.3119	1.0000	0.5144	0.2618	0.2453	1.0000	0.7407	0.3433	0.3321
	B	TN	None	1.0000	0.6712	1.0000	1.0000	0.3806	0.3626	1.0000	1.0000	0.4493	0.4396	1.0000	0.9771	0.3037	0.2893	1.0000	1.0000	0.4046	0.3959
			Hurricane	0.9271	0.5752	1.0000	0.8161	0.2966	0.2759	1.0000	0.8957	0.3532	0.3422	1.0000	0.8923	0.2702	0.2573	1.0000	1.0000	0.3706	0.3622
		Clip	None	0.8557	0.4932	1.0000	0.7126	0.2954	0.2722	1.0000	0.8115	0.3227	0.3063	1.0000	0.5582	0.2594	0.2427	1.0000	0.7814	0.3530	0.3397
			Hurricane	0.8023	0.4398	1.0000	0.6127	0.2586	0.2375	1.0000	0.7347	0.2934	0.2800	1.0000	0.5193	0.2390	0.2211	1.0000	0.7663	0.3267	0.3180
		Wrap	None	0.8678	0.4793	1.0000	0.6121	0.2750	0.2519	1.0000	0.6851	0.3019	0.2894	1.0000	0.5047	0.2495	0.2312	1.0000	0.7407	0.3481	0.3387
			Hurricane	0.7986	0.4251	1.0000	0.5908	0.2553	0.2332	1.0000	0.6626	0.2770	0.2653	1.0000	0.4760	0.2249	0.2084	1.0000	0.7208	0.3236	0.3121
	C	TN	None	1.0000	0.6664	1.0000	1.0000	0.3809	0.3612	1.0000	1.0000	0.4512	0.4419	1.0000	0.9792	0.3004	0.2865	1.0000	1.0000	0.4023	0.3905
			Hurricane	0.9334	0.5738	1.0000	0.8142	0.2943	0.2759	1.0000	0.8948	0.3576	0.3471	1.0000	0.8980	0.2718	0.2589	1.0000	1.0000	0.3686	0.3594
		Clip	None	0.8532	0.4896	1.0000	0.7165	0.2909	0.2682	1.0000	0.8033	0.3246	0.3132	1.0000	0.5572	0.2573	0.2427	1.0000	0.7780	0.3504	0.3415
			Hurricane	0.8023	0.4339	1.0000	0.6272	0.2597	0.2389	1.0000	0.7169	0.2918	0.2800	1.0000	0.5208	0.2358	0.2205	1.0000	0.7655	0.3300	0.3170
		Wrap	None	0.8191	0.4511	1.0000	0.6035	0.2776	0.2523	1.0000	0.6950	0.3019	0.2890	1.0000	0.5007	0.2476	0.2297	1.0000	0.7448	0.3451	0.3338
			Hurricane	0.7924	0.4240	1.0000	0.5834	0.2520	0.2305	1.0000	0.6658	0.2785	0.2648	1.0000	0.4754	0.2243	0.2083	1.0000	0.7193	0.3236	0.3132
FBC Old (Shingle > 13 yr // Tile or Metal > 20 yr)	A	TN	None	1.0000	0.9897	1.0000	0.7633	0.4438	0.4206	0.9941	0.8422	0.4596	0.4495	1.0000	0.7863	0.3275	0.3119	0.9847	0.8054	0.4095	0.4000
			Hurricane	1.0000	0.6657	0.8357	0.5511	0.3704	0.3496	0.7299	0.5555	0.3660	0.3553	0.9211	0.6791	0.2947	0.2794	0.8240	0.6524	0.3729	0.3637
		Clip	None	1.0000	0.8649	0.8345	0.5499	0.3847	0.3643	0.7072	0.5103	0.3692	0.3551	0.6511	0.3597	0.2877	0.2718	0.6460	0.4473	0.3706	0.3591
			Hurricane	0.9982	0.5628	0.7651	0.4688	0.3582	0.3338	0.6231	0.4333	0.3313	0.3191	0.6143	0.3274	0.2705	0.2523	0.6212	0.4158	0.3448	0.3346
		Wrap	None	1.0000	0.6086	0.7815	0.4792	0.3774	0.3532	0.6662	0.4619	0.3631	0.3519	0.6253	0.3233	0.2836	0.2660	0.6212	0.4161	0.3665	0.3545
			Hurricane	1.0000	0.5657	0.7471	0.4521	0.3527	0.3291	0.6014	0.4106	0.3244	0.3119	0.5951	0.2997	0.2618	0.2453	0.5949	0.3880	0.3433	0.3321
	B	TN	None	1.0000	0.6712	1.0000	0.7812	0.3806	0.3626	0.9989	0.8591	0.4493	0.4396	1.0000	0.7671	0.3037	0.2893	0.9905	0.8291	0.4046	0.3959
			Hurricane	0.9271	0.5752	0.8017	0.5644	0.2966	0.2759	0.7356	0.5738	0.3532	0.3422	0.9203	0.6884	0.2702	0.2573	0.8485	0.6779	0.3706	0.3622
		Clip	None	0.8557	0.4932	0.7148	0.4572	0.2954	0.2722	0.6784	0.4895	0.3227	0.3063	0.6240	0.3373	0.2594	0.2427	0.6375	0.4358	0.3530	0.3397
			Hurricane	0.8023	0.4398	0.6325	0.3660	0.2586	0.2375	0.5913	0.4123	0.2934	0.2800	0.5734	0.3048	0.2390	0.2211	0.6013	0.4059	0.3267	0.3180
		Wrap	None	0.8678	0.4793	0.6368	0.3612	0.2750	0.2519	0.5728	0.3734	0.3019	0.2894	0.5826	0.2876	0.2495	0.2312	0.5895	0.3834	0.3481	0.3387
			Hurricane	0.7986	0.4251	0.5916	0.3271	0.2553	0.2332	0.5446	0.3502	0.2770	0.2653	0.5375	0.2587	0.2249	0.2084	0.5640	0.3658	0.3236	0.3121
	C	TN	None	1.0000	0.6664	1.0000	0.7789	0.3809	0.3612	1.0000	0.8586	0.4512	0.4419	1.0000	0.7621	0.3004	0.2865	1.0000	0.8332	0.4023	0.3905
			Hurricane	0.9334	0.5738	0.8023	0.5713	0.2943	0.2759	0.7358	0.5688	0.3576	0.3471	0.9047	0.6738	0.2718	0.2589	0.8498	0.6833	0.3686	0.3594
		Clip	None	0.8532	0.4896	0.7170	0.4622	0.2909	0.2682	0.6660	0.4907	0.3246	0.3132	0.6168	0.3344	0.2573	0.2427	0.6406	0.4378	0.3504	0.3415
			Hurricane	0.8023	0.4339	0.6300	0.3718	0.2597	0.2389	0.5852	0.4083	0.2918	0.2800	0.5762	0.3043	0.2358	0.2205	0.5972	0.4082	0.3300	0.3170
		Wrap	None	0.8191	0.4511	0.6357	0.3581	0.2776	0.2523	0.5717	0.3736	0.3019	0.2890	0.5662	0.2826	0.2476	0.2297	0.5944	0.3870	0.3451	0.3338
			Hurricane	0.7924	0.4240	0.5926	0.3254	0.2520	0.2305	0.5435	0.3437	0.2785	0.2648	0.5450	0.2597	0.2243	0.2083	0.5573	0.3637	0.3236	0.3132
FBC Mid Range (Shingle = 6-13 yr // Tile or Metal = 6-20 yr)	A	TN	None	1.0000	0.8477	0.8734	0.7191	0.3846	0.3716	0.8816	0.8042	0.4181	0.4119	0.8760	0.7569	0.2832	0.2750	0.8544	0.7852	0.3585	0.3545
			Hurricane	0.8537	0.6304	0.6714	0.5158	0.3103	0.2990	0.6134	0.5238	0.3182	0.3114	0.7754	0.6559	0.2519	0.2438	0.7052	0.6304	0.3250	0.3206
		Clip	None	0.9520	0.7149	0.6592	0.4969	0.3213	0.3105	0.5862	0.4813	0.3164	0.3094	0.4810	0.3377	0.2440	0.2357	0.4943	0.4077	0.3195	0.3129
			Hurricane	0.7627	0.5112	0.5899	0.4177	0.2936	0.2809	0.4975	0.3940	0.2792	0.2719	0.4469	0.3001	0.2241	0.2151	0.4598	0.3742	0.2923	0.2880
		Wrap	None	0.8274	0.5762	0.6033	0.4367	0.3130	0.3006	0.5297	0.4173	0.3074	0.3017	0.4518	0.2950	0.2397	0.2304	0.4715	0.3829	0.3153	0.3084
			Hurricane	0.7830	0.5276	0.5741	0.4024	0.2899	0.2779	0.4769	0.3732	0.2726	0.2664	0.4158	0.2696	0.2161	0.2086	0.4414	0.3543	0.2908	0.2863
	B	TN	None	0.8349	0.6448	0.8772	0.7489	0.3288	0.3186	0.8816	0.8069	0.4125	0.4062	0.8525	0.7391	0.2648	0.2570	0.8759	0.8074	0.3559	0.3504
			Hurricane	0.7343	0.5361	0.6476	0.5191	0.2449	0.2336	0.6212	0.5374	0.3093	0.3031	0.7643	0.6560	0.2324	0.2253	0.7075	0.6345	0.3215	0.3178
		Clip	None	0.6866	0.4749	0.5683	0.4197	0.2406	0.2282	0.5524	0.4525	0.2749	0.2664	0.4491	0.3158	0.2188	0.2104	0.4881	0.4043	0.3037	0.2974
			Hurricane	0.6207	0.4129	0.4730	0.3261	0.2065	0.1951	0.4645	0.3698	0.2455	0.2392	0.4103	0.2778	0.1970	0.1882	0.4506	0.3722	0.2778	0.2737
		Wrap	None	0.6719	0.4480	0.4719	0.3176	0.2221	0.2099	0.4436	0.3387	0.2541	0.2467	0.4005	0.2597	0.2068	0.1979	0.4393	0.3520	0.2978	0.2926
			Hurricane	0.6148	0.3982	0.4288	0.2829	0.2022	0.1909	0.4117	0.3115	0.2298	0.2234	0.3740	0.2350	0.1844	0.1759	0.4197	0.3323	0.2732	0.2676
	C	TN	None	0.8105	0.6245	0.8680	0.7432	0.3294	0.3185	0.8883	0.8096	0.4117	0.4053	0.8636	0.7454	0.2619	0.2546	0.8728	0.8038	0.3530	0.3471
			Hurricane	0.7246	0.5251	0.6529	0.5261	0.2429	0.2329	0.6184	0.5351	0.3132	0.3083	0.7649	0.6544	0.2323	0.2260	0.7190	0.6467	0.3207	0.3167
		Clip	None	0.6809	0.4696	0.5695	0.4205	0.2383	0.2257	0.5589	0.4584	0.2770	0.2711	0.4464	0.3148	0.2178	0.2097	0.4907	0.4049	0.3015	0.2974
			Hurricane	0.6210	0.4072	0.4714	0.3283	0.2061	0.1953	0.4645	0.3719	0.2457	0.2397	0.4135	0.2804	0.1951	0.1871	0.4542	0.3724	0.2794	0.2727
		Wrap	None	0.6466	0.4317	0.4739	0.3144	0.2224	0.2089	0.4451	0.3378	0.2535	0.2469	0.4055	0.2574	0.2065	0.1972	0.4406	0.3517	0.2967	0.2903
			Hurricane	0.5974	0.3863	0.4336	0.2815	0.1992	0.1885	0.4123	0.3124	0.2303	0.2236	0.3741	0.2333	0.1839	0.1756	0.4138	0.3280	0.2738	0.2682
FBC New (0-5 yr, all types)	A	TN	None	0.7561	0.7056	0.6397	0.6328	0.3254	0.3226	0.7204	0.7118	0.3765	0.3742	0.7136	0.7121	0.2389	0.2382	0.7101	0.7070	0.3075	0.3091
			Hurricane	0.6474	0.5950	0.4151	0.4101	0.2502	0.2485	0.4438	0.4405	0.2703	0.2676	0.6141	0.6145	0.2092	0.2081	0.5451	0.5469	0.2771	0.2774
		Clip	None	0.6368	0.5650	0.4035	0.4026	0.2579	0.2566	0.3963	0.3938	0.2636	0.2638	0.2841	0.2836	0.2003	0.1995	0.3418	0.3438	0.2685	0.2667
			Hurricane	0.5273	0.4595	0.3230	0.3212	0.2290	0.2279	0.3073	0.3082	0.2272	0.2247	0.2491	0.2489	0.1777	0.1778	0.3057	0.3027	0.2398	0.2414
		Wrap	None	0.6148	0.5438	0.3300	0.3308	0.2486	0.2481	0.3330	0.3317	0.2518	0.2516	0.2395	0.2390	0.1957	0.1947	0.3080	0.3078	0.2641	0.2623
			Hurricane	0.5654	0.4896	0.3034	0.3023	0.2271	0.2268	0.2842	0.2831	0.2209	0.2209	0.2141	0.2143	0.1704	0.1718	0.2794	0.2802	0.2383	0.2406
	B	TN	None	0.6606	0.6185	0.6550	0.6447	0.2769	0.2747	0.7478	0.7362	0.3757	0.3727	0.6939	0.6952	0.2259	0.2247	0.7349	0.7359	0.3073	0.3050
			Hurricane	0.5416	0.4969	0.4365	0.4293	0.1932	0.1913	0.4636	0.4609	0.2655	0.2640	0.5944	0.5945	0.1946	0.1933	0.5607	0.5609	0.2723	0.2733
		Clip	None	0.5174	0.4566	0.3305	0.3283	0.1858	0.1842	0.3805	0.3797	0.2272	0.2265	0.2650	0.2666	0.1781	0.1781	0.3305	0.3292	0.2544	0.2552
			Hurricane	0.4390	0.3859	0.2353	0.2310	0.1544	0.1527	0.2924	0.2892	0.1975	0.1984	0.2287	0.2288	0.1549	0.1552	0.3055	0.3055	0.2289	0.2294
		Wrap	None	0.4760	0.4167	0.2242	0.2233	0.1692	0.1679	0.2549	0.2543	0.2064	0.2040	0.2086	0.2075	0.1641	0.1647	0.2792	0.2807	0.2475	0.2465
			Hurricane	0.4310	0.3713	0.1919	0.1892	0.1492	0.1485	0.2289	0.2320	0.1826	0.1815	0.1860	0.1836	0.1439	0.1434	0.2595	0.2577	0.2227	0.2230
	C	TN	None	0.6210	0.5826	0.6499	0.6407	0.2779	0.2758	0.7499	0.7398	0.3721	0.3687	0.7084	0.7085	0.2234	0.2227	0.7344	0.7338	0.3037	0.3037
			Hurricane	0.5159	0.4764	0.4353	0.4291	0.1915	0.1899	0.4609	0.4567	0.2688	0.2695	0.6075	0.6081	0.1928	0.1931	0.5691	0.5676	0.2728	0.2741
		Clip	None	0.5086	0.4497	0.3283	0.3243	0.1858	0.1831	0.3778	0.3757	0.2295	0.2291	0.2621	0.2625	0.1783	0.1768	0.3321	0.3280	0.2526	0.2534
			Hurricane	0.4398	0.3804	0.2321	0.2322	0.1524	0.1518	0.2928	0.2909	0.1996	0.1994	0.2291	0.2297	0.1544	0.1536	0.3073	0.3063	0.2289	0.2284
		Wrap	None	0.4742	0.4123	0.2213	0.2193	0.1672	0.1655	0.2575	0.2575	0.2051	0.2049	0.2078	0.2074	0.1653	0.1647	0.2817	0.2838	0.2483	0.2467
			Hurricane	0.4024	0.3486	0.1922	0.1910	0.1464	0.1464	0.2299	0.2299	0.1822	0.1824	0.1850	0.1860	0.1434	0.1428	0.2593	0.2564	0.2240	0.2232

Table 5-11. MF Group I, Pre-FBC, Region 3, Terrain C Loss Relativities

Roof Cover Strength	Roof Deck	RWC	Opening Protection	Flat		Low Slope (<=6:12)								High Slope (> 6:12)							
				Flat		Other Roof Shape				Hip				Other Roof Shape				Hip			
				BUR		Shingles		Tiles		Shingles		Tiles		Shingles		Tiles		Shingles		Tiles	
				NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR
Non-FBC	A	TN	None	1.0000	0.9788	1.0000	0.9300	0.4581	0.4363	1.0000	1.0000	0.4675	0.4545	1.0000	0.9321	0.3541	0.3348	1.0000	1.0000	0.3811	0.3673
			Hurricane	1.0000	0.6398	1.0000	0.6227	0.3519	0.3253	1.0000	0.6838	0.3346	0.3213	1.0000	0.7985	0.2923	0.2716	1.0000	0.8230	0.3230	0.3075
		Clip	None	1.0000	0.6556	1.0000	0.6436	0.3783	0.3525	1.0000	0.6363	0.3445	0.3301	1.0000	0.4893	0.3043	0.2805	1.0000	0.5841	0.3333	0.3141
			Hurricane	0.9501	0.4846	1.0000	0.5301	0.3259	0.2992	1.0000	0.5250	0.2832	0.2668	1.0000	0.4247	0.2582	0.2336	1.0000	0.5152	0.2832	0.2653
		Wrap	None	1.0000	0.6169	1.0000	0.5561	0.3725	0.3451	1.0000	0.5714	0.3361	0.3228	1.0000	0.4354	0.2968	0.2746	1.0000	0.5504	0.3314	0.3130
			Hurricane	0.9499	0.4725	1.0000	0.4931	0.3243	0.2945	1.0000	0.4890	0.2768	0.2624	1.0000	0.3861	0.2511	0.2264	1.0000	0.4937	0.2789	0.2616
	B	TN	None	1.0000	0.6902	1.0000	0.9658	0.4043	0.3814	1.0000	1.0000	0.4462	0.4332	1.0000	0.9346	0.3251	0.3050	1.0000	1.0000	0.3646	0.3497
			Hurricane	0.7907	0.6589	1.0000	0.6478	0.2682	0.2443	1.0000	0.6977	0.3170	0.3046	1.0000	0.8037	0.2649	0.2464	1.0000	0.8494	0.3067	0.2913
		Clip	None	0.8950	0.5007	1.0000	0.5596	0.2763	0.2482	1.0000	0.6060	0.2816	0.2624	1.0000	0.4651	0.2566	0.2312	1.0000	0.5557	0.2951	0.2755
			Hurricane	0.7422	0.3220	0.9938	0.4146	0.2149	0.1858	1.0000	0.4919	0.2300	0.2100	1.0000	0.3965	0.2090	0.1843	1.0000	0.5017	0.2470	0.2281
		Wrap	None	0.8012	0.4099	1.0000	0.4141	0.2506	0.2162	1.0000	0.4367	0.2469	0.2251	1.0000	0.3715	0.2365	0.2080	1.0000	0.4894	0.2895	0.2688
			Hurricane	0.6901	0.2807	0.9610	0.3526	0.2012	0.1701	0.9524	0.3967	0.2017	0.1823	1.0000	0.3260	0.1881	0.1623	1.0000	0.4375	0.2400	0.2198
	C	TN	None	1.0000	0.6813	1.0000	0.9701	0.4018	0.3795	1.0000	1.0000	0.4554	0.4428	1.0000	0.9330	0.3234	0.3036	1.0000	1.0000	0.3652	0.3523
			Hurricane	0.8369	0.4963	1.0000	0.6507	0.2706	0.2490	1.0000	0.7022	0.3155	0.3037	1.0000	0.8072	0.2661	0.2469	1.0000	0.8523	0.3083	0.2924
		Clip	None	0.8446	0.4727	1.0000	0.5663	0.2756	0.2456	1.0000	0.6037	0.2831	0.2636	1.0000	0.4600	0.2556	0.2298	1.0000	0.5550	0.2973	0.2785
			Hurricane	0.6303	0.4669	1.0000	0.4198	0.2128	0.1835	1.0000	0.4906	0.2279	0.2112	1.0000	0.3990	0.2108	0.1871	1.0000	0.4984	0.2473	0.2285
		Wrap	None	0.8386	0.4233	1.0000	0.4111	0.2476	0.2124	1.0000	0.4429	0.2462	0.2231	1.0000	0.3671	0.2352	0.2084	1.0000	0.4887	0.2892	0.2703
			Hurricane	0.7139	0.2867	0.9541	0.3486	0.1987	0.1659	0.9436	0.3969	0.2022	0.1823	1.0000	0.3242	0.1880	0.1622	1.0000	0.4435	0.2376	0.2200
FBC Old (Shingle > 13 yr // Tile or Metal > 20 yr)	A	TN	None	1.0000	0.9788	1.0000	0.8014	0.4581	0.4363	1.0000	0.8790	0.4675	0.4545	1.0000	0.8095	0.3541	0.3348	0.9716	0.8131	0.3811	0.3673
			Hurricane	1.0000	0.6398	0.7278	0.4956	0.3519	0.3253	0.6552	0.5102	0.3346	0.3213	0.9070	0.6969	0.2923	0.2716	0.7871	0.6185	0.3230	0.3075
		Clip	None	1.0000	0.6556	0.7480	0.5076	0.3783	0.3525	0.6427	0.4711	0.3445	0.3301	0.6301	0.3639	0.3043	0.2805	0.5833	0.3771	0.3333	0.3141
			Hurricane	0.9501	0.4846	0.6390	0.3867	0.3259	0.2992	0.5250	0.3513	0.2832	0.2668	0.5598	0.2980	0.2582	0.2336	0.5190	0.3201	0.2832	0.2653
		Wrap	None	1.0000	0.6169	0.6814	0.4232	0.3725	0.3451	0.5808	0.5776	0.3361	0.3228	0.5881	0.3054	0.2968	0.2746	0.5546	0.3451	0.3314	0.3130
			Hurricane	0.9499	0.4725	0.6184	0.3605	0.3243	0.2945	0.4932	0.3160	0.2768	0.2624	0.5269	0.2555	0.2511	0.2264	0.4919	0.2893	0.2789	0.2616
	B	TN	None	1.0000	0.6902	1.0000	0.8305	0.4043	0.3814	1.0000	0.8836	0.4462	0.4332	1.0000	0.8044	0.3251	0.3050	0.9959	0.8456	0.3646	0.3497
			Hurricane	0.7907	0.6589	0.7042	0.5161	0.2682	0.2443	0.6603	0.5285	0.3170	0.3046	0.8739	0.6788	0.2649	0.2464	0.8048	0.6456	0.3067	0.2913
		Clip	None	0.8950	0.5007	0.6485	0.4331	0.2763	0.2482	0.6008	0.4384	0.2816	0.2624	0.5912	0.3420	0.2566	0.2312	0.5579	0.3552	0.2951	0.2755
			Hurricane	0.7422	0.3220	0.4996	0.2815	0.2149	0.1858	0.4790	0.3196	0.2300	0.2100	0.5206	0.2758	0.2090	0.1843	0.4897	0.3010	0.2470	0.2281
		Wrap	None	0.8012	0.4099	0.5267	0.2842	0.2506	0.2162	0.4684	0.2746	0.2469	0.2251	0.5263	0.2477	0.2365	0.2080	0.5042	0.2874	0.2895	0.2688
			Hurricane	0.6901	0.2807	0.4505	0.2227	0.2012	0.1701	0.4075	0.2303	0.2017	0.1823	0.4620	0.2005	0.1881	0.1623	0.4408	0.2363	0.2400	0.2198
	C	TN	None	1.0000	0.6813	1.0000	0.8281	0.4018	0.3795	1.0000	0.8830	0.4554	0.4428	1.0000	0.8035	0.3234	0.3036	1.0000	0.8508	0.3652	0.3523
			Hurricane	0.8369	0.4963	0.7080	0.5228	0.2706	0.2490	0.6678	0.5330	0.3155	0.3037	0.8719	0.6748	0.2661	0.2469	0.8061	0.6480	0.3083	0.2924
		Clip	None	0.8446	0.4727	0.6492	0.4340	0.2756	0.2456	0.5970	0.4376	0.2831	0.2636	0.5904	0.3424	0.2556	0.2298	0.5564	0.3573	0.2973	0.2785
			Hurricane	0.6303	0.4669	0.5088	0.2920	0.2128	0.1835	0.4808	0.3213	0.2279	0.2112	0.5241	0.2740	0.2108	0.1871	0.4926	0.3010	0.2473	0.2285
		Wrap	None	0.8386	0.4233	0.5277	0.2827	0.2476	0.2124	0.4719	0.2757	0.2462	0.2231	0.5271	0.2483	0.2352	0.2084	0.5016	0.2896	0.2892	0.2703
			Hurricane	0.7139	0.2867	0.4482	0.2222	0.1987	0.1659	0.4094	0.2313	0.2022	0.1823	0.4559	0.2005	0.1880	0.1622	0.4423	0.2380	0.2376	0.2200
FBC Mid Range (Shingle = 6-13 yr // Tile or Metal = 6-20 yr)	A	TN	None	1.0000	0.8484	0.9014	0.7750	0.4070	0.3947	0.9168	0.8456	0.4267	0.4190	0.8991	0.7931	0.3122	0.3021	0.8633	0.7909	0.3327	0.3251
			Hurricane	0.8531	0.6170	0.6102	0.4765	0.2960	0.2820	0.5657	0.4874	0.2928	0.2853	0.7807	0.6752	0.2509	0.2402	0.6649	0.5909	0.2746	0.2669
		Clip	None	0.8168	0.6037	0.6135	0.4752	0.3224	0.3088	0.5401	0.4441	0.2966	0.2888	0.4865	0.3497	0.2591	0.2469	0.4449	0.3552	0.2813	0.2718
			Hurricane	0.7415	0.4631	0.5074	0.3588	0.2686	0.2546	0.4193	0.3222	0.2336	0.2254	0.4226	0.2840	0.2134	0.2006	0.3857	0.2974	0.2309	0.2221
		Wrap	None	0.7915	0.5671	0.5370	0.3908	0.3126	0.2983	0.4776	0.3740	0.2868	0.2798	0.4315	0.2866	0.2495	0.2378	0.4233	0.3208	0.2802	0.2703
			Hurricane	0.7423	0.4571	0.4773	0.3271	0.2632	0.2477	0.3938	0.2895	0.2276	0.2201	0.3804	0.2361	0.2045	0.1917	0.3581	0.2633	0.2269	0.2176
	B	TN	None	0.8195	0.6546	0.9161	0.8110	0.3619	0.3484	0.9379	0.8709	0.4123	0.4044	0.8864	0.7911	0.2892	0.2786	0.8714	0.8028	0.3191	0.3121
			Hurricane	0.6481	0.5543	0.5955	0.4899	0.2255	0.2120	0.5823	0.5078	0.2825	0.2747	0.7696	0.6722	0.2268	0.2177	0.6931	0.6254	0.2623	0.2545
		Clip	None	0.6493	0.4516	0.5276	0.4052	0.2289	0.2138	0.5068	0.4124	0.2399	0.2292	0.4567	0.3245	0.2168	0.2036	0.4238	0.3353	0.2479	0.2379
			Hurricane	0.5548	0.3044	0.3890	0.2607	0.1662	0.1505	0.3866	0.3006	0.1862	0.1760	0.3852	0.2572	0.1706	0.1578	0.3719	0.2796	0.2004	0.1907
		Wrap	None	0.6067	0.3720	0.4042	0.2593	0.2002	0.1813	0.3648	0.2538	0.2013	0.1896	0.3757	0.2325	0.1940	0.1789	0.3676	0.2635	0.2395	0.2286
			Hurricane	0.5694	0.2962	0.3310	0.1956	0.1529	0.1361	0.3057	0.2059	0.1575	0.1474	0.3226	0.1852	0.1478	0.1343	0.3137	0.2175	0.1909	0.1805
	C	TN	None	0.8079	0.6461	0.9139	0.8090	0.3615	0.3482	0.9340	0.8679	0.4178	0.4102	0.8892	0.7918	0.2865	0.2761	0.8800	0.8101	0.3203	0.3140
			Hurricane	0.6850	0.4873	0.6039	0.4931	0.2260	0.2138	0.5745	0.5039	0.2790	0.2724	0.7729	0.6771	0.2284	0.2190	0.6944	0.6275	0.2626	0.2544
		Clip	None	0.6239	0.4368	0.5320	0.4041	0.2280	0.2122	0.5035	0.4112	0.2387	0.2282	0.4526	0.3233	0.2168	0.2033	0.4258	0.3334	0.2487	0.2396
			Hurricane	0.4831	0.3630	0.3956	0.2660	0.1647	0.1486	0.3870	0.2998	0.1855	0.1768	0.3893	0.2609	0.1704	0.1581	0.3686	0.2784	0.1998	0.1900
		Wrap	None	0.5816	0.3738	0.3977	0.2576	0.1965	0.1776	0.3650	0.2533	0.2016	0.1888	0.3762	0.2322	0.1936	0.1795	0.3646	0.2667	0.2392	0.2298
			Hurricane	0.5119	0.2572	0.3332	0.1940	0.1495	0.1316	0.3053	0.2047	0.1572	0.1469	0.3183	0.1824	0.1475	0.1338	0.3092	0.2162	0.1892	0.1801
FBC New (0-5 yr, all types)	A	TN	None	0.7242	0.7181	0.7308	0.7158	0.3559	0.3531	0.8188	0.8046	0.3859	0.3834	0.7532	0.7530	0.2704	0.2694	0.7579	0.7580	0.2843	0.2829
			Hurricane	0.6603	0.5942	0.4226	0.4166	0.2401	0.2387	0.4441	0.4390	0.2511	0.2493	0.6399	0.6398	0.2094	0.2089	0.5538	0.5539	0.2262	0.2263
		Clip	None	0.5562	0.5518	0.4225	0.4179	0.2664	0.2650	0.3856	0.3820	0.2487	0.2475	0.3113	0.3109	0.2138	0.2134	0.3088	0.3094	0.2293	0.2295
			Hurricane	0.5329	0.4415	0.3001	0.2975	0.2114	0.2100	0.2755	0.2744	0.1839	0.1841	0.2508	0.2494	0.1687	0.1676	0.2494	0.2492	0.1787	0.1789
		Wrap	None	0.5170	0.5173	0.3284	0.3257	0.2526	0.2514	0.3104	0.3096	0.2376	0.2368	0.2529	0.2519	0.2022	0.2011	0.2726	0.2719	0.2290	0.2275
			Hurricane	0.5347	0.4417	0.2687	0.2661	0.2022	0.2009	0.2360	0.2357	0.1785	0.1777	0.2002	0.1997	0.1578	0.1570	0.2159	0.2152	0.1749	0.1736
	B	TN	None	0.6236	0.6190	0.7740	0.7564	0.3194	0.3153	0.8336	0.8202	0.3785	0.3755	0.7667	0.7667	0.2534	0.2522	0.7655	0.7654	0.2736	0.2745
			Hurricane	0.5056	0.4498	0.4467	0.4398	0.1828	0.1797	0.4673	0.4595	0.2480	0.2448	0.6362	0.6369	0.1887	0.1890	0.5855	0.5851	0.2180	0.2178
		Clip	None	0.4036	0.4025	0.3568	0.3511	0.1814	0.1793	0.3670	0.3644	0.1982	0.1960	0.2902	0.2879	0.1771	0.1760	0.2882	0.2877	0.2007	0.2004
			Hurricane	0.3673	0.2868	0.2103	0.2048	0.1175	0.1152	0.2512	0.2502	0.1425	0.1419	0.2274	0.2256	0.1323	0.1313	0.2298	0.2302	0.1538	0.1533
		Wrap	None	0.4121	0.3341	0.2050	0.2013	0.1498	0.1464	0.2040	0.2035	0.1557	0.1542	0.2015	0.2008	0.1515	0.1499	0.2214	0.2209	0.1895	0.1884
			Hurricane	0.4488	0.3117	0.1404	0.1373	0.1046	0.1022	0.1563	0.1554	0.1134	0.1125	0.1523	0.1505	0.1076	0.1063	0.1709	0.1702	0.1418	0.1411
	C	TN	None	0.6159	0.6110	0.7675	0.7507	0.3212	0.3169	0.8342	0.8200	0.3803	0.3775	0.7626	0.7629	0.2496	0.2486	0.7664	0.7658	0.2755	0.2757
			Hurricane	0.5331	0.4783	0.4512	0.4430	0.1814	0.1785	0.4694	0.4632	0.2426	0.2410	0.6378	0.6383	0.1907	0.1912	0.5871	0.5860	0.2169	0.2164
		Clip	None	0.4032	0.4009	0.3633	0.3575	0.1804	0.1788	0.3666	0.3628	0.1943	0.1928	0.2876	0.2865	0.1780	0.1769	0.2901	0.2892	0.2001	0.2007
			Hurricane	0.3358	0.2590	0.2108	0.2076	0.1165	0.1137	0.2515	0.2496	0.1431	0.1423	0.2272	0.2251	0.1299	0.1290	0.2311	0.2322	0.1524	0.1514
		Wrap	None	0.3246	0.3243	0.2024	0.1990	0.1453	0.1429	0.2056	0.2035	0.1569	0.1545	0.2016	0.1976	0.1521	0.1506	0.2219	0.2187	0.1892	0.1893
			Hurricane	0.3099	0.2277	0.1388	0.1348	0.1004	0.0974	0.1569	0.1558	0.1121	0.1114	0.1532	0.1516	0.1071	0.1053	0.1714	0.1711	0.1409	0.1401

5.2.2. Group I Secondary Factors

Group I secondary factors incorporate those in Section 4.2.4 for single-family residences with the following exception:

- Reinforced concrete roof deck does not apply. Group I buildings must have wood roof decks. A group I building that has a reinforced concrete roof deck is treated as a Group II multi-family building.

Two additional secondary factors are considered for Group I buildings with a flat roof shape. These factors are parapets and rooftop equipment (RTE). Parapets of sufficient height can dramatically reduce the wind loads on a flat roof. Inadequately restrained RTE is highly vulnerable to wind damage. If the restraints for the RTE fail, total replacement (vs. repair) of the RTE is generally required. These two features are rare for Group I buildings with wooden roof decks, but we have analyzed both parapets and RTE for Group I buildings.

Parapets and Rooftop Equipment. The relativities presented in Section 5.2.1 are for the case of no parapet and no RTE. Parapets can have a significant effect on reducing the extent and magnitude of negative pressures on a flat roof. As discussed in Section 3.6.1 of the 2008 study, wind tunnel test data have been used to model this effect. The parapets must be at least 6 feet in height to achieve the full benefit of the pressure reduction. Rooftop equipment (RTE) is vulnerable to wind damage, which adds to the losses for a building. RTE failures can also result in holes in the flat roof cover, thereby producing another path for water to enter the building.

The secondary factors developed for parapets and RTE in the 2008 study are reproduced here in Table 5-12. Additional information on the development of these factors can be found in Section 5.2.1 of the 2008 study.

Table 5-12. Flat Roof Group I Parapet and RTE Secondary Factor Values

Parapet and RTE Cases		K_i Value	
Parapet	Inadequately- Restrained Rooftop Equipment	No SWR	SWR
No	No	1.00	1.00
No	Yes	1.04	1.04
Yes	No	0.86	0.93
Yes	Yes	0.90	0.97

5.2.3. FBC 2006 & Beyond Construction

We developed new designs for each FBC 2006 wind zone from 120 to 180 mph, including the HVHZ locations. We used a single point in each wind zone to perform the design calculations. The resulting loss relativities for Post-FBC 2006 Group I buildings were developed using the same normalizing values used for the weakest reasonable Pre-FBC Group I buildings. This preserves consistency between the loss relativities presented in this section with those presented in Sections 5.2.1 (Pre-FBC), and 5.2.4 (FBC 2001 & 2004).

The following tables present the MF Group I, FBC 2006 and beyond loss relativities by analysis terrain.

- Table 5-13. MF Group I, FBC06 and Beyond, Terrain A Loss Relativities
- Table 5-14. MF Group I, FBC06 and Beyond, Terrain B Loss Relativities
- Table 5-15. MF Group I, FBC06 and Beyond, Terrain C Loss Relativities

Table 5-13. MF Group I, FBC06 and Beyond, Terrain A Loss Relativities

Roof Cover	Region	Opening Protection	Flat		Low Roof Slope (≤5:12)								Other Roof Slope (≥6:12)							
					Gable				Hip				Gable				Hip			
			Built-Up		Shingle		Tile		Shingle		Tile		Shingle		Tile		Shingle		Tile	
			No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR
FBC Old (Shingle > 13 yr // Tile or Metal > 20 yr)	Region 3	None	0.8240	0.8174	0.7017	0.4644	0.3003	0.2842	0.6646	0.4998	0.3481	0.3395	0.8244	0.5816	0.2730	0.2621	0.8776	0.7149	0.4015	0.3955
		Hurricane	0.8025	0.5351	0.6805	0.4416	0.2914	0.2755	0.6352	0.4724	0.3361	0.3317	0.8083	0.5705	0.2655	0.2533	0.8608	0.6925	0.3933	0.3892
	Region 2	None	0.8389	0.5071	0.5783	0.3419	0.3182	0.2871	0.5410	0.3694	0.3432	0.3241	0.5526	0.3193	0.2597	0.2346	0.5669	0.4031	0.3464	0.3306
		Hurricane	0.7903	0.4526	0.5516	0.3163	0.3012	0.2690	0.5162	0.3458	0.3262	0.3047	0.5282	0.3038	0.2502	0.2266	0.5536	0.3852	0.3381	0.3215
	Region 1	Hurricane	0.7707	0.3819	0.4564	0.2412	0.3054	0.2484	0.4416	0.2706	0.3133	0.2757	0.4219	0.2273	0.2449	0.2046	0.4328	0.2747	0.3026	0.2712
FBC Mid Range (Shingle = 6-13 yr // Tile or Metal = 6-20 yr)	Region 3	None	0.6541	0.6374	0.5334	0.4075	0.2460	0.2372	0.5323	0.5323	0.2987	0.2939	0.6734	0.5594	0.2318	0.2261	0.7369	0.6776	0.3511	0.3479
		Hurricane	0.6260	0.4789	0.5186	0.3869	0.2354	0.2276	0.5096	0.4292	0.2867	0.2842	0.6520	0.5384	0.2240	0.2176	0.7205	0.6556	0.3422	0.3416
	Region 2	None	0.6727	0.4762	0.4505	0.3173	0.2644	0.2473	0.4359	0.3452	0.2942	0.2844	0.4156	0.3050	0.2194	0.2062	0.4523	0.4523	0.3027	0.2937
		Hurricane	0.6225	0.4205	0.4220	0.2892	0.2461	0.2287	0.4106	0.3176	0.2769	0.2656	0.4066	0.2910	0.2106	0.1981	0.4365	0.3651	0.2934	0.2840
	Region 1	Hurricane	0.6116	0.3605	0.3662	0.2308	0.2546	0.2220	0.3630	0.2612	0.2709	0.2506	0.3275	0.2213	0.2076	0.1852	0.3389	0.2655	0.2609	0.2441
FBC New (0-5 yr, all types)	Region 3	None	0.4842	0.4574	0.2911	0.2898	0.1918	0.1902	0.3503	0.3493	0.2493	0.2483	0.4854	0.4861	0.1907	0.1900	0.5974	0.5959	0.3007	0.3004
		Hurricane	0.4495	0.4227	0.2706	0.2697	0.1795	0.1797	0.3222	0.3228	0.2373	0.2367	0.4783	0.4777	0.1825	0.1819	0.5705	0.5705	0.2910	0.2940
	Region 2	None	0.5065	0.4453	0.2601	0.2576	0.2107	0.2075	0.2942	0.2937	0.2452	0.2447	0.2694	0.2681	0.1791	0.1778	0.3370	0.3360	0.2589	0.2568
		Hurricane	0.4546	0.3883	0.2342	0.2291	0.1910	0.1883	0.2648	0.2635	0.2276	0.2266	0.2596	0.2584	0.1709	0.1695	0.3178	0.3182	0.2487	0.2465
	Region 1	Hurricane	0.4524	0.3391	0.2210	0.2091	0.2038	0.1957	0.2425	0.2385	0.2285	0.2254	0.2120	0.2064	0.1703	0.1659	0.2504	0.2501	0.2191	0.2171

Table 5-14. MF Group I, FBC06 and Beyond, Terrain B Loss Relativities

Roof Cover	Region	Opening Protection	Flat		Low Roof Slope (≤5:12)								Other Roof Slope (≥6:12)							
					Gable				Hip				Gable				Hip			
			Built-Up		Shingle		Tile		Shingle		Tile		Shingle		Tile		Shingle		Tile	
			No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR
FBC Old (Shingle > 13 yr // Tile or Metal > 20 yr)	Region 3	None	0.9909	0.6604	0.6641	0.4155	0.2733	0.2546	0.6111	0.4424	0.2991	0.2920	0.8331	0.5888	0.2548	0.2384	0.8708	0.7057	0.3576	0.3520
		Hurricane	0.9249	0.5686	0.6240	0.3780	0.2471	0.2292	0.5642	0.3902	0.2718	0.2621	0.7843	0.5464	0.2384	0.2247	0.8194	0.6526	0.3344	0.3264
	Region 2	None	0.8157	0.4844	0.5473	0.3210	0.3055	0.2727	0.5111	0.3435	0.3172	0.2962	0.5409	0.3145	0.2501	0.2238	0.5420	0.3791	0.3216	0.3035
		Hurricane	0.7317	0.3879	0.5025	0.2688	0.2689	0.2321	0.4615	0.2876	0.2855	0.2627	0.5139	0.2906	0.2359	0.2091	0.5108	0.3481	0.3067	0.2868
	Region 1	Hurricane	0.6813	0.3227	0.4289	0.2187	0.2857	0.2259	0.4144	0.2443	0.2970	0.2576	0.4195	0.2263	0.2451	0.2016	0.4135	0.2620	0.2902	0.2562
FBC Mid Range (Shingle = 6-13 yr // Tile or Metal = 6-20 yr)	Region 3	None	0.8019	0.6161	0.6641	0.4155	0.2224	0.2125	0.6111	0.4424	0.2547	0.2514	0.8331	0.5888	0.2152	0.2070	0.8708	0.7057	0.3088	0.3061
		Hurricane	0.7228	0.5218	0.6240	0.3780	0.1950	0.1859	0.5642	0.3902	0.2256	0.2213	0.7843	0.5464	0.1994	0.1924	0.8194	0.6526	0.2853	0.2821
	Region 2	None	0.6552	0.4569	0.4366	0.3023	0.2566	0.2391	0.4207	0.3261	0.2745	0.2635	0.4185	0.3034	0.2130	0.1992	0.4370	0.3626	0.2816	0.2719
		Hurricane	0.5707	0.3636	0.3875	0.2485	0.2188	0.1981	0.3695	0.2709	0.2406	0.2285	0.3929	0.2781	0.1977	0.1835	0.4094	0.3344	0.2644	0.2542
	Region 1	Hurricane	0.5462	0.3111	0.3440	0.2110	0.2378	0.2035	0.3406	0.2377	0.2546	0.2328	0.3308	0.2214	0.2081	0.1837	0.3317	0.2562	0.2509	0.2323
FBC New (0-5 yr, all types)	Region 3	None	0.6128	0.5718	0.2824	0.2810	0.1714	0.1703	0.3244	0.3220	0.2103	0.2108	0.5066	0.5075	0.1756	0.1756	0.5770	0.5780	0.2600	0.2603
		Hurricane	0.5207	0.4750	0.2393	0.2376	0.1430	0.1427	0.2735	0.2735	0.1794	0.1805	0.4684	0.4677	0.1603	0.1600	0.5487	0.5502	0.2363	0.2378
	Region 2	None	0.4947	0.4294	0.2612	0.2575	0.2077	0.2055	0.2827	0.2818	0.2318	0.2308	0.2773	0.2760	0.1758	0.1746	0.3299	0.3284	0.2416	0.2403
		Hurricane	0.4097	0.3394	0.2070	0.2019	0.1686	0.1642	0.2304	0.2294	0.1958	0.1943	0.2543	0.2519	0.1596	0.1578	0.2962	0.2944	0.2220	0.2216
	Region 1	Hurricane	0.4111	0.2995	0.2024	0.1912	0.1900	0.1810	0.2246	0.2202	0.2122	0.2080	0.2166	0.2105	0.1710	0.1658	0.2435	0.2413	0.2116	0.2085

Table 5-15. MF Group I, FBC06 and Beyond, Terrain C Loss Relativities

Roof Cover	Region	Opening Protection	Flat		Low Roof Slope (≤5:12)								Other Roof Slope (≥6:12)							
					Gable				Hip				Gable				Hip			
			Built-Up		Shingle		Tile		Shingle		Tile		Shingle		Tile		Shingle		Tile	
			No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR
FBC Old (Shingle > 13 yr // Tile or Metal > 20 yr)	Region 3	None	1.0000	0.6711	0.4776	0.2714	0.2287	0.2056	0.4279	0.2740	0.2315	0.2170	0.4753	0.2369	0.1746	0.1518	0.4594	0.2790	0.2243	0.2095
		Hurricane	0.4536	0.4054	0.4082	0.1995	0.1783	0.1508	0.3635	0.1980	0.1798	0.1638	0.4580	0.2205	0.1626	0.1414	0.4343	0.2547	0.2092	0.1932
	Region 2	None	0.6641	0.2824	0.3654	0.1685	0.2044	0.1633	0.3383	0.1826	0.2108	0.1822	0.3826	0.1710	0.1831	0.1484	0.3633	0.1994	0.2229	0.1944
		Hurricane	0.6397	0.2529	0.3531	0.1544	0.1999	0.1560	0.3311	0.1730	0.2032	0.1756	0.3756	0.1620	0.1806	0.1445	0.3553	0.1909	0.2208	0.1921
	Region 1	Hurricane	0.5713	0.2397	0.3480	0.1691	0.2440	0.1760	0.3463	0.1944	0.2550	0.2084	0.3943	0.2192	0.2343	0.1818	0.3808	0.3806	0.2626	0.2200
	HVHZ	Hurricane	0.5713	0.2397	0.3480	0.1691	0.2440	0.1760	0.3463	0.1944	0.2550	0.2084	0.3943	0.2192	0.2343	0.1818	0.3808	0.3806	0.2626	0.2200
FBC Mid Range (Shingle = 6-13 yr // Tile or Metal = 6-20 yr)	Region 3	None	0.7334	0.5364	0.3642	0.2448	0.1834	0.1706	0.3365	0.2538	0.1901	0.1826	0.3383	0.2182	0.1365	0.1246	0.3349	0.2542	0.1788	0.1714
		Hurricane	0.3805	0.3190	0.2951	0.1718	0.1312	0.1163	0.2623	0.1758	0.1377	0.1293	0.3281	0.2051	0.1238	0.1126	0.3115	0.2322	0.1630	0.1543
	Region 2	None	0.5045	0.2629	0.2774	0.1574	0.1600	0.1366	0.2644	0.1716	0.1699	0.1542	0.2753	0.1611	0.1454	0.1263	0.2775	0.1932	0.1811	0.1661
		Hurricane	0.4802	0.2329	0.2670	0.1454	0.1536	0.1290	0.2557	0.1595	0.1627	0.1480	0.2685	0.1552	0.1422	0.1228	0.2685	0.1850	0.1780	0.1623
	Region 1	Hurricane	0.4594	0.2312	0.2858	0.1665	0.1989	0.1590	0.2878	0.1885	0.2147	0.1888	0.3176	0.2162	0.1969	0.1675	0.3069	0.2280	0.2233	0.2001
	HVHZ	Hurricane	0.4594	0.2312	0.2858	0.1665	0.1989	0.1590	0.2878	0.1885	0.2147	0.1888	0.3176	0.2162	0.1969	0.1675	0.3069	0.2280	0.2233	0.2001
FBC New (0-5 yr, all types)	Region 3	None	0.4668	0.4017	0.1923	0.1893	0.1380	0.1357	0.2032	0.2012	0.1487	0.1483	0.1855	0.1835	0.0985	0.0973	0.2085	0.2076	0.1334	0.1333
		Hurricane	0.3075	0.2327	0.1181	0.1146	0.0841	0.0818	0.1255	0.1251	0.0956	0.0948	0.1697	0.1688	0.0850	0.0837	0.1870	0.1857	0.1169	0.1154
	Region 2	None	0.3449	0.2434	0.1311	0.1242	0.1155	0.1099	0.1467	0.1440	0.1291	0.1261	0.1488	0.1436	0.1077	0.1042	0.1702	0.1687	0.1393	0.1378
		Hurricane	0.3207	0.2129	0.1183	0.1106	0.1073	0.1020	0.1366	0.1336	0.1222	0.1204	0.1405	0.1361	0.1038	0.1010	0.1636	0.1614	0.1351	0.1326
	Region 1	Hurricane	0.3475	0.2227	0.1639	0.1477	0.1538	0.1421	0.1853	0.1776	0.1745	0.1692	0.2166	0.2083	0.1596	0.1533	0.2229	0.2186	0.1841	0.1802
	HVHZ	Hurricane	0.3475	0.2227	0.1639	0.1477	0.1538	0.1421	0.1853	0.1776	0.1745	0.1692	0.2166	0.2083	0.1596	0.1533	0.2229	0.2186	0.1841	0.1802

5.2.4. FBC 2001-2004 Construction

We developed new designs for each FBC 2001 & 2004 wind zone from 100 to 150 mph, including the HVHZ locations. The resulting loss relativities for Post-FBC 2001 & 2004 Group I were developed using the same normalizing values used for the weakest reasonable Pre-FBC Group I buildings. This preserves consistency between the loss relativities presented in this section with those presented in Sections 5.2.1 (Pre-FBC), and 5.2.3 (FBC 2006 & beyond).

The following tables present the single-family, FBC 2001 & 2004 loss relativities by analysis terrain.

- Table 5-16. MF Group I, FBC 2001 & 2004, Terrain C Loss Relativities
- Table 5-17. MF Group I, FBC 2001 & 2004, Terrain B Loss Relativities
- Table 5-18. MF Group I, FBC 2001 & 2004, Terrain C Loss Relativities

Table 5-16. MF Group I, FBC 2001 & 2004, Terrain C Loss Relativities

Roof Cover	Region	Opening Protection	Flat		Low Roof Slope (≤5:12)								Other Roof Slope (≥6:12)							
					Gable				Hip				Gable				Hip			
			Built-Up		Shingle		Tile		Shingle		Tile		Shingle		Tile		Shingle		Tile	
			No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR
FBC Old (Shingle > 13 yr // Tile or Metal > 20 yr)	Region 3	None	0.8262	0.5720	0.7035	0.4599	0.3027	0.2880	0.6586	0.4964	0.3481	0.3436	0.8248	0.5814	0.2705	0.2602	0.8799	0.7172	0.4000	0.3940
		Hurricane	0.8016	0.5303	0.6834	0.4452	0.2923	0.2784	0.6358	0.4730	0.3339	0.3266	0.8131	0.5741	0.2657	0.2531	0.8616	0.7004	0.3925	0.3869
	Region 2	None	0.8740	0.5204	0.5772	0.3461	0.3212	0.2886	0.5378	0.3709	0.3394	0.3203	0.5460	0.3190	0.2597	0.2361	0.5625	0.4011	0.3474	0.3303
		Hurricane	0.8327	0.4673	0.5512	0.3181	0.3047	0.2706	0.5154	0.3423	0.3219	0.3016	0.5327	0.3040	0.2490	0.2266	0.5501	0.3856	0.3392	0.3213
	Region 1	None	0.5038	0.4019	0.4837	0.2737	0.3228	0.2690	0.4656	0.2986	0.3369	0.3017	0.4395	0.2414	0.2556	0.2144	0.4437	0.2891	0.3097	0.2787
		Hurricane	0.4524	0.3391	0.4564	0.2412	0.3054	0.2484	0.4416	0.2706	0.3133	0.2757	0.4219	0.2273	0.2449	0.2046	0.4328	0.2747	0.3026	0.2712
FBC Mid Range (Shingle = 6-13 yr // Tile or Metal = 6-20 yr)	Region 3	None	0.6547	0.5140	0.5459	0.4128	0.2469	0.2386	0.5263	0.4471	0.2979	0.2960	0.6604	0.5470	0.2297	0.2250	0.7381	0.6776	0.3500	0.3470
		Hurricane	0.6348	0.4849	0.5151	0.3905	0.2365	0.2293	0.5112	0.4292	0.2856	0.2820	0.6478	0.5370	0.2245	0.2181	0.7209	0.6586	0.3425	0.3412
	Region 2	None	0.6990	0.4880	0.4250	0.2916	0.2670	0.2494	0.4123	0.3182	0.2921	0.2826	0.4036	0.2921	0.2198	0.2068	0.4322	0.3629	0.3024	0.2937
		Hurricane	0.6539	0.4360	0.2611	0.2575	0.2496	0.2309	0.2918	0.2908	0.2745	0.2628	0.2726	0.2721	0.2103	0.1980	0.3343	0.3347	0.2935	0.2842
	Region 1	None	0.5038	0.4019	0.3945	0.2649	0.2731	0.2424	0.3873	0.2890	0.2905	0.2709	0.3412	0.2365	0.2168	0.1942	0.3536	0.2816	0.2683	0.2519
		Hurricane	0.4524	0.3391	0.3662	0.2308	0.2546	0.2220	0.3630	0.2612	0.2709	0.2506	0.3275	0.2213	0.2076	0.1852	0.3389	0.2655	0.2609	0.2441
FBC New (0-5 yr, all types)	Region 3	None	0.4833	0.4561	0.2911	0.2882	0.1911	0.1891	0.3500	0.3490	0.2477	0.2483	0.4907	0.4894	0.1890	0.1898	0.5974	0.5974	0.3000	0.3000
		Hurricane	0.4680	0.4394	0.2742	0.2737	0.1808	0.1802	0.3225	0.3228	0.2373	0.2373	0.4710	0.4714	0.1833	0.1831	0.5735	0.5739	0.2925	0.2955
	Region 2	None	0.5240	0.4557	0.2611	0.2575	0.2127	0.2103	0.2918	0.2908	0.2447	0.2450	0.2726	0.2721	0.1798	0.1774	0.3343	0.3347	0.2574	0.2572
		Hurricane	0.4751	0.4048	0.2351	0.2324	0.1945	0.1911	0.2636	0.2641	0.2271	0.2240	0.2590	0.2581	0.1715	0.1695	0.3204	0.3196	0.2477	0.2472
	Region 1	None	0.5038	0.4019	0.2522	0.2425	0.2233	0.2158	0.2691	0.2659	0.2441	0.2402	0.2260	0.2210	0.1781	0.1739	0.2649	0.2624	0.2269	0.2250
		Hurricane	0.4524	0.3391	0.2210	0.2091	0.2038	0.1957	0.2425	0.2385	0.2285	0.2254	0.2120	0.2064	0.1703	0.1659	0.2504	0.2501	0.2191	0.2171

Table 5-17. MF Group I, FBC 2001 & 2004, Terrain B Loss Relativities

Roof Cover	REGION	Opening Protection	Flat		Low Roof Slope (≤5:12)								Other Roof Slope (≥6:12)							
					Gable				Hip				Gable				Hip			
			Built-Up		Shingle		Tile		Shingle		Tile		Shingle		Tile		Shingle		Tile	
			No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR
FBC Old (Shingle > 13 yr // Tile or Metal > 20 yr)	Region 3	None	1.0000	0.6651	0.6617	0.4172	0.2764	0.2577	0.6163	0.4447	0.2997	0.2899	0.8099	0.5713	0.2539	0.2390	0.8646	0.6986	0.3558	0.3461
		Hurricane	0.9187	0.5700	0.6288	0.3735	0.2519	0.2327	0.5637	0.3904	0.2720	0.2617	0.7932	0.5547	0.2396	0.2249	0.8255	0.6554	0.3346	0.3280
	Region 2	None	0.8263	0.5930	0.5544	0.3289	0.3085	0.2747	0.5134	0.3427	0.3155	0.2954	0.5417	0.3173	0.2522	0.2257	0.5486	0.3816	0.3252	0.3066
		Hurricane	0.4289	0.3536	0.5046	0.2711	0.2746	0.2371	0.4625	0.2865	0.2826	0.2585	0.5148	0.2917	0.2350	0.2085	0.5165	0.3504	0.3069	0.2885
	Region 1	None	0.7467	0.4108	0.4735	0.2731	0.3164	0.2609	0.4545	0.2909	0.3201	0.2841	0.4463	0.2521	0.2582	0.2147	0.4412	0.2863	0.3045	0.2705
		Hurricane	0.6813	0.3227	0.4289	0.2187	0.2857	0.2259	0.4144	0.2443	0.2970	0.2576	0.4195	0.2263	0.2451	0.2016	0.4135	0.2620	0.2902	0.2562
FBC Mid Range (Shingle = 6-13 yr // Tile or Metal = 6-20 yr)	Region 3	None	0.7926	0.6049	0.5147	0.3785	0.2241	0.2148	0.4950	0.4127	0.2547	0.2498	0.6700	0.5557	0.2141	0.2065	0.7218	0.6511	0.3083	0.3040
		Hurricane	0.7094	0.5145	0.4693	0.3318	0.1986	0.1889	0.4464	0.3502	0.2262	0.2210	0.6433	0.5286	0.1997	0.1919	0.6983	0.6301	0.2868	0.2835
	Region 2	None	0.6619	0.5133	0.3886	0.2504	0.2588	0.2401	0.3666	0.2686	0.2732	0.2632	0.3897	0.2780	0.2138	0.2001	0.4108	0.3351	0.2812	0.2719
		Hurricane	0.4201	0.3478	0.2638	0.2599	0.2233	0.2028	0.2831	0.2801	0.2384	0.2255	0.2793	0.2767	0.1977	0.1834	0.3262	0.3249	0.2642	0.2540
	Region 1	None	0.6099	0.3954	0.3922	0.2668	0.2700	0.2388	0.3841	0.2867	0.2801	0.2600	0.3531	0.2472	0.2214	0.1973	0.3584	0.2807	0.2646	0.2465
		Hurricane	0.5462	0.3111	0.3440	0.2110	0.2378	0.2035	0.3406	0.2377	0.2546	0.2328	0.3308	0.2214	0.2081	0.1837	0.3317	0.2562	0.2509	0.2323
FBC New (0-5 yr, all types)	Region 3	None	0.5853	0.5446	0.2895	0.2874	0.1719	0.1719	0.3305	0.3286	0.2097	0.2097	0.5107	0.5106	0.1743	0.1740	0.5829	0.5829	0.2608	0.2618
		Hurricane	0.5000	0.4590	0.2395	0.2397	0.1453	0.1450	0.2730	0.2728	0.1805	0.1803	0.4730	0.4722	0.1597	0.1589	0.5530	0.5540	0.2391	0.2391
	Region 2	None	0.4975	0.4337	0.2638	0.2599	0.2092	0.2055	0.2831	0.2801	0.2310	0.2310	0.2793	0.2767	0.1754	0.1744	0.3262	0.3249	0.2372	0.2371
		Hurricane	0.4114	0.3420	0.2103	0.2060	0.1721	0.1685	0.2277	0.2267	0.1943	0.1924	0.2515	0.2501	0.1603	0.1584	0.2989	0.2983	0.2216	0.2196
	Region 1	None	0.4732	0.3800	0.2608	0.2500	0.2236	0.2167	0.2711	0.2677	0.2400	0.2359	0.2432	0.2368	0.1846	0.1800	0.2679	0.2648	0.2248	0.2225
		Hurricane	0.4111	0.2995	0.2024	0.1912	0.1900	0.1810	0.2246	0.2202	0.2122	0.2080	0.2166	0.2105	0.1710	0.1658	0.2435	0.2413	0.2116	0.2085

Table 5-18. MF Group I, FBC 2001 & 2004, Terrain C Loss Relativities

Roof Cover	REGION	Opening Protection	Flat		Low Roof Slope (≤5:12)								Other Roof Slope (≥6:12)							
					Gable				Hip				Gable				Hip			
			Built-Up		Shingle		Tile		Shingle		Tile		Shingle		Tile		Shingle		Tile	
			No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR	No SWR	SWR
FBC Old (Shingle > 13 yr // Tile or Metal > 20 yr)	Region 3	None	0.6908	0.3222	0.4214	0.2125	0.1882	0.1612	0.3702	0.2095	0.1852	0.1698	0.4649	0.2303	0.1666	0.1445	0.4448	0.2660	0.2104	0.1953
		Hurricane	0.6688	0.2936	0.4146	0.2010	0.1820	0.1563	0.3543	0.1964	0.1794	0.1629	0.4557	0.2168	0.1631	0.1401	0.4333	0.2541	0.2064	0.1915
	Region 2	None	0.6723	0.2888	0.3753	0.1752	0.2138	0.1695	0.3363	0.1783	0.2109	0.1802	0.3842	0.1698	0.1844	0.1485	0.3727	0.2021	0.2213	0.1935
		Hurricane	0.6518	0.2601	0.3638	0.1619	0.2087	0.1642	0.3291	0.1679	0.2036	0.1732	0.3745	0.1626	0.1807	0.1450	0.3646	0.1948	0.2188	0.1924
	Region 1	None	0.6080	0.2858	0.3681	0.1935	0.2565	0.1929	0.3615	0.2135	0.2677	0.2215	0.4047	0.2313	0.2386	0.1875	0.3829	0.2398	0.2664	0.2245
		Hurricane	0.5713	0.2397	0.3480	0.1691	0.2440	0.1760	0.3463	0.1944	0.2550	0.2084	0.3943	0.2192	0.2343	0.1818	0.3736	0.2299	0.2626	0.2200
	HVHZ	Hurricane	0.5713	0.2397	0.2810	0.1594	0.2440	0.1760	0.2775	0.1833	0.2550	0.2084	0.3231	0.2147	0.2343	0.1818	0.3043	0.2252	0.2626	0.2200
FBC Mid Range (Shingle = 6-13 yr // Tile or Metal = 6-20 yr)	Region 3	None	0.5686	0.3538	0.3137	0.1901	0.1408	0.1257	0.2784	0.1860	0.1435	0.1354	0.3294	0.2104	0.1277	0.1161	0.3242	0.2430	0.1645	0.1564
		Hurricane	0.4889	0.2649	0.3020	0.1803	0.1347	0.1206	0.2628	0.1733	0.1370	0.1280	0.3243	0.2034	0.1244	0.1121	0.3148	0.2307	0.1608	0.1535
	Region 2	None	0.5125	0.2699	0.2865	0.1632	0.1675	0.1425	0.2631	0.1674	0.1687	0.1522	0.2775	0.1615	0.1463	0.1268	0.2770	0.2770	0.1793	0.1640
		Hurricane	0.4913	0.2404	0.2767	0.1505	0.1615	0.1363	0.2550	0.1575	0.1621	0.1454	0.2700	0.1536	0.1428	0.1231	0.2671	0.1846	0.1759	0.1618
	Region 1	None	0.4961	0.2769	0.3053	0.1892	0.2133	0.1757	0.3042	0.2086	0.2277	0.2018	0.3269	0.2253	0.2018	0.1731	0.3181	0.2386	0.2282	0.2055
		Hurricane	0.4594	0.2312	0.2858	0.1665	0.1989	0.1590	0.2878	0.1885	0.2147	0.1888	0.3176	0.2162	0.1969	0.1675	0.3069	0.2280	0.2233	0.2001
	HVHZ	Hurricane	0.4594	0.2312	0.2311	0.1551	0.1845	0.1493	0.2349	0.1780	0.2023	0.1788	0.2696	0.2107	0.1877	0.1611	0.2598	0.2220	0.2135	0.1921
FBC New (0-5 yr, all types)	Region 3	None	0.4463	0.3853	0.1361	0.1337	0.0934	0.0901	0.1371	0.1361	0.1018	0.1009	0.1808	0.1792	0.0888	0.0878	0.1967	0.1952	0.1186	0.1174
		Hurricane	0.3090	0.2363	0.1207	0.1191	0.0874	0.0849	0.1251	0.1250	0.0945	0.0932	0.1741	0.1719	0.0857	0.0841	0.1855	0.1847	0.1153	0.1154
	Region 2	None	0.3528	0.2509	0.1432	0.1359	0.1211	0.1155	0.1440	0.1410	0.1266	0.1241	0.1498	0.1452	0.1081	0.1051	0.1706	0.1672	0.1373	0.1345
		Hurricane	0.3308	0.2207	0.1316	0.1225	0.1144	0.1085	0.1353	0.1311	0.1206	0.1176	0.1409	0.1367	0.1049	0.1013	0.1609	0.1593	0.1330	0.1311
	Region 1	None	0.3842	0.2680	0.1880	0.1734	0.1701	0.1586	0.2040	0.1971	0.1878	0.1821	0.2270	0.2183	0.1650	0.1586	0.2318	0.2278	0.1899	0.1865
		Hurricane	0.3475	0.2227	0.1639	0.1477	0.1538	0.1421	0.1853	0.1776	0.1745	0.1692	0.2166	0.2083	0.1596	0.1533	0.2229	0.2186	0.1841	0.1802
	HVHZ	Hurricane	0.3475	0.2227	0.1508	0.1461	0.1249	0.1226	0.1711	0.1691	0.1496	0.1492	0.2072	0.2051	0.1411	0.1404	0.2135	0.2130	0.1643	0.1642

5.3. Group II and III Buildings

Group II and III MF residential buildings are engineered structures with flat concrete or metal roof decks. The primary difference between the two group types is the overall height of the building. Group II buildings are 60 feet tall or less and Group III buildings are over 60 feet tall.

Group II and III structures differ from the largely prescriptive design requirement for single-family and Group I MF buildings. As such, their loss relativities are based on the following design code era: SBC 1976, SBC 1991, or FBC. This is the same approach that was used in the 2002 and 2008 studies.

The Group II and III loss relativity data for a 2% deductible (as a percentage of building replacement value) are given in the tables in the following subsections for Terrains, A, B and C. These relativity tables use ultimate 3-second gust design wind speeds ranging from less than 120 mph in north Florida to 180 mph in Monroe County. These ultimate wind speeds are used for design in FBC 2023 and have been used since the FBC 2010 edition. However, Group II and III buildings built to FBC editions earlier than 2010 (i.e., FBC 2001-2007) used 3-second gust Allowable Stress Design (ASD) wind speeds. Although, these ASD wind speeds result in similar wind loads to those of ultimate wind speeds because a load factor of 1.6 was applied, the allowable stress design wind speeds cannot be used directly with the relativities tables.

To use these tables, one must obtain the following information:

1. The exposure category: Terrain A, B, or C. Use the definitions given in Section A.1.1.1 of Appendix A. Note that the determination of the terrain type for the purposes of determining loss relativities for Group II buildings does not depend on whether the building is within the High Velocity Hurricane Zone (HVHZ).
2. The basic wind speed zone. Use the FBC 2024 Figure 1609 or simply the county if the building is located in Broward, Miami-Dade, or Monroe County.

The relativities tables for Group II and III building are provided for ultimate 3-second gust wind speeds ranging from less than 120 mph in north Florida to 180 mph in Monroe County. These ultimate wind speeds are used for design in FBC 2023 and have been used since the FBC 2010 edition. However, Group II and III buildings built to FBC editions earlier than 2010 (i.e., FBC 2001-2007) used 3-second gust Allowable Stress Design (ASD) wind speeds. Although, these ASD wind speeds result in similar wind loads to those of ultimate wind speeds because a load factor of 1.6 was applied, the allowable stress design wind speeds cannot be used directly with the relativities tables.

To use these tables, one must obtain the following information:

1. ***The exposure category:*** Terrain B or Terrain C. Use the definitions given in Section A.1.1.1 of Appendix A. Note that the determination of the terrain type for the purposes of determining loss relativities for Group II and III buildings does not depend on whether the building is within the High Velocity Hurricane Zone (HVHZ).
2. ***The basic wind speed zone:*** Use the 2023 revision to FBC 2004 Figure 1609 or simply the county if the building is located in Broward, Miami-Dade, or Monroe County.

Alternatively, if the original design windspeed of a pre-2010 FBC Group II or III building is known (i.e., an ASD wind speed), then Table 5-19 can be used to determine the equivalent ultimate design wind speed.

3. ***The design code era:*** SBC 1976, SBC 1991, or FBC. The FBC 2001 and 2004 allowed for buildings located in the Wind-Borne Debris Region (WBDR) to be designed as "Partially Enclosed" in lieu of designing as "Enclosed" and providing opening protection. As such, this design option is listed within the tables for applicable (ultimate) design wind speed corresponding to the WBDR. Note that the Partially Enclosed design option was removed from the FBC effective July 1, 2007.

Table 5-19. Mapping ASD Wind Speeds to Ultimate Design Wind Speeds

3-Second Gust Wind Speeds	
Allowable Stress Design (FBC 2001, 2004, 2007)	**Ultimate Design (FBC 2010 - present)**
<=100	121 – 130
101 – 108	131 – 140
109 – 116	141 – 150
117 – 124	151 – 160
125 – 132	161 – 170
>=133	171 - 180
140 (HVHZ – Broward)	161 – 170 (incl. HVHZ Broward)
146 (HVHZ – Miami Dade)	175 VHZ – Miami Dade)

The Group II and III loss relativities are normalized by the weakest building within each design wind speed range as discussed in detail in Section 2.3.1.2. The weakest building in each category was designed with the SBC 1976, has a non-FBC roof cover with no SWR, no window protection and the sliding glass door leakiness model turned on. By default, the loss relativities that include sliding glass door leakiness should be used. Only buildings that either (1) do not have any sliding glass doors, or (2) can be shown to effectively prevent water from entering through the tracks of the sliding glass doors are eligible to use the relativities with no sliding glass door leakiness. The second option would be difficult to justify given the current lack of available sliding glass door products that prevent water intrusion through the tracks and the lack of industry standards for determining water pressure resistance on par with the wind pressure design for the buildings.

5.3.1. Group II Loss Relativities Tables

The Group II loss relativity data for a 2% deductible (as a percentage of building replacement value) are given in Table 5-20, Table 5-21, and Table 5-22 for Terrains, A, B and C, respectively.

There are a few small reversals between the FBC Partially Enclosed (no shutters) and Fully Enclosed (with shutters) buildings in Group II buildings in Terrains A and B. This is caused by the roof decks of buildings without shutters being designed for higher wind loads than the buildings with shutters. The net result of which, when coupled with the hazard curves and terrain adjustments, is occasional loss relativities being higher for buildings with shutters. This indicates that, from an expected loss perspective, that designing the structures as partially enclosed without shutters is similarly beneficial to designing as fully enclosed with shutters.

Table 5-20. MF Group II Terrain A Loss Relativities

FBC 2023 Windspeed, Ultimate (mph)	Building Code	Design Option	Opening Protection	Water Leakage through Sliding Glass Doors						No Water Leakage through Sliding Glass Doors					
				Metal Roof Deck				Concrete		Metal Roof Deck				Concrete	
				Non-FBC Roof Cover		FBC Roof Cover		Non-FBC Roof	FBC Roof Cover	Non-FBC Roof Cover		FBC Roof Cover		Non-FBC Roof	FBC Roof Cover
				No SWR	SWR	No SWR	SWR			No SWR	SWR	No SWR	SWR		
<= 120	SBC 1976		None	1.0000	0.2654	0.1858	0.1780	0.2259	0.1439	0.3372	0.2222	0.1689	0.1615	0.1843	0.1326
	(Pre-1983)		Hurricane	0.9687	0.2213	0.1313	0.1261	0.2102	0.1209	0.2564	0.1529	0.1057	0.1001	0.1807	0.0908
	SBC 1991		None	0.9649	0.2129	0.1279	0.1231	0.1796	0.1278	0.2449	0.1452	0.0968	0.0918	0.1429	0.0886
	(1983-2001)		Hurricane	0.9643	0.2116	0.1205	0.1160	0.1746	0.1209	0.2397	0.1400	0.0939	0.0885	0.1370	0.0857
	FBC		None	0.2789	0.1810	0.1339	0.1264	0.1945	0.1003	0.2716	0.1724	0.1318	0.1234	0.1452	0.0915
	(2002-present)	Enclosed	Hurricane	0.2652	0.1663	0.1170	0.1111	0.1926	0.0972	0.2605	0.1579	0.1072	0.1020	0.1394	0.0855
121 - 130	SBC 1976		None	1.0000	0.3528	0.3178	0.3042	0.3226	0.2674	0.4650	0.3029	0.2686	0.2548	0.2450	0.1951
	(Pre-1983)		Hurricane	0.9660	0.2989	0.2332	0.2192	0.2695	0.1967	0.3710	0.2179	0.1871	0.1710	0.1928	0.1439
	SBC 1991		None	0.9628	0.2892	0.2286	0.2150	0.2540	0.2050	0.3777	0.2252	0.1901	0.1756	0.2023	0.1523
	(1983-2001)		Hurricane	0.9543	0.2773	0.2108	0.1972	0.2475	0.1966	0.3573	0.2037	0.1719	0.1566	0.1886	0.1419
	FBC		None	0.9752	0.3135	0.2548	0.2389	0.2374	0.1875	0.4232	0.2709	0.2362	0.2197	0.2001	0.1542
	(2002-present)	Enclosed	Hurricane	0.4174	0.2654	0.2311	0.2166	0.2319	0.1825	0.3810	0.2307	0.1940	0.1797	0.1882	0.1423
131 - 140	SBC 1976		None	1.0000	0.3949	0.4129	0.3227	0.4312	0.3607	0.4144	0.2487	0.2141	0.2005	0.2219	0.1718
	(Pre-1983)		Hurricane	0.9427	0.3457	0.3927	0.2772	0.3650	0.3250	0.3699	0.2085	0.1755	0.1602	0.1923	0.1431
	SBC 1991		None	0.9235	0.2829	0.2253	0.2129	0.2540	0.2059	0.3752	0.2208	0.1858	0.1724	0.2012	0.1523
	(1983-2001)		Hurricane	0.9164	0.2727	0.2095	0.1969	0.2472	0.1975	0.3569	0.2016	0.1700	0.1558	0.1876	0.1424
	FBC	Partially-Encl.	None	0.9696	0.3291	0.2754	0.2622	0.3423	0.2744	0.3653	0.2096	0.1740	0.1600	0.1986	0.1488
	(2002-present)	Enclosed	Hurricane	0.4260	0.2674	0.2299	0.2172	0.2563	0.2083	0.3695	0.2138	0.1796	0.1660	0.1877	0.1419
141 - 150	SBC 1976		None	1.0000	0.4826	0.5474	0.4234	0.5031	0.4489	0.5431	0.3424	0.3268	0.3033	0.2863	0.2454
	(Pre-1983)		Hurricane	0.9392	0.4265	0.5125	0.3697	0.4470	0.4150	0.4627	0.2636	0.2524	0.2245	0.2286	0.1881
	SBC 1991		None	0.9158	0.3537	0.3211	0.2982	0.3071	0.2669	0.4840	0.2963	0.2818	0.2572	0.2482	0.2083
	(1983-2001)		Hurricane	0.8967	0.3272	0.2904	0.2664	0.2953	0.2536	0.4451	0.2544	0.2444	0.2180	0.2222	0.1863
	FBC	Partially-Encl.	None	0.5904	0.3938	0.3921	0.3679	0.4179	0.3706	0.4662	0.2667	0.2533	0.2277	0.2561	0.1991
	(2002-present)	Enclosed	Hurricane	0.5453	0.3502	0.3582	0.3340	0.3676	0.3330	0.4489	0.2605	0.2471	0.2206	0.2267	0.1865
151 - 160	SBC 1976		None	1.0000	0.5166	0.5975	0.4624	0.5286	0.4806	0.5907	0.3796	0.3710	0.3442	0.3113	0.2742
	(Pre-1983)		Hurricane	0.9370	0.4566	0.5555	0.4042	0.4747	0.4459	0.4967	0.2856	0.2828	0.2502	0.2416	0.2047
	SBC 1991		None	0.9143	0.3830	0.3593	0.3328	0.3273	0.2904	0.5249	0.3272	0.3202	0.2919	0.2667	0.2305
	(1983-2001)		Hurricane	0.8891	0.3485	0.3217	0.2933	0.3117	0.2733	0.4775	0.2755	0.2739	0.2429	0.2344	0.2021
	FBC	Partially-Encl.	None	0.6760	0.4636	0.5615	0.4224	0.5080	0.4654	0.4976	0.2837	0.2777	0.2461	0.2545	0.2186
	(2002-present)	Enclosed	Hurricane	0.6510	0.4400	0.5546	0.3963	0.4744	0.4458	0.4853	0.2767	0.2709	0.2391	0.2379	0.2014
161 - 170	SBC 1976		None	1.0000	0.5534	0.5808	0.5197	0.5801	0.5643	0.6163	0.3756	0.3774	0.3402	0.3227	0.2875
	(Pre-1983)		Hurricane	0.7353	0.4982	0.5085	0.4753	0.5408	0.5294	0.5425	0.3071	0.3125	0.2728	0.2622	0.2306
	SBC 1991		None	0.6971	0.4649	0.4504	0.4150	0.4725	0.4176	0.5726	0.3398	0.3418	0.3045	0.2995	0.2521
	(1983-2001)		Hurricane	0.6674	0.4320	0.4137	0.3770	0.4301	0.3978	0.5192	0.2911	0.2953	0.2564	0.2628	0.2267
	FBC	Partially-Encl.	None	0.7626	0.5244	0.5663	0.4975	0.5659	0.5577	0.5412	0.3063	0.3110	0.2705	0.2816	0.2470
	(2002-present)	Enclosed	Hurricane	0.7349	0.4977	0.5084	0.4751	0.5329	0.5294	0.5337	0.3003	0.3044	0.2639	0.2582	0.2272
171 - 180	SBC 1976		None	1.0000	0.7157	0.8636	0.6544	0.7852	0.7355	0.7517	0.4533	0.4553	0.4021	0.3922	0.3488
	(Pre-1983)		Hurricane	0.9496	0.6627	0.8185	0.5981	0.7317	0.6947	0.6718	0.3774	0.3944	0.3336	0.3277	0.2836
	SBC 1991		None	0.8679	0.5868	0.5743	0.5268	0.5840	0.5151	0.7221	0.4402	0.4474	0.3975	0.3781	0.3186
	(1983-2001)		Hurricane	0.8244	0.5376	0.5211	0.4709	0.5251	0.4858	0.6483	0.3694	0.3809	0.3276	0.3162	0.2795
	FBC	Partially-Encl.	None	0.9803	0.6912	0.8525	0.6290	0.7669	0.7283	0.6854	0.3914	0.4052	0.3481	0.3523	0.3091
	(2002-present)	Enclosed	Hurricane	0.9493	0.6623	0.8185	0.5980	0.7316	0.6947	0.6518	0.3651	0.3789	0.3235	0.3236	0.2801

Table 5-21. MF Group II Terrain B Loss Relativities

FBC 2023 Windspeed, Ultimate (mph)	Building Code	Design Option	Opening Protection	Water Leakage through Sliding Glass Doors						No Water Leakage through Sliding Glass Doors					
				Metal Roof Deck				Concrete		Metal Roof Deck				Concrete	
				Non-FBC Roof Cover		FBC Roof Cover		Non-FBC Roof Cover	FBC Roof Cover	Non-FBC Roof Cover		FBC Roof Cover		Non-FBC Roof Cover	FBC Roof Cover
				No SWR	SWR	No SWR	SWR			No SWR	SWR	No SWR	SWR		
<= 120	SBC 1976		None	1.0000	0.2808	0.2512	0.2029	0.2369	0.1596	0.3847	0.2508	0.2015	0.1930	0.2051	0.1585
	(Pre-1983)		Hurricane	0.2948	0.1800	0.1406	0.1332	0.2074	0.1250	0.2801	0.1626	0.1211	0.1145	0.1422	0.0970
	SBC 1991		None	0.9497	0.2076	0.1355	0.1290	0.1767	0.1283	0.2733	0.1550	0.1152	0.1075	0.1479	0.1056
	(1983-2001)		Hurricane	0.2838	0.1670	0.1255	0.1191	0.1749	0.1250	0.2597	0.1429	0.1028	0.0966	0.1424	0.0988
	FBC	Enclosed	None	0.3267	0.2082	0.2491	0.1620	0.1929	0.1134	0.3251	0.2054	0.1699	0.1590	0.1545	0.1077
	(2002-present)		Hurricane	0.2836	0.1694	0.1312	0.1235	0.1865	0.1060	0.2764	0.1623	0.1229	0.1159	0.1388	0.0983
121 - 130	SBC 1976		None	1.0000	0.3630	0.3183	0.3033	0.3046	0.2544	0.5188	0.3367	0.3105	0.2946	0.2733	0.2351
	(Pre-1983)		Hurricane	0.9518	0.2916	0.2439	0.2278	0.2646	0.1994	0.4043	0.2305	0.2075	0.1918	0.2234	0.1569
	SBC 1991		None	0.9476	0.2929	0.2483	0.2328	0.2536	0.2093	0.4196	0.2491	0.2248	0.2071	0.2157	0.1791
	(1983-2001)		Hurricane	0.4162	0.2448	0.2190	0.2026	0.2447	0.1984	0.3820	0.2112	0.1869	0.1708	0.1958	0.1582
	FBC	Enclosed	None	0.9948	0.3363	0.2890	0.2695	0.2348	0.1939	0.4646	0.3007	0.2861	0.2667	0.2204	0.1821
	(2002-present)		Hurricane	0.9517	0.2901	0.2386	0.2220	0.2185	0.1779	0.4108	0.2412	0.2172	0.2001	0.1912	0.1575
131 - 140	SBC 1976		None	1.0000	0.3809	0.3824	0.3237	0.3787	0.3354	0.4793	0.2862	0.2624	0.2459	0.2540	0.2115
	(Pre-1983)		Hurricane	0.5062	0.3229	0.3010	0.2871	0.3594	0.3034	0.4128	0.2262	0.2038	0.1857	0.2061	0.1641
	SBC 1991		None	0.9340	0.2952	0.2534	0.2383	0.2627	0.2188	0.4314	0.2528	0.2288	0.2114	0.2228	0.1871
	(1983-2001)		Hurricane	0.4315	0.2523	0.2269	0.2110	0.2546	0.2089	0.3955	0.2173	0.1931	0.1776	0.2037	0.1670
	FBC	Partially-Encl.	None	0.4707	0.2913	0.2631	0.2483	0.2992	0.2615	0.4135	0.2360	0.2176	0.2029	0.2388	0.1759
	(2002-present)	Enclosed	Hurricane	0.4543	0.2750	0.2530	0.2383	0.2838	0.2269	0.4116	0.2332	0.2139	0.1978	0.1993	0.1620
141 - 150	SBC 1976		None	1.0000	0.4715	0.4914	0.4285	0.4460	0.4128	0.6103	0.3883	0.3822	0.3565	0.3250	0.2908
	(Pre-1983)		Hurricane	0.6098	0.3986	0.3957	0.3712	0.4104	0.3679	0.4983	0.2805	0.2785	0.2485	0.2390	0.2056
	SBC 1991		None	0.9301	0.3751	0.3584	0.3333	0.3146	0.2782	0.5449	0.3398	0.3351	0.3068	0.2729	0.2451
	(1983-2001)		Hurricane	0.5195	0.3101	0.3046	0.2768	0.2940	0.2554	0.4786	0.2700	0.2665	0.2388	0.2338	0.2051
	FBC	Partially-Encl.	None	0.9413	0.3948	0.3775	0.3522	0.3570	0.3386	0.5153	0.2985	0.2863	0.2589	0.2725	0.2254
	(2002-present)	Enclosed	Hurricane	0.5706	0.3616	0.3550	0.3290	0.3418	0.3233	0.4864	0.2768	0.2743	0.2457	0.2325	0.2002
151 - 160	SBC 1976		None	1.0000	0.5067	0.5324	0.4688	0.4715	0.4420	0.6578	0.4276	0.4278	0.3993	0.3521	0.3212
	(Pre-1983)		Hurricane	0.6468	0.4271	0.4312	0.4029	0.4279	0.3903	0.5296	0.3024	0.3080	0.2739	0.2513	0.2213
	SBC 1991		None	0.9296	0.4069	0.3989	0.3706	0.3351	0.3017	0.5866	0.3741	0.3762	0.3445	0.2929	0.2682
	(1983-2001)		Hurricane	0.5512	0.3327	0.3348	0.3028	0.3077	0.2719	0.5091	0.2912	0.2956	0.2634	0.2448	0.2191
	FBC	Partially-Encl.	None	0.6545	0.4285	0.4947	0.4009	0.4321	0.4039	0.5327	0.3046	0.3099	0.2762	0.2722	0.2448
	(2002-present)	Enclosed	Hurricane	0.6374	0.4120	0.4170	0.3869	0.4172	0.3890	0.5146	0.2907	0.2920	0.2582	0.2389	0.2149
161 - 170	SBC 1976		None	1.0000	0.4882	0.5484	0.4534	0.4863	0.4632	0.6321	0.3930	0.4030	0.3682	0.3462	0.3124
	(Pre-1983)		Hurricane	0.9542	0.4377	0.4629	0.3972	0.4515	0.4270	0.5313	0.2965	0.3123	0.2709	0.2528	0.2276
	SBC 1991		None	0.6370	0.4163	0.4121	0.3816	0.3849	0.3597	0.5686	0.3455	0.3618	0.3258	0.2965	0.2625
	(1983-2001)		Hurricane	0.5957	0.3700	0.3698	0.3338	0.3672	0.3421	0.5077	0.2828	0.2997	0.2597	0.2465	0.2221
	FBC	Partially-Encl.	None	0.9614	0.4462	0.4440	0.4102	0.4638	0.4401	0.5454	0.3091	0.3215	0.2830	0.2892	0.2550
	(2002-present)	Enclosed	Hurricane	0.9534	0.4371	0.4306	0.3966	0.4509	0.4264	0.5205	0.2893	0.2983	0.2603	0.2465	0.2210
171 - 180	SBC 1976		None	1.0000	0.6834	0.8341	0.6227	0.6621	0.6325	0.8520	0.5258	0.5565	0.5012	0.4597	0.4281
	(Pre-1983)		Hurricane	0.9260	0.6066	0.7965	0.5515	0.6111	0.5766	0.7299	0.4049	0.4398	0.3747	0.3665	0.3153
	SBC 1991		None	0.9050	0.6032	0.6011	0.5552	0.5400	0.5043	0.8153	0.5100	0.5354	0.4818	0.4259	0.3756
	(1983-2001)		Hurricane	0.8356	0.5244	0.5291	0.4734	0.5066	0.4709	0.7178	0.4070	0.4348	0.3736	0.3428	0.3081
	FBC	Partially-Encl.	None	0.9568	0.6324	0.8046	0.5693	0.6334	0.6028	0.7718	0.4420	0.4665	0.4034	0.3982	0.3617
	(2002-present)	Enclosed	Hurricane	0.9251	0.6047	0.7961	0.5489	0.6096	0.5753	0.7075	0.3947	0.4179	0.3585	0.3559	0.3042

Table 5-22. MF Group II Terrain C Loss Relativities

FBC 2023 Windspeed, Ultimate (mph)	Building Code	Design Option	Opening Protection	Water Leakage through Sliding Glass Doors						No Water Leakage through Sliding Glass Doors					
				Metal Roof Deck				Concrete		Metal Roof Deck				Concrete	
				Non-FBC Roof Cover		FBC Roof Cover		Non-FBC Roof Cover	FBC Roof Cover	Non-FBC Roof Cover		FBC Roof Cover		Non-FBC Roof Cover	FBC Roof Cover
				No SWR	SWR	No SWR	SWR			No SWR	SWR	No SWR	SWR		
<= 120	SBC 1976 (Pre-1983)		None	1.0000	0.3309	0.3144	0.2635	0.2645	0.1915	0.4389	0.2994	0.2700	0.2584	0.2265	0.1838
			Hurricane	0.3199	0.1932	0.2308	0.1561	0.2154	0.1394	0.2903	0.1644	0.1289	0.1189	0.1647	0.0882
	SBC 1991 (1983-2001)		None	0.9057	0.2131	0.2341	0.1478	0.2016	0.1286	0.2856	0.1600	0.1249	0.1158	0.1421	0.0974
			Hurricane	0.2876	0.1606	0.2253	0.1300	0.1972	0.1215	0.2599	0.1358	0.0992	0.0900	0.1271	0.0857
	FBC (2002-present)		None	0.9128	0.2328	0.2322	0.1670	0.2171	0.1438	0.2952	0.1696	0.1366	0.1261	0.1405	0.0949
		Enclosed	Hurricane	0.3135	0.1853	0.1581	0.1494	0.2149	0.1390	0.2781	0.1475	0.1123	0.1036	0.1298	0.0852
121 - 130	SBC 1976 (Pre-1983)		None	1.0000	0.4281	0.4926	0.3972	0.3733	0.3260	0.5695	0.3844	0.3639	0.3432	0.2837	0.2446
			Hurricane	0.8999	0.3181	0.4312	0.2919	0.3222	0.2778	0.4084	0.2280	0.3383	0.1982	0.1824	0.1427
	SBC 1991 (1983-2001)		None	0.9417	0.3216	0.3928	0.2757	0.2754	0.2173	0.4524	0.2765	0.2580	0.2381	0.2187	0.1792
			Hurricane	0.4240	0.2408	0.3582	0.2192	0.2511	0.1906	0.3858	0.2058	0.1869	0.1650	0.1750	0.1400
	FBC (2002-present)		None	0.9344	0.3475	0.4557	0.3175	0.3302	0.2863	0.4571	0.2732	0.2475	0.2257	0.2031	0.1666
		Enclosed	Hurricane	0.4814	0.2936	0.4301	0.2869	0.3216	0.2773	0.3931	0.2115	0.1937	0.1718	0.1785	0.1421
131 - 140	SBC 1976 (Pre-1983)		None	1.0000	0.4665	0.5011	0.3970	0.4610	0.4126	0.5029	0.3039	0.3009	0.2787	0.2559	0.2166
			Hurricane	0.6132	0.4061	0.4636	0.3428	0.4438	0.3922	0.4166	0.2194	0.2107	0.1856	0.1915	0.1537
	SBC 1991 (1983-2001)		None	0.9449	0.3309	0.4149	0.2890	0.2875	0.2316	0.4754	0.2858	0.2686	0.2478	0.2291	0.1902
			Hurricane	0.4504	0.2537	0.3820	0.2342	0.2650	0.2070	0.4087	0.2156	0.1977	0.1753	0.1860	0.1521
	FBC (2002-present)	Partially-Encl.	None	0.5656	0.3620	0.3752	0.3150	0.3908	0.3430	0.4366	0.2332	0.2178	0.1950	0.2101	0.1702
		Enclosed	Hurricane	0.5536	0.3499	0.3233	0.3004	0.3864	0.3349	0.4046	0.2084	0.1935	0.1704	0.1846	0.1506
141 - 150	SBC 1976 (Pre-1983)		None	1.0000	0.5611	0.6120	0.5051	0.5126	0.4770	0.6266	0.4151	0.4316	0.4007	0.3231	0.2929
			Hurricane	0.6839	0.4566	0.5401	0.4019	0.4698	0.4322	0.4882	0.2702	0.2840	0.2454	0.2128	0.1840
	SBC 1991 (1983-2001)		None	0.9402	0.4273	0.5307	0.4002	0.3346	0.2935	0.5928	0.3918	0.3944	0.3637	0.2857	0.2560
			Hurricane	0.5210	0.3050	0.4619	0.2944	0.2817	0.2388	0.4783	0.2652	0.2698	0.2343	0.2059	0.1808
	FBC (2002-present)	Partially-Encl.	None	0.6630	0.4367	0.4448	0.4094	0.4179	0.4067	0.4976	0.2739	0.2957	0.2548	0.2459	0.2161
		Enclosed	Hurricane	0.6449	0.4193	0.4274	0.3908	0.4047	0.3933	0.4635	0.2427	0.2528	0.2132	0.2086	0.1791
151 - 160	SBC 1976 (Pre-1983)		None	1.0000	0.5949	0.6511	0.5439	0.5307	0.4998	0.6700	0.4560	0.4794	0.4457	0.3483	0.3216
			Hurricane	0.7068	0.4743	0.5663	0.4232	0.4766	0.4439	0.5131	0.2896	0.3116	0.2684	0.2202	0.1949
	SBC 1991 (1983-2001)		None	0.9384	0.4629	0.5722	0.4410	0.3530	0.3171	0.6341	0.4308	0.4404	0.4066	0.3076	0.2815
			Hurricane	0.5452	0.3241	0.4901	0.3169	0.2869	0.2494	0.5026	0.2842	0.2971	0.2570	0.2129	0.1911
	FBC (2002-present)	Partially-Encl.	None	0.7193	0.4806	0.5655	0.3967	0.4843	0.4582	0.5422	0.3013	0.3211	0.2742	0.2613	0.2362
		Enclosed	Hurricane	0.6952	0.4564	0.5516	0.3703	0.4673	0.4429	0.4815	0.2494	0.2697	0.2228	0.2146	0.1881
161 - 170 (incl. HVHZ, Broward)	SBC 1976 (Pre-1983)		None	1.0000	0.5880	0.7213	0.5670	0.5333	0.5034	0.6778	0.4446	0.4742	0.4337	0.3478	0.3281
			Hurricane	0.8964	0.4776	0.6571	0.4602	0.4782	0.4475	0.5416	0.2949	0.3300	0.2759	0.2344	0.2097
	SBC 1991 (1983-2001)		None	0.7161	0.4869	0.6246	0.4706	0.4146	0.3879	0.6490	0.4176	0.4356	0.3928	0.3103	0.2805
			Hurricane	0.6394	0.3960	0.5720	0.3812	0.3741	0.3468	0.5337	0.2908	0.3102	0.2601	0.2390	0.2088
	FBC (2002-present)	Partially-Encl.	None	0.7504	0.4919	0.6671	0.4786	0.4911	0.4679	0.5889	0.3288	0.3478	0.2928	0.2869	0.2604
		Enclosed	Hurricane	0.7166	0.4587	0.6502	0.4479	0.4705	0.4471	0.5150	0.2655	0.2981	0.2406	0.2250	0.2053
175 (HVHZ - Miami Dade)	SBC 1976 (Pre-1983)		None	1.0000	0.5880	0.7213	0.5670	0.5333	0.5034	0.6778	0.4446	0.4742	0.4337	0.3478	0.3281
			Hurricane	0.8964	0.4776	0.6571	0.4602	0.4782	0.4475	0.5416	0.2949	0.3300	0.2759	0.2344	0.2097
	SBC 1991 (1983-2001)		None	0.7161	0.4869	0.6246	0.4706	0.4146	0.3879	0.6490	0.4176	0.4356	0.3928	0.3103	0.2805
			Hurricane	0.6394	0.3960	0.5720	0.3812	0.3741	0.3468	0.5337	0.2908	0.3102	0.2601	0.2390	0.2088
	FBC (2002-present)	Enclosed	Hurricane	0.6662	0.4125	0.6061	0.4095	0.4465	0.4137	0.5139	0.2614	0.2941	0.2377	0.2382	0.2049
171 - 180	SBC 1976 (Pre-1983)		None	1.0000	0.5637	0.6553	0.5363	0.5318	0.4824	0.6973	0.4543	0.4704	0.4277	0.3644	0.3300
			Hurricane	0.8973	0.4553	0.5852	0.4271	0.4692	0.4145	0.5554	0.2998	0.3358	0.2750	0.2465	0.2111
	SBC 1991 (1983-2001)		None	0.7431	0.5179	0.6503	0.5000	0.4276	0.3998	0.6794	0.4523	0.4703	0.4261	0.3300	0.2973
			Hurricane	0.6519	0.4089	0.5852	0.3927	0.3746	0.3460	0.5395	0.2992	0.3288	0.2746	0.2300	0.2109
	FBC (2002-present)	Partially-Encl.	None	0.7173	0.4590	0.5402	0.4367	0.4976	0.4469	0.5928	0.3278	0.3647	0.3003	0.3084	0.2757
		Enclosed	Hurricane	0.6799	0.4251	0.4640	0.4045	0.4688	0.4139	0.5252	0.2728	0.3094	0.2456	0.2329	0.2065

5.3.2. Group III Loss Relativities Tables

The Group III loss relativity data for a 2% deductible (as a percentage of building replacement value) are given in Table 5-23, Table 5-24, and Table 5-25, for Terrains, A, B and C, respectively.

There are a few small reversals between the FBC Partially Enclosed (no shutters) and Fully Enclosed (with shutters) buildings in Group II buildings in Terrains A and B. This is caused by the roof decks of buildings without shutters being designed for higher wind loads than the buildings with shutters. The net result of which, when coupled with the hazard curves and terrain adjustments, is occasional loss relativities being higher for buildings with shutters. This indicates that, from an expected loss perspective, that designing the structures as partially enclosed without shutters is similarly beneficial to designing as fully enclosed with shutters.

There are also a few small reversals in the Group III Terrain A and C tables where the relativity for “Non-FBC roof” is slightly lower than the same building with an “FBC Roof”. These cases have the sliding glass door leakiness model on. In these cases, the losses are driven by the water getting in through the tracks of the sliding glass doors and the importance of the roof cover strength diminishes. This effect can be seen by comparing the large difference between these relativities and those for the equivalent building with the sliding glass door leakiness model off.

Table 5-23. MF Group III Terrain A Loss Relativities

FBC 2023 Windspeed, Ultimate (mph)	Building Code	Design Option	Opening Protection	Water Leakage through Sliding Glass Doors						No Water Leakage through Sliding Glass Doors					
				Metal Roof Deck				Concrete		Metal Roof Deck				Concrete	
				Non-FBC Roof Cover		FBC Roof Cover		Non-FBC Roof Cover	FBC Roof Cover	Non-FBC Roof Cover		FBC Roof Cover		Non-FBC Roof Cover	FBC Roof Cover
				No SWR	SWR	No SWR	SWR			No SWR	SWR	No SWR	SWR		
<= 120	SBC 1976		None	1.0000	0.3461	0.3589	0.2293	0.3431	0.2381	0.3762	0.2561	0.1870	0.1644	0.1893	0.0977
	(Pre-1983)		Hurricane	0.4024	0.2866	0.3509	0.2103	0.3191	0.2027	0.3267	0.2092	0.1372	0.1175	0.1632	0.0740
	SBC 1991		None	0.4134	0.3018	0.3486	0.2197	0.3125	0.2381	0.2788	0.1731	0.0945	0.0801	0.1633	0.0838
	(1983-2001)		Hurricane	0.3837	0.2736	0.3486	0.2021	0.2861	0.1973	0.2785	0.1706	0.0922	0.0780	0.1608	0.0727
	FBC	Enclosed	None	0.9675	0.3216	0.3166	0.2038	0.2847	0.1674	0.3265	0.2093	0.1402	0.1198	0.1676	0.0758
	(2002-present)		Hurricane	0.3985	0.2816	0.2090	0.1908	0.2823	0.1674	0.3160	0.2034	0.1335	0.1145	0.1618	0.0733
121 - 130	SBC 1976		None	1.0000	0.4627	0.5342	0.3904	0.4571	0.3803	0.4638	0.3112	0.2829	0.2452	0.2224	0.1609
	(Pre-1983)		Hurricane	0.9728	0.4372	0.5334	0.3729	0.4238	0.3394	0.4174	0.2631	0.2327	0.1962	0.1941	0.1323
	SBC 1991		None	0.5686	0.4236	0.5290	0.3700	0.4286	0.3757	0.3624	0.2253	0.1861	0.1554	0.1936	0.1363
	(1983-2001)		Hurricane	0.5411	0.3976	0.5289	0.3534	0.4046	0.3394	0.3568	0.2174	0.1770	0.1466	0.1881	0.1234
	FBC	Enclosed	None	0.9710	0.4457	0.5029	0.3806	0.3961	0.3078	0.4239	0.2765	0.2381	0.2016	0.2206	0.1307
	(2002-present)		Hurricane	0.9708	0.4367	0.3979	0.3635	0.3834	0.2970	0.4063	0.2591	0.2285	0.1919	0.1900	0.1233
131 - 140	SBC 1976		None	1.0000	0.5031	0.5858	0.4260	0.4838	0.4019	0.4374	0.2759	0.2535	0.2138	0.2096	0.1464
	(Pre-1983)		Hurricane	0.6087	0.4499	0.5855	0.3956	0.4488	0.3725	0.4125	0.2517	0.2303	0.1889	0.1944	0.1390
	SBC 1991		None	0.5887	0.4378	0.5553	0.3908	0.4461	0.3978	0.3677	0.2254	0.1928	0.1608	0.1949	0.1425
	(1983-2001)		Hurricane	0.5624	0.4129	0.5552	0.3747	0.4233	0.3634	0.3626	0.2184	0.1842	0.1523	0.1895	0.1300
	FBC	Partially-Encl.	None	0.6402	0.4809	0.5854	0.4243	0.4293	0.3796	0.3714	0.2232	0.1951	0.1590	0.1941	0.1338
	(2002-present)	Enclosed	Hurricane	0.6057	0.4469	0.5854	0.3945	0.4012	0.3427	0.3973	0.2442	0.2199	0.1818	0.1900	0.1278
141 - 150	SBC 1976		None	1.0000	0.5975	0.7139	0.5444	0.5531	0.4896	0.5195	0.3495	0.3594	0.3046	0.2470	0.2011
	(Pre-1983)		Hurricane	0.7250	0.5572	0.7126	0.5200	0.5257	0.4665	0.4755	0.3040	0.3167	0.2584	0.2158	0.1763
	SBC 1991		None	0.6895	0.5296	0.6751	0.5028	0.5188	0.4847	0.4352	0.2834	0.2840	0.2363	0.2216	0.1851
	(1983-2001)		Hurricane	0.6692	0.5102	0.6745	0.4902	0.5015	0.4589	0.4207	0.2663	0.2649	0.2171	0.2102	0.1685
	FBC	Partially-Encl.	None	0.9770	0.5755	0.5767	0.5278	0.5202	0.4703	0.4381	0.2744	0.2745	0.2211	0.2226	0.1766
	(2002-present)	Enclosed	Hurricane	0.7038	0.5384	0.5492	0.5003	0.4902	0.4523	0.4301	0.2737	0.2786	0.2267	0.2109	0.1691
151 - 160	SBC 1976		None	1.0000	0.6309	0.7568	0.5857	0.5764	0.5191	0.5480	0.3774	0.3987	0.3388	0.2613	0.2218
	(Pre-1983)		Hurricane	0.7635	0.5945	0.7547	0.5634	0.5519	0.4982	0.4965	0.3232	0.3482	0.2840	0.2232	0.1895
	SBC 1991		None	0.7231	0.5619	0.7152	0.5422	0.5429	0.5137	0.4593	0.3060	0.3185	0.2653	0.2319	0.2010
	(1983-2001)		Hurricane	0.7050	0.5445	0.7143	0.5308	0.5275	0.4911	0.4406	0.2844	0.2949	0.2415	0.2171	0.1820
	FBC	Partially-Encl.	None	0.9773	0.6056	0.5951	0.5378	0.5581	0.5090	0.4554	0.2872	0.3083	0.2472	0.2321	0.1923
	(2002-present)	Enclosed	Hurricane	0.7410	0.5716	0.5783	0.5209	0.5418	0.4919	0.4401	0.2782	0.3046	0.2445	0.2220	0.1818
161 - 170	SBC 1976		None	1.0000	0.6519	0.7111	0.5951	0.6407	0.6092	0.5460	0.3649	0.4019	0.3330	0.2598	0.2269
	(Pre-1983)		Hurricane	0.9698	0.6226	0.6386	0.5733	0.6240	0.5900	0.5109	0.3267	0.3682	0.2945	0.2320	0.1992
	SBC 1991		None	0.7831	0.6166	0.6508	0.5933	0.5987	0.5951	0.4679	0.3086	0.3349	0.2752	0.2456	0.2115
	(1983-2001)		Hurricane	0.7670	0.6012	0.6295	0.5716	0.5783	0.5827	0.4387	0.2788	0.3054	0.2446	0.2318	0.1978
	FBC	Partially-Encl.	None	0.9921	0.6480	0.7075	0.5909	0.6332	0.6085	0.4546	0.2871	0.3111	0.2471	0.2520	0.2099
	(2002-present)	Enclosed	Hurricane	0.7900	0.6145	0.6386	0.5732	0.6162	0.5900	0.4552	0.2869	0.3216	0.2545	0.2273	0.1978
171 - 180	SBC 1976		None	1.0000	0.6362	0.8078	0.6281	0.6079	0.5743	0.5292	0.3518	0.3964	0.3243	0.2599	0.2239
	(Pre-1983)		Hurricane	0.9957	0.6168	0.8044	0.6078	0.5869	0.5569	0.4953	0.3153	0.3646	0.2872	0.2444	0.2013
	SBC 1991		None	0.7754	0.6126	0.6436	0.5860	0.5888	0.5789	0.4792	0.3226	0.3459	0.2857	0.2505	0.2128
	(1983-2001)		Hurricane	0.7580	0.5958	0.6207	0.5626	0.5663	0.5657	0.4459	0.2879	0.3120	0.2502	0.2333	0.1956
	FBC	Partially-Encl.	None	0.9929	0.6316	0.8018	0.6240	0.6067	0.5731	0.4394	0.2790	0.3058	0.2426	0.2478	0.2102
	(2002-present)	Enclosed	Hurricane	0.9923	0.6165	0.8014	0.6077	0.5868	0.5569	0.4477	0.2810	0.3148	0.2459	0.2334	0.2011

Table 5-24. MF Group III Terrain B Loss Relativities

FBC 2023 Windspeed, Ultimate (mph)	Building Code	Design Option	Opening Protection	Water Leakage through Sliding Glass Doors						No Water Leakage through Sliding Glass Doors					
				Metal Roof Deck				Concrete		Metal Roof Deck				Concrete	
				Non-FBC Roof Cover		FBC Roof Cover		Non-FBC Roof Cover	FBC Roof Cover	Non-FBC Roof Cover		FBC Roof Cover		Non-FBC Roof Cover	FBC Roof Cover
				No SWR	SWR	No SWR	SWR			No SWR	SWR	No SWR	SWR		
<= 120	SBC 1976 (Pre-1983)		None	1.0000	0.3522	0.3793	0.2370	0.3327	0.2196	0.4063	0.2751	0.3793	0.2015	0.2008	0.1130
			Hurricane	0.4340	0.3058	0.3352	0.2218	0.3257	0.2133	0.3558	0.2240	0.3172	0.1447	0.1693	0.0922
	SBC 1991 (1983-2001)		None	0.9734	0.3328	0.2321	0.2137	0.3029	0.2163	0.3079	0.1837	0.1158	0.0969	0.1696	0.0834
			Hurricane	0.4177	0.2905	0.2231	0.2042	0.2938	0.2075	0.2975	0.1778	0.1103	0.0905	0.1690	0.0819
	FBC (2002-present)		None	0.9770	0.3316	0.2301	0.2072	0.2483	0.1734	0.3544	0.2258	0.1665	0.1426	0.1769	0.0890
		Enclosed	Hurricane	0.4258	0.2971	0.2285	0.2053	0.2449	0.1732	0.3526	0.2204	0.1559	0.1319	0.1693	0.0801
121 - 130	SBC 1976 (Pre-1983)		None	1.0000	0.4743	0.5821	0.3876	0.4197	0.3649	0.5072	0.3385	0.3242	0.2808	0.2434	0.1849
			Hurricane	0.9881	0.4594	0.5781	0.3771	0.4062	0.3433	0.4551	0.2844	0.2659	0.2214	0.2057	0.1398
	SBC 1991 (1983-2001)		None	0.9505	0.4442	0.3981	0.3617	0.4132	0.3507	0.4090	0.2509	0.2257	0.1883	0.2077	0.1469
			Hurricane	0.5794	0.4157	0.3894	0.3526	0.4056	0.3433	0.3853	0.2320	0.2088	0.1697	0.2029	0.1396
	FBC (2002-present)		None	0.6167	0.4460	0.5758	0.3732	0.3864	0.3114	0.4651	0.2996	0.2785	0.2356	0.2157	0.1527
		Enclosed	Hurricane	0.6082	0.4389	0.5742	0.3700	0.3793	0.3029	0.4466	0.2816	0.2606	0.2166	0.2038	0.1397
131 - 140	SBC 1976 (Pre-1983)		None	1.0000	0.4935	0.5546	0.4298	0.5031	0.3941	0.4996	0.3135	0.3045	0.2569	0.2376	0.1789
			Hurricane	0.9866	0.4799	0.4466	0.4038	0.4725	0.3852	0.4680	0.2823	0.2714	0.2223	0.2312	0.1541
	SBC 1991 (1983-2001)		None	0.9604	0.4718	0.4349	0.3954	0.4446	0.3862	0.4293	0.2612	0.2432	0.2028	0.2171	0.1611
			Hurricane	0.6202	0.4456	0.4266	0.3867	0.4372	0.3791	0.4045	0.2417	0.2262	0.1838	0.2129	0.1536
	FBC (2002-present)	Partially-Encl.	None	0.6341	0.4538	0.5343	0.4086	0.4470	0.3580	0.4239	0.2543	0.2384	0.1949	0.2159	0.1601
		Enclosed	Hurricane	0.6258	0.4454	0.4341	0.3888	0.4155	0.3440	0.4518	0.2757	0.2612	0.2142	0.2108	0.1547
141 - 150	SBC 1976 (Pre-1983)		None	1.0000	0.5835	0.6593	0.5385	0.5676	0.4749	0.5918	0.3977	0.4217	0.3581	0.2817	0.2396
			Hurricane	0.9851	0.5679	0.5718	0.5132	0.5434	0.4648	0.5355	0.3392	0.3631	0.2961	0.2484	0.1941
	SBC 1991 (1983-2001)		None	0.9573	0.5565	0.5569	0.5019	0.5088	0.4666	0.5084	0.3312	0.3472	0.2902	0.2487	0.2100
			Hurricane	0.7204	0.5359	0.5477	0.4922	0.5019	0.4600	0.4676	0.2947	0.3135	0.2537	0.2354	0.1929
	FBC (2002-present)	Partially-Encl.	None	0.9720	0.5451	0.6230	0.4991	0.5149	0.4672	0.4874	0.3045	0.3333	0.2693	0.2508	0.2063
		Enclosed	Hurricane	0.9701	0.5356	0.5404	0.4801	0.5048	0.4575	0.4848	0.3045	0.3297	0.2680	0.2469	0.1936
151 - 160	SBC 1976 (Pre-1983)		None	1.0000	0.6159	0.6948	0.5769	0.5891	0.5022	0.6234	0.4291	0.4646	0.3957	0.2984	0.2625
			Hurricane	0.9834	0.5982	0.6148	0.5506	0.5656	0.4905	0.5576	0.3600	0.3962	0.3231	0.2549	0.2084
	SBC 1991 (1983-2001)		None	0.9568	0.5867	0.5998	0.5393	0.5295	0.4932	0.5359	0.3581	0.3860	0.3232	0.2609	0.2285
			Hurricane	0.7525	0.5666	0.5894	0.5283	0.5223	0.4862	0.4890	0.3146	0.3457	0.2798	0.2430	0.2067
	FBC (2002-present)	Partially-Encl.	None	0.7694	0.5779	0.6588	0.5430	0.5719	0.4826	0.5078	0.3201	0.3633	0.2905	0.2694	0.2295
		Enclosed	Hurricane	0.7591	0.5667	0.5949	0.5287	0.5649	0.4774	0.4946	0.3095	0.3496	0.2790	0.2530	0.2070
161 - 170	SBC 1976 (Pre-1983)		None	1.0000	0.6302	0.6217	0.5464	0.5952	0.5525	0.6039	0.4067	0.4634	0.3862	0.2943	0.2621
			Hurricane	0.9878	0.6104	0.5964	0.5185	0.5841	0.5413	0.5626	0.3584	0.4114	0.3278	0.2520	0.2214
	SBC 1991 (1983-2001)		None	0.9869	0.6484	0.7389	0.5322	0.5808	0.5535	0.5252	0.3483	0.3915	0.3240	0.2729	0.2463
			Hurricane	0.8138	0.6274	0.7220	0.5135	0.5741	0.5434	0.4864	0.3045	0.3437	0.2736	0.2510	0.2170
	FBC (2002-present)	Partially-Encl.	None	0.9901	0.6183	0.6005	0.5266	0.5911	0.5487	0.5134	0.3247	0.3613	0.2884	0.2721	0.2408
		Enclosed	Hurricane	0.9877	0.6103	0.5903	0.5157	0.5840	0.5412	0.5121	0.3218	0.3608	0.2823	0.2519	0.2198
171 - 180	SBC 1976 (Pre-1983)		None	1.0000	0.6263	0.7211	0.5319	0.5652	0.5145	0.5673	0.3797	0.4301	0.3549	0.2871	0.2499
			Hurricane	0.9788	0.6039	0.6975	0.5061	0.5500	0.4993	0.5192	0.3262	0.3836	0.3003	0.2384	0.2046
	SBC 1991 (1983-2001)		None	0.9542	0.6137	0.6969	0.5032	0.5408	0.5116	0.5101	0.3450	0.3821	0.3178	0.2629	0.2343
			Hurricane	0.7635	0.5896	0.6773	0.4814	0.5325	0.4997	0.4676	0.2968	0.3308	0.2637	0.2377	0.2019
	FBC (2002-present)	Partially-Encl.	None	0.9915	0.6155	0.5843	0.5138	0.5613	0.5105	0.4694	0.2973	0.3399	0.2686	0.2683	0.2259
		Enclosed	Hurricane	0.9788	0.6039	0.5736	0.5025	0.5499	0.4993	0.4679	0.2915	0.3382	0.2619	0.2378	0.2040

Table 5-25. MF Group III Terrain C Loss Relativities

FBC 2023 Windspeed, Ultimate (mph)	Building Code	Design Option	Opening Protection	Water Leakage through Sliding Glass Doors						No Water Leakage through Sliding Glass Doors					
				Metal Roof Deck				Concrete		Metal Roof Deck				Concrete	
				Non-FBC Roof Cover		FBC Roof Cover		Non-FBC Roof Cover	FBC Roof Cover	Non-FBC Roof Cover		FBC Roof Cover		Non-FBC Roof Cover	FBC Roof Cover
				No SWR	SWR	No SWR	SWR			No SWR	SWR	No SWR	SWR		
<= 120	SBC 1976 (Pre-1983)		None	1.0000	0.4018	0.4520	0.3010	0.3678	0.2692	0.4462	0.3063	0.2518	0.2210	0.2333	0.1287
			Hurricane	0.9812	0.3785	0.4247	0.2715	0.3281	0.2459	0.3568	0.2233	0.1707	0.1439	0.1638	0.0832
	SBC 1991 (1983-2001)		None	0.4803	0.3471	0.4218	0.2608	0.3645	0.2652	0.3131	0.1888	0.1309	0.1100	0.1650	0.0963
			Hurricane	0.4649	0.3315	0.4214	0.2534	0.3276	0.2454	0.2936	0.1713	0.1124	0.0921	0.1572	0.0815
	FBC (2002-present)	Enclosed	None	0.9805	0.3758	0.3807	0.2766	0.3093	0.2530	0.3487	0.2156	0.3071	0.1387	0.1654	0.0976
			Hurricane	0.9803	0.3753	0.2872	0.2616	0.3052	0.2402	0.3214	0.1936	0.1425	0.1178	0.1573	0.0821
121 - 130	SBC 1976 (Pre-1983)		None	1.0000	0.5249	0.6306	0.4654	0.4948	0.4019	0.8698	0.3815	0.5303	0.3264	0.2493	0.1989
			Hurricane	0.9792	0.5010	0.6013	0.4363	0.4634	0.3802	0.4509	0.2829	0.4442	0.2387	0.1921	0.1349
	SBC 1991 (1983-2001)		None	0.6509	0.4832	0.6036	0.4130	0.4674	0.3953	0.4280	0.2734	0.2565	0.2168	0.2089	0.1598
			Hurricane	0.6379	0.4699	0.6002	0.4034	0.4425	0.3796	0.3806	0.2273	0.2095	0.1700	0.1861	0.1330
	FBC (2002-present)	Enclosed	None	0.9711	0.5076	0.5524	0.4423	0.4748	0.3852	0.4605	0.2957	0.2846	0.2380	0.2084	0.1575
			Hurricane	0.6571	0.4819	0.4729	0.4270	0.4632	0.3716	0.4111	0.2475	0.2369	0.1911	0.1897	0.1329
131 - 140	SBC 1976 (Pre-1983)		None	1.0000	0.5365	0.6548	0.4940	0.5195	0.4749	0.8083	0.3420	0.5040	0.2942	0.2343	0.1842
			Hurricane	0.9953	0.5240	0.6327	0.4702	0.5074	0.4609	0.4573	0.2776	0.2768	0.2263	0.2094	0.1428
	SBC 1991 (1983-2001)		None	0.6805	0.5060	0.6358	0.4395	0.4899	0.4234	0.4395	0.2794	0.2706	0.2281	0.2137	0.1692
			Hurricane	0.6689	0.4940	0.6327	0.4307	0.4677	0.4092	0.3906	0.2321	0.2221	0.1801	0.1908	0.1431
	FBC (2002-present)	Partially-Encl.	None	0.9877	0.5197	0.5838	0.4795	0.4589	0.4153	0.6983	0.2446	0.2300	0.1860	0.2226	0.1573
			Hurricane	0.9870	0.5132	0.5134	0.4647	0.4474	0.3997	0.4051	0.2368	0.2338	0.1854	0.2047	0.1433
141 - 150	SBC 1976 (Pre-1983)		None	1.0000	0.6172	0.7473	0.5907	0.5661	0.5377	0.8113	0.4289	0.6042	0.4000	0.2823	0.2473
			Hurricane	0.9880	0.5985	0.7175	0.5574	0.5504	0.5214	0.5144	0.3300	0.3599	0.2935	0.2212	0.1743
	SBC 1991 (1983-2001)		None	0.7650	0.5873	0.7260	0.5319	0.5313	0.4814	0.5264	0.3634	0.3838	0.3268	0.2488	0.2172
			Hurricane	0.7530	0.5744	0.7175	0.5174	0.5124	0.4678	0.4461	0.2824	0.3030	0.2455	0.2063	0.1735
	FBC (2002-present)	Partially-Encl.	None	0.7489	0.5597	0.5947	0.5302	0.5187	0.5308	0.4549	0.2815	0.3076	0.2449	0.2396	0.2034
			Hurricane	0.7382	0.5497	0.5844	0.5196	0.5087	0.5213	0.4339	0.2600	0.2965	0.2297	0.2099	0.1738
151 - 160	SBC 1976 (Pre-1983)		None	1.0000	0.6451	0.7768	0.6233	0.5806	0.5570	0.8158	0.4623	0.6390	0.4392	0.3010	0.2712
			Hurricane	0.9846	0.6234	0.7435	0.5859	0.5626	0.5390	0.5339	0.3496	0.3902	0.3182	0.2263	0.1858
	SBC 1991 (1983-2001)		None	0.7918	0.6150	0.7546	0.5636	0.5442	0.4996	0.5578	0.3956	0.4262	0.3641	0.2628	0.2356
			Hurricane	0.7792	0.6012	0.7434	0.5463	0.5250	0.4853	0.4657	0.3018	0.3333	0.2701	0.2121	0.1843
	FBC (2002-present)	Partially-Encl.	None	0.7570	0.5652	0.6603	0.5489	0.5649	0.5340	0.4567	0.2832	0.3331	0.2618	0.2514	0.2207
			Hurricane	0.7443	0.5525	0.6102	0.5356	0.5553	0.5261	0.4537	0.2753	0.3198	0.2431	0.2160	0.1841
161 - 170 (incl. HVHZ, Broward)	SBC 1976 (Pre-1983)		None	1.0000	0.6619	0.8382	0.6281	0.5725	0.5442	0.8128	0.4745	0.5159	0.4401	0.3080	0.2816
			Hurricane	0.9681	0.6197	0.8143	0.5912	0.5545	0.5236	0.5477	0.3540	0.4112	0.3264	0.2293	0.2030
	SBC 1991 (1983-2001)		None	0.9739	0.6368	0.7122	0.6412	0.5547	0.5167	0.5786	0.4077	0.4412	0.3727	0.2756	0.2518
			Hurricane	0.9635	0.6210	0.7006	0.6293	0.5458	0.5024	0.4719	0.3001	0.3447	0.2721	0.2248	0.2006
	FBC (2002-present)	Partially-Encl.	None	0.9635	0.6094	0.7733	0.5633	0.5563	0.5328	0.4914	0.3042	0.4845	0.2809	0.2784	0.2439
			Hurricane	0.9599	0.6043	0.7688	0.5560	0.5471	0.5232	0.4466	0.2686	0.3269	0.2486	0.2287	0.1962
175 (HVHZ - Miami Dade)	SBC 1976 (Pre-1983)		None	1.0000	0.6619	0.8382	0.6281	0.5725	0.5442	0.8128	0.4745	0.5159	0.4401	0.3080	0.2816
			Hurricane	0.9681	0.6197	0.8143	0.5912	0.5545	0.5236	0.5477	0.3540	0.4112	0.3264	0.2293	0.2030
	SBC 1991 (1983-2001)		None	0.9739	0.6368	0.7122	0.6412	0.5547	0.5167	0.5786	0.4077	0.4412	0.3727	0.2756	0.2518
			Hurricane	0.9635	0.6210	0.7006	0.6293	0.5458	0.5024	0.4719	0.3001	0.3447	0.2721	0.2248	0.2006
	FBC (2002-present)	Enclosed	Hurricane	0.7696	0.5816	0.6199	0.5455	0.5465	0.5211	0.4285	0.2548	0.3002	0.2265	0.2288	0.2010
171 - 180	SBC 1976 (Pre-1983)		None	1.0000	0.6510	0.7357	0.6272	0.5607	0.5467	0.8227	0.4593	0.6355	0.4250	0.3086	0.2785
			Hurricane	0.8135	0.6070	0.6734	0.5937	0.5380	0.5283	0.7266	0.3529	0.4026	0.3142	0.2309	0.1984
	SBC 1991 (1983-2001)		None	0.9959	0.6411	0.7089	0.6390	0.5498	0.5080	0.5926	0.4243	0.4529	0.3853	0.2834	0.2562
			Hurricane	0.9831	0.6218	0.6944	0.6241	0.5379	0.4895	0.4810	0.3103	0.3507	0.2782	0.2262	0.1978
	FBC (2002-present)	Partially-Encl.	None	0.9227	0.5773	0.6889	0.5748	0.5498	0.5369	0.4894	0.3009	0.3414	0.2605	0.2797	0.2518
			Hurricane	0.7526	0.5608	0.6430	0.5654	0.5369	0.5282	0.4458	0.2693	0.3148	0.2375	0.2249	0.1940

5.3.3. Secondary Factors for Group II Loss Relativities

Secondary factors for Group II and III buildings were developed in the 2008 study and reproduced here. Three sets of factors are provided for parapets and inadequately restrained roof top equipment: (1) parapets only, (2) rooftop equipment only, and (3) parapets combined with rooftop equipment. Tall parapets (minimum of 6 feet in height) reduce expected losses – particularly for building with metal roof decks, no secondary water resistance, and/or non-FBC equivalent roof coverings. The reduction in loss costs ranges from 24% for buildings with the weakest roofs to 2% for buildings with the strongest roofs. Unrestrained or poorly restrained rooftop equipment increases expected losses. The increase in loss costs ranges from 5% for buildings with the weakest roofs to 9% for buildings with the strongest roofs. The effect of parapets combined with rooftop equipment also varies depending on the types of roof construction and roof covering.

Table 5-26 provides the secondary factors for parapets and inadequately restrained rooftop equipment for Group II buildings. Table 5-27 provides the secondary factors for parapets and inadequately restrained rooftop equipment for Group II buildings.

Table 5-26. Group II Secondary Factors for Parapets and Inadequately Restrained Roof Top Equipment

Roof Deck	SWR	Roof Cover	Parapets	Unrestrained Rooftop Equipment	Both
Metal	No	Non-FBC Equivalent	0.76	1.05	0.80
Metal	No	FBC Equivalent	0.88	1.06	0.94
Metal	Yes	Non-FBC Equivalent	0.92	1.07	0.99
Metal	Yes	FBC Equivalent	0.94	1.07	1.01
Concrete	N/A	Non-FBC Equivalent	0.95	1.09	1.03
Concrete	N/A	FBC Equivalent	0.98	1.09	1.06

Table 5-27. Group III Secondary Factors for Parapets and Inadequately Restrained Roof Top Equipment

Roof Deck	SWR	Roof Cover	Parapets	Rooftop Equipment	Both
Metal	No	Non-FBC Equivalent	0.81	1.05	0.85
Metal	No	FBC Equivalent	0.89	1.05	0.94
Metal	Yes	Non-FBC Equivalent	0.91	1.06	0.97
Metal	Yes	FBC Equivalent	0.94	1.06	1.00
Concrete	N/A	Non-FBC Equivalent	0.93	1.07	1.00
Concrete	N/A	FBC Equivalent	0.97	1.07	1.04

In addition to the parapets and rooftop equipment secondary factor, the following Group I secondary factors from Table 5-11 also apply to Group III MF residential buildings:

- Opening coverage – all openings
- Shutter interpolation between None and Hurricane

5.3.4. Water Intrusion through Tracks of Sliding Glass Doors

The loss relativity tables for Group II and III buildings include a primary factor for sliding glass door leakiness. This factor was evaluated by modeling the buildings with and without the sliding glass door leakiness model updates discussed in Section 2.2.2. Using this model has a significant impact on loss relativities for these buildings.

5.3.4.1. Comparison to Insured Loss History

Figure 5-1 compares the empirical loss curves developed from our analysis of insurance losses from recent hurricanes with the loss curves developed for this study for new (0-5 years old), mid (6-13 years old), and old (14 years or older). The ARA loss functions shown in the figure are weighted based on the wind mitigation characteristics reported in the exposure data provided with the insured loss data. The solid green and orange lines in these plots represent weighted loss functions for buildings with Non-FBC and FBC roof covers respectively. The dotted green and orange lines are corresponding loss functions without sliding glass door leakiness. Ideally, one would expect the solid and dotted lines to envelope the actual losses as there are likely buildings with and without sliding glass doors included in the insurance loss history.

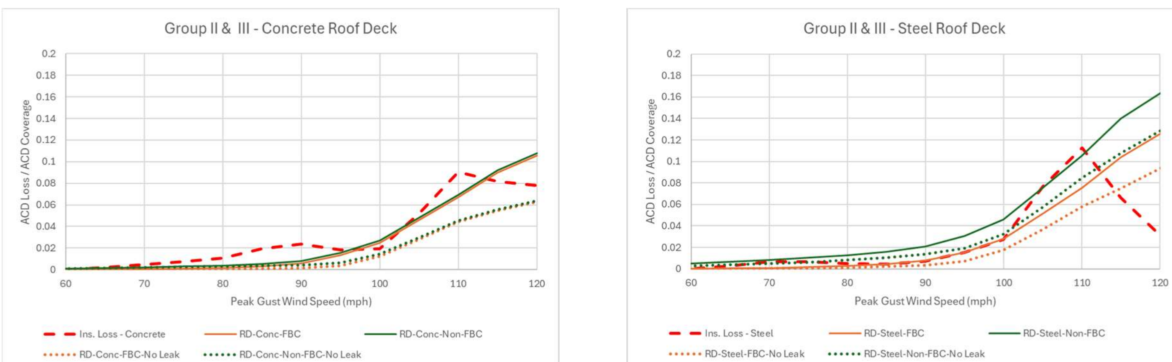


Figure 5-1. Comparison of Empirical Loss Functions (solid lines) with weighted ARA Loss Functions (dashed lines) for Group II & III Buildings with and without Sliding Glass Door Leakage

6. Loss Relativities for Manufactured Housing/Mobile Homes

Mobile and manufactured homes are included in the Florida Wind Loss Mitigation study for the first time in 2024. Unlike the Single- and Multi-Family buildings discussed in Section 4 and 0, construction of mobile and manufactured homes is not governed by the FBC. The code to which such a home is built is the basis for the difference between "mobile" and "manufactured" homes, specifically:

- ***Mobile Home.*** A mobile home is a structure, transportable in one or more sections, which is 8 feet or more in width and built on an integral chassis and designed to be used as a dwelling when connected to the required utilities and includes the plumbing, heating, air-conditioning, and electrical systems contained therein.
- ***Manufactured Home.*** A "manufactured home" is a mobile home fabricated on or after June 15, 1976 in an offsite manufacturing facility for installation or assembly at the building site, with each section bearing a seal certifying that it is built in compliance with the federal Manufactured Home Construction and Safety Standard Act.

Prior to June 15, 1976, mobile homes in Florida were built to the ANSI A-119.1 Standard. On June 15, 1976, the HUD took over regulation of the mobile/manufactured home industry. Their regulations are known as the "Manufactured Home Construction and Safety Standards MHCSS" 24 CFR, Part 3280. With this change came the introduction of wind zones. All of Florida was designated as Wind Zone II. In 1994, the wind loading requirements were increased in response to years of excessive damage, particularly following Hurricane Andrew in 1992 (HUD 1994). In the 1994 updated regulations, HUD added Wind Zone III. The following counties, shown in Figure 6-1, are included in Wind Zone III: Broward, Charlotte, Collier, Miami-Dade, Franklin, Gulf, Hendry, Lee, Martin, Manatee, Monroe, Palm Beach, Pinellas, and Sarasota. All other counties are in Wind Zone II.

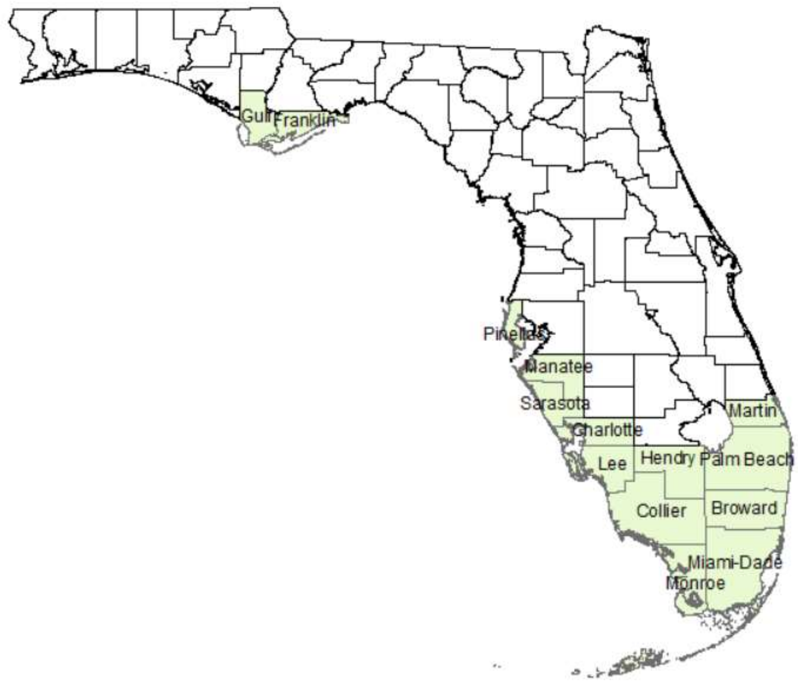


Figure 6-1. Wind Zones II (white) and III (green) for Manufactured Homes in Florida using 1994 HUD Regulations.

6.1. Mitigation Options for Manufactured Housing

HUD regulates manufactured home construction, but not installation. State and local governments regulate installation. The manufacturers' responsibility is to provide a homeowner's manual with installation details for the specific model. The American National Standards Institute's Standard A225.1, "Manufactured Home Installations" is a consensus standard for the installation of manufactured homes and minimum construction requirements for manufactured home communities.

The main mitigation options for mobile home and manufactured housing are adding properly installed tiedowns (i.e., anchoring mobile/manufactured home to the foundation) and shutters. As noted in the updated HUD regulations in 1994, while many of the manufactured homes in the area impacted by Hurricane Andrew had tiedowns, the tiedowns generally performed poorly and were not installed correctly.

Similarly, opening protection (i.e., shutters) or impact-resistant glazing are not required for mobile/manufactured homes. The 1994 regulations only require manufactures to provide instructions for appropriate method for installing shutters.

6.2. Modeling Approach

We modeled mobile/manufactured homes to include the following failure modes:

- Roof cover loss
- Roof sheathing loss

- Window breakage (pressure and wind-borne debris)
- Siding failure
- Roof to wall connection failure (minor and major)
- Wall failure following roof failure
- Floor-wall connection failure (minor and major)
- Foundation failure (minor and major sliding, overturning)

Table 6-1 shows the resistance properties of the mobile/manufactured homes used for this study. The mobile/manufactured home damage and loss modeling is based on the work of Vasquez (1994).

Table 6-1. Resistance parameters used to model mobile/manufactured homes

Building Component	Pre-HUD	HUD	1994 HUD Wind Zone I	1994 HUD Wind Zone II	1994 HUD Wind Zone III
Roof Cover Model	Residential Shingle Model	Residential Shingle Model	Residential Shingle Model	1.2 Times Residential Shingle Model	1.2 Times Residential Shingle Model
Roof Sheathing Capacity (psf)	Mean = 45COV = 12%	Mean = 45COV = 12%	Mean = 45COV = 12%	Mean = 90COV = 12%	Mean = 90COV = 12%
Siding Resistance	Mean = 25COV = 15%	Mean = 25COV = 15%	Mean = 25COV = 15%	Mean = 72COV = 15%	Mean = 88COV = 15%
Window Resistance	Mean = 32COV = 18%	Mean = 32 COV = 18%	Mean = 32COV = 18%	Mean = 57COV = 18%	Mean = 72COV = 18%
Design Uplift Load (psf)	15	15	9	27	32
Design Drag Load (psf)	25	25	15	39	47
Roof-Wall Connection Safety Factor	Mean = 1.5COV = 25%	Mean = 1.2COV = 25%	Mean = 1.5COV = 25%	Mean = 1.5COV = 25%	Mean = 1.5COV = 25%
Floor-Wall Connection Safety Factor	Mean = 1.6COV = 24%	Mean = 1.6COV = 24%	Mean = 1.6COV = 24%	Mean = 1.6COV = 24%	Mean = 1.6COV = 24%
Anchor Pull Out Capacity (lb)	Mean = 1500COV = 35%	Mean = 1500COV = 35%	Mean = 1500COV = 35%	Mean = 1500COV = 35%	Mean = 1500COV = 35%

6.3. Minimal Conditions

The loss relativities provided herein are based on the fundamental assumption that each wind mitigation feature is in good condition and able to perform its function. Obviously rotting wood or other deteriorated conditions do not qualify for mitigation rate differentials and these conditions should be noted in the mitigation inspections. Specific minimal conditions are discussed below for roof coverings, windows and doors, and MH anchorage.

Roof Cover Condition. An important condition assumption inherent in this updated study is roof cover condition. The modeled results assume that the roof cover is in good condition and can be repaired if some of the roof cover fails. For example, if a shingle roof in good condition losses <1% of its cover in a hurricane, this amount of loss generally results in repair and replacement of the damaged shingles and does not result in a total re-roof of the building. However, if the roof cover is in disrepair and cannot be repaired because the existing material is in very poor condition, then <1% loss in roof cover may require a total recovering of the building. The loss relativities were not derived for roof covers that are not repairable. We do not believe that roof covers that cannot be repaired should qualify for mitigation rate differentials. That is, if the building has a degraded roof cover, it should ***not qualify*** for mitigation rate differentials (regardless of what other mitigation features are on the building) until the roof cover is replaced. The rationale behind this recommendation is that the loss relativities are so dependent on the roof cover that an entire table of relativities would need to be developed for poorly conditioned roof covers.

Window and Door Condition. Another condition assumption in this study is that windows and doors are in reasonably good condition. Windows that are in disrepair (or have large gaps) will allow large amounts of water (from the wind-driven rain within a hurricane) to enter the building without the window failing from wind pressure and/or missile loads. While shutters over these windows may act as a rain screen and thereby help reduce the amount of water leakage in a hurricane, the loss relativities were not developed for buildings with windows in a state of neglect with large visible cracks or gaps, or otherwise in obvious need of replacement. We believe that buildings with windows that are in clear need of replacement/repair ***should not qualify*** for wind mitigation rate differentials, regardless of the presence/absence of other features.

MH Tie-Downs/Anchors. The mobile home loss data sets did not include indicators for the type or condition of MH tie-downs and we presumed that tie downs are required by all Florida insurance companies writing mobile home coverage. As such, the MH loss relativities developed assume that the homes have appropriate tie-downs. MH observed to not be tied down, or have deteriorated tie downs ***should not qualify*** for any wind mitigation rate differentials.

6.4. MH Loss Relativities

MH Loss relativities are developed for the following primary factors:

- MH construction code and related zone. A total of four unique construction levels were considered in the analysis. Initial model results showed negligible differences in loss relativities for pre-1976 and HUD 1976 homes. Similarly, initial model results for HUD 1994 Zone II and III homes showed negligible differences in loss relativity as well. As such, we simplified the final relativity tables to have only 2 construction classes:
    - Pre-1976 and HUD 1976 (Zone II), and
    - HUD 1994 Zones II and III
- Opening Protection is not required for MH but can be added. Two options (None and Hurricane) are included as potential mitigation items
- Roof Cover Strength. The assumed MH roof cover strength is shown in Table 6-1 for original roofs, however, homeowners can re-roof with FBC compliant products and methods. We have also applied the asphalt roof cover aging model to MH. However, the default assumption for roof cover strength is the Non-FBC level because MH are not required to meet the FBC and the HUD 1994 design requirement predate the FBC.

Table 6-2. Region 1 MH Loss Relativity Table for All Terrains

Roof Cover	Opening Protection	Terrain A				Terrain B				Terrain C			
		Pre 1976 & HUD 1976		1994 HUD (Zones 2 & 3)		Pre 1976 & HUD 1976		1994 HUD (Zones 2 & 3)		Pre 1976 & HUD 1976		1994 HUD (Zones 2 & 3)	
		NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR
Non-FBC Old (> 13 yr)	None	1.0000	0.8390	1.0000	0.6994	1.0000	0.8644	1.0000	0.6642	1.0000	0.9029	1.0000	0.6491
	Hurricane	0.9703	0.8110	0.9287	0.6471	0.9679	0.8343	0.8588	0.5636	0.9908	0.8963	0.9106	0.5835
Non-FBC Mid (6-13 yr)	None	0.8812	0.8011	0.7776	0.6362	0.9008	0.8321	0.7835	0.6169	0.9321	0.8791	0.8040	0.6158
	Hurricane	0.8535	0.7754	0.7106	0.5874	0.8651	0.7975	0.6514	0.5111	0.9269	0.8743	0.7196	0.5485
Non-FBCNew (0-5 yr)	None	0.7304	0.7208	0.5089	0.4875	0.7725	0.7625	0.5185	0.4911	0.8415	0.8293	0.5660	0.5260
	Hurricane	0.7034	0.6935	0.4554	0.4370	0.7406	0.7303	0.4102	0.3881	0.8359	0.8231	0.4946	0.4606
FBC Old (> 13 yr)	None	0.8213	0.7573	0.6273	0.5146	0.8518	0.7986	0.6504	0.5130	0.9003	0.8581	0.6983	0.5397
	Hurricane	0.7932	0.7299	0.5635	0.4621	0.8173	0.7640	0.5237	0.4103	0.8942	0.8533	0.6158	0.4734
FBC Mid (6-13 yr)	None	0.7547	0.7254	0.5193	0.4762	0.7947	0.7690	0.5349	0.4787	0.8575	0.8346	0.5785	0.5106
	Hurricane	0.7292	0.7002	0.4615	0.4240	0.7629	0.7371	0.4242	0.3793	0.8521	0.8291	0.5040	0.4437
FBCNew (0-5 yr)	None	0.6621	0.6576	0.3867	0.3852	0.7175	0.7122	0.4004	0.3996	0.7996	0.7924	0.4465	0.4431
	Hurricane	0.6386	0.6338	0.3331	0.3316	0.6842	0.6785	0.3001	0.2984	0.7943	0.7862	0.3786	0.3762

Table 6-3. Region 2 MH Loss Relativity Table for All Terrains

Roof Cover	Opening Protection	Terrain A				Terrain B				Terrain C			
		Pre 1976 & HUD 1976		1994 HUD (Zones 2 & 3)		Pre 1976 & HUD 1976		1994 HUD (Zones 2 & 3)		Pre 1976 & HUD 1976		1994 HUD (Zones 2 & 3)	
		NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR
Non-FBC Old (> 13 yr)	None	1.0000	0.8152	1.0000	0.7824	1.0000	0.8328	1.0000	0.7281	1.0000	0.8705	1.0000	0.6625
	Hurricane	0.9753	0.7922	0.9737	0.7630	0.9722	0.8063	0.9334	0.6827	0.9914	0.8637	0.9482	0.6221
Non-FBC Mid (6-13 yr)	None	0.8210	0.7395	0.7435	0.6572	0.8435	0.7698	0.7313	0.6184	0.8893	0.8273	0.7292	0.5778
	Hurricane	0.7989	0.7200	0.7196	0.6452	0.8120	0.7370	0.6618	0.5621	0.8839	0.8215	0.6797	0.5370
Non-FBCNew (0-5 yr)	None	0.5802	0.5751	0.3975	0.3910	0.6333	0.6274	0.3667	0.3581	0.7386	0.7305	0.3893	0.3711
	Hurricane	0.5588	0.5527	0.3781	0.3727	0.6033	0.5968	0.3137	0.3071	0.7340	0.7247	0.3457	0.3308
FBC Old (> 13 yr)	None	0.6884	0.6239	0.4909	0.4300	0.7361	0.6787	0.4835	0.3969	0.8274	0.7782	0.5329	0.4067
	Hurricane	0.6650	0.6020	0.4674	0.4100	0.7042	0.6471	0.4205	0.3473	0.8215	0.7736	0.4819	0.3663
FBC Mid (6-13 yr)	None	0.6060	0.5796	0.3995	0.3789	0.6613	0.6367	0.3769	0.3450	0.7639	0.7411	0.4059	0.3580
	Hurricane	0.5869	0.5610	0.3771	0.3585	0.6330	0.6082	0.3235	0.2980	0.7596	0.7365	0.3611	0.3178
FBCNew (0-5 yr)	None	0.4862	0.4839	0.2659	0.2656	0.5517	0.5486	0.2308	0.2313	0.6777	0.6733	0.2470	0.2457
	Hurricane	0.4685	0.4662	0.2454	0.2449	0.5240	0.5202	0.1822	0.1818	0.6727	0.6674	0.2061	0.2060

Table 6-4. Region 3 MH Loss Relativity Table for All Terrains

Roof Cover	Opening Protection	Terrain A				Terrain B				Terrain C			
		Pre 1976 & HUD 1976		1994 HUD (Zones 2 & 3)		Pre 1976 & HUD 1976		1994 HUD (Zones 2 & 3)		Pre 1976 & HUD 1976		1994 HUD (Zones 2 & 3)	
		NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR	NoSWR	SWR
Non-FBC Old (> 13 yr)	None	1.0000	0.8243	1.0000	0.8524	1.0000	0.8290	1.0000	0.8079	1.0000	0.8525	1.0000	0.7335
	Hurricane	0.9833	0.8124	0.9936	0.8493	0.9836	0.8126	0.9775	0.7961	0.9935	0.8460	0.9779	0.7134
Non-FBC Mid (6-13 yr)	None	0.7661	0.6963	0.7221	0.6707	0.7873	0.7214	0.7065	0.6382	0.8457	0.7818	0.6969	0.5950
	Hurricane	0.7535	0.6873	0.7180	0.6803	0.7672	0.6957	0.6699	0.6079	0.8403	0.7747	0.6718	0.5721
Non-FBCNew (0-5 yr)	None	0.4312	0.4290	0.3212	0.3205	0.4851	0.4816	0.2676	0.2682	0.6258	0.6203	0.2835	0.2763
	Hurricane	0.4183	0.4146	0.3174	0.3163	0.4604	0.4569	0.2462	0.2469	0.6221	0.6149	0.2598	0.2550
FBC Old (> 13 yr)	None	0.5334	0.4790	0.3863	0.3560	0.5902	0.5383	0.3524	0.3057	0.7321	0.6817	0.4049	0.3224
	Hurricane	0.5177	0.4653	0.3791	0.3494	0.5662	0.5148	0.3269	0.2877	0.7266	0.6771	0.3794	0.3024
FBC Mid (6-13 yr)	None	0.4472	0.4274	0.3107	0.3013	0.5067	0.4867	0.2630	0.2482	0.6538	0.6331	0.2903	0.2620
	Hurricane	0.4359	0.4163	0.3045	0.2957	0.4868	0.4660	0.2432	0.2311	0.6512	0.6297	0.2686	0.2428
FBCNew (0-5 yr)	None	0.3166	0.3156	0.1912	0.1909	0.3781	0.3763	0.1279	0.1285	0.5454	0.5427	0.1318	0.1309
	Hurricane	0.3061	0.3060	0.1847	0.1847	0.3591	0.3566	0.1096	0.1095	0.5406	0.5371	0.1114	0.1123

6.5. MH Secondary Factors

Single-family secondary factors number 4 (opening protection on all openings) , and 10 (vinyl siding) as defined in Section 4.2.4 are applicable to MH construction.

7. Implementation and Inspections

Sections 4, 0, and 5.3.4 developed the loss relativity tables and secondary factor tables for single-family, multi-family, and manufactured home residences, respectively. Section 6 of the 2008 study provided step-by-step procedures that summarize the computation of loss relativities for a residential building as well as the steps to convert a relativity into an insurance credit or rate differential. Those instructions remain valid and are not repeated here.

The implementation discussion in the 2008 referred to inspections as a cornerstone for success for a wind loss mitigation programs. The application of loss relativities requires knowledge of how base rates match up with relativities and the need to determine what wind mitigation features are on a building. How the base rates are mapped into the relativity tables determines how the rate differentials are turned into credits and/or surcharges. Numerous approaches are feasible. An accurate and reliable determination of what the rate differential should be generally requires a competent inspection of the building for pre-FBC construction. Within an insurance company's book of business, there are buildings that have been inspected for wind mitigation features, have not been inspected, or have some features that have been self-determined (partial inspection). This situation produces what might be called different "classes" within a line of business. Each class may have some average wind mitigation loss relativity; however, only the inspected class will have a pre-determined average class relativity. A statistical sample of inspections may be needed for some classes to determine how to quantify the base rate changes between classes.

The following subsections summarize our efforts regarding inspections as part of this study. Specifically, Section 7.1 summarizes ARA Florida employee experiences with recent hurricanes, Section 7.2 recommendations for changes to the Uniform Mitigation Verification Form, and Section 7.3 provides an outline of a model statistically valid statewide inspection program.

7.1. ARA FL Employee Survey and Home Inspections

ARA has over 200 employees that live in the state of Florida. Many of those employees live in areas that have been impacted by recent major hurricanes, including Hurricane Michael (2018). Two features that were investigated for this study, that had not been included previously, were the performance of sliding glass doors and metal roofs. We conducted a survey of ARA employees living in Florida, to which we received responses from ARA employees that included questions about features of their homes that are important for wind mitigation. Although this is a small sample size that cannot be used to derive statistically significant conclusions, it did allow us to identify some common factors in performance of building features.

Sliding Glass Doors. Of the 58 people who responded to the survey, 22 (38%) had sliding glass doors on their homes. Of those 22 respondents, only three indicated that they had ever experienced water leaking through an undamaged sliding glass door. We interviewed each of the three respondents to learn more about their home and experience with water leakage through an undamaged sliding glass door.

All three respondents were from the Panama City, FL area and their homes were impacted by Hurricane Michael in September 2018. Each of the respondents had at least one sliding glass door that was on the north side of the house. Their homes were located on the western side of the Hurricane Michael eye so the predominant wind direction was from the north-northeast as was evident from viewing overhead imagery (i.e., Google Earth) from October 2018 where it could be seen that trees had fallen to the south-southwest as a result of the hurricane, as shown in Figure 7-1.

Figure 7-1. To the west of the eye in Hurricane Michael, trees generally fell south to south-southwest, indicating the strongest winds came from the north to north-northeast.

Wind direction is an important consideration for water leakage through sliding glass doors. Sliding glass doors have small weep holes in the track at the bottom, which allow water to drain out when it rains (see discussion in Section 2.2.2. However, if there is a high positive wind pressure also acting against the sliding glass door, that pressure will prevent the water from draining through the weep holes and push the water into the home instead. In contrast, homes in the same neighborhoods that had sliding glass doors on the south, east, and west walls would not be expected to have leakage through the sliding glass doors because they would experience suctions (i.e., negative pressures), where the wind is acting outward from the sliding glass door. The respondents stated that they have never experienced leakage through the sliding glass doors during other storms.

For these homes, the amount of water intrusion was relatively limited. The respondents stated that water came in only a few feet from the sliding glass door and that there was nothing directly in the path of the water other than tile or vinyl flooring. However, the limited amount of water did cause damage and could become expensive because of having to replace that small section of flooring may lead to the rest of the flooring being replaced to match.

Although water intrusion through sliding glass doors may occur on single-family homes during a hurricane, this would not be expected to occur on every home impacted by a given hurricane. Only homes with sliding glass doors that experience positive pressure would have the possibility of water intrusion through an undamaged sliding glass door. This means that water intrusion through an undamaged sliding glass door is dependent on the orientation of the sliding glass door compared to the oncoming wind, as shown in Figure 7-2.

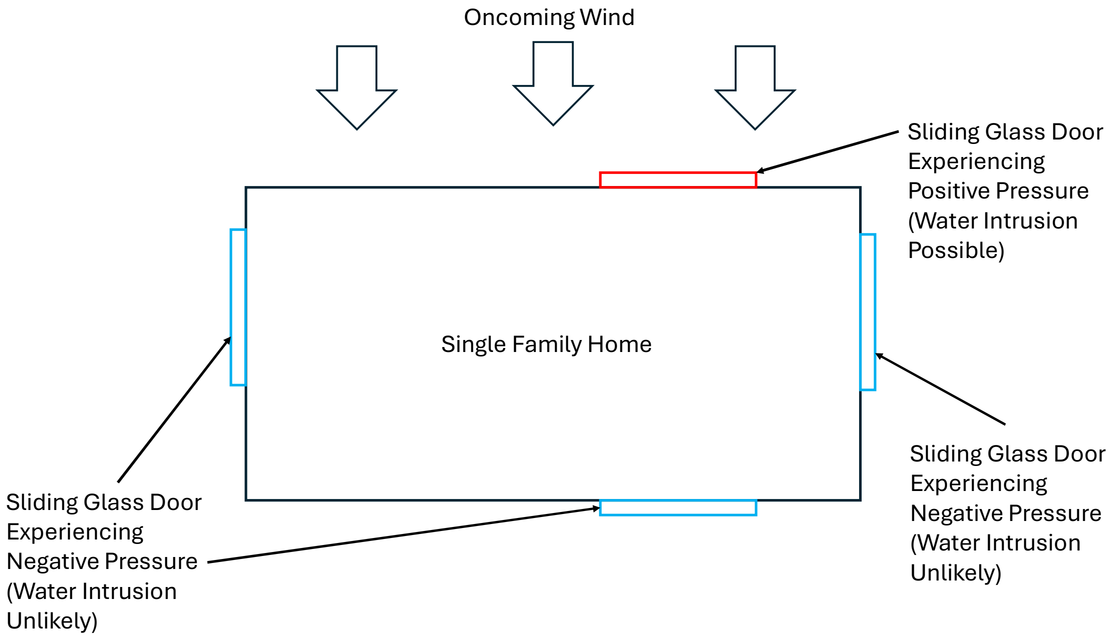


Figure 7-2. Illustration of sliding glass door that may experience water intrusion due to positive pressure on one side of a house (red) vs. sliding glass doors that are unlikely to experience water intrusion because of negative wind pressure (blue).

Our approach for developing the relativities uses a probabilistic storm set. That is, thousands of synthesized hurricane storms tracks are simulated and used to develop damage and losses for a given type of building. While this approach is effective for developing losses for typical building features that are not heavily dependent on wind direction, a limitation is that it will not capture the effect of losses for features that are heavily dependent on wind direction. To capture the effect of building feature losses that are dependent on wind direction, individual simulated hurricanes need to be evaluated. However, since this would be for individual storms, it would not be appropriate to include in the development of probabilistically based loss relativities. Furthermore, inspectors would not be able to document anything about the sliding glass door that would qualify for a discount since the prominent wind direction will vary by storm.

For multi-family buildings, leakage through sliding glass doors may be more likely to occur than in single-family homes because there may be many sliding glass doors on all sides of the building, meaning one side of the building would always have positive pressure that is prevents water from draining through the weepholes in the sliding glass doors' track.

Metal Roofs. Of the 58 people who responded to the survey, only 6 (10%) had metal roofs their homes. We conducted interviews with four of the respondents with metal roofs. Two of the metal roofs were installed on plywood as new builds, with no secondary water resistance. The other two metal roofs were installed over existing asphalt shingle roofs.

Only three of the respondents were directly impacted by a hurricane (Hurricane Michael in 2018). These respondents indicated that they experienced limited damage to their metal roofs during Hurricane Michael when compared to their neighbors who had much more significant roof cover losses to asphalt shingle roofs. Two of the respondents stated that a tree fell on their metal roof causing damage, but the metal panels were not pulled off by the wind. One advantage of metal roofs that the respondents noted was that since they had limited damaged to their metal roofs, they were able patch the damaged roof areas with metal panels while waiting for repairs which could be delayed by several months. On the other hand, asphalt shingle roofs with large areas of roof cover failures required blue tarps for protection while waiting for repairs (see Figure 7-3). However, the metal roof panels ultimately needed to be replaced due to damage from tree fall. These replacements are more expensive to replace than asphalt roof shingles.

Metal roof panels can be installed in several ways since the FBC does not provide prescriptive requirements other than meeting the manufacturers' instructions. Based on our discussions with wind mitigation inspectors and homeowners with metal roofs: some are installed over plywood, others over battens (1 x 4's) on very old homes (i.e., pre-plywood), and some are installed over existing asphalt shingle roofs. To develop and incorporate inspection criteria into the 1802 Form, additional research and modeling of metal roof covering is needed. Due to time constraints for this study, sufficient research and modeling was not completed to develop conclusions about metal roof coverings. In the short-term, one approach to understand how metal roof panels are installed would be to require roofers to complete and sign an affidavit describing how the roof was installed. Some inspectors already require similar proof for secondary water resistance since the FBC has not always been clear on this feature and it is not possible to visually inspect it.

Figure 7-3. Overhead imagery of a Panama City, FL area neighborhood in October 2018, one month after Hurricane Michael (Top) and December 2018 (Bottom). This figure shows that an example where many homes with asphalt shingle roofs required blue tarps while homes with metal roof panels did not require blue tarps as frequently.

7.2. Recommended Changes to Uniform Mitigation Verification Inspection Form

The Uniform Mitigation Verification Inspection form (UMVI or 1802 form) that is used in Florida has not seen significant updates since 2012 and is primarily based on the 2002 Wind Loss Mitigation Study. Given the significance of several improvements included in the 2008 and 2024 studies, the following improvements are recommended to be made to the UMVI form:

Recommendation #1: Update UMVI to include all Features in 2024 Loss Mitigation Study. The current UMVI form does not include several features that are shown to be important in this study. These include:

- **Number of stories.** One story single-family homes typically perform better than two-story single-family homes. As shown in Table 4-2, going from a two-story to a one-story home results in a reduction in losses ranging from 50-60% depending on roof shape, terrain, and location.
- **Roof slope.** High roof slopes generally result in lower uplift loads on the roof, resulting in better overall roof performance. As shown in Table 4-2, a high slope roof results in 0-40% lower losses for a single-family home depending on roof shape, terrain, and location. We recommend qualifying whether the roof has a low slope (< 6:12) or high slope (≥ 6:12). The inspection should also require a slope measurement image. For single-family homes with multiple slopes, the higher slope can be assigned if it accounts 90% or more of the roof. Otherwise, lower roof slope should be applied.
- **Terrain.** Although terrain (i.e., the area surrounding home) may be difficult for inspectors to identify. It could be included on the form by either including 1) Overhead imagery (e.g., Google Earth) of the home for 1600 feet around the house; or 2) Provide simplified categories to indicate what is around the home being inspected. An example of the latter could be: Terrain C – Rural area with few buildings and trees or waterfront area; Terrain B – Suburban/urban area with many surrounding buildings and/or trees; Terrain A -Homes in areas surrounded by densely populated tall trees. We would recommend a note is included that Terrain B is to be used unless evidence can be presented that another terrain is appropriate.
- **Building Code.** Update title to be "Building Code and Wind Mitigation Certifications". Within this section, a line(s) should be added to identify whether the single-family home has been certified by any wind mitigation programs (e.g., IBHS Fortified Home). This line would need to capture the certification name, certification number, and expiration date. The homeowner would have to provide supporting documentation in this case. This would be helpful to inspectors and insurance companies in determining the existence of other qualifying features. For example, IBHS' Fortified Home Roof, Silver, or Gold certifications all address the roof system. Silver and Gold certifications address opening protection, and Gold certification addresses the roof to wall, foundation, and load path systems. In addition, we recommend changing the first line in Section 1 from "what code was the structure built to" to "was the 2001/SFBC code in force at time of construction".

Recommendation #2: Performance-Based Thresholds. The current UMVI form includes roof deck attachment configuration criteria and minimum uplift resistance thresholds that can also be used as an alternative. The UMVI form should be updated to include minimum thresholds of resistance where possible. For example, roof-to-wall connection criteria should be updated to include uplift resistances of the connection instead of just prescribing toe-nails, clip, single wrap, or double wraps. The thresholds in Table 7-1 should be included for roof-to-wall connections:

Table 7-1. Threshold Strength Requirements for Roof-to-Wall Connections

Roof to Wall Connection	Minimum Required Ultimate Strength (lbs.)
Toe-nail (3-16d)	550
Clip	866
Single Wrap	1200
Double Wrap	2000

Recommendation #3. Secondary Water Resistance (SWR). On the UMVI Form, the SWR section should be retitled to "Sealed Roof Deck/Secondary Water Resistance (SWR)." In addition, the current parenthetical after section title should be updated to read "(standard underlayments or hot-mopped felts – ***which are not self-adhered*** – do not qualify as SWR).

The SWR section should also acknowledge the changes to the FBC to mirror the requirements of the IBHS Fortified program for a sealed roof deck. The UMVI should include a list of SWR that is acceptable per the FBC:

- Fully adhered polymer-modified bitumen underlayment complying with ASTM D1970.
- Tape over roof deck seams with felt or synthetic
- Double layer of felt or synthetic with no tape
- Foam seal adhesives with an uplift resistance of 110 psf (Fos 1.5)
- Since SWR is not possible to see during an inspection for an existing roof, proof will need to be provided of how SWR was installed otherwise, the "No SWR" box should be used. Acceptable proof would be IBHS Fortified Home Certification, an affidavit from the roofing contractor who installed the SWR, or similar documentation.

Recommendation #4: Reorganization of UMVI Form**.** We recommend reorganizing the UMVI two have two major categories: 1) Architectural Features; and 2) Structural Features. The architectural features category would include features that do not have minimum requirements in the FBC (i.e., are not dependent on building code):

- Roof geometry
- Roof slope
- Number of stories

The structural features category would include features that have minimum requirements in the FBC (i.e., are dependent on building code):

- Building code and Wind Mitigation Certification (see recommendations above)
- Roof cover
- Roof deck attachment
- Roof to wall connection
- Sealed Roof Deck/Secondary Water Resistance (SWR)
- Opening Protection

If terrain is added to the UMVI, as we have recommended, it could be included under the architectural features category or a separate "Other" category.

Recommendation #5: Add Minimal Conditions. To ensure the UMVI is being used as intended, minimal conditions should be added for several features. Specifically, minimal conditions should be included for:

- **Roof Cover (Age and Condition).** If asphalt shingles are more than 15 years old, a roof certification inspection should be required to verify the useful remaining life of the roof cover. Similarly, for metal and tile roof covers over 20 years old, proof of further inspection should be required to confirm useful life remaining. For practical purposes, this section could require the inspector to determine whether the roof cover is in "good condition with at least 5 years of remaining life" or not. The inspector should also be required to record observations related to the condition of the roof cover that may impact its' performance, such as:
    - Missing or curling asphalt shingles
    - Obvious granule loss on asphalt shingles
    - Cracked or missile tiles
    - Gaps at seams in metal roof panels
    - Corrosion of metal roofing
    - Cosmetic damage to metal roofing
    - Loose or missing flashing
    - Leaks
    - Rotted soffits fascia or other deferred maintenance observed could be a sign the roof system or decking may have hidden issues that could cause a failure.
    - Corrosion of metal roof exposed fasteners
- **Metal Roof Cover.** Unlike asphalt shingle roof cover, metal roof covers have limited prescriptive requirements in the FBC. The UMVI should require homeowners to provide proof that their metal roof cover was installed in accordance with the requirements from the product testing/approval. This would typically be the result of a more in-depth inspection completed on the home such as that done as part of the IBHS Fortified Inspection program. However, we note that this does present some challenges because product testing is rarely followed in installation and the variation of testing is wide. Additionally, identifying the manufacturer and model is not always easy and the permits, even if they list FPA's are many times identifying the wrong product.
- **Roof to Wall Connections (Condition/Installation).** Inspectors and other industry professionals have found that it is not uncommon for roof to wall connections to not be installed as intended. If an inspector finds that a roof to wall connection is not installed as intended, that should be noted on the UMVI form so that an insurance company can decide as to whether the credit is applicable.

Recommendation #6: Acknowledgement and Acceptance of Documentation Other Inspection Programs. The authors are aware of and have reviewed the requirements for IBHS' Fortified program and recommend that such certification should be accepted as proof for features based on the program standards and inspection requirements. As described above, IBHS' Fortified Home certifications address the roof system (i.e., SWR, roof deck attachment, roof to wall connection, roof cover), opening protection, foundation, and load path. Other third-party certification programs should be reviewed for acceptability as well.

Recommendation #7: Multi-Family Buildings. The UMVI is currently only used for single-family homes. However, for Group I multi-family buildings the form could be used with some adjustments. For example, the form may need to describe whether the inspection is for the entire building or an individual unit and identify where the unit is located within the building. For Group II and III multi-family buildings, a new form needs to be developed but would be simpler than the single-family home form since there are fewer building features included in this wind loss mitigation study for these buildings.

7.3. Statistically Valid Statewide Inspection Program

Florida insurers may be interested in implementing a statistically valid statewide inspection program to develop a better inventory and understanding of the homes they insure, including:

1. Confirming the quality of homes that automatically qualify for rate differentials based on being built to the FBC (i.e., post-FBC homes); and
2. Determining the distribution of wind mitigation features for homes whose owners have not elected to have inspected.

Designing a statistically valid inspection program begins with a random sampling procedure to accurately represent the homes of interest throughout Florida. This sampling process selects the homes to be inspected in a rational manner based on location, construction era, and relative home value.

For example, a sample of homes can be selected based on the homes currently insured by a specific insurer. Then, a stratified sampling approach could be developed to address critical strata. For example, an insurer could identify the follow critical strata:

1. Year Built Era:
    a. Pre-1965: Home built prior to widespread use of plywood for roof sheathing.
    b. 1966-1994: Pre-Hurricane Andew building code. These codes contained limited/early wind design requirements.
    c. 1995-2002: Post-Hurricane Andrew building code, which is especially important in South Florida (i.e., SFBC 1994), where more strict wind design requirements were put in place
    d. 2002-2006 (FBC01-04): Initial version of the FBC which greatly improved the baseline for wind design of Florida homes.
    e. Post-2006 (FBC06 and later): Prescriptive requirement for ring-shank nails roof deck attachments on single-family homes in FBCR, elimination of the Panhandle exception, and elimination of the partially enclosed design option (i.e., shutters now required) in WBDR. Note that FBC 06 is a fictional designation that refers to FBCR 2004 with the 2007 supplements.
2. Region in Florida

a. The three regions established for the 2024 Loss mitigation Study could be used. Figure 7-4 shows the mitigation regions developed for this loss mitigation study.

3. Coverage A Value
    a. Four quartiles from each subpopulation conditioned on strata 1 and 2. The breakup of Coverage A values into quartiles provides for survey data from economy to high value homes in a systematic manner.

Stratification, such as the example listed above, ensures sufficient sampling within each group so that the insurer has a representative sample for all year-built eras, locations, and building values statewide. The year-built eras recommended above follow from ARA research on Florida building codes and predominate construction methods. Although brief descriptions for these eras are included above, Further discussion of these eras can be found in the 2002 and 2008 loss mitigations studies.

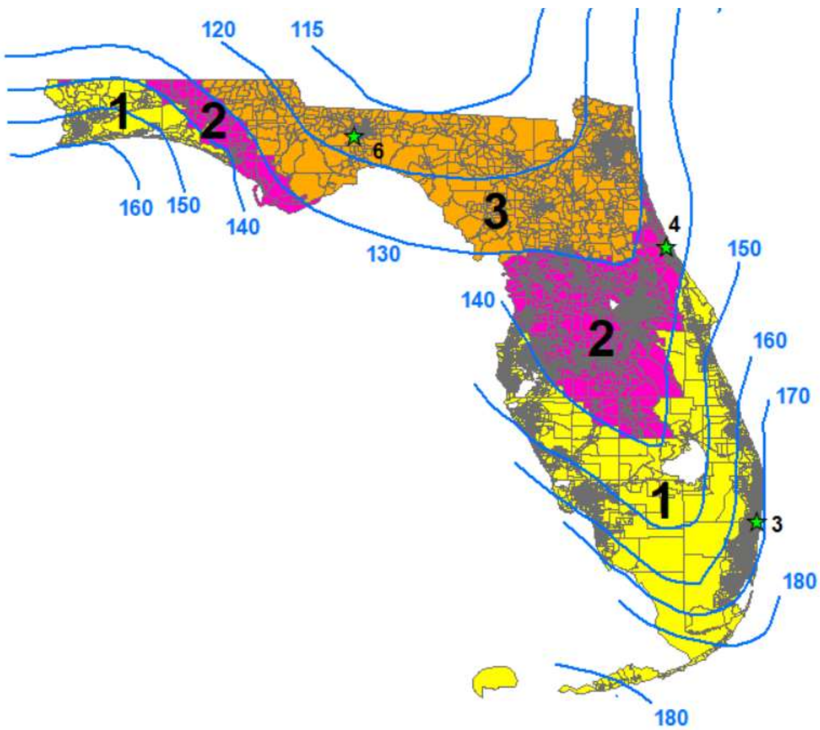


Figure 7-4. Mitigation Regions Defined for 2024 Loss Mitigation Study.

The total number of bins produced by the strata for this example is 60 (5 eras x 3 regions x 4 Coverage A value groups). Therefore, an insurer's entire Florida book of homeowner policies (1-4 units) would be analyzed policy by policy for year built, region, and coverage A value. Each policy would be placed into one of these 60 bins for purposes of drawing the survey sample.

Individual homes from within each bin should then be selected for inspection. For example, if 100 homes were selected from each bin, this would result in a total of 6,000 homes to be inspected. The total number of homes selected should be more than the actual number of homes desired for inspection. In the case illustrated above. if only an average of 90 inspections in each cluster completed, there would still be a total of 5,400 homes inspected.

Florida insurers track the wind mitigation features of homes for application of loss relativities and for the catastrophe modeling of their book of business. The only parameter in the inspection program design that requires a weighting adjustment is the building value quartile. A value quartile weighting is often necessary because each quartile will have slightly different counts because invariably not all planned inspections will be completed. As a result, quarterlies may not have had exactly 25% of the inspections (e.g., 24%, 26%, 25.5%, 24.5% instead of 25%). To compile the wind mitigation feature frequencies by region and construction era, a quartile weighting factor (W_i) can be calculated for each value quartile within each region-era bin as the expected number of records within the bin divided by the actual number of homes surveyed in the bin. This results in the following equation:

$$W_i = \frac{\sum_{i=1}^{4} N_i}{4N_i} \qquad \textbf{17}$$

where W_i is the weighting factor for quartile *i* and N_i is the actual number of homes surveyed in quartile *i*.

With the weighting factors calculated, the weighted frequency of homes in categories representing various combinations of wind mitigation features can be calculated. Frequencies of homes in each category can be calculated using the following equation:

$$f_c = \frac{1}{4}\sum_{i=1}^{n} W_i\, N_{ci} / N_i \qquad \textbf{18}$$

where f_c is the weighted frequency for category *c*.

8. Summary and Recommendations

8.1. Summary and Conclusions

This study estimates the effects of wind-resistive building features in reducing hurricane damage and loss to single family and multi-family residential structures located throughout the state of Florida. This goal of this project was to systematically update previously developed loss mitigation relativities (ARA, 2002a,2002b, and 2008). A major task in this project included the analysis of new data relevant to wind loss mitigation. This data includes insurance loss data from the 2017-2023 Florida hurricanes, damage survey data, and engineering data from laboratory tests and wind tunnel experiments.

The scope of this project has included construction prior to the introduction of the Florida Building Code 2001 (pre-FBC era) and post-FBC construction. To reflect wind-resistive design improvements implemented in the FBC, the post-FBC construction period includes two eras: FBC 2001 and FBC 2006 (i.e., the 2006 revisions to the 2004 FBC). Further changes after to the FBC after 2006 were also evaluated and found to not result in significant changes to structural design of Florida residences.

The results of this study are based on the analysis of individually modeled buildings at locations throughout Florida. For post-FBC construction, the buildings were designed to the FBC 2001 and FBC 2006 according to the design wind speed, wind-borne debris region design options, and FBC definitions of Terrain Category. In the wind-borne debris region, the FBC 2001 era designs include both enclosed and partially enclosed structures, per the FBC and ASCE 7-98.

Each building has been modeled with a specific set of wind resistive features. There are two broad classes of buildings: single family houses and multi-family (5 or more units) residences. The multi- family residences include three groups, based primarily on building height and roof deck material: Group I (less than 60 feet tall with wood roof decks), Group II (less than 60 feet tall with non-wood roof decks), and Group III (more than 60 feet tall).

The 2002 and 2008 studies were conducted when the FBC was in its infancy. This study has the benefit of being performed after the FBC has been enforced for over 20 years. The analysis of insured losses and post-hurricane damage surveys from the 2017-2023 Florida hurricanes presented in Section 3 show the improved performance of FBC buildings. However, despite improved performance, new vulnerabilities have been identified, including the aging of FBC-compliant roofing materials and water intrusion through the tracks of undamaged sliding glass doors.

The 2024 mitigation study also includes the following updates from the 2008 study:

- Loss relativities for three distinct regions of Florida, as opposed to single set of tables in the previous studies.
- Loss relativities for Terrain A, representing areas with tall trees
- Normalization of single-family and multi-family Group I loss relativity tables based first on Architectural features, and then separately by strength features allowing homeowners to better understand decisions they can make to improve the performance of their homes

- Aging of asphalt shingle roofing materials as a primary factor for single-family and multi-family Group I buildings
- Metal panel roof coverings as a primary factor for single-family homes
- Water intrusion through tracks of sliding glass doors as a primary factor to multi-family Group II and III buildings
- Hurricane hazard curves used in the analysis reflect the current climate conditions
- Loss relativities for Manufactured/Mobile Homes

The results of the wind mitigation analysis are presented in the form of "loss relativity" tables. These tables measure the loss reduction effectiveness of all possible combinations of the modeled wind mitigation features on a building. The tables provide a convenient way to "look-up" the effectiveness of wind mitigation features on any building, such as a two-story gable house or a one-story hip house with a tile roof cover. The loss relativities were developed such that they directly measure the difference in average annual insured loss for 2% deductible. Hence, the loss relativities can be used directly to compute insurance rate differentials on the wind premium. The rate differentials only apply to the portion of the wind premium associated with the dwelling, its contents, and loss of use (not any attached or detached structures or common deductible associated with such structures).

Significant reductions in loss are achieved on all building types in all regions and terrains when they have the appropriate wind mitigation construction techniques. While these reductions are similar in magnitude to the results obtained in the 2002 and 2008 studies, the fact that this study includes more construction features results in a broader range of reduction, when measured from the weakest building.

8.2. Recommendations

Recommendations are grouped into two general areas: short-term updating of relativities and longer-term research needs.

Short-term Updates: We recommend immediate efforts to refine the results of this study prior to implementation in 2025 insurance rate filings. This short term updating would include the following:

1. Continue evaluation of insured loss data from 2017-2023 hurricanes. The abbreviated schedule for this study required that model enhancements and analysis of insured loss be conducted in parallel. As such, it was not until late in the project that we were able to compare the performance of the updated models with insured loss data. The loss data showed several instances where, on the surface, the data do not make physical sense (e.g., Section 3.2.5). Further analysis of this data should be conducted to discern the reasons for these possible discrepancies and advise adjustments to the current loss functions with empirical data if warranted. The loss relativities in this study should then be adjusted as needed. Such adjustments may be appropriate for areas such as:
    a. Aging effects for roof cover types other than asphalt shingles

   b. Threshold damage levels to roof covering triggering full roof replacement
   c. Effects of social inflation and claims-related litigation leading to higher insured losses (and possibly the efforts of the Florida legislature and OIR to mitigate them)

2. Work with stakeholders to formally update the UMVI. This report contains ARA's recommendations to update the form for consistency with the loss mitigation studies and input from a limited number of interested parties we interacted with on the project. Expanding this effort to include a broader base of stakeholders is the next logical step to building consensus for updates to the inspection forms. This could also include development of new inspection forms for multi-family Group I, II, and III buildings.
3. Develop metal roof relativities for MF Group I buildings.
4. Develop a secondary factor for soffit strength for SF and Group I sloped roof buildings. Separate relativities by soffit strength were not included in this study in order to be able to complete modeling for the roof cover aging. The 2008 study shows that soffit strength can have a substantial impact on loss relativity for certain building configurations.
5. Additional analysis of study results to improve understanding and communication of the implications of the relativities to Florida homeowners and insurers.

Long-term Research: Suggested long-term research areas for future updates of the residential wind-loss mitigation study include:

1. Detailed claim folder review to better understand how insured losses accrue from physical damage. For example, the 2008 LMS included a claim folder review that was used to develop a logistic regression model to predict the damage threshold after which a roof is completed replaced (as opposed to repaired). An updated analysis should consider how roof age affects this threshold. We anecdotally understand that product matching often becomes an issue with repairing older roofs which may, in turn, can cause the damage threshold to require re-roofing to any discernable damage to the roof. Such a result will have a significant effect on losses for low level damage.
2. Research effects of increasing uncertainty in physical damage modeling and damage-to-loss modeling.
3. Research reasons for current observations of poor roof covering performance and develop approaches for improving performance. The loss data analyzed for this study suggest that losses are driven by roof cover damage at wind speeds well below FBC design wind speeds (i.e. losses between 70 and 100 mph in areas with FBC design wind speeds between 120 and 150 mph).
4. Continued research into water intrusion through the tracks of sliding glass doors and incorporate the results of ongoing research in this area. This should consider the potential effects of strengthened code requirements for water resistance of sliding glass doors.
5. Expansion of water intrusion modeling to include other fenestration types including sliding, casement, and single/double hung windows. Claim folder reviews could also help

here to better understand how losses accrue prior to wind pressure or missile failure of the building envelope.

6. Effects of attached structures on loss relativities
7. Allocation of losses between building owners and tenants, or between condo associations and unit owners.

9. References

Applied Research Associates, Inc. (2008). “2008 Florida Residential Wind Loss Mitigation Study,” Florida Office of Insurance Regulation, Tallahassee, Florida, October.

AIR (2007). The AIR Hurricane Model: AIR Atlantic Tropical Cyclone Model V9.0, 2006 Standards Submission, Final Revision, May 3.

Aluminum Association of Florida, Inc. (2003). *Guide to Aluminum Construction in High-Wind Areas*, Aluminum Association of Florida, Boca Raton, FL.

American Society of Civil Engineers (2005). “Minimum Design Loads for Buildings and Other Structures,” ASCE Standard ASCE/SEI 7-05.

Applied Research Associates, Inc. (2002a). “Development of Loss Relativities for Wind Resistive Features of Residential Structures,” Florida Department of Community Affairs, Tallahassee, Florida, March.

Applied Research Associates, Inc. (2002b). “Development of Loss Relativities for Wind Resistive Features for Residential Buildings with Five or More Units,” Florida Department of Community Affairs, Tallahassee, Florida, August.

Applied Research Associates, Inc. (2007). *HURLOSS 4.0.c: Florida Commission on Hurricane Loss Projection Methodology,* 2006 Standards Submission, Final Revision, May 3.

Applied Research Associates, Inc. (2007). “My Safe Florida Home Program: Database and Data Dispatch System Administrator’s Guide,” Version 2.0, for Florida Department of Financial Services, Tallahassee, Florida, March 30.

Applied Research Associates, Inc. (2007). “My Safe Florida Home Program: Database and Data Dispatch System User’s Guide for Wind Certification Entities,” Version 2.0, for Florida Department of Financial Services, Tallahassee, Florida, March 30.

Applied Research Associates, Inc. (2007). “My Safe Florida Home Program: Database and Data Dispatch System Methodology Guide,” Version 2.0, for Florida Department of Financial Services, Tallahassee, Florida, March 30.

Applied Research Associates (ARA). (2008). “2008 Florida residential wind loss mitigation study. Version 1.11.”, Florida Office of Insurance Regulation, Raleigh, NC.

ASCE (2005). “Minimum Design Loads for Buildings and Other Structures,” ASCE Standard ASCE/SEI 7-05.

Baskaran, B. A., Ham, H. J. and Lei, W. (2006). New design procedure for wind uplift resistance of architectural metal roofing systems. Journal of Architectural Engineering. Vol. 12, No. 4, pp. 168-177.

Batts, M.E., M.R. Cordes, L.R. Russell, J.R. Shaver, and E. Simiu (1980). “Hurricane Windspeeds in the United States,” Report Number BSS-124, U.S. Department of Commerce, National Bureau of Standards, Washington, D.C., May.

Black, P.G., E.A. D’saro, W.M. Drennan, J.R. French, P.P. Niler, T.B Sanford, E.J. Terrill, E.J. Walsh and J.U Zhang, (2007). “Air-sea exchange in hurricanes: Synthesis of observations from coupled boundary layer air-sea transfer experiment,” *Bull. Amer. Meteor. Soc.*, 20, 357-374.

Blake, E.S., E.N. Rappaport, J.D. Jarrell, and C.W. Landsea (2007). "The Deadliest, Costliest and Most Intense United States Hurricanes from 1851 to 2006 (and Other Frequently Requested Hurricane Facts)," *Technical Memorandum NWS-TPC-5*, NOAA, 43 pp.

Boardman, A.E., D.H. Greenberg, A.R. Vining, and D.L. Weimer (1996). *Cost-Benefit Analysis: Concepts and Practice*, Prentice Hall, Upper Saddle River, NJ.

Cook, N.J. (1990). The Designer's Guide to Wind Loading of Building Structures: Part 2 Static Structures, London, UK.

DeMaria, M., and J. Kaplan (1999). "An Updated Statistical Hurricane Intensity Prediction Scheme (SHIPS) for the Atlantic and Eastern North Pacific Basins," *Weather and Forecasting*, Volume 14, pp. 326-337.

Dixon, L. J.W. Macdonald, and J. Zissimopoulos (2007). *Commercial Wind Insurance in the Gulf States: Developments Since Hurricane Katrina and Challenges Moving Forward*, Rand Corporation.

Dixon, C. R., Prevatt, D. O., Masters, F. J. and Gurley, K., R. (2013). The Unsealing of Naturally Aged Ashphalt Shingles: An In-situ Survey. 1st Residential Building Design and Construction Conference, Bethlehem, PA, February.

Dixon, C. R., Prevatt, D. O., Masters, F. J. and Gurley, K., R. (2014). Wind Uplift Resistance of Artificially and Naturally Aged Asphalt Shingles. Journal of Architectural Engineering, 20(4).

Donelan, M.A., B.K. Haus, N. Reul, W.J. Plant, M. Stiassnie, H.C. Graber, O.B. Brown, and E.S. Saltzman, (2004). "On the limiting aerodynamic roughness in the ocean in very strong winds" *Geophys. Res. Lett.*, **31**, L18306

Emanuel, K.A, S. Ravela, E. Vivant and C. Risi (2006). "A Statistical-Deterministic Approach to Hurricane Risk Assessment," *Bulletin of American Meteorological Soc*iety, Volume 19, pp. 299-314.

Emanuel, K.A. (1988). "The Maximum Intensity of Hurricanes," *Journal of Atmospheric. Science*, Volume 45, pp. 1143-1155.

Emanuel, K.A. (2005). "Increasing Destructiveness of Tropical Cyclones Over the Past 30 Years," *Nature*, Volume 436, pp. 686-688.

ESDU (1982), "Strong Winds in the Atmospheric Boundary Layer, Part 1: Mean Hourly Wind Speed", Engineering Sciences Data Unit Item No. 82026, London, England.

EQECAT (2007). Florida Commission on Hurricane Loss Projection Methodology, 2006 Standards Submission.

FEMA (2007). "HAZUS-MH MR3 Hurricane Technical Manual, Prepared by Applied Research Associates, Inc., Raleigh, North Carolina.

FEMA 488 (2005a). Hurricane Charley in Florida, Observations Recommendations and Technical Guidance," April.

FEMA 490 (2005b). *Summary Report on Building Performance – 2004 Hurricane Season*, Federal Emergency Management Agency, Washington, D.C., March.

FEMA 548 (2008). *Summary Report on Building Performance – Hurricane Katrina 2005*, Federal Emergency Management Agency, Washington, D.C., August.

FEMA (2020). Mitigation Assessment Team Report. Hurricane Michael in Florida. Building Performance Observations, Recommendations, and Technical Guidance. FEMA P-2077, February.

FEMA (2023). Mitigation Assessment Team Report. Hurricane Ian in Florida. Building Performance Observations, Recommendations, and Technical Guidance. FEMA P-2342, December.

Florida Department of Financial Services (2006). "Wind Certification Entity Surveyor Training Program," Tallahassee, Florida, November.

Florida Department of Financial Services (2006). "Wind Certification Entity Surveyor Training Program," Tallahassee, Florida, November.

Florida Department of Financial Services (FLFDS) (2003a). Filing Number 03-02605, United Service Automobile Association, USAA Casualty Insurance Corporation, Tallahassee, Florida.

Florida Department of Financial Services (FLFDS) (2003b). Filing Number 03-02830, Citizens Property Insurance Corporation, Tallahassee, Florida.

Florida Public Model (2007). *Florida Public Hurricane Loss Model*, 2006 Standards Submission.

Garratt, J.R. (1977). "Review of Drag Coefficients over Oceans and Continents," *Mon. Wea. Rev.* 105, 915–929.

Georgiou, P.N. (1985) "Design Windspeeds in Tropical Cyclone-Prone Regions," Ph.D. Thesis, Faculty of Engineering Science, University of Western Ontario, London, Ontario, Canada, 1985.

Giammanco, I. M., Newby, E. and Pogorzelski, W. H. (2023). Observations of Building Performance in Southwest Florida During Hurricane Ian (2022): Part 1: Roof Cover Damage Assessment on Residential and Light Commercial Structures. IBHS research Report.

Grossi, P., and R. Muir-Wood (2006). "Flood Risk In New Orleans: Implications for Future Management and Insurability," Risk Management Solutions, California.

Gurley, K. and Aponte, L. "Lateral Length Scales Measured in Land Falling Tropical Cyclones," 10th Americas Conference on Wind Engineering, Baton Rouge, LA, June 1-4, 2005.

Gurley, K., Masters, F., Prevatt, D. and Reinhold, T. (2005). "Hurricane Data Collection: FCMP Deployments During the 2004 Atlantic Hurricane Season," 10th Americas Conference on Wind Engineering, Baton Rouge, LA, June 1-4.

Gurley, K.R and Masters, F. (2011). "Post -2004 Hurricane Field Survey of Residential Building Performance," Natural Hazards Review, 12, 177-183, November.

FEMA (2007). "MultiHazard Loss Estimation – Hurricane Model, HAZUS MH MR3 Technical Manual," Federal Emergency Management Agency, Mitigation Division, Washington, D.C.

Ho, F.P. et al. (1987). "Hurricane Climatology for the Atlantic and Gulf Coasts of the United States," NOAA Technical Report NWS38, Federal Emergency Management Agency, Washington, D.C.

Holland, G.J. (1980). "An Analytic Model of the Wind and Pressure Profiles in Hurricanes," *Monthly Weather Review*, Volume 108, pp. 1212-1218.

HUD (1976). PART 3280: Manufactured Home Construction and Safety Standards and Interpretative Bulletins to the Standards," U.S. Department of Housing and Urban Development, Washington, DC.

HUD (1994). PART 3280: Manufactured Home Construction and Safety Standards and Interpretative Bulletins to the Standards," U.S. Department of Housing and Urban Development, Washington, DC.

HUD (1998). PART 3280: Manufactured Home Construction and Safety Standards and Interpretative Bulletins to the Standards," U.S. Department of Housing and Urban Development, Washington, DC.

Institute for Business and Home Safety (2007). *Fortified for safer living® Fortified Builder's Guide*, Institute for Business and Home Safety, Tampa, Florida.

International Code Council (2004). *Florida Building Code 2004*, International Code Council, Country Club Hills, IL.

James, M.K. and L.B. Mason (2005). "Synthetic Tropical Cyclone Database," *Journal of Waterways. Port, Coastal, Ocean Engineering*, Volume 131, Number 4, pp. 181-192.

Kopp, G.A., D. Surry and V. Mans (2005). "Wind Effects of Parapets on Low Buildings: Part 1. Basic Aerodynamics and Local Loads," *Journal of Wind Engineering and Industrial Aerodynamics*, Vol. 93, pp. 817-841.

Landsea, C.W. (2007). "Counting Atlantic Tropical Cyclones Back to 1900," *Eos Trans*. AGU, Volume 88, pp. 197-208.

Landsea, C.W., Harper, B.A., Hoarau, K., and Knaff, J.A. (2006). "Can We Detect Trends in Extreme Tropical Cyclones?" *Science*, Volume 313, pp. 452-454.

Lavelle, F., Vickery, P., Schauer, B., Twisdale, Jr., L., and Laatsch, E. (2003). "The HAZUS-MH Hurricane Model," *11th International Conference on Wind Engineering*, Lubbock, Texas, 2-5 June.

Lavelle, F.M., Vickery, P.J., and Twisdale, L.A. (2003). "Hurricane Mitigation Cost/Benefit Analysis for Hawaii," *11th International Conference on Wind Engineering*, Lubbock, Texas, 2-5 June.

Masters, F., "Field measurement activities to come when the next hurricane strikes Miami-Dade County," Miami-Dade County Local Mitigation Strategy, Miami, Florida, March 16, 2005.

Masters, F., Aponte, L., Gurley, K., Reinhold, T. (2004). "Gust Factors Observed in Tropical Cyclones Isabel, Lili, Isidore Gabrielle and Irene during the 1999-2003 Atlantic Hurricane Seasons," ASCE joint specialty Conference on Probabilistic Mechanics and Structural Reliability, Albuquerque, NM, July 16-28.

Masters, F., Gurley, K. and Reinhold, T. (2003). "Ground Level Wind Characteristics of Isidore and Lili," *11th International Conference on Wind Engineering*, Lubbock, TX, June 2-5.

Masters, F., Reinhold, T., Gurley, K., and Prevatt, D. (2005). "The Effect of Hurricane Eyewall and Convective Features on Surface-Level Turbulence," 10th Americas Conference on Wind Engineering, Baton Rouge, LA, June 1-4.

Masters, F.J., P.G. Black and M.D. Powell (2006). "The perspective below: ground-level reconnaissance in landfalling hurricanes," 27th AMS Conference on Hurricanes and Tropical Cyclones, Monterey, California, April 24-28.

Masters, F. J., Dixon, C. R., Prevatt, D. O. and Gurley, K. R. (2013). Investigation of the Wind Resistance of Asphalt Shingle Roof Coverings. Report Submitted to Southwest Region Research Initiative.

Murnane, R.J. (2004). "Climate Research and Reinsurance," *Bulletin of the American Meteorological Society*, Volume 85, 10.1175/BAMS-85-5-697, pp. 697-707.

Murnane, R.J. (2004). "The Importance of Best-Track Data for Understanding the Past, Present, and Future of Hurricanes and Typhoons," in *Hurricanes and Typhoons: Past, Present, and Future*, R.J. Murnane and K.-b. Liu, eds., Columbia University Press, New York, pp. 249-266.

Murnane, R.J. and Knap, A. (2008). "The Risk Prediction Initiative: A Successful Science-Business Partnership for Analyzing Natural Hazard Risk," *Climate Extremes and Society*, Cambridge University Press, Cambridge, 320-336.

Murnane, R.J. and Liu, K. eds. (2004). *Hurricanes and Typhoons: Past, Present, and Future*, Columbia University Press, New York, 462pp.

Murnane, R.J., Barton, C., Collins, E., Donnelly, J., Elsner, J., Emanuel, K., Ginis, I., Howard, S., Landsea, C., Liu, K., Malmquist, D., McKay, M., Michaels, A., Nelson, N., O'Brien, J., Scott, D., and Webb, T. (2000). "Model Estimates Hurricane Windspeed Probabilities," *EOS Trans. AGU*, Volume 81, pp. 433-438, September.

NCE (2023). Statistical Analysis for Stormarmour Technical Report. Project# NC23-191.

NIST (2006). Performance of Physical Structures in Hurricane Katrina and Hurricane Rita: A Reconnaissance Report," Technical Note 1476, National Institute of Standards and Technology, Gaithersburg, Maryland.

Office of Insurance Regulation (2003). Informational Memorandum OIR-03-006M, Tallahassee, Florida, March.

Parackal, K., Arraiza, P, Morrison, M. and Henderson, D. (2023). Development of Improved Test Methods for Wind Driven Rainwater Ingress through Windows and Doors. 16th International Conference on Wind Engineering, Florence, Italy, August.

Peterka, J. A., Cermak, J. E., Cochran, L. S., Hosoya, N., Derckson, R. G., Metz, B. (1997). Wind Uplift Model for Asphalt Shingles. Journal of Architectural Engineering. Vol. 3, No. 4.

Pinelli, J.P., Gurley, K., Subramanian, C., Hamid, S., and Pita, G. (2008). "Validation of a Probabilistic Model for Hurricane Insurance Loss Projections in Florida," *Journal of Reliability Engineering and System Safety,* Vol. 93, 12, 1896 – 1905.

Powell, M., Murillo, S., Reinhold, T., Gurley, K., Masters, F. and Prevatt, D. (2005). "Hurricane Winds at Landfall: 2004," 10th Americas Conference on Wind Engineering, Baton Rouge, LA, June 1-4.

Powell, M.D., P.J. Vickery and T.A. Reinhold (2003). "Reduced Drag Coefficient for High Windspeeds in Tropical Cyclones," *Nature*, Volume 422, pp. 279-283, March.

Powell, M.D. (1980). "Evaluations of Diagnostic Marine Boundary-Layer Models Applied to Hurricanes," *Mon. Wea. Rev.* 108, 757–766

Prevatt, D. O., Smith, D. J. and Louis, M. J. (2019). Wind Driven Rain Test of Building Envelope Systems up to Hurricane-Strength Wind-Driven Rain Intensity. Report submitted to Florida Department of Business and Professional Regulation. Project#P0150337.

Prevatt, D. O. and Roueche, D. B. (2019). Survey and Investigation of Buildings Damaged by Category-III, IV & V Hurricanes in FY 2018-2019 – Hurricane Michael. Report submitted to Florida Department of Business and Professional Regulation. Project# 0091032.

Raiffa, H. (1968). Decision Analysis: Introductory Lectures on Choices under Uncertainty, Addison- Wesley, Reading, Massachusetts.

Rao, G., J. Sciaudone, and S. Daneshvaran, (1997). "Restoration Process Modeling for Hurricane Vulnerability Assessment," Eighth U.S. National Conference on Wind Engineering, Johns Hopkins University, Baltimore, Maryland. June.

Reinhold, T.A., B.L. Sill, P.J. Vickery, and M.D. Powell (1993). "Windspeeds in Hurricane Andrew," *7th U.S. National Conference on Wind Engineering*, Los Angeles, California, June.

Reinhold, T.A., J. Belcher, D. Miller, and C. Everley. "Wind Loads on Screen Enclosures," Unpublished manuscript.

Reinhold, T.A., P.J. Vickery, and M.D. Powell (1993). "Windspeeds in Hurricane Andrew: Myths and Reality," *7th U.S. National Conference on Wind Engineering,* Los Angeles, California, June.

RMS (2007). *RMS U.S. Hurricane Model*, 2006 Standards Submission.

RS Means (2024a). "2024 Square Foot Costs with RSMeans Data", The Gordian Group, Greenville, SC., www.rsmeans.com, 2024.

RS Means (2024b). "2024 Residential Costs with RSMeans Data", The Gordian Group, Greenville, SC., www.rsmeans.com, 2024.

SBC(SBC 1988). "1988 Standard Building Code," Southern Building Code Congress International, Birmingham, AL, June.

Sciaudone J.C. (1999). "Commercial Window Retrofit," *Natural Hazard Mitigation Insights*, Institute for Business & Home Safety, Boston, Massachusetts, September.

Sciaudone, J., (2002). "Building Codes: Making a Difference," *Global Reinsurance*, London, United Kingdom, July/Aug.

Sciaudone, J.C. (2000). "Industry Perspective: Impact Resistance Standards," *Natural Hazard Mitigation Insights*, Institute for Business & Home Safety, Boston, Massachusetts, February.

Sciaudone, J.C., (1999). "Metal Edge Flashing," *Natural Hazard Mitigation Insights*, Institute for Business & Home Safety, Boston, Massachusetts, June.

Sciaudone, J.C., Feuerborn, D., Rao, G., and Daneshvaran, S. (1997). "Development of Objective Wind Damage Functions to Predict Wind Damage to Low-Rise Structures," Eighth U.S. National Conference on Wind Engineering, Johns Hopkins University, Baltimore, Maryland, June.

Sciaudone, J.C., (2004). Invited Testimony for "Hearing on H.R. 3980, The National Windstorm Impact Reduction Act of 2004," U.S. House of Representatives, Committee on Science, Subcommittees on Research and Environment, Technology and Standards, Washington, D.C., 24 March.

Sciaudone, J.C., Reinhold, T.A., and Nelson, J.K. (1997). "Development of a Methodology for Evaluating Wind Borne Debris Impact Forces," Fourth Asia-Pacific Symposium on Wind Engineering, Gold Coast, Australia, July.

Sheffield Metals (2023). Engineered & Non-Engineered Metal Roof & Wall Panel Profiles. https://sheffieldmetals.com/products/panel-profiles/.

Simiu, E., Changery, M., and Filliben, J. (1979). "Extreme Windspeeds at 129 Stations in the Contiguous United States," NBS Building Science Series 118.

Simiu, E., P.J. Vickery and A. Kareem (2007). "Relations Between Saffir-Simpson Hurricane Scale Windspeeds and Peak 3-s Gust Speeds Over Open Terrain," *J. Struct. Eng.*, Vol. 133, No. 7, pp. 1043-1045, July.

Sivapathasundaram, M. and Mahedran, M. (2017). New pull-out capacity equations for the design of screw fastener connections in steel cladding systems. Thin-Walled Structures. Vol. 122, pp. 439-451.

Skerlj, P.F., and P.J. Vickery (2003). "Hurricane-Induced Flood and Wind Risk Model," *11th International Conference on Wind Engineering*, Lubbock, Texas, 2-5 June.

Steckley, A.C., L.A. Twisdale, and P.J. Vickery (1996). "Use of GIS Mapping to Illustrate the Sensitivity of Wind Hazard Insurance Loss Estimation to Modeling Parameters," *ASCE Natural Disaster Reduction Conference*, Washington, D.C., December.

Twisdale, L., P. Vickery, J. Chen, C. Driscoll, D. Wadhera, J. Sciaudone, and W. York (2006). Wind-Borne Debris Criteria for the Florida Panhandle, Florida Department of Community Affairs for the Florida Building Commission, June.

Twisdale, L.A. (1986). "Reliability and Risk Models Based on Independent Trials," *Probabilistic Engineering Mechanics*, December.

Twisdale, L.A. (1998). "Probability of Facility Damage from Extreme Wind Effects," *J. Struct. Eng.*, Volume 114, Number 10, October.

Twisdale, L.A. (2005). "Hurricane Loss Estimation Modeling," *Invited Keynote Presentation, 10th Americas Conference on Wind Engineering*, Baton Rouge, Louisiana, June.

Twisdale, L.A. (2006). "Updating Loss Relativities for Florida's Insurance Credit System for Hurricane Wind Loss Mitigation Construction Features and Integration into a Statewide Home Structure Rating System," Applied Research Associates, Inc., November 28.

Twisdale, L.A., and P.J. Skerlj (1998). "Analysis of Instrumented House Spacing and Location for Florida'" Coastal Mitigation Project, Applied Research Associates, Inc., Raleigh, North Carolina, for Florida Department of Community Affairs, Tallahassee, Florida, and Institute for Business and Home Safety, Boston, Massachusetts, December.

Twisdale, L.A., and P.J. Vickery (1992). "Investigation of Predictive Methods for Hurricane Winds in the United States," NSF SBIR ISI-9160135, National Science Foundation, Washington, D.C., July.

Twisdale, L.A., and P.J. Vickery (1995). "Wind, Hurricane, and Tornado Risk Assessment," Chapter 20,

Probabilistic Structural Mechanics Handbook, Van Nostrund Reinhold, New York.

Twisdale, L.A., and P.J. Vickery (1996). "Optimum Management with Uncertain Hazard and Vulnerability Information," *ASCE Natural Disaster Reduction Conference*, Washington, D.C., December.

Twisdale, L.A., and P.J. Vickery (2003). "The classification of Single-family Residential Buildings for Hurricane Damage and Loss," *11th International Conference on Wind Engineering*, Lubbock, Texas, 2-5 June.

Twisdale, L.A., Wadhera, D., Vickery, P.J., and Driscoll, C.W. (2007). "Home Structure Rating System – Methodology Development for Hurricane Wind Effects," University of Florida, Gainesville, Florida, and Florida Office of Insurance Regulation, Tallahassee, Florida, March.

Twisdale, L.A., et al. (2003). "Analysis of Loss Reduction Benefits of Improvements to International Residential Code for Texas Tier I Locations," IBHS, February.

Twisdale, L.A., et al. (2003). "Loss Relativities for FBC Wood Panel Shutters," Florida Department of Community Affairs, Tallahassee, Florida, June.

Twisdale, L.A., Lin, J., and Vickery, P.J. (2005). "Sensitivity Analysis of Expected Hurricane Loss Costs Estimates," Unpublished White Paper, Applied Research Associates, Inc., Raleigh, NC.

Twisdale, L.A., Sciaudone, J., Vickery, P.J., Chen, J., and Wadhera, D. (2007). "Evaluation and Report on the Insurability of Attached and Free Standing Structures," Florida Office of Insurance Regulation, Tallahassee, Florida, May.

Twisdale, L.A., Young, M.A., and Driscoll, C. (1998). "Residential Construction Mitigation Program Inspection Checklist Quality Assurance Analysis for Palm Beach County, "Applied Research Associates, Inc., Raleigh, North Carolina, for Florida Department of Community Affairs, Tallahassee, Florida, December.

Twisdale, L.A., Vickery, P.J., and Steckley, A.C. (1996). "Analysis of Hurricane Windborne Debris Impact Risk for Residential Structures," State Farm Mutual Insurance Automobile Companies, Bloomington, Illinois, March.

Twisdale, L.A., Vickery, P.J., and Steckley, A.C. (1996). "Toward Risk-Consistent Wind Hazard Design/Mitigation Criteria Using Probabilistic Methods," *ASCE Natural Disaster Reduction Conference*, Washington, D.C., December.

Twisdale, L.A., Vickery, P.J. and Hardy, M.B. (1993). "Uncertainties in the Prediction of Hurricane Windspeeds," *ASCE Conference on Hurricanes of 1992*, Miami, Florida, December.

Twisdale, L.A., Vickery, P.J. and Chen, Y. (2008a). "Analysis of Hurricane Windborne Debris Impact Risk for Residential Structures: Part I," *J. Struct. Eng.*

Twisdale, L.A., Vickery, P.J. and Chen, Y. (2008b). "Analysis of Hurricane Windborne Debris Impact Risk for Residential Structures: Part II," *J. Struct. Eng.*

Twisdale, L. A., Banik, S.S., Quayyum, S., Mudd, L. A., Liu, F., Faletra, M. K., Hardy, M.B., Vickery, P.J., Levitan (NIST), M. and Phan, L. (NIST) (2023), "Tornado Windspeed Risk Maps for Building Design," National Institute of Standards and Technology, Technical Note, Gaithersburg, MD (Applied Research Associates, Raleigh, NC Task Order under NIST Disaster and Failure Studies Contract SB1341-12-CQ-0014.

US Army Corps of Engineers (2007). "Performance Evaluation of the New Orleans and Southeast Louisiana Hurricane Protection System," Draft Final Report, Interagency Performance Evaluation Task Force, March 26.

Vickery P.J. and Skerlj, P.F. (2000). "Elimination of Exposure D Along Hurricane Coastline in ASCE-7," *J. Struct. Eng.*, Volume 126, Number 4, 545-549, April.

Vickery P.J. and Twisdale, L.A. (1994). "Prediction of Hurricane Windspeeds at Inland Locations," *Structures Congress 94*, Atlanta, Georgia, April.

Vickery P.J., Twisdale, L.A., and Wilson, S.L. (1995). "Optimized Design of Transmission Lines in Hurricane Regions," *ASCE Engineering Mechanics Specialty Conference*, Boulder, Colorado, 21-24 May.

Vickery, P.J, Skerlj, P.F., Steckley, A.C. and Twisdale, L.A. (2000a). "Hurricane windfield model for use in hurricane simulations," *J. Struct. Eng.*, 126, 1222-1237.

Vickery P.J., P.F. Skerlj, A.C. Steckley, and L.A. Twisdale (2000b). "A Hurricane Windfield and Gust Factor Models for Use in Hurricane Simulations," *J. Struct. Eng.*,126, 1222-1237, October.

Vickery, P., Chen, J., and Sciaudone, J. (2006). "Mitigation of Two-Story Single-family Residences," Florida Department of Community Affairs, Tallahassee, Florida, July.

Vickery, P.J. (1992). "A Comparison of Measured and Predicted Surface Level Windspeeds in an Urban Environment," *ASCE 10th Structures Congress,* San Antonio, Texas, pp. 356-359, April.

Vickery, P.J. (2005). "Simple Empirical Models for Estimating the Increase in the Central Pressure of Tropical Cyclones after Landfall along the Coastline of the United States," *J. Appl. Meteor*, Vol. 44, pp. 1807-1826.

Vickery, P.J. (2008). "Component and Cladding Wind Loads for Soffit," *J. Struct. Eng.*, In press.

Vickery, P.J., and Wadhera, D. (2008). "Statistical Models of Holland Pressure Profiles Parameters and Radius to Maximum Winds of Hurricanes from Flight Level Pressure and H Wind Data," *J. Appl. Meteor. Climatol*., 4-7, 2497-2517.

Vickery, P.J., and Twisdale, L.A. (1993). "Hurricane Windspeeds at Selected Locations in the US," *7th*.

U.S. National Conference on Wind Engineering, Los Angeles, California, pp. 823-832, June.

Vickery, P.J., and Twisdale, L.A (1995). "Prediction of Hurricane Windspeeds in the U.S.," *J. Struct. Eng.*, Volume 121, Number 11, November.

Vickery, P.J., and Twisdale, L.A. (1995). "Wind-Field and Filling Models for Hurricane Windspeed Predictions," *J. Struct. Eng.*, Volume 121, Number 11, November.

Vickery, P.J., and Twisdale, L.A. (1996). "Reducing the Vulnerability of Transmission Lines in Hurricane Regions by Choosing Minimum Life Cycle Cost Designs," *ASCE Natural Disaster Reduction Conference*, Washington, D.C., December

Vickery, P.J., Skerlj, P.F., Steckley, A.C., and Twisdale, L.A. (2000) "Hurricane Wind Field Model for Use in Hurricane Simulations," *J. Struct. Eng.*, 126(10), 1203-1221.

Vickery, P.J., and Skerlj, P.F. (2005), "Hurricane Gust Factors Revisited," *J. Struct. Eng.*, Vol. 131, No. 5, pp. 825-832.

Vickery, P.J., Wadhera, D. (2008a). "Statistical Models of Holland Pressure Profile Parameter and Radius to Maximum Winds of Hurricanes from Flight Level Pressure and H* Wind Data," *Journal of Applied Meteorology*, 47, 2497-2517.

Vickery, P.J., Wadhera, D., Powell, M.D., and Chen, Y. (2009a) "A Hurricane Boundary Layer and Windfield Model for Use in Engineering Applications," *J. Appl. Meteoro., 48(2)*, 381-405.

Vickery, P.J., Wadhera, D., Twisdale, L.A., and Lavelle, F.M. (2009b). "United States Hurricane Windspeed Risk and Uncertainty," *J. Struct. Eng.*, 135(3), 301-320.

Vickery, P.J., Lin, J.-X., and Twisdale, L.A. (1998). "Analysis of Hurricane Windborne Debris Impact Risk for Residential Structures: Part II," Applied Research Associates, Inc., Raleigh, North Carolina, for State Farm Mutual Automobile Insurance Companies, Bloomington, Illinois, April.

Vickery, P.J., Lin, J.-X., and Twisdale, L.A. (2003). "Analysis of Hurricane Pressure Cycling Following Missile Impact for Residential Structures," *J. Wind. Eng. Ind. Aerodyn.*, Volume 91, pp. 1703-1730.

Vickery, P.J., Lin, J.-X., Skerlj, P.F. and Twisdale, L.A. (2006). "The HAZUS-MH Hurricane Model Methodology Part I: Hurricane Hazard, Terrain and Wind Load Modeling," *Natural Hazards Review*, Vol. 7 No. 2, May.

Vickery, P.J., Twisdale, L.A., and Steckley, A.C. (1996). "Wind Hazards in the United States," *ASCE Natural Disaster Reduction Conference*, Washington, D.C., December

Vickery, P.J., Twisdale, L.A., and Young, M.A. (2002). "Mitigation of Hurricane Losses in Residential Construction through the Residential Construction Mitigation Program," *Proceedings Solutions to Coastal Disasters '02*, San Diego, California, pp. 997-1011, February 24-27,

Vickery, P.J., Skerlj, P.F., Lin, J.X., Twisdale, L.A., Young, M.A., and Lavelle, F.M. (2006). "The HAZUS- MH Hurricane Model Methodology Part II. Damage and Loss Estimation," *Natural Hazards Review*, Vol. 7, No. 2, May.

Vickery, P. J., Quayyum, S., Liu, F., Mudd, L. A., Lavelle, F. M., Rozelle, J., and Zuzak, C. (2023). Hazus hurricane wind model for the US Caribbean territories: Hazard modeling and development of residential damage functions. Natural Hazards Review, 24(4), 04023033.

Vutukuru, K. S., Erwin, J. and Chowdhury, A. G. (2024). "Full-scale simulation of wind driven rain and a case study to determine the rain mitigation effect of shutters", *Wind and Structures*, Vol. 38, No. 3, March.

Webster, P.J., Holland, G.J., Curry, J.A., and Chang, H.-R. (2005). "Changes in Tropical Cyclone Number, Duration, and Intensity in a Warming Environment," *Science*, Volume 309, pp. 1844-1846.

Willoughby, H. and Masters, F. (2005). “Early 21st century hurricane threats: maximum potential intensity, the Atlantic multidecadal oscillation, global warming, and chance,” Tenth Americas Conference on Wind Engineering, Baton Rouge, Louisiana, May 31–June 4.

Xia, Y. (2022). Analysis of Standing Seam Metal Roofs Subjected to Extreme Wind Loads. PhD Dissertation. The University of Western Ontario, London, Ontario, Canada.

York, W.H., Young, M.A., and Twisdale, L.A. (2002). *Florida Building Code Cost and Loss Reduction Benefit Comparison Study*, Florida Department of Community Affairs, Tallahassee, Florida, January.

York, William H. (1998) (1999). “Hurricane Preparedness and Mitigation for Homes,” *South Florida Hurricane Conferences*, Fort Lauderdale, FL, May.

York, William H. (1999). “Inspection of Individual Buildings for Hurricane Preparedness,” *National Hurricane Conference*, Orlando, FL, April.

York, William H. (2001). “Retrofitting to Reduce Wind Vulnerability & Hurricane Losses.” American Society of Civil Engineers Conference, Houston, TX, October.

York, William H. (2001). “Understand Homes Built to the 2001 Florida Building Code,” State approved class for contractors, building officials and building inspectors. November.

Appendix A. Definitions of Wind Resistive Features

This appendix provides definitions for each of the wind resistive features evaluated in this study. The appendix is split into two main sections for: (1) Single-family or Group I multi-family (MF) buildings and (2) Group II or Group III MF buildings. The flowchart in Figure A-1 shows how we categorize MF buildings with five or more units into Group I, II, or III. Sections A.1 and A.2 are further divided into primary factors and secondary factors.

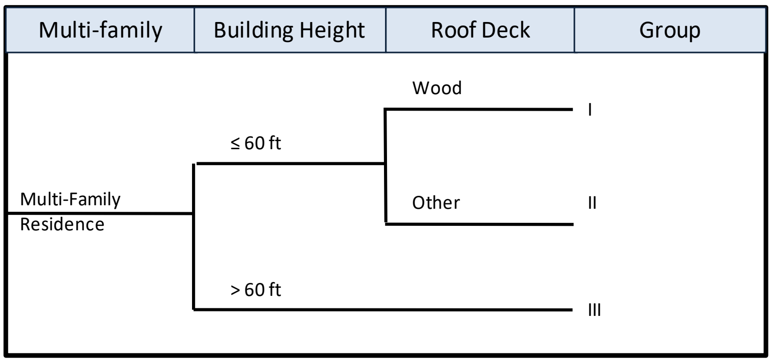


Figure A-1. Flowchart for Categorizing Multi-Family Buildings with Five or More Units

A.1. Single-Family Homes or Group I Multi-Family

Single Family (SF) Homes. Site-built residential dwellings with 1-4 units.

Group I Multi-Family (MF) Buildings. Residential buildings less than or equal to 60 feet high with 5 or more units and wood roof decks. These buildings are typically masonry or wood frame construction and one to four stories tall.

For SF homes and Group I MF residential buildings the following ***Building Code Eras*** are defined:

- ***FBC 2006 & onward.*** Buildings designed to the wind load provisions of the 2006 revisions to the 2004 Florida Building Code (FBC). This era includes buildings with permit application dates on or after December 8, 2006.
- ***FBC 2001 & 2004.*** Buildings treated as being designed to the wind load provisions of FBC 2001 or 2004. This era includes buildings with permit application dates between March 1, 2002 and December 7, 2006.
- ***Pre-FBC.*** All other buildings.

A.1.1. Primary Factors

The primary factors for pre-FBC SF and MF Group I buildings are listed in Table 4-1. The definitions for each primary factor are provided in the following sub-sections.

A.1.1.1. Terrain

The effects of terrain on building performance and hurricane losses are significant. However, terrain remains a complex parameter for purposes of loss mitigation and insurance company rate differentials. There are several options for an insurance company to treat terrain. The reader is urged to review Sections 2.3.3 and 2.3.4 for background information and discussion of options on treating terrain as a building specific feature or as a rating territory feature. The loss relativity tables are self-normalized to terrain and, hence the difference in loss costs for the same building in different terrains is not reflected in the loss relativity tables herein.

The basic options are:

1. ***Individual Building Terrain.*** Determine the terrain the building is in using the definitions of terrain in Section 2.3.4 (and ASCE 7), which is given below. Given the terrain, use the appropriate terrain-based relativity table. Ideally, the insurance company would have different base rates that corresponded to different terrains.
2. ***Territory-Based Predominate Terrain.*** In this approach, the insurance company assigns the predominate terrain in a territory to all buildings in that territory. For example, coastal territories would be Terrain C and inland territories would be Terrain B.

Under Option 1, the insurance company uses the terrain assigned to the building from the mitigation inspection. Under Option 2, the insurance company would base the terrain on the territory in which the building is located. We recommend that the insurance company retain the individual building terrain in its database even if it uses Option 2.

For purposes of inspecting the building and classifying the terrain in which the building is located, the procedure needs to follow the accepted national standard, which requires determining the terrain for distances up to 2600 feet (or more for buildings taller than 130 feet) from the building. The approach involves determining if the building has sufficient obstructions (other buildings or trees) around it for the Terrain to be classified as Category B, otherwise the Terrain defaults to Category C.

Terrain is defined in terms of ASCE 7-22, which is referenced in FBC 2023:

- ***Exposure Category B.*** Urban and suburban areas, wooded areas, or other terrain with numerous closely spaced obstructions having the size of single-family dwellings or larger. For buildings whose mean roof height is less than or equal to 30 feet, these conditions must prevail for an upwind distance of 1500 feet. For buildings whose mean roof height is greater than 30 feet but less than 130 feet, these conditions must prevail for an upwind distance of 2600 feet. For buildings whose mean roof height is greater than or equal to 130 feet, these conditions must prevail for an upwind distance of 20 times the height of the building.
- ***Exposure Category C.*** Open terrain with scattered obstructions having heights generally less than 30 feet. This category includes flat open country, grasslands, and shorelines and shall extend downwind for a distance of 1500 feet. This category shall also apply to any building located within 100 feet horizontally in any direction of open areas of Exposure C-type terrain that extends more than 600 feet and width greater than 150 feet in the upwind direction.

For this study, Terrain A is also used. Terrain A is intended to be used for multi-family buildings that are in Urban areas surrounded by mid-rise and high-rise buildings, whereas for single-family homes, terrain A is more representative of houses in tall treed suburban settings.

For the purposes of determining loss relativities, the terrain shall be determined for eight sectors of 45 degrees each. For example, if the terrain is determined to be Exposure Category B in all eight sectors, the building site shall be classified as Terrain B. If the terrain is determined to be Exposure Category C in one or more of the eight sectors, the building site shall be classified as Terrain C.

A.1.1.2. Roof Shape

There are many common roof shapes in residential construction. Gable and hip are the most common, although flat, Dutch hip, gambrel, mono slope, and many shape combinations are possible. Figure A-2 illustrates some of these shapes. Gable roofs have vertical walls that extend all the way to the top of the inverted V. A pure hip roof has sloping ends and sloping sides and horizontal eaves around the full perimeter of the building.

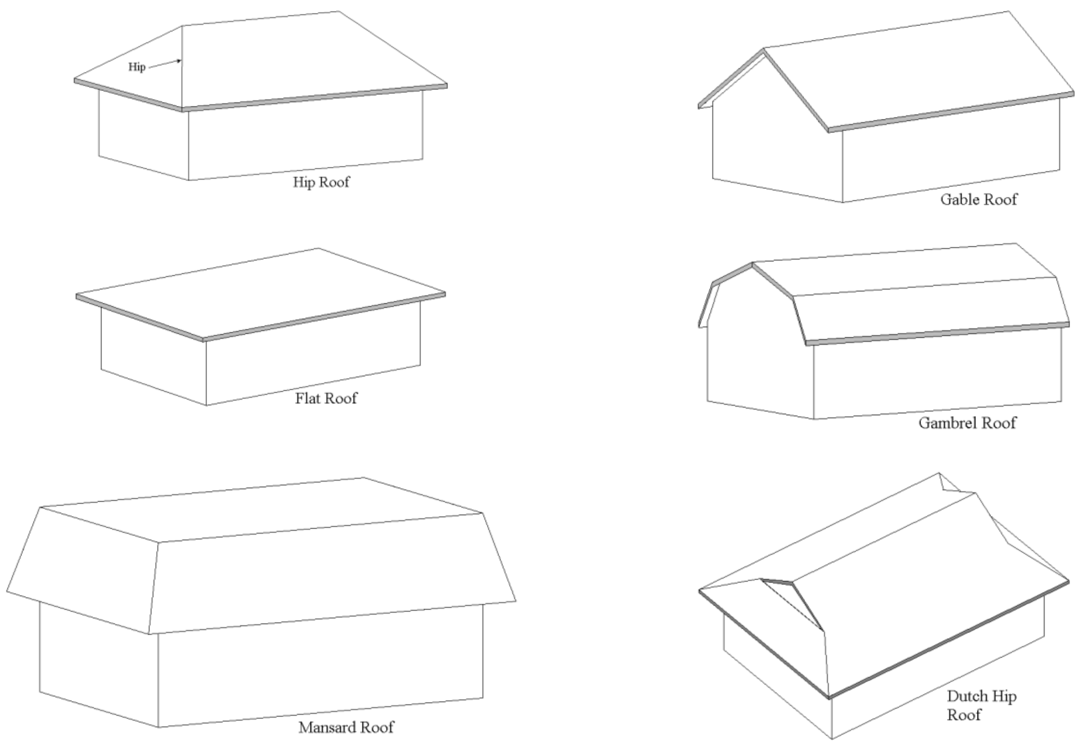


Figure A-2. Roof Geometry Shapes

Roof shape determines the aerodynamic pressure loads experienced by the roof due to wind flow and wind direction. For some wind directions, the maximum uplift loads on gable roofs are almost twice those of the hip at the locations with the highest negative pressures. Hence, with the same deck nailing pattern and roof covering, gable roofs will experience more damage than hip roofs.

For practical reasons, we consider only two basic roof shapes for SF homes in this study: hip and other (other is analyzed as gable). For Group I MF buildings, we consider three basic roof shapes:

hip, gable, and flat. For classification purposes, the gable classification can be thought of as "other". That is, for SF homes, a roof is either a hip roof, per the definition given below, or it is in the "other" category. For Group I MF buildings, a roof is either a hip roof or a flat roof, per the definitions given below, or it is in the "other" category.

In classifying the roof shape of a building, we are concerned with the ***main roof sections*** that cover the attic space (if any) and the exterior wall envelope[1] of the building. Separate, secondary roof sections that cover only exterior spaces such as porches or carports are not considered in determining the roof shape. Architectural elements that are completely isolated from the attic or living space by the roof decking (e.g., a decorative dormer constructed completely outside the main roof deck) are also excluded from consideration.

- ***Hip Roof.*** The main roof sections of a hip roof must be sloped all the way down to horizontal eaves over at least 90% of the perimeter of the exterior wall envelope. To qualify, the total horizontal length of all non-hip roof sections (including dormers, gables, Dutch hip gables, flat sections, mansards, etc.) must be no greater than 10% of the perimeter of the exterior wall envelope.[2]
- ***Flat Roof.*** At least 90% of the main roof area of the building has a slope of less than 2:12.
- ***Other Roof.*** For SF homes, any roof that does not qualify as a Hip Roof. For Group I MF buildings, any roof that does not qualify as either a Hip Roof or a Flat Roof.

Insurance classification procedures for roof shapes are best developed with many example photos and supporting discussion/rules to ensure accurate ratings. Because the relative difference in hurricane losses for roof shape is significant, roof shape ratings should be done as accurately as possible.

A.1.1.3. Roof Covering Type

There are several common roof coverings used in residential construction. For sloped roofs, tiles and asphalt shingles are the most common materials; however, metal panels, wood shakes, and other materials are also used.

For practical reasons, we consider only three basic roof coverings for sloped roofs in this study: asphalt shingle, tile, and metal panels. Tile roofs are different from asphalt shingle roofs in several important respects. First, they provide added mass to the roof, reducing the effect of the uplift forces. This added self-weight (8-10 psf) can significantly reduce the wind induced uplift loads acting at the truss-wall connection, reducing the likelihood of whole roof failures. Thus, the loss relativity value for stronger roof wall connections for tiled roofs is less than that for shingle roofs. Second, however, tile roof covers are much more vulnerable to debris impact damage and are also more expensive to replace. These factors make tile and other heavy roof covers a distinct

[1] Exterior Wall Envelope: A system or assembly of exterior wall components, including exterior wall finish materials, that provides protection of the building structural members, including framing and sheathing materials, and conditioned interior space, from the detrimental effects of the exterior environment [Source: 2007 FBC, Section 1402].

[2] For a Dutch hip roof, the length of the base of each vertical triangular face should be counted as if it were resting on the exterior wall even though it is set back from the exterior wall.

class. The method of attachment of tile roof covers is also a key consideration if an insurer chooses to rate tile roofs distinctly. Metal roof panels have grown in popularity in Florida in recent years. Metal roof panels have not been modeled in past wind loss mitigation studies but are included in this study for single-family homes only.

For SF homes and Group I MF buildings with sloped roofs, the following roof cover classifications are used:

- ***Tile Roof Coverings.*** Any type of overlapping clay, concrete, or stone tiles. Tiles are typically rectangular in shape and can be either flat or curved. To qualify as a tile roof covering, at least one third of the main roof area must be covered with tiles.
- ***Metal Panels.*** For (single-family buildings only) with sloped roofs, standing seam metal roof panels are modeled. These metal panels are secured to plywood roof decks with sheet metal screws.
- ***Asphalt Shingle Roof Coverings.*** For buildings with sloped roofs, any roof covering that does not qualify as a tile or metal roof covering.

A.1.1.4. Roof Cover Strength and Age

A key factor in roof covering performance is the method of attachment of the roof covering to the roof deck. The most common roof covering materials in Florida are asphalt shingles, tiles, and metal panels. Other roof covering materials used for residential construction in Florida include built-up, slate, wood shakes, and single ply membranes.

For classification purposes, roof cover strength is classified as either FBC Equivalent or Non-FBC Equivalent:

- ***FBC Equivalent.*** Any roof covering meeting the material requirements and attachment specifications of the FBC Chapter 15 (FBC 2001 or later) or the 1994 SFBC. For asphalt shingles, these requirements include improved self-seal strips and compliance with ASTM D-3161 (Modified for 110 mph, ASD wind speed). This requirement is commonly referred to as the “110 mph” rated shingle. The rating of roof covering for existing construction can be certified by requiring the roofing contractor to certify that the installation met the 1994 SFBC or the FBC 2001 requirements.
- ***FBC - Plus Shingle Roof Covers.*** The 2006 supplement to the FBC 2004 included an option for the ASTM D-7158 Class H (150 mph, ASD wind speed) shingle for wind zones ≥ 130 mph (ASD wind speed). For purposes of applying the FBC 2006 loss relativity tables for FBC 2006 buildings with shingle roof covers, the FBC 2006 shingles must meet the optional requirements of ASTM D-7159 Class H shingles. If FBC 2006 buildings located in ≥ 130 mph wind zones have shingles that do not meet the ASTM D-7159 Class H specifications, then the FBC 2001 loss relativity tables should be used for FBC 2006 shingle roof cover construction. This determination may require review of the construction plans/specifications and/or by separate affidavit. Also, refer to Section 2.2.4.8 and Section 4.3.1 and Figure 4-7. *This level of shingle is only used for Post-FBC homes located in the HVHZ and the 180 mph wind zone and is reflected in the loss relativities for those building classifications.*

- ***Non- FBC Equivalent.*** Any roof covering that does not qualify as FBC Equivalent or FBC 2006 Shingle Roof Covering.

In addition, the age of FBC roof cover was modeled to simulate the degradation/loss of strength over time. The following roof cover ages were used:

Table A-1. Roof Cover Ages Modeled

Roof Cover Age Description	Roof Cover Age (Years)		
	Asphalt Shingles	Tiles	Metal Panels
FBC New	0-5	0-5	0-5
FBC Mid-Range	6-13	6-20	6-20
FBC Old	>13	>20	>20

Minimal Conditions. If the building has a degraded roof cover in poor condition, it cannot qualify for any mitigation rate differentials (regardless of what other mitigation features are on the building) until the roof cover is replaced. The rationale behind this requirement is that the loss relativities are so dependent on the roof cover that an entire table of relativities would need to be developed for poorly-conditioned roof covers.

Shingle roofs with any of the following deficiencies shall not meet the minimal condition for eligibility for roof cover related insurance discounts:

- Any missing shingles or tabs
- Significant cupping of the shingle tabs
- Singles/tabs not sealed to the layer below
- Granule loss to the point where you can see a smooth surface on the top of the shingles
- Cracked or broken shingles

Tile roofs with any of the following deficiencies shall not meet the minimal condition eligibility for roof cover related insurance discounts:

- Missing tiles
- Loose tiles
- Cracked or broken tiles

Metal roof panels with any of the following deficiencies shall not meet the minimal condition eligibility for roof cover related insurance discounts:

- Gaps at seams in metal roof panels
- Corrosion of metal roofing
- Corrosion of metal roof exposed fasteners

The following general deficiencies shall not meet minimal conditions for roof cover insurance discounts:

- Loose or missing flashing
- Leaks

- Rotted soffits fascia or other deferred maintenance observed that could be a sign the roof system or decking may have hidden issues that could cause a failure

Other types of roof cover systems (metal, wood, etc.) that have either (1) missing, loose, or damaged elements, or (2) missing, corroded, or inadequate fasteners shall not meet the minimal condition requirement.

A.1.1.5. Secondary Water Resistance

Secondary water resistance (SWR) is a layer of protection that seals to the roof deck and protects the building if the roof covering and underlayment fail. This mitigation technique is aimed at keeping rainwater out of the house once the roof covering fails. SWR covers or seals the seams in the roof deck and provides a redundant layer of water proofing.

The most economical way to achieve SWR is to apply Self-Adhering Modified Bitumen Tape to the plywood joints. This self-adhering tape is generically known as Ice & Water Shield or Peel N Seal and is a rubber-like product applied directly to a roof deck to prevent damage from ice dams in northern climates. Here, the product is applied to the outside of a clean plywood/OSB deck prior to application of regular underlayments and roof covering. The most economical use of this product is to use 6″ widths as shown in Figure A-3. This is done when a new roof covering is being put on the house.

Another way to achieve SWR is a foamed polyurethane structural adhesive applied from inside the attic to cover the joints between all plywood sheets. Figure A-4 shows this product installed in an attic. Note that this product is also used to reinforce the connection between trusses and roof sheathing, qualifying for improved roof deck attachment. Structural adhesives that meet AFG-01 should not be confused with foamed insulating products.

Figure A-3. Self-Adhering Modified Bitumen Strips Applied to Plywood Joints of Roof Deck

Figure A-4. Sprayed on Structural Adhesives to Seal Plywood Joints (SWR) and Strengthen Roof Deck Attachment

The verification of externally applied SWR must be done at the time of application since once covered, it is difficult to verify. The foamed structural adhesive applied from inside the attic, however, is readily verified with an attic inspection. Roofing contractors should complete a form to provide certification for the owner to receive this credit.

Standard roofing underlayments or hot-mopped felts do not qualify for SWR because they may be blown off the roof deck at high windspeeds. In contrast, off-the-shelf self-adhering bitumen tape has been tested to negative pressures of over 150 psf without failure of the SWR strips. The use of SWR in this study assumes that the waterproofing is self-adhering to the roof deck and will not fail when the roof cover fails. In the past, there has been some confusion in the FBC as to what qualified as SWR. However, the latest edition of the FBC (FBC 2023) has adopted language regarding SWR that is consistent with IBHS' definition of a sealed roof deck.

A.1.1.6. Roof-to-Wall Connection

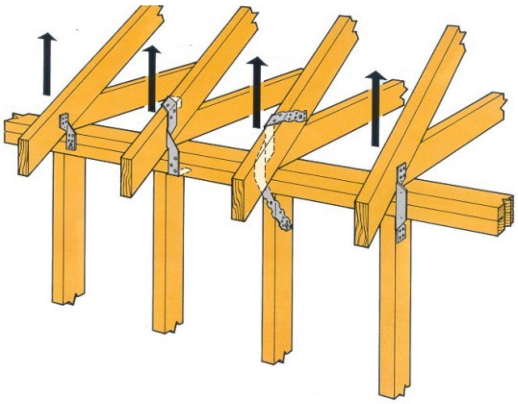
The roof-to-wall connection keeps the roof on the building by transferring uplift loads on the roof into the supporting walls. Verification of the type of roof-to-wall connection requires access to the attic.

For practical purposes, a classification is used herein to distinguish the uplift capacity of roof-to-wall connections based on connector type.

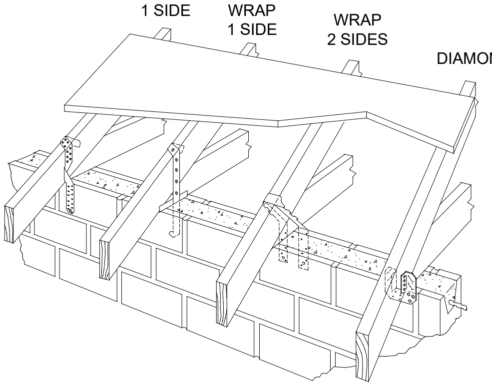
- ***Toe-nails.*** Typically three nails driven at an oblique angle through the rafter and into the top plate. An example of a toe-nail connection is shown in Figure A-5.
- ***Clips or Non-Wrapped Straps.*** Metal clips or non-wrapped straps nailed into the side of the rafter/truss and into the side of the top plate or wall stud. The metal does not wrap around the top of the rafter/truss and is typically only located on one side of the connection. A diamond clip is a special type of clip that has a slot in the middle to accept the rafter, and nails to the outside edge of the top plate. At least three fasteners are needed to transfer the loads at each end of the clip and the fasteners must always be loaded in shear (perpendicular to the nail direction). Non-wrapped straps may be embedded into the bond beam of a masonry wall. Clips or non-wrapped straps must be installed at every rafter/truss, and there must not be severe corrosion visible.
- ***Single Wraps:*** Metal straps attached to the side and/or bottom of the top plate and nailed to the rafter/truss. At least three fasteners are needed to transfer the loads at each end of the strap and the fasteners must always be loaded in shear (perpendicular to the nail direction). The strap may be embedded into the bond beam of a masonry wall. In this case, the point of embedment must be within 1.5 inches of the rafter/truss. Straps must be installed at every rafter/truss, and there must not be severe corrosion visible.
- ***Double Wraps:*** Metal straps attached to the side and/or bottom of the top plate on either side of the rafter/truss and wrapped over the top of the rafter/truss. At least three fasteners are needed to transfer the loads at each end of the strap and the fasteners must always be loaded in shear (perpendicular to the nail direction). The strap may be embedded into the bond beam of a masonry wall. In this case, the point of embedment must be within 1.5 inches of the rafter/truss. Straps must be installed at every rafter/truss, and there must not be severe corrosion visible.

There are several manufacturers of metal connectors for hurricane uplift connectors and each company has a fairly wide line of products. Several examples are shown in Figure A-6.

Figure A-5. Example of a Toe-Nail Connection Used for Rafter-to-Top Plate Connection



(a) Wood Frame



(b) Masonry

Figure A-6. Typical Hurricane Roof-to-Wall Metal Connectors

Typical design strengths and ultimate strengths for the four roof-to-wall connection types are summarized in Table A-2. The uplift resistance capacities are mean ultimate values based on tests results. The ultimate values are distinctly different from the design value of the connection. For example, a 386 lb rated clip has an ultimate capacity of about 866 lbs. The ultimate values are the mean failure values used in the loss relativity calculations.

Table A-2. Roof-to-Wall Connections Analyzed for Loss Relativities

Description	*Typical Design Strength* (lbs)*	*Mean Ultimate Strength Used in Calculations (lbs)*
Toe-nail (3-16d)	185	550
Clip	386	866
Wrap	535	1200
Double Wrap	891	2000

* Includes 60% increase for wind loading

Some of the older straps found in Florida are simply strips of galvanized metal that were pounded into shape on site to perform the same functions as the straps shown here. These galvanized straps were often 1″ by 1/8″ thick pieces of galvanized steel. If these straps are installed correctly and are not compromised by corrosion, they will perform adequately.

A.1.1.7. Roof Deck Attachment – Plywood or OSB Roof Decks

Roof decks for SF and Group I MF buildings are typically constructed with plywood, OSB, dimensional lumber, tongue and groove boards, or battens. The most common roof deck types are plywood and Oriented Strand Board (OSB) decks. Secondary factors have been developed for dimension lumber roof decks, concrete roof decks, and enhanced roof decks which are defined in Sections A.1.2.1, A.1.2.6, and A.1.2.7 respectively.

By far the most important feature of roof decks is the attachment to the framing, which is usually achieved by nail fasteners. Nail size, type, spacing, and penetration depth into the truss or rafters determines the uplift resistance of the deck. The difference in uplift capacity of 8d (2½″) nails at a typical nail spacing and 6d (2″) nails at the same spacing is a factor of about two times stronger, which makes a significant difference in deck performance in hurricanes.

The thickness of the deck material is important primarily in the determination of the penetration depth of the nail into the truss/rafter. Prescriptive building codes specify longer nails for thicker decks. Thicker decks have an added advantage of adding additional weight to the roof which helps to resist whole roof failures. However, thicker decks by themselves do not make a notable difference for deck attachment failures as these are governed by local pressures. The effect of deck thickness is treated as a secondary factor (see Section A.1.2.8).

For existing construction, the only practical way to determine deck type and fastener type and spacing is by a trained inspector going into the attic. We have analyzed roof deck attachments for the following cases:

- ***Roof Deck Attachment Level A.*** Plywood/OSB (minimum thickness of 7/16”) nailed with 6 penny common nails at 6″ spacing on the edge and 12″ in the field on 24″ truss spacing. This provides for a mean uplift resistance of 55 lbs per square foot. To qualify for Level A, the average number of missed or side-splitting nails over a 48” length must be three or less.
- ***Roof Deck Attachment Level B.*** Plywood/OSB (minimum thickness of 7/16”) nailed with 8 penny common nails at 6″ spacing on the edge and 12″ in the field on 24″ truss spacing. This provides for a mean uplift resistance of 103 lbs per square foot. To qualify for Level B, the average number of missed or side-splitting nails over a 48” length must be three or less.
- ***Roof Deck Attachment Level C.*** Plywood/OSB (minimum thickness of 7/16”) nailed with 8 penny common nails at 6″ spacing on the edge and 6″ in the field on 24″ truss spacing. Within 4′ of a gable end the nail spacing is 4″. This provides for a mean uplift resistance of 182 lbs per square foot for non-gable end locations and 219 lbs per sq foot for gable end locations. To qualify for Level C, the average number of missed or side-splitting nails over a 48” length must be three or less.

Minimal Conditions. Any plywood or OSB roof deck that does not meet the minimum requirements for Level A does not meet the minimal condition requirements for roof deck strength. Buildings with less than Strength A cannot qualify for any mitigation rate differentials (regardless of what other mitigation features are on the building) until the roof deck attachment is brought up to at least Level A. Of course, we recommend that all decks be brought up to at least Strength C given the opportunity to add additional fasteners. This is especially true since the FBCR has required 8d ring-shank nails to be used for nearly all single-family homes in Florida since the 2007 amendments to FBC 2004 were adopted.

The panel uplift resistances given above are based on a combination of experimental data obtained from individual nail withdrawal tests and laboratory uplift tests performed using full sizes (4′ by 8′) sheets of plywood and OSB. Note that the uplift resistance of a panel is dependent upon the species of wood of the underlying truss or rafters and the moisture content of the wood. Decks attached with screws and or adhesives should be rated according to the equivalent uplift resistance of these attachments using the categories above.

Based on the RCMP and FWUA inspections in Florida, more than about 60% of the existing roof deck/attachments will be superior to Level A (6d nails at 6/12 spacing).

There are many technical issues that affect the proper rating of the roof deck (see Figure A-7), including a great variety of available nail sizes, nail penetration depths, the consideration of missed nails, etc. Proper inspection guidelines and training are essential to determining the deck attachment of existing residences.

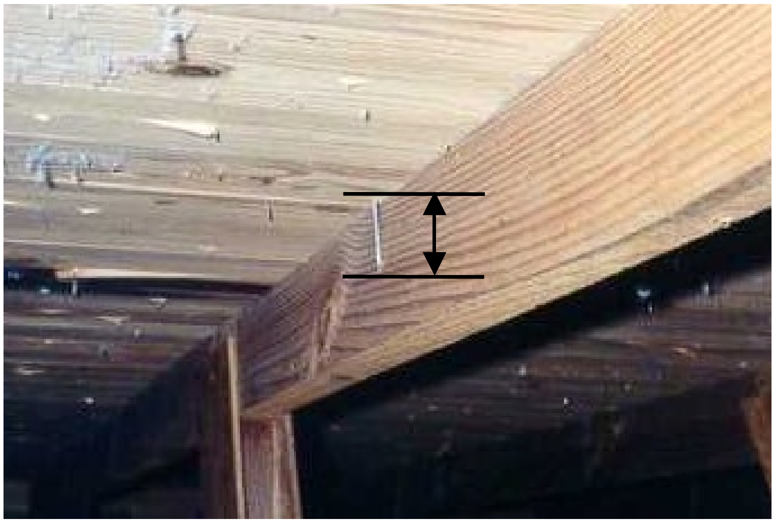


Figure A-7. Roof Deck Attachment Rating Requires an Attic Inspection.

A batten deck is a system where boards are laid perpendicular to the rafters and spaced apart from each other. This deck forms the basis for which to install wood shakes or wood shingles. There is no continuous deck in this roofing system. Batten decks with wood shakes have not been analyzed separately in this study. An interim recommendation is to use Roof Deck Attachment Level C.

A.1.1.8. Opening Protection – None vs. Hurricane

Openings in the wall and roof include windows, doors, sliding glass doors, skylights, and garage doors. Gable end vents and other roof vents are not considered openings for purposes of this study. Openings are vulnerable to wind-borne debris impacts in hurricanes and other windstorms. Typical single and double strength glazing are easily broken by impact from light weight debris that is generated from roof covering failures during high winds. In addition, heavier debris, such as roof tiles, 2″ by 4″ wood members, and plywood will easily penetrate openings that are not protected by impact resistant products.

The protection of openings is perhaps the greatest single loss mitigation strategy for a building. Once a window or door fails, the pressure inside of the structure increases due to the breach in the building envelope. The positive pressure inside of the building produces an additive load on the building envelope. The increase in load can be up to twice the loads the building experiences without a breach of the envelope. This approximate doubling of the load can easily put the roof, other windows, doors, in an overload situation. The result is often additional failures that occur after the original opening fails.

The first building code to adopt opening protection requirements in the United States was the South Florida Building Code in 1994. The testing protocol in this code requires the protection device to withstand impacts by 2 by 4 studs followed by pressure cycle loading. The Standard Building Code's SSTD-12 has similar requirements. In 1999, the ASTM also came out with a debris impact standard (E 1996) and test (E 1886). These standards include requirements for both wind pressure and debris impact. Opening protection products manufactured before 1994 would not have been tested to these standards. Figure A-8 shows an example of opening protection with the Miami-Dade County sticker showing product compliance with test standards.

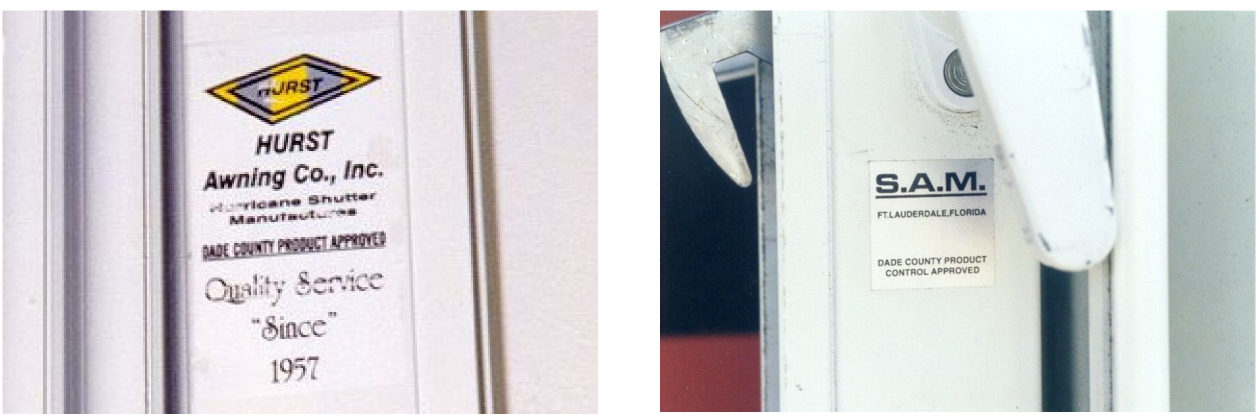


Figure A-8. Two product approval sticker on accordion shutters indicating that they meet Miami-Dade County impact resistance and wind pressure load standards. These labels contain the words "Dade County Product Approved" or equivalent.

For this study, the primary levels of opening protection are:

- ***Hurricane.*** All glazed openings impact resistant or protected with an impact resistant covering meeting the requirements of SSTD 12, ASTM E 1886 and ASTM E 1996, or Miami-

Dade TAS 201, 202, and 203. Note that outside the HVHZ, skylights need only be protected to ASTM Missile Level B (4.5 lb 2” × 4” missile).

- ***None.*** One or more glazed openings not protected to the Hurricane level protection.

Minimal Conditions. All openings (windows, doors, and skylights) must be in good condition. Openings that are in disrepair (or have large gaps) will allow large amounts of water (from the wind-driven rain within a hurricane) to enter the building without the window or door failing from pressure or missile loads. While shutters over these opening may act as a rain screen and thereby help reduce the amount of water leakage in a hurricane, the loss relativities were not developed for buildings with openings in a state of disrepair or needing replacement. Buildings with openings that are in need of replacement do not qualify for wind mitigation rate differentials, regardless of the presence/absence of other features.

Intermediate levels of opening protection (OSB, Plywood, Ordinary, and Basic) are defined in Section A.1.2.8. Each intermediate level requires that all glazed openings be protected to at least that level.

A.1.1.9. Roof Slope

Roof slope is a key factor in determining roof loads which directly impacts the level of roof covering damage, roof deck damage, and whole roof failures.

For classification purposes, sloped roofs are defined as either Low Roof Slope or High Roof Slope:

- ***High Roof Slope.*** At least two thirds of the main roof area has a slope of 6:12 or steeper.
- ***Low Roof Slope.*** For single-family homes, a roof that does not qualify as a High Roof Slope. For Group I buildings, a roof that is neither Flat (see Section A.1.1.2) nor High Roof Slope.

A.1.1.1 Soffits

Prior to the 2006 revisions to the 2004 FBC, there were no design requirements for soffits. Therefore, for the pre-FBC and FBC 2001 building code eras, soffit material is a key factor in determining the likelihood of soffit failures. Soffit failures can result in water infiltration into the attic space and pressure changes in the attic space.

For classification purposes, soffit material is defined as either Wood or Other:

- ***Wood Soffits.*** All soffits that are constructed with plywood, OSB, solid wood, or fiber cement siding products. To qualify as wood soffits, the wood soffits must be in good condition (no visible evidence of rotting or sagging) with adequate fasteners.
- ***Other.*** Soffits that do not qualify as wood soffits.

Buildings with both wood and other soffits should be classified as “other.”

A.1.1.10. Number of Stories

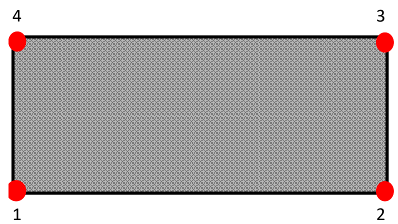
The SF houses used in this study are either one- or two-story buildings. One- and two-story residences generally fall into building heights less than 30 feet and the loads on the buildings are very sensitive to the building height. Significant differences in loads can result between buildings

15 feet tall and 25 feet tall because of the exponential nature of the vertical wind profile. SF homes greater than two-stories in height should use the two-story relativities.

For classification purposes, the number of stories for a SF home is defined as follows:

- ***One-Story.*** A SF home with a mean (horizontal) eave height less than or equal to 13 feet above local grade. The mean (horizontal) eave height shall be computed at four perimeter corners of the building. The average of the (horizontal) eave heights must be less than or equal to 13 feet for the building to be classified as one story.
- ***Two-Story.*** Any SF home that does not qualify as One-Story.

Eaves are defined as the external horizontal overhang of a roof over a wall of a building. The eave height is measured at corner locations that tend to bound the footprint of the building, as illustrated in Figure A-9. If the roof does not overhang the walls, the eave height is defined as the point where the roof wall horizontal intersection begins. The eave height is measured from the bottom of the eave to the ground. For corners with no eave, the measurement shall be made to where the roof surface intersects the wall.



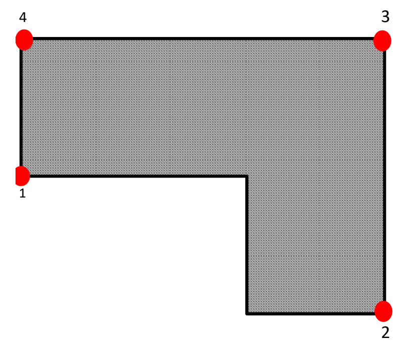


Figure A-9. Example Locations of Corner Eave Height Measurement for Determination of Number of Stories.

Number of stories is not a rating factor for MF buildings. The model MF Group I buildings used in this study are two-story buildings.

A.1.2. Secondary Factors

The secondary factors for pre-FBC SF and MF Group I buildings are listed in Section 4.2.5. The definitions for each secondary factor are provided in the following sub-sections.

A.1.2.1. Dimensional Lumber Deck

Plywood did not become widely available and used for roof decks until around 1965. Prior to the availability of plywood and oriented strand board (OSB), the most common roof decking material was dimensional lumber or tongue and groove (T&G) boards. Because of the inherently large number of nails in dimensional lumber or T&G, the uplift capacity is generally far greater than typical plywood/OSB decks.

- ***Dimensional Lumber and Tongue and Groove Decks.*** A main roof deck that is 100% sheathed with solid wood dimensional lumber or T&G boards. The boards are usually 4″ to 8″ wide and nominally 1″ thick (¾″ actual thickness) and are laid in a fashion that is parallel to the ridge or diagonal to the ridge. The boards must be fastened with at least two 8d nails per truss/rafter connection.

We have analyzed the case of two 8d nails per board, producing a mean uplift resistance of 338 lbs per square foot.

A.1.2.2. Unreinforced and Reinforced Masonry Walls

The most common types of wall construction used for SF and Group I MF residential construction are wood frame, masonry, and combinations of the two. The different construction materials are important for fire resistance considerations but are less important for wind resistance. Masonry walls are further distinguished by whether or not there is steel reinforcing to carry vertical and horizontal loads.

Insurance companies have generally rated buildings by wall construction material. However, it is likely that there are many rating errors since wood frame buildings with brick veneer may have been incorrectly rated as masonry walls. Also, many homes in Florida have an exterior stucco finish, which can be applied over a number of wall construction materials, including masonry, wood frame, insulated concrete forms, etc. Therefore, an important consideration for insurers is whether to accept the wall construction information they may have in their database or obtain an updated wall construction certification as part of the overall procedure to determine the proper building class based on all the important wind-resistive rating features.

- ***Reinforced Masonry or Concrete Wall Construction*** has at least two thirds of the exterior wall area constructed of masonry or concrete materials that are reinforced with both vertical and horizontal steel reinforcement and are relied upon for structural stability. It is important that the vertical reinforcement is fully grouted in the hollow cells of Concrete Block Masonry Units (CMUs), and that horizontal reinforcement be fully grouted in specially formed units. Tilt-up or poured concrete wall units must be reinforced with both vertical and horizontal steel reinforcement. The existence of reinforcing steel must be verified with a metal detector at a minimum of three locations, including at least two corner locations and at least one window or door location. The walls may be left unfinished, stuccoed, or have a veneer system hung from the walls.
- ***Unreinforced Masonry Wall Construction*** has at least two thirds of the exterior wall area constructed of masonry materials that do not meet the reinforcing requirements of Reinforced Masonry Construction. The walls may be left unfinished, stuccoed, or have a veneer system hung from the walls.
- ***Framed Wall Construction*** is composed of a stick frame made from wood or metal studs and is often sheathed with plywood or Oriented Strand Board (OSB) upon which an exterior wall covering is installed. Any SF or Group I MF building that does not meet the requirements of Reinforced Masonry or Concrete Wall Construction or Unreinforced Masonry Wall Construction should be classified as having Framed Wall Construction.

There are inspection techniques that can distinguish frame, masonry, and reinforced masonry wall construction. With appropriate training, an inspection of an existing building can accurately determine the proper classification of reinforced masonry versus masonry.

The model houses analyzed in this study were either all masonry, all wood frame, or all reinforced masonry. We did not analyze mixed masonry-wood construction. In general, mixed construction consists of masonry first floors and wood frame second floors. A conservative rule is to classify the building as wood frame if wood construction is more than one third of the exterior wall construction of the building.

A.1.2.3. Opening Protection Coverage – All Openings Protected

The analyses performed herein for opening protection are for two extents of protection:

- ***All glazed openings protected***. A glazed opening refers to glass or a transparent or translucent plastic sheet used in windows, doors, or skylights (ASCE 7-98 and later editions). For this case, entry doors and garage doors that do not contain glazing may be unprotected.
- ***All openings protected.*** For this case, all openings, including all non-glazed entry doors and garage doors, must be protected to "Hurricane" level of protection.

The first case was analyzed because there are many homes with protection over windows and other glazed openings but no additional protection over solid (non-glazed) entry doors or garage doors. In addition, the first case also corresponds to FBC Section 1609.1.2, which only requires opening protection over glazed openings (except in Miami-Dade and Broward Counties). We did not analyze the case when some of the windows and doors are protected, and other windows and doors are not protected. For the second case, all openings are protected, including all non-glazed doors.

The level of protection (None, OSB, Plywood, Ordinary, Basic, or Hurricane) is determined separately from the extent of protection. The level of protection is the lowest level of protection present among either all glazed openings or all openings. See A.1.1.8 and A.1.2.8 for further details.

A.1.2.4. Gable End Bracing

The end walls of gable roofs extend vertically to the sloping roof line. These gable end walls, if not properly built, have been noted to fail outward due to the negative suctions on the wall.

There are two ways that gable end walls fail. The first mode of failure occurs when the roof deck fails on the gable end and the gable end truss becomes unstable due to lack lateral restraint at the top of the end truss or rafter. The gable end wall therefore will generally collapse. This failure mode can be prevented by properly securing the roof deck at the gable end with higher density nailing patterns. Once the roof deck is lost, the building experiences high losses because of the vast amounts of rainwater that enter the structure. Hence, the gable end failure in this case is not the primary cause of the high loss, but a result of the failure of the roof deck. Improved roof deck nailing and/or bracing of the top chord of the gable end can prevent this type of failure.

However, if the roof deck fails the building will still have high losses regardless of whether the gable end wall fails or not.

Another failure mode for gable end walls includes failure at the bottom chord of the truss. There are many ways to properly brace a gable end wall, and this is further complicated by the wide variety of custom engineered solutions available.

There are four general types of gable end wall construction that are commonly seen in the field. These are masonry walls, balloon framed walls, truss walls, and platform or standard frame walls.

- ***Braced Gable Ends.*** Masonry walls and balloon framed walls continuous up to the roof diaphragm are considered braced. All truss and platform framed gable walls 4 feet or more in height require bracing systems meeting the prescriptive requirements of the FBC 2006 or the Florida Residential Construction Mitigation Program's "Gable End Retrofit Guide"(http://www.floridadisaster.org/mitigation/rcmp/HRG/content/structural/gable_end_guide.asp).

Bracing of gable end walls is relatively easy provided there is attic access. Figure A-10 shows an example of cross bracing from the gable end to the second truss.

Figure A-10. Gable End Bracing Secured with Metal Connections.

The HURLOSS analysis for gable end failures has focused on bottom chord failures for improperly braced gable ends. No analysis was performed for top chord failures, as experiments would be required to provide supporting data to model this failure mode properly.

A.1.2.5. Foundation Restraint

Foundation failures from hurricane wind forces alone are very rare. Typically, foundation failures associated with hurricanes occur when the surge from the water damages the foundation and structure.

Typical foundations include the following, as shown in Figure A-11:

- Crawl space (Stem Wall)
- Basement
- Slab on Grade with Stem Wall
- Monolithic slab

- Piles
- Piers/Posts

A crawl space is a perimeter foundation that creates an enclosed under-floor space that is not habitable. The perimeter foundation is typically a continuous footing with a stem wall that is attached to the wall/flooring structure of the building. The interior area in a crawl space may or may not extend below grade. Alternatively, a basement foundation is a wall foundation that extends below grade and encloses an area that may be used for living space or storage.

A slab on grade foundation with a stem wall is a concrete floor that is supported directly by the soil, and an independent stem wall that supports the weight of the building. A monolithic slab is a concrete floor that has an integrated footing that supports the weight of the building.

Pile foundations are necessary when the weight of the building must be transmitted to a deeper soil layer that is more stable, or when the structure must be elevated above required flood elevations. Pier or Post foundations are sometimes an economical alternative to stem wall perimeter foundations. These foundations may or may not have bracing between posts/piers depending on the height of the post/pier compared to its width. There may also be bracing or in-filled masonry walls between the posts and piers to resist lateral loads. Note that pile foundations are typically much deeper than post/pier foundations.

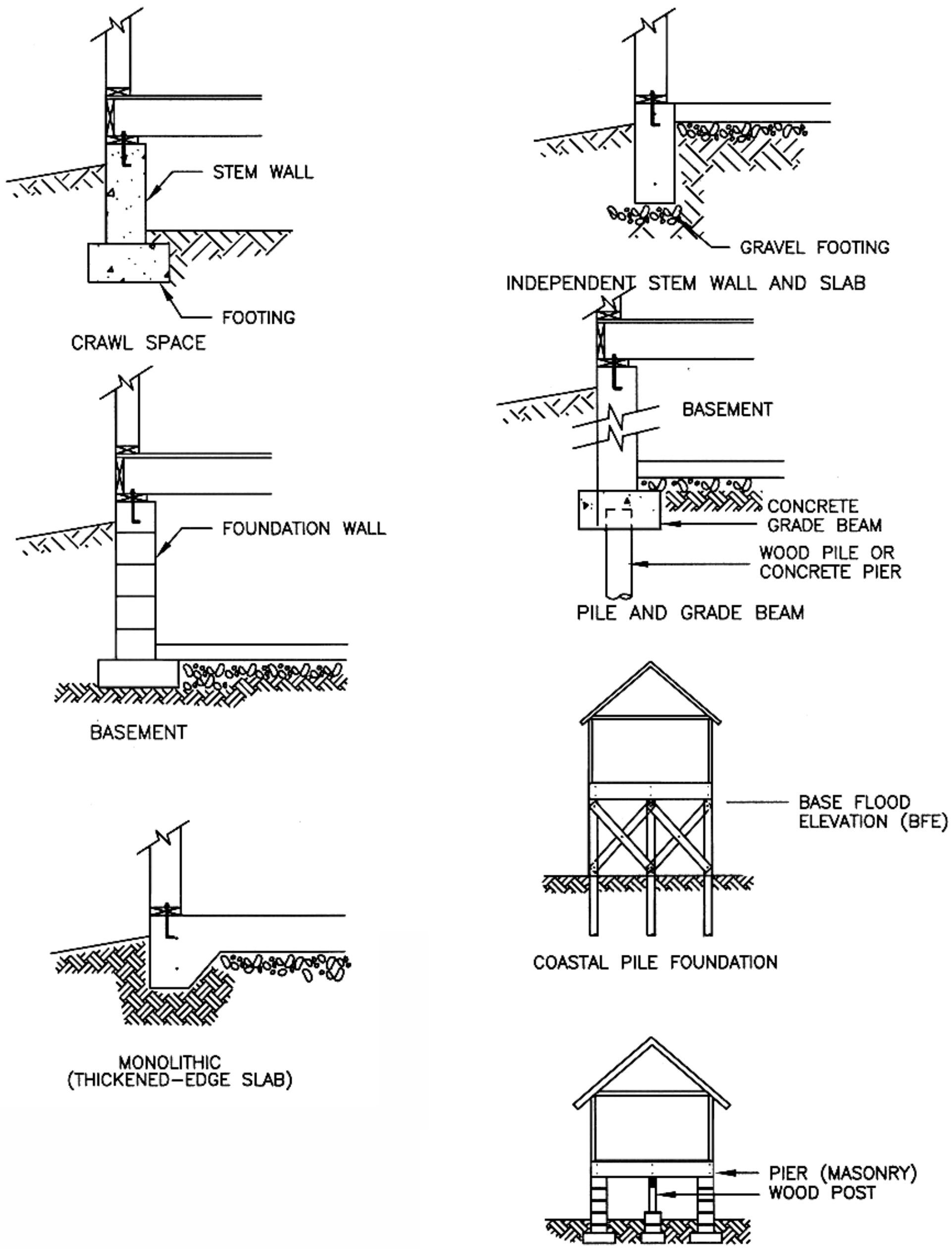


Figure A-11. Typical Foundation Types in Residential Construction (adapted from Residential Structural Design Guide, 2000 Edition, US. Dept of Housing and Urban Development, March 2000).

Inspections of foundation attachments are not practical for common slab-on-grade construction. Inspections of stem wall foundations require access through a crawl space. Because of these issues and the fact that foundation failures are very rare for hurricane winds (and, if they do occur, the house is usually significantly damaged from other failures), we have classified foundations into:

- ***Restrained:*** Foundations are assumed to have sufficient horizontal and vertical restraining forces unless classified as unrestrained.
- ***Unrestrained.*** Houses or Group I Buildings that are supported at discrete points by piles, piers, posts, or blocks and such that the support system has obviously-inadequate connections and/or bracing at the foundation support points to resist the uplift and horizontal wind forces acting on the building.

Almost all site-built houses will qualify as restrained. Building codes and inspections of houses confirm that there is almost always an attachment mechanism that provides suitable uplift and lateral resistance, especially when the building weight is also considered. Houses or Group I buildings built directly on slabs or stem walls should be assumed to be restrained, unless there is clear visible evidence that the building has previously moved laterally from its original position and is at further risk of sliding or overturning from hurricane wind loads. The unrestrained category is intended only for the most obvious situations, such as: (1) a building supported by stacked concrete blocks at discrete points; (2) a building on piles or piers where there are 2 or more piles with missing or severely corroded fasteners; and (3) a building where the discrete supports are leaning, inclined or have slipped from their original intended orientation. These examples illustrate that the use of “unrestrained” should be for only readily discernable cases where the building could be uplifted from the foundation and or severe sliding and overturning of the entire building is possible.

In computing the unrestrained foundation secondary factors, our modeling of unrestrained foundations included the case of a foundation provided only by discrete supports, with only support friction resisting the lateral wind loads. The wind uplift forces were resisted by the weight of the building. The modeling treated two failure modes – sliding of the building off the foundation and overturning of the entire building. The secondary factors for unrestrained foundations in Table 4-15 were developed in 2002 and have not been reanalyzed in this study.

A.1.2.6. Reinforced Concrete Roof Deck

Although not very common in residential construction in Florida, there are homes constructed with reinforced concrete roof decks. When these buildings are equipped with wind-borne debris impact resistant opening protection, they are extremely resistant to building failures. Damage to the building will largely consist of damage to the wall finish and roof covering (if any). The hurricane loss costs are therefore reduced dramatically.

- ***Concrete Roof Decks.*** At least 90% of the main roof deck is reinforced concrete designed and constructed in accordance with the provisions of ACI (American Concrete Institute) 318, including integral construction with a reinforced masonry or reinforced concrete wall system.

The roof covering on concrete roof decks for SF homes is either classified as “tile” or “other.” Note that there are no Group I type buildings with reinforced concrete roof decks. Such buildings must be classified as Group II buildings.

A.1.2.7. Enhanced Roof Deck

Roof deck strengths beyond Roof Deck Attachment Level C (see Section A.1.1.7) can be achieved with thicker plywood and stronger fasteners (e.g., 8d ring-shank nails). The requirements for the “enhanced” roof deck secondary factor are as follows:

- ***Enhanced Roof Deck.*** Plywood roof decks meeting the minimum requirements of Roof Deck Attachment Level C are considered “enhanced” if the deck is constructed with 5/8-inch thick (or thicker) plywood and the fasteners are either 8d ring shank nails or 2½ inch screws.

Enhanced roof decks can be determined through visual inspection.

A.1.2.8. Shutter Interpolation between None and Hurricane

There are three secondary levels of opening protection that fall between the two primary levels of None and Hurricane. These intermediate levels of protection are defined below.

- ***Basic.*** The Basic level of protection corresponds to 32% of the impact energy resistance of the Miami-Dade standards (112 ft lb of energy). This corresponds to Missile Level B (4.5 lb 2″ × 4″ missile at 40 ft/sec) in ASTM E 1996.
- ***Plywood or OSB Wood Structural Panels.*** Wood structural panels with a minimum thickness of 7/16” and a maximum span of 8 feet meeting the requirements of Section 1609.1.4 of the 2006 FBC. Wood structural panels must be precut and predrilled and are only permitted on one- and two-story buildings. All required hardware must be provided with anchors permanently installed on the building in accordance with Table 1609.1.4. Plywood panels have been found to perform better than Oriented Strand Board (OSB) panels. Separate relativity interpolation factors are provided in Section 4.2.5 for Plywood and OSB wood structural panels.
- ***Ordinary.*** There are many untested opening protection products that have been installed in Florida both prior to and after the development of the impact/pressure cycling standards. In general, these products provide some protection for pressure and missile impact, but there is no practical way to quantify all the possible variations in debris impact and pressure cycling resistance. The Citizens class plan has an “Ordinary” protection level based on ASCE 7-88 wind pressure design that provides an intermediate level of protection between the Miami-Dade standard and no opening protection. We include an “Ordinary” shutter in Section 4.2.5 which is similar to the OSB level of protection. Ordinary shutters include certain steel, aluminum, and polycarbonate products that are properly installed but do not meet the current impact/pressure-cycling test standards. Many of these products may have been installed prior to the standardized requirements for wind-borne debris impact and hurricane pressure cycle loads. We also recommend that the “Ordinary” shutter designation includes shutters of any style and material that meets the

ASCE 7-88 requirement for wind pressure resistance.[3] We map the Ordinary designation to the OSB shutter protection since this is the minimal level of opening protection recognized in this study. These products will provide protection for shingle and other light weight debris as well as provide some rain-screen protection of the openings to reduce the effects of wind-driven rain.

The applicable level of protection is the weakest level of protection present on the building when considering either All Glazed Openings or All Openings (see Section A.1.2.3).

A.1.2.9. Vinyl Siding

Vinyl siding is an exterior wall covering that has been observed to be more vulnerable to failure in windstorms than other types of siding. We apply an engineering judgment factor of 1.02 for houses with vinyl siding wall covers.

- ***Vinyl Siding.*** A shaped material, made principally from rigid polyvinyl chloride (PVC) that is used as an exterior wall covering on at least one-third of the exterior wall area of the building.

A.1.2.10. Double Wrap Roof-to-Wall Connector

See Section A.1.1.6.

A.1.3. Additional Secondary Factors for Group I Multi-Family

There are two additional secondary factors for Group I MF buildings that are not used in the SF home relativities. The additional factors are related to features found on flat roof buildings.

A.1.3.1. Rooftop Equipment

Flat-roofed buildings often have air conditioning units and other equipment on the roof deck. The tie down connections and water proofing details around this equipment are important to the roof cover and roof deck performance. Equipment that is not tied down or inadequately-restrained poses the most significant risk.

- ***Adequately-Restrained Rooftop Equipment.*** Equipment and supports are fastened to the roof structure with connections designed to resist lateral loads and uplift loads in accordance with the 2006 revisions to the 2004 FBC. This may be accomplished by design or by Section 301.13.1, which outlines the anchorage requirements for roof top equipment. When verifying adequate restraint by visual inspection on pre-FBC buildings, equipment mounted on a frame and restrained by at least two metal straps with at least

[3] The "Ordinary" protection rating provides credits to policy holders with existing shutter devices that cannot be verified under the more stringent Hurricane or Basic definitions. The Ordinary credit allows for policyholders to receive a credit for their devices that will provide some protection. ARA developed the concept of Ordinary shutters as part of a study for Citizens Property Insurance Corp in 2002. Ordinary was mapped to plywood opening protection in earlier studies. However, due to the fact that Ordinary shutters do not have minimal fastening requirements (whereas the fastening requirements for OSB/Plywood panels are specified in the FBC), we map Ordinary shutters to the weaker OSB type in this study.

two screws or bolts at each end shall be deemed to be adequately restrained provided that the screws or bolts are or sufficient length and diameter to ensure a positive connection with the roof structure system.

- ***Inadequately-Restrained Rooftop Equipment.*** One or more items of rooftop equipment are not adequately restrained. Significant corrosion, missing fasteners, or broken straps shall be considered evidence of inadequate restraint.

A.1.3.2. Parapets

A parapet is a low wall projecting up from the edge of a roof. They are sometimes used to conceal roof top equipment. Flat-roofed buildings with parapets can experience lower uplift pressures than flat-roofed buildings without parapets.

- ***Parapet.*** A wall projecting up from the entire perimeter of a flat roof. The minimum height must be 6 feet to qualify for a reduction in loss relativity.
- ***No Parapet.*** All other flat roof buildings.

A.2. Group II or Group III Multi-Family

Group II Multi-Family (MF) buildings include all residential dwellings with 5 or more units with reinforced concrete or steel frame construction up to 60 feet in height. These buildings are typically one to five stories in height.

Group III Multi-Family (MF) buildings include all residential dwellings with 5 or more units taller than 60 feet. These buildings are typically six or more stories in height and typically have reinforced concrete or steel frame construction.

For Group II and Group III MF residential buildings the following ***building code eras*** are defined:

- ***FBC.*** Group II or Group III buildings treated as being designed to the wind load provisions of the FBC. This era includes buildings permitted on or after March 1, 2002.
- ***SBC 1991.*** Group II and III buildings treated as being designed to the wind load provisions of SBC 1991. This building code is intended to be representative of Group II and III buildings permitted between January 1, 1983 and February 28, 2002.
- ***SBC 1976.*** Group II or Group III buildings permitted before January 1, 1983.

A.2.1. Primary Factors

The primary factors for Group II and Group III MF residential buildings are defined in the following sub-sections.

A.2.1.1. Terrain

See Section A.1.1.1.

A.2.1.2. Roof Cover Strength

For Group II and III buildings, only flat roofs are modeled with built-up roof covers. Built-up roofs comprise multiple plies of roofing felts adhered to each other and to the insulation substrate with a full mop of hot asphalt, coal tar or cold adhesive. For modeling of Group II and III buildings, these roofs and modeled as either meeting FBC requirements or not meeting FBC requirements (non-FBC).

A.2.1.3. Secondary Water Resistance

See Section A.1.1.5.

A.2.1.4. Opening Protection – None vs. Hurricane

See Section A.1.1.8.

A.2.1.5. Roof Deck

For Group II and Group III buildings, the most common roof deck types are reinforced concrete roof decks or corrugated metal roof decks supported on rolled steel framing or open web steel joists. [4] Thus, for practical reasons, we consider only two basic roof deck types for Group II and Group III buildings in this study: concrete and metal. For classification purposes, the metal deck classification can be thought of as "not a reinforced concrete roof deck".

- ***Concrete Roof Decks.*** At least 90% of the main roof deck is reinforced concrete designed and constructed in accordance with the provisions of ACI (American Concrete Institute) 318 and properly connected to the rest of the structure.
- ***Metal Roof Decks.*** Any Group II or Group III building not classified as having a Concrete Roof Deck. Buildings in this group are modeled as having metal roof decks supported by open web steel joists.

A.2.1.6. Sliding Glass Door Leakage

Sliding glass door leakage is a new feature included in the 2024 wind loss mitigation study. In recent hurricanes, water intrusion through undamaged sliding glass doors has been observed. Through both research on sliding glass door performance and interviews of ARA staff who live in Florida and experienced recent hurricanes (e.g., Hurricane Michael in 2018), water leakage through sliding glass doors occurs when the wind direction is such that wind pressure is being applied against a sliding glass door and pushing water into the track and weep holes. Whereas, in normal conditions, rainwater hits the sliding glass door and drains through the weep holes in the sliding glass doors track.

For single family homes, this was not a significant issue because they typically only have one sliding glass door and the wind direction must be oriented such that pressure is applied to it (e.g., wind coming from the north on a north-facing door). Similarly, on Group I home, the wind direction plays a role in whether this becomes an issue and there are relatively few sliding glass doors on those buildings. However, for Group II and III building, which are modeled as having many sliding glass doors and each side of the building, sliding glass door leakage is much more of an issue that needs to be considered.

[4] Recall that MF residential buildings up to 60 feet in height with wood panel roof decks are classified as Group I buildings.

A.2.2. Secondary Factors

The secondary factors for Group II and Group III MR residential buildings are defined in the following sub-sections.

A.2.2.1. Roof Top Equipment

See Section A.1.3.1.

A.2.2.2. Parapets

See Section A.1.3.2.

Appendix B. Observed and Modeled Windspeeds for Recent Florida Hurricanes

This appendix contains the ARA hurricane windfield model windspeeds (peak gust windspeed in unobstructed open terrain) at the zip code level for Hurricanes Irma, Michael, Ian, and Idalia. The windspeeds developed were used in the insurance data analysis discussed in Section 3. Significant effort was put forth into validating the modeled windspeeds through comparisons with full scale records of windspeeds, wind directions, and pressures measured both over water and on land. The following paragraphs present summaries of the windspeed for these hurricanes.

Hurricane Irma (2017): The observed windspeeds in Hurricane Irma cover nearly the entire state of Florida from the Florida Keys at the landfall point, through Georgia, well to the north of the point of landfall. As indicated in Figure B-1, there is very good agreement between the maximum modeled and observed windspeeds. Each data point given in Figure B-1 represents the observed (x-axis) and modeled windspeed at an individual measurement location. The model and the observations indicate that the Everglades and the interior of the state up to Lake Okeechobee experienced peak gust windspeeds (in open unobstructed terrain) of about 100-110 mph, reducing to about 70 mph in the north of the state near the Atlantic Coast and to less than 30 mph in the far west of the Panhandle. The good agreement between the modeled and observed windspeeds provides us with the confidence that the modeled peak gust windspeeds represent a reliable estimate of the actual maximum windspeeds experienced by the homes in Hurricane Irma. Figure B-2 shows contours of the maximum modeled peak gust windspeeds as well as the locations of the anemometers for which the comparisons between modeled and observed windspeeds were performed.

Hurricane Michael (2018): Figure B-3 presents a summary comparison plot of the observed and modeled peak gust windspeeds produced by Hurricane Michael. The observed windspeeds cover a region from Pensacola to the west of the landfall point, and across the state and into Georgia, to the east of the landfall point. As indicated in Figure B-3, there is good agreement between the modeled and observed windspeeds, with both the model and the observations indicating that the area around Mexico Beach just to the east of the landfall point experienced peak gust windspeeds (in open unobstructed terrain) of about 150 mph, reducing to about than 120 mph as the storm exited the state to the North and moved into Georgia, 30 mph in the Pensacola area and about 50 mph in the Big Bend area. The good agreement between the modeled and observed windspeeds provides us with the confidence that the modeled peak gust windspeeds represent a reliable estimate of the actual maximum windspeeds experienced by the homes in most of the areas affected Hurricane Michael. Figure B-4 shows contours of the maximum modeled peak gust windspeeds as well as the locations of the anemometers for which the comparisons between modeled and observed windspeeds were performed.

Hurricane Ian (2021): Figure B-5 presents a summary comparison plot of the observed and modeled peak gust windspeeds produced by Hurricane Ian. The observed windspeeds cover a large portion of the peninsula from Naples to the south of the landfall point, through to Tampa, on the north side of the landfall point, in addition to points on the east coast and inland from Lake Okeechobee to the Orlando area. As indicated in Figure B-5, there is good agreement between the modeled and observed windspeeds, with an R^2 value of 0.70. The model results and observations indicate that the area just to the north of the landfall point experienced peak gust windspeeds (in open unobstructed terrain) of about 130 mph, reducing to about 60 mph near both Tampa and Naples, about 80 mph in the Orlando area, and around 60 mph for much of the affected area along the Atlantic coast. Figure B-6 shows contours of the maximum modeled peak gust windspeeds as well as the locations of the anemometers for which the comparisons between modeled and observed windspeeds were performed.

Hurricane Idalia (2022): Figure B-7 presents a summary comparison plot of the observed and modeled peak gust windspeeds produced by Hurricane Idalia. The observed windspeeds cover a region from the Panama City to the west of the landfall location, eastward through to Orlando and south to Fort Myers. As indicated in Figure B-7, the agreement between the modeled and observed windspeeds is good, with an R^2 of 0.49 based on the agreement at 288 anemometer locations. The model results indicate that the maximum peak gust windspeeds on land to the east of the point of landfall were about 110 mph. Peak gust windspeeds in excess of 50 mph were experienced at locations as far east as Apalachicola National Forest and as far west as Orlando. Only a small region in the Big Bend area experienced windspeeds in excess of 100 mph. Figure B-8 shows contours of the maximum modeled peak gust windspeeds as well as the locations of the anemometers for which the comparisons between modeled and observed windspeeds were performed.

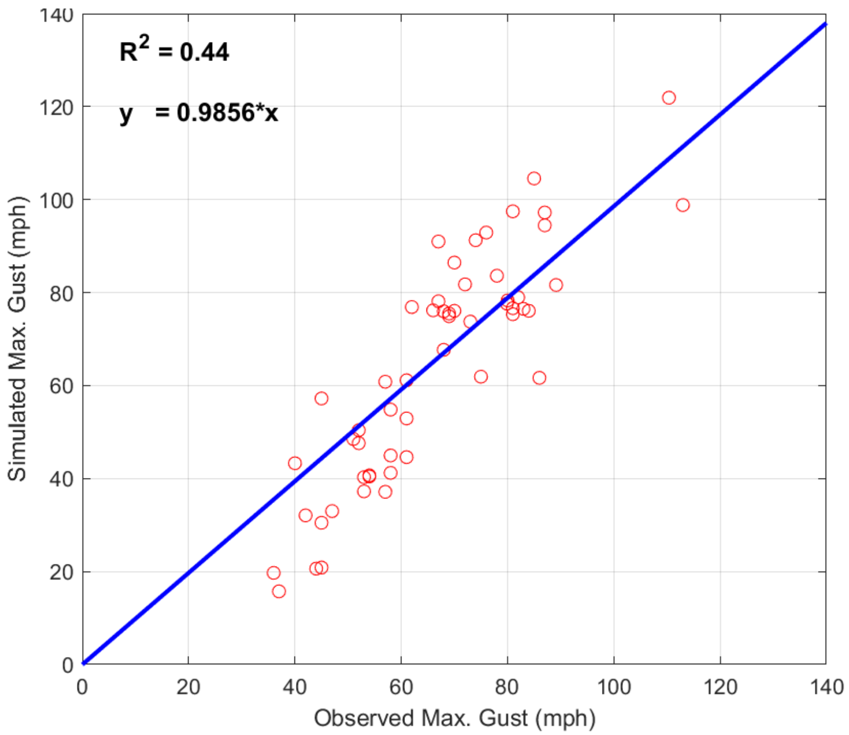


Figure B-1. Modeled and observed maximum peak gust windspeeds during Hurricane Irma (2017).

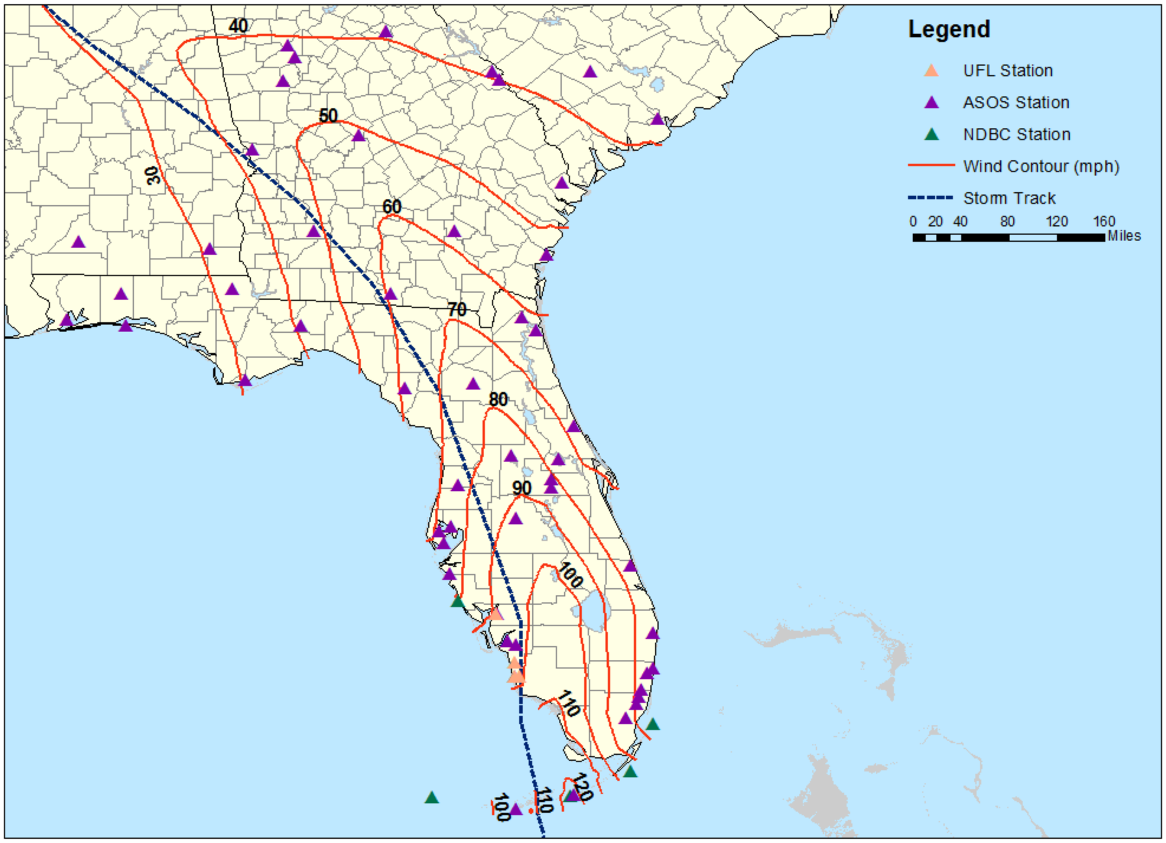


Figure B-2. Peak gust windspeed contour map for Hurricane Irma (2017) modeled with ARA windfield model fit to surface level observations.

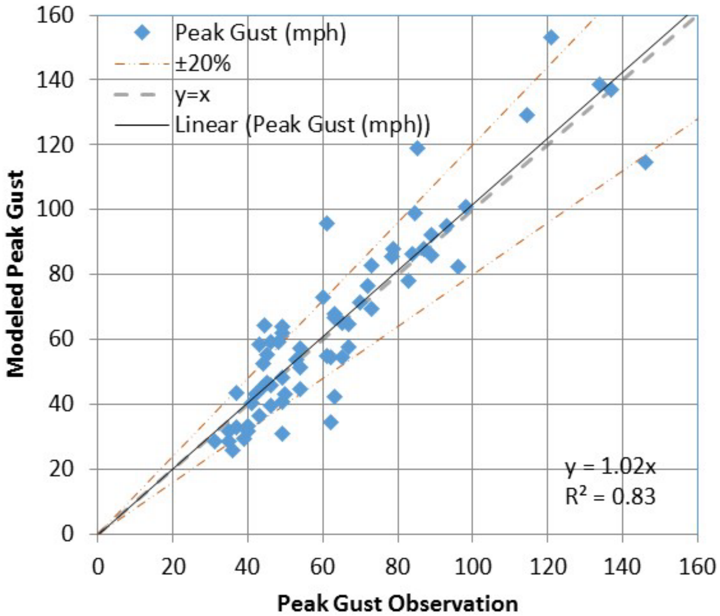


Figure B-3. Modeled and observed maximum peak gust windspeeds during Hurricane Michael (2018).

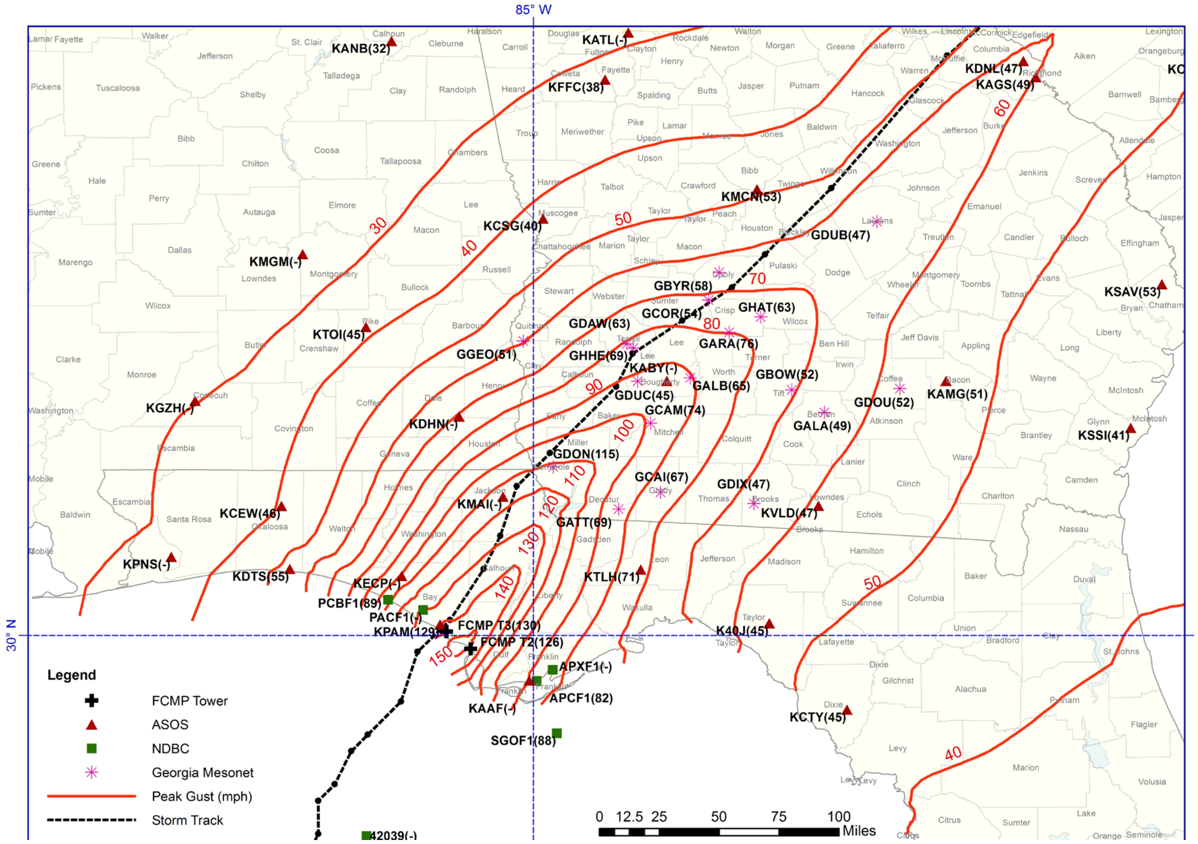


Figure B-4. Peak gust windspeed contour map for Hurricane Michael (2018) modeled with ARA windfield model fit to surface level observations.

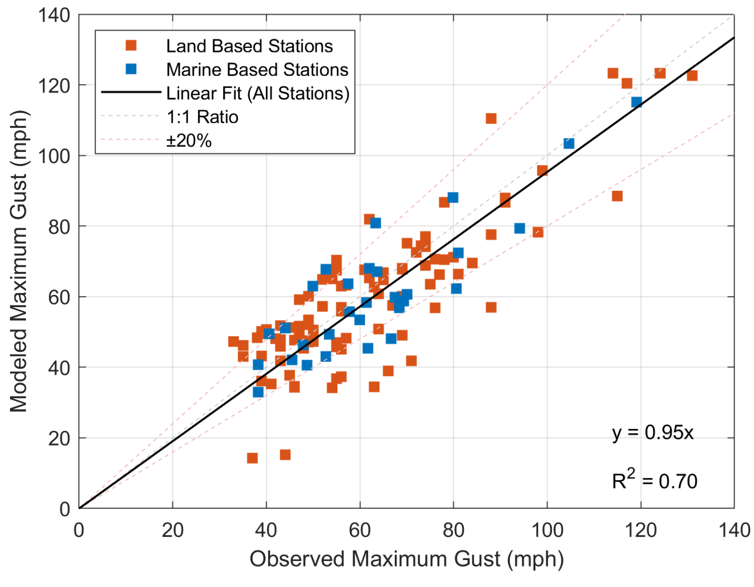


Figure B-5. Modeled and observed maximum peak gust windspeeds during Hurricane Ian (2021).

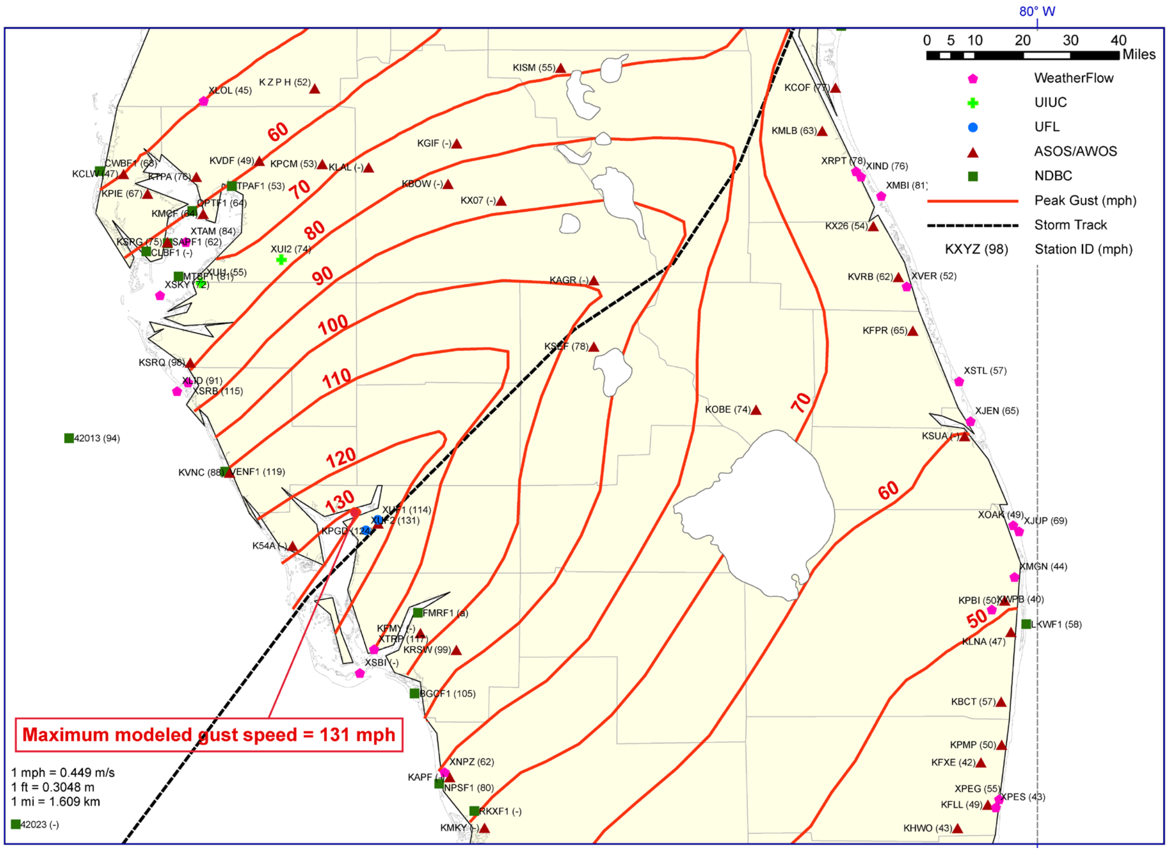


Figure B-6. Peak gust windspeed contour map for Hurricane Ian (2021) modeled with ARA windfield model fit to surface level observations.

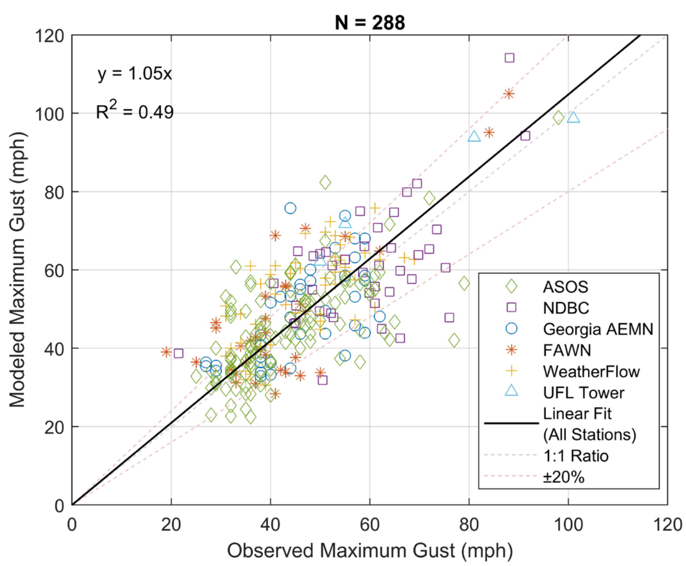


Figure B-7. Modeled and observed maximum peak gust windspeeds during Hurricane Idalia (2022).

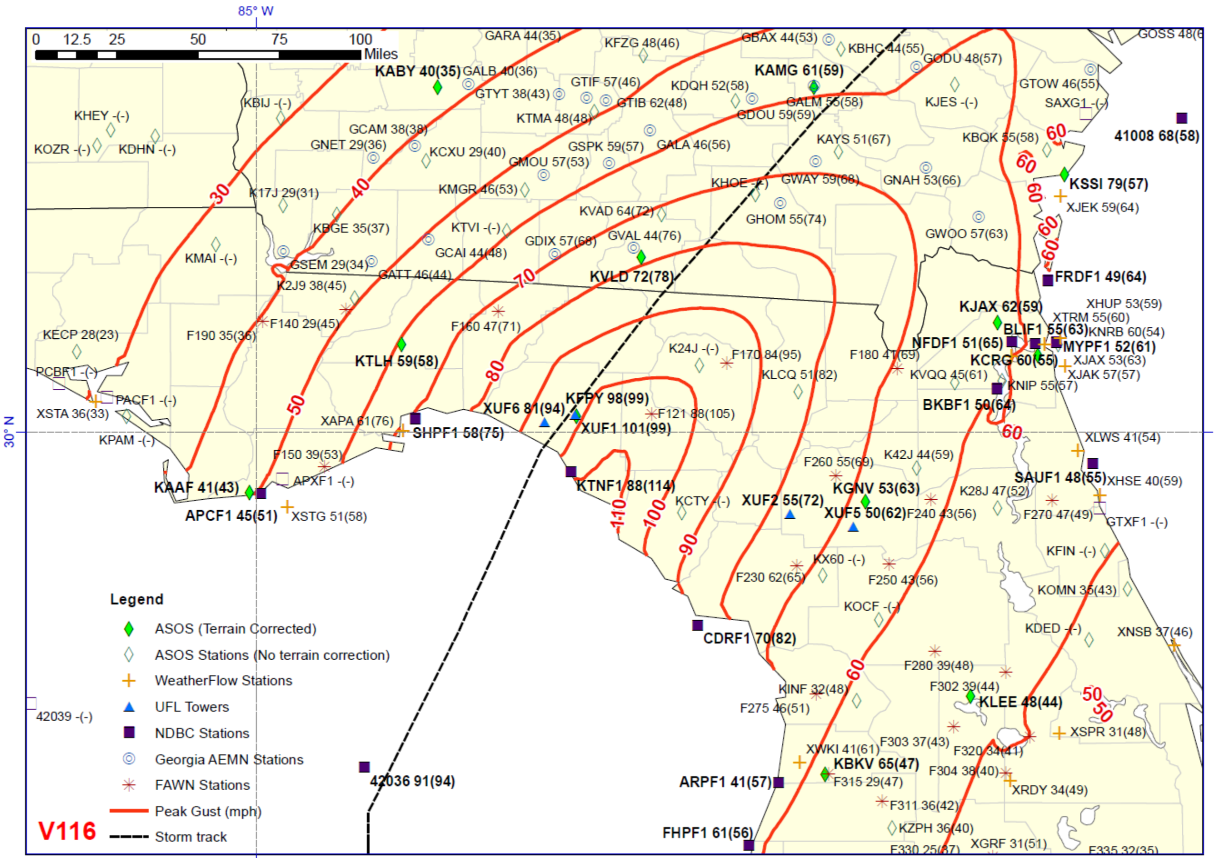


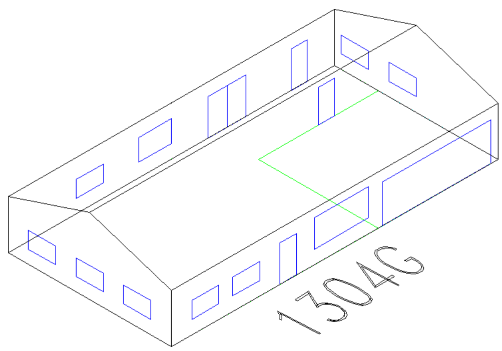
Figure B-8. Peak gust windspeed contour map for Hurricane Idalia (2022) modeled with ARA windfield model fit to surface level observations.

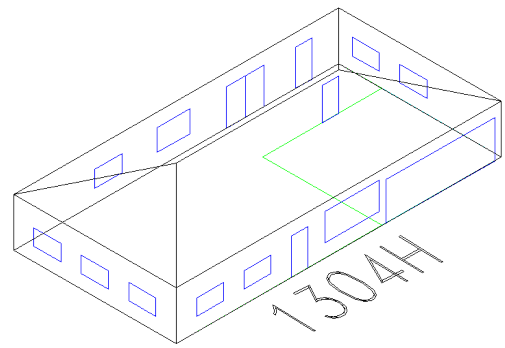
Appendix C. CAD Views or Model Buildings

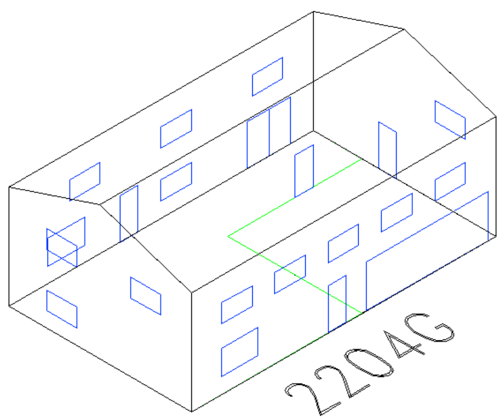
This appendix includes CAD views of 44 model buildings in Section 2.4. The CAD model number adjacent to each figure corresponds to the “Building” column in the following table, which is a shortened version of Table 2-6. The color bands in Table C-1 represent single-family and multi-family Groups I, II, and III.

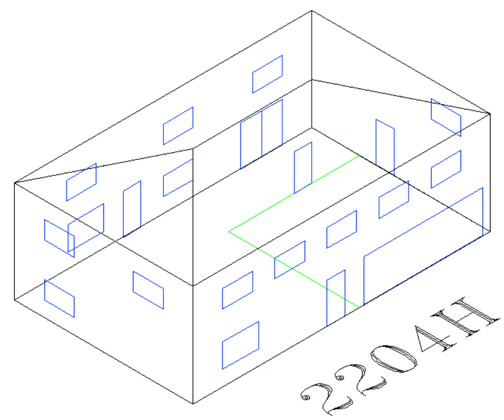
Table C-1. Summary Data for Modeled Buildings

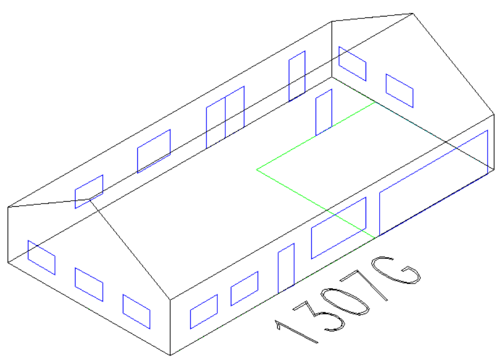
Model Index No.	Building Group	Building Model	Roof Geometry	Roof Slope	No. of Stories	SF Garage	SF Porch	SF Skylight	Wall Area % Fens	Wall Area % Glazing	Total Sq Ft	Livable Sq Ft	Notes
1	SF	1304g	Gable	4:12	1	Yes	No	No	26	14	1,800	1,316	Simple model. This is model 0013 used in the 2002 studies
2	SF	1304h	Hip	4:12	1	Yes	No	No	26	15	1,800	1,316	Simple model. This is model 0013 used in the 2002 studies
3	SF	1307g	Gable	7:12	1	Yes	No	No	22	13	1,800	1,316	Simple model. This is model 0013 used in the 2002 studies
4	SF	1307h	Hip	7:12	1	Yes	No	No	26	15	1,800	1,316	Simple model. This is model 0013 used in the 2002 studies
5	SF	2304g	Gable	4:12	2	Yes	No	No	16	11	3,600	3,116	Simple 2 story model; not used in final production runs.
6	SF	2304h	Hip	4:12	2	Yes	No	No	17	12	3,600	3,116	Simple 2 story model; not used in final production runs.
7	SF	2307g	Gable	7:12	2	Yes	No	No	16	11	3,600	3,116	Simple 2 story model; not used in final production runs.
8	SF	2307h	Hip	7:12	2	Yes	No	No	17	12	3,600	3,116	Simple 2 story model; not used in final production runs.
9	SF	2204G	Gable	4:12	2	Yes	No	No	17	10	3,000	2,516	Simple 2 story model, used in previous studies.
10	SF	2204H	Hip	4:12	2	Yes	No	No	18	11	3,000	2,516	Simple 2 story model, used in previous studies.
11	SF	2207G	Gable	7:12	2	Yes	No	No	16	10	3,000	2,516	Simple 2 story model, used in previous studies.
12	SF	2207H	Hip	7:12	2	Yes	No	No	18	11	3,000	2,516	Simple 2 story model, used in previous studies.
13	SF	A103g	Gable	6:12	1	Yes	Yes	No	20	12	2,657	1,986	Actual Florida home w/ porch; not analyzed in study
14	SF	A143g	Gable	4:12	1	Yes	Yes	No	18	11	2,657	1,986	Actual Florida home w/ porch; not analyzed in study
15	SF	A143h	Hip	4:12	1	Yes	Yes	No	20	12	2,657	1,986	Actual Florida home w/ porch; not analyzed in study
16	SF	A173g	Gable	7:12	1	Yes	Yes	No	16	10	2,657	1,986	Actual Florida home w/ porch; not analyzed in study
17	SF	A173h	Hip	7:12	1	Yes	Yes	No	20	12	2,657	1,986	Actual Florida home w/ porch; not analyzed in study
18	SF	A144g	Gable	4:12	1	Yes	No	No	18	11	2,467	1,986	Actual Florida home design; A143g without porch;
19	SF	A144h	Hip	4:12	1	Yes	No	No	20	12	2,467	1,986	A143h without porch
20	SF	A174g	Gable	7:12	1	Yes	No	No	16	10	2,467	1,986	A173g without porch
21	SF	A174h	Hip	7:12	1	Yes	No	No	20	12	2,467	1,986	A173h without porch
22	SF	A175G	Gable	7:12	1	No	No	No	11	10	2,467	2,406	Used for no garage Sensitivity Case
23	SF	A176G	Gable	7:12	1	Yes	No	Yes	16	10	2,467	1,986	Used for skylight Sensitivity Case
24	SF	A177G	Gable	7:12	1	Yes	No	No	27	20	2,467	1,986	Used for increased Fenestration Sensitivity
25	SF	A178G	Gable	7:12	1	Yes	No	No	16	10	2,467	1,986	Used for decreased Fenestration Sensitivity
26	SF	K203h	Hip	6:12	2	Yes	No	No	14	11	4,233	3,820	Actual Florida Home- 2 story with no porch
27	SF	K243g	Gable	4:12	2	Yes	No	No	13	10	4,233	3,820	Actual Florida Home- 2 story with no porch
28	SF	K243h	Hip	4:12	2	Yes	No	No	14	11	4,233	3,820	Actual Florida Home- 2 story with no porch
29	SF	K273g	Gable	7:12	2	Yes	No	No	12	9	4,233	3,820	Actual Florida Home- 2 story with no porch
30	SF	K273h	Hip	7:12	2	Yes	No	No	14	11	4,233	3,820	Actual Florida Home- 2 story with no porch
31	MF-I	0024F	Flat	0:12	2				18	15	14,592	14,592	Simple plan; large Group I model used in the 2002 study
32	MF-I	0024G	Gable	4:12	2				21	17	14,592	14,592	Simple plan; large Group I model used in the 2002 study
33	MF-I	0024H	Hip	4:12	2				21	18	14,592	14,592	Simple plan; large Group I model used in the 2002 study
34	MF-I	0027G	Gable	7:12	2				20	17	14,592	14,592	Simple plan; large Group I model used in the 2002 study
35	MF-I	0027H	Hip	7:12	2				21	18	14,592	14,592	Simple plan; large Group I model used in the 2002 study
36	MF-I	S301F	Flat	0:12	3				24	21	35,160	35,160	Actual Florida Building- Group I
37	MF-I	S341G	Gable	4:12	3				22	19	35,160	35,160	Actual Florida Building- Group I
38	MF-I	S341H	Hip	4:12	3				23	20	35,160	35,160	Actual Florida Building- Group I
39	MF-I	S371G	Gable	7:12	3				20	18	35,160	35,160	Actual Florida Building- Group I
40	MF-I	S371H	Hip	7:12	3				22	19	35,160	35,160	Actual Florida Building- Group I
41	MF-II	0057F	Flat	0:12	5				24	24	33,600	33,600	Simple plan; Group II model used in 2002 study
42	MF-II	WW31F	Flat	0:12	3				14	12	28,620	28,620	Actual Florida Building-Group II
43	MF-III	0087F	Flat	0:12	8				24	24	53,760	53,760	Simple plan; Group III model used in 2002 study
44	MF-III	SB31F	Flat	0:12	10				28	28	240,000	240,000	Actual Florida Building-Group Iii

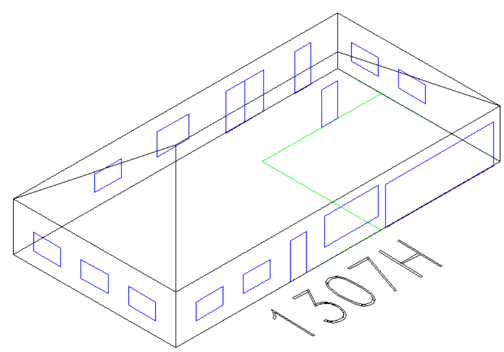

1304G

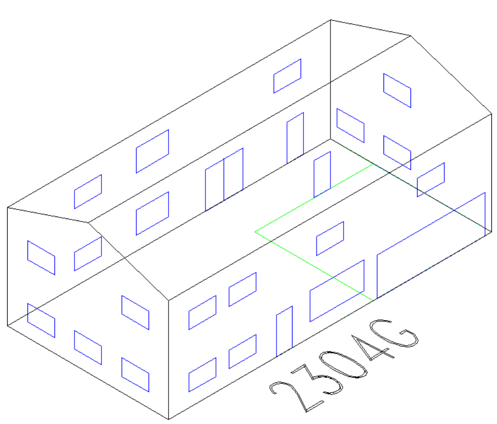

1304H

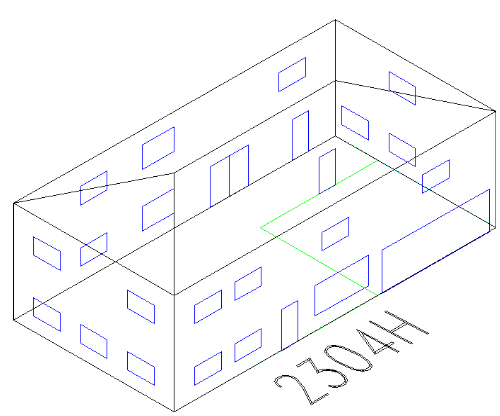

2204G

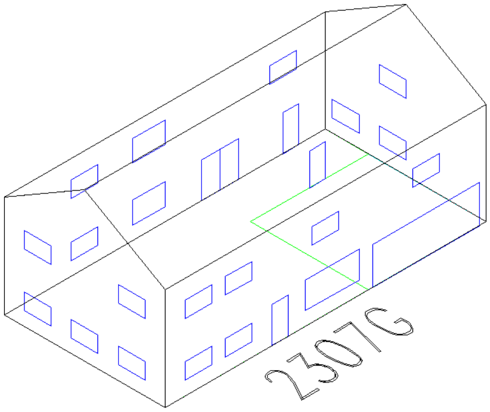

2204H


1307G

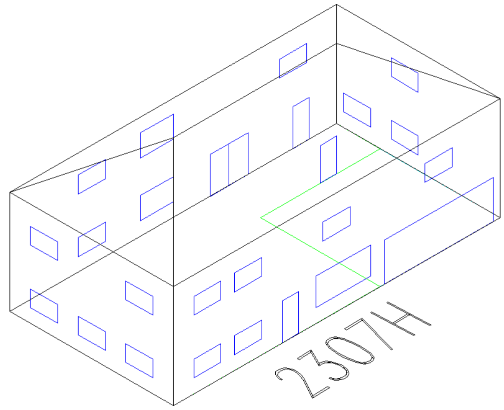

1307H


2304G

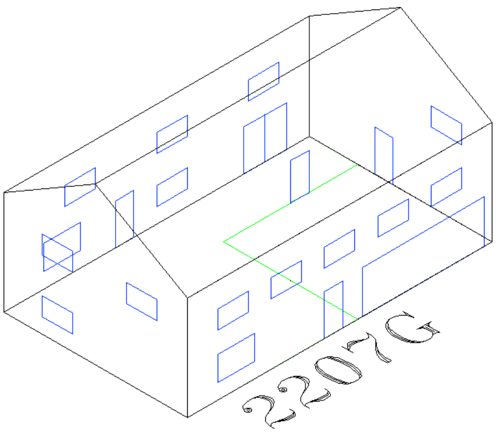

2304H



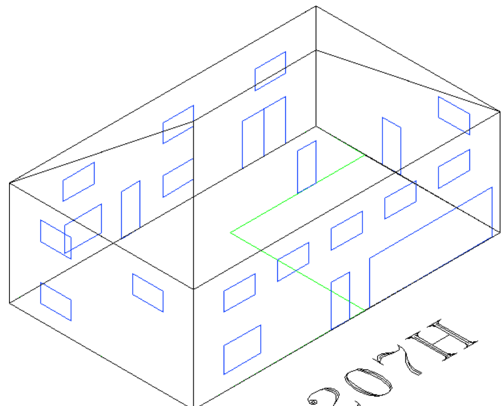
2307G



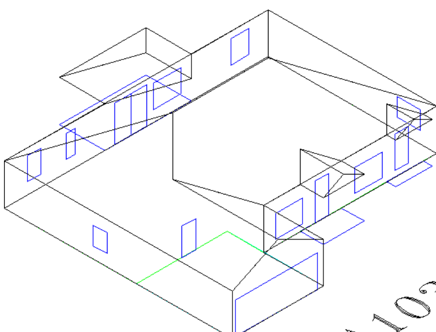
2307H



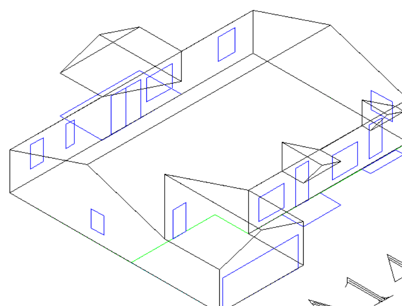
2207G



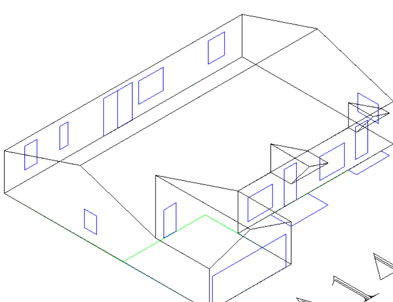
2207H



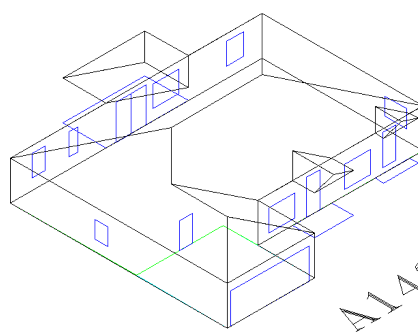
A103G



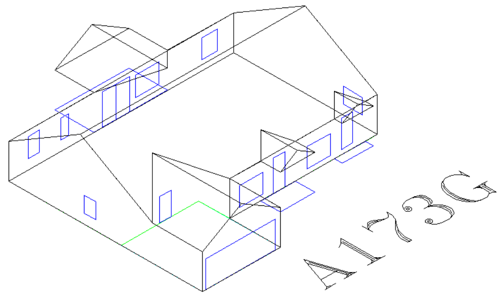
A143G

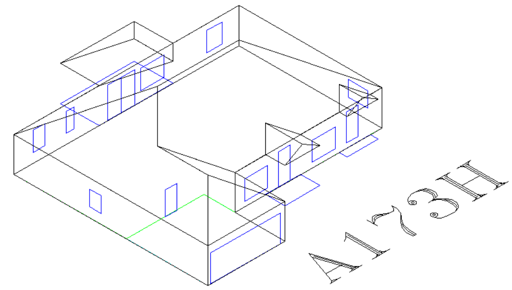


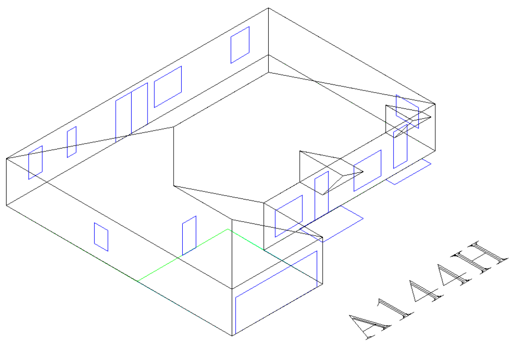
A144G

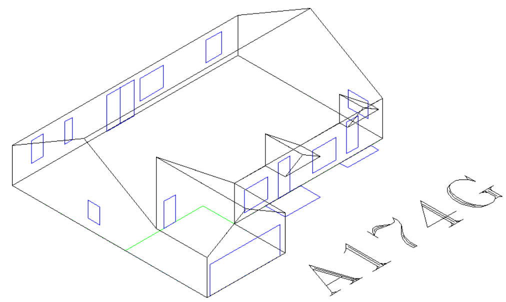


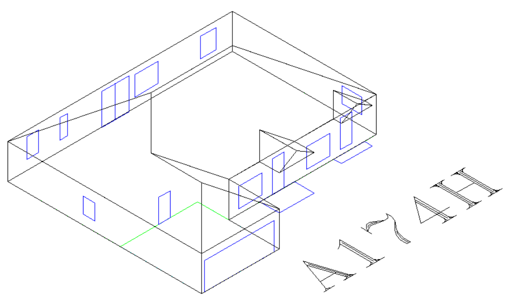
A143H

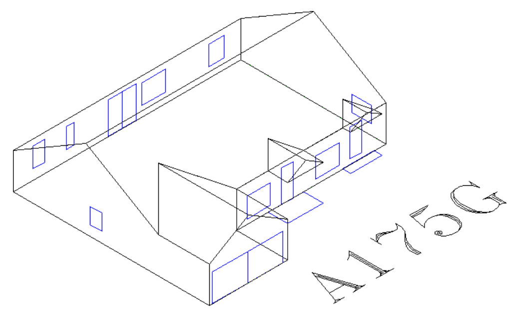

A173G

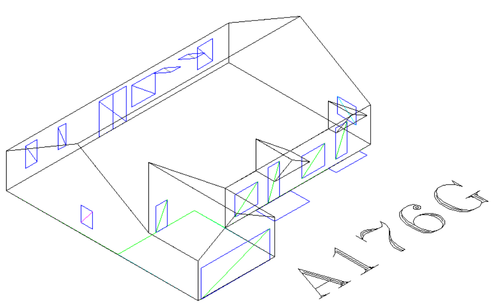

A173H

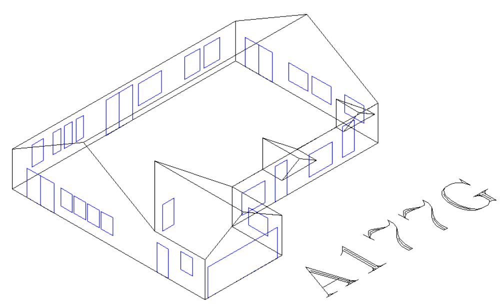

A144H

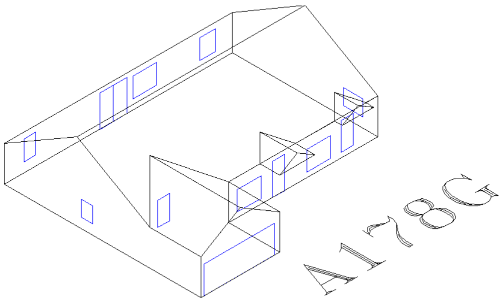

A174G

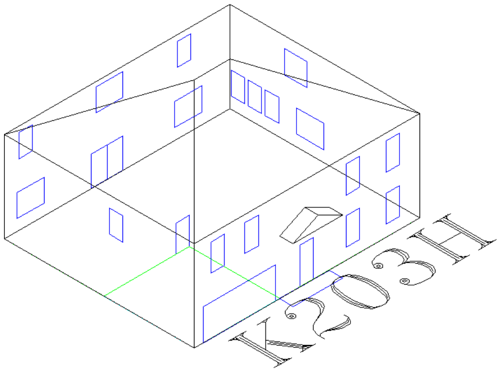

A174H

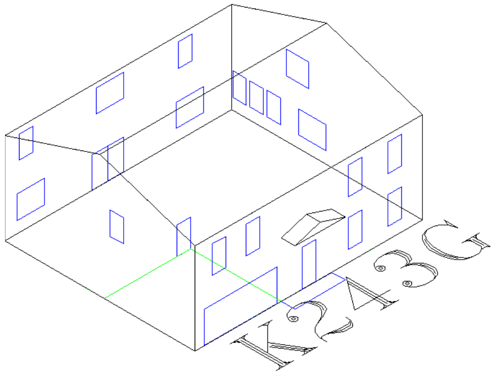

A175G

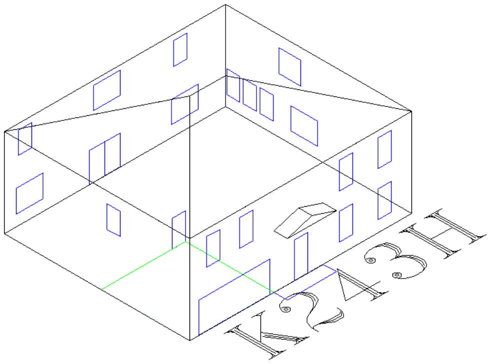

A176G

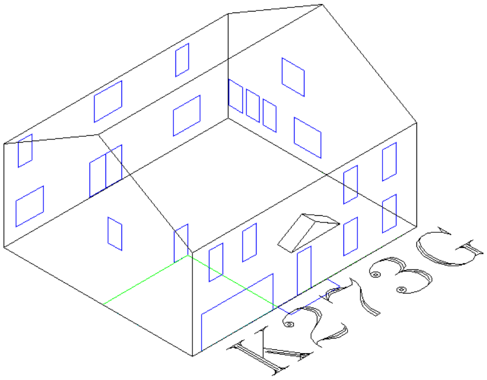

A177G

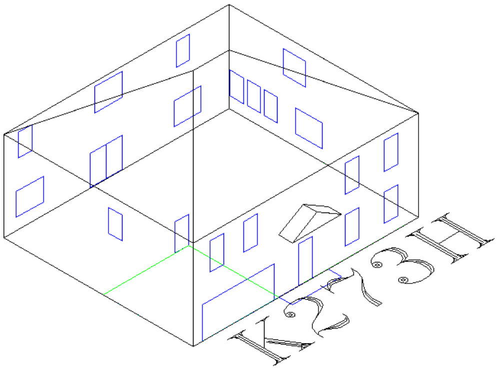

A178G

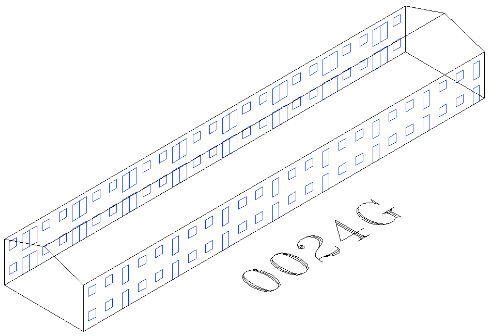

K203H

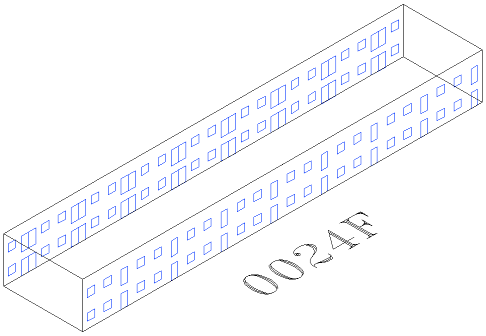

K243G

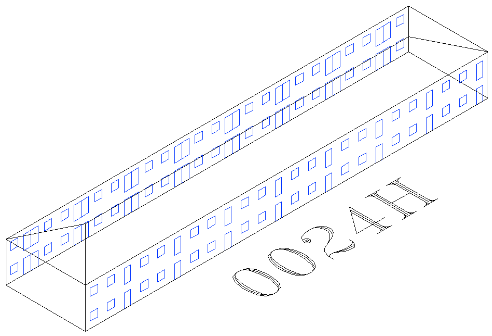

K243H

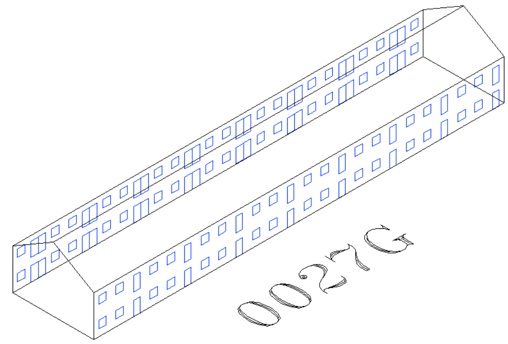

K273G

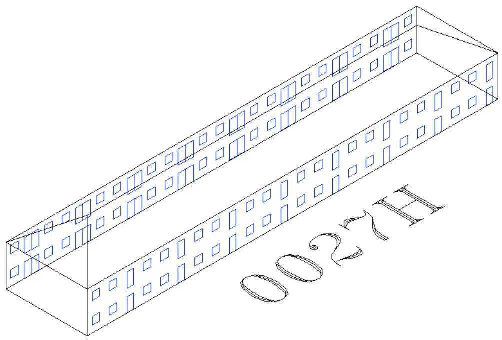

K273H

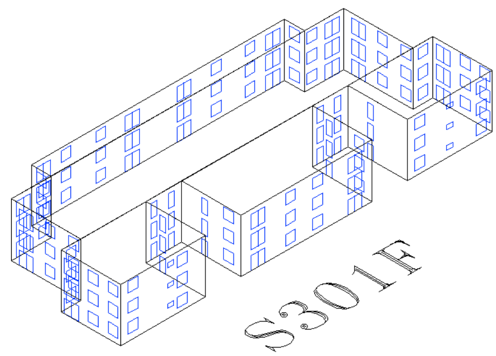

0024G

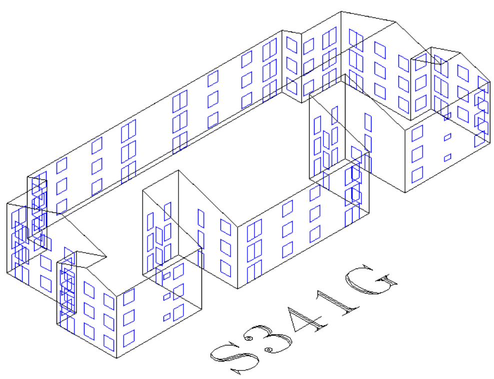

0024F

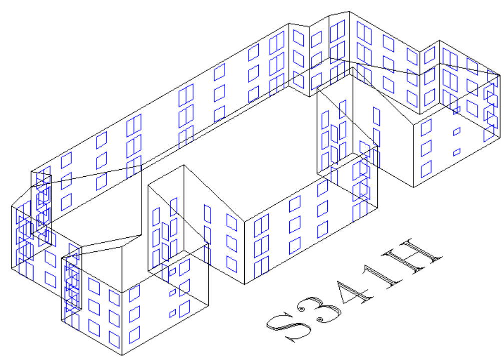

0024H

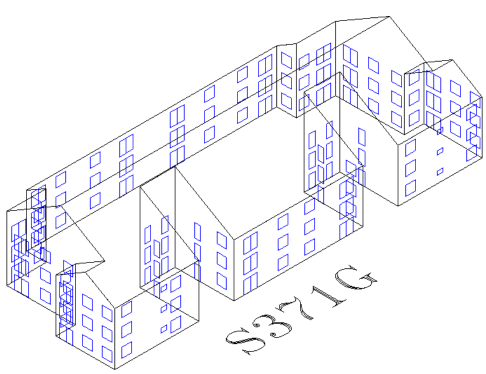

0027G

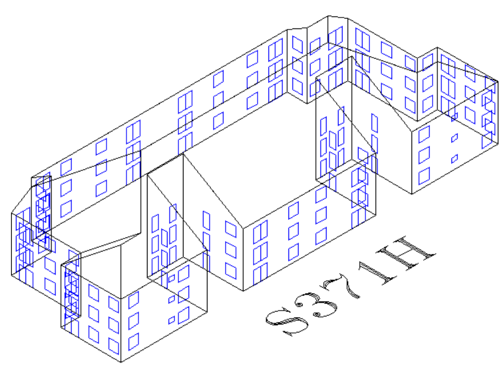

0027H

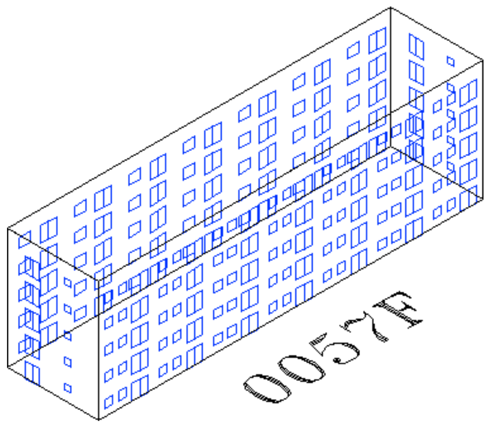

S301F

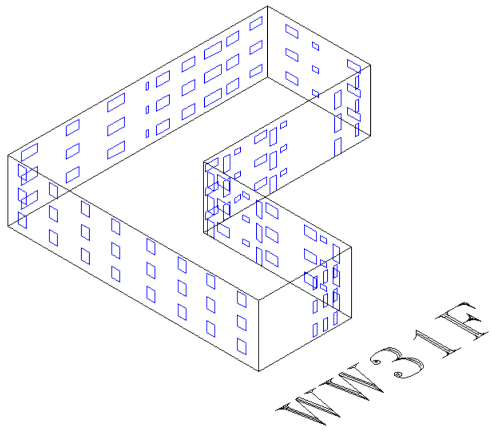

S341G

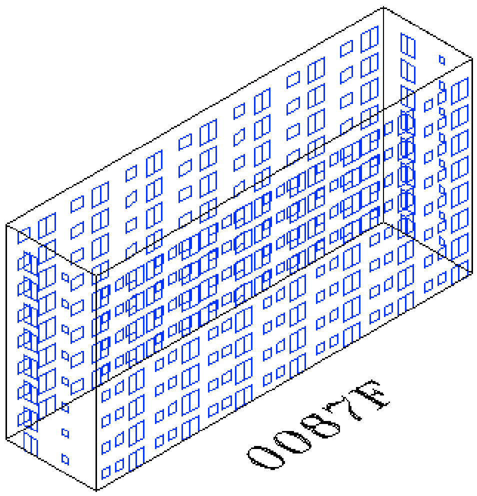

S341H

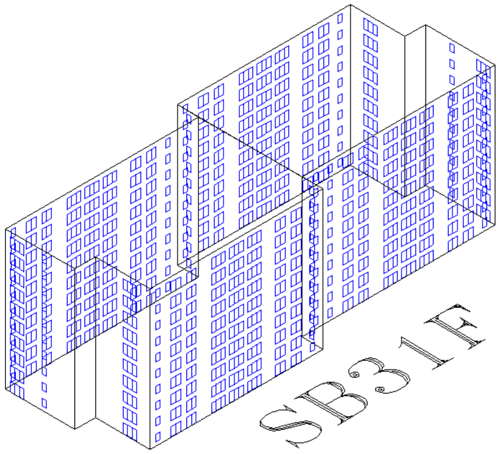

S371G


S371H


0057F


WW31F


0087F


SB31F

Appendix D. Example 2006 FBC Design Calculations

This appendix presents example FBC wind resistive design calculations that have been completed for modeled buildings, including:

- Single-family homes
- Group I multi-family homes
- Group II multi-family homes
- Group III multi-family homes

D.1. Design Codes and Features

FBC 2001 was used for the design of all buildings in Florida permitted on or after March 1, 2002. However, FBC was divided into two codes for the 2004 edition and has remained that way since: a residential code (FBCR) and a general building code (FBC). The FBCR is used for the design of one and two-family dwellings (i.e., single-family homes and duplexes), whereas the FBC is used for the design of all other buildings (i.e., multi-family homes).

Mobile homes (built prior to June 15, 1976) were required to meet the ANSI A-119.1 Standard. Manufactured homes, built on or after June 15, 1976, were required to meet the requirements of “Manufactured Home Construction and Safety Standards MHCSS” 24 CFR, Part 3280, a standard developed by HUD. All manufactured homes in Florida were required to be design for Wind Zone II in this standard. This HUD standard was updated in 1994, following Hurricane Andrew (1992), to add Wind Zone III, which includes several counties in Florida as discussed in Section 6. It should be noted that this appendix does not include calculations for manufactured/mobile homes because the main features that contribute to mitigation are tie-downs and opening protection for these structures.

D.1.1. Definition of Terrain Exposure

In the FBC 2001, the definition of terrain exposure was different than that of ASCE 7. A simplified definition of terrain was used in which Terrain Exposure C included the barrier islands and areas within 1500 feet of the coast. All other locations in Florida were designated as Terrain B. Hence, the 2001 FBC did not require buildings with open exposure and away from the coast, to be designed for Exposure C wind loads.

The FBC adopted terrain exposure definitions similar to ASCE 7 in 2006 and has continued to do so since then. ASCE 7 uses Terrain C as the default terrain unless the site and surrounding roughness warrant Terrain Exposure B. This means that buildings located next to large open areas in Florida should be considered in Terrain C, regardless of distance from the coast.

D.1.2. Partially Enclosed vs. Enclosed Design

Building codes define three conditions regarding the effect of whether the wind is able to enter a building and change the loading pattern on the building components. The first is an “Enclosed” building where the envelope is completely closed, and only wind “leaking” around doors, windows, framing, etc. is allowed to affect the interior of the building. The second condition is called an "Open" building such as a stadium grandstand where wind can freely enter the inside of the structure.

In between these two conditions is the third case, which is a "Partially Enclosed" building, where openings are assumed to exist in one or more faces of the building. These openings allow the wind to create pressures inside the building. These "internal" pressures for partially enclosed designs are typically larger than the internal pressures in an enclosed building. Hence, partially enclosed designs that are based on larger internal pressures typically result in individual parts of the structure being stronger than if designed to an "enclosed" condition. However, the openings (windows, doors, etc.) in partially enclosed designs are vulnerable to wind-borne debris impact failures and the resulting wind and rainwater damage to the building interior and contents. Determining which condition is appropriate for a given building depends on the number and size of the openings in a building.

Prior to FBC 2006 (i.e., FBC 2004 with 2006 and 2007 amendments), partially enclosed design was allowed in the WBDR of the FBC (see Section 2.2), with the exception of the HVHZ. Since 2008 (FBC 2006), partially enclosed designs have not been permitted and all buildings must have opening protection in the WBDR. Hence, all new designs from FBC 2006 & onward in the WBDR require opening protection for debris impact. These buildings generally perform better than partially enclosed designs and result in lower losses.

D.1.3. Effect of Loading Assumptions in Truss Strap Design

A designer is allowed two methods of calculating the loads on the roof-to-wall connection. The designer can choose to: (1) use prescriptive requirements, or (2) design the connection using performance-based methods.

One set of loads in the code is called Components and Cladding (C&C) loads and these are to be applied to any cladding or member that receives wind loads directly from the wind. These loading pressures consider the lack of correlation of the wind gusts over larger and larger areas. The other set of loads in the code are called Main Wind Force Resisting System (MWFRS) loads and are intended to calculate the effect of loads acting on several surfaces at once. Much discussion and debate among design professionals over which loading set is appropriate for roof trusses has ensued over the years.

The ASCE 7 standard indicates that trusses are to be considered as both C&C loading and MWFRS loading. The commentary describes the situation where long span trusses should be designed for MWFRS loads and individual members of the truss designed for C&C loads. Unfortunately, the commentary does not discuss what is appropriate for the straps holding the truss to the wall, nor does it define what constitutes a long span truss.

According to ASCE 7, a threshold of 700 square feet of tributary area should be used for considering a component to be designed with MWFRS loads. From this threshold, a logical argument could be made that most residential trusses are not large enough to qualify for the MWFRS loads, and therefore should be designed for C&C loads, and subsequently, the strap size chosen to be consistent with C&C loads. For residential structures, both the MWFRS and the C&C

loads should be checked, and the larger of the two chosen. Typically, for residential construction, the C&C loads are significantly higher than the MWFRS loads.

The prescriptive requirements for truss uplift given in the AFPA Wood frame construction manual (WFCM) are based on the MWFRS low-rise provisions of as defined in ASCE 7. The prescriptive uplift requirements given in the FBC are also based on the MWFRS loads as given in ASCE 7. Thus, whether using the MWFRS loads from ASCE 7 or the prescriptive requirements in the WFCM, the designer should obtain similar roof-to-wall design requirements. The relationship between versions of the FBC, ASCE 7, and WFCM are shown in Table D-1.

Table D-1. ASCE and WFCM editions referenced in FBC

Building Code	ASCE Standard	WFCM
FBC 2010	7-10	2001
FBC 2014	7-10	2012
FBC 2017	7-10	2015
FBC 2020	7-16	2018
FBC 2023	7-22	2021

While the C&C loads produce larger uplift forces than the MWFRS loads, the loss relativity results indicate that the effect of the design method for the uplift requirements on the roof-to-wall connection has a relatively minor effect on loss costs. Therefore, the loss relativity results presented in this study focus on the MWFRS results. In addition, it is our understanding that industry practice employs the MWFRS loads.

D.2. Wind Design Features

For this study, we break the wind design features for buildings into three types:

- Architectural - building features that are not dependent on building code.
- Structural – building features that are dependent on the building code.
- Other – features that are do not fall into either of the categories above.

Examples of these features are shown in Table D-2.

Table D-2. Wind design features types

Architectural	Structural	Other
• Roof shape • Roof cover type • Roof slope • Soffit material • Number of stories • Sliding glass door protection	• Roof cover strength • Secondary water resistance (SWR) • Roof-to-wall connection • Roof deck attachment • Opening protection • Design window strength	• Terrain

This appendix provides discussion and sample calculations for the structural features shown in Table D-2 and discussion only of some of the features that were not included.

D.2.1. Effect of Wall Construction on Wall Features

We designed a wood frame wall and a masonry wall for each of the single-family buildings in this study. The wood frame wall was examined for capacity in bending due to wind loads, axial loads from the roof and shear loads along the length of the wall. The design calculations indicate that a standard 2x4 wall at 16 inch spacing is adequate if an appropriate grade of wood is used to carry the wind loads in most parts of the state.

We analyzed the new construction single-family homes with wood frame walls and masonry walls in the 2002 relativity study and found that the wall construction has little effect on the loss relativity. Our models show that the failure rates of wood frame are higher than those of masonry. The model also indicates that the wall failures are correlated with whole roof failures, which result in losses that approach the coverage limit. The FBC requires that any structures that has more than 50% damage that the entire building must be built to the current requirements of the FBC. Hence, we believe that the increased strength of masonry walls on loss costs is minimal. Houses with masonry walls may have other design features that help them perform better, but we do not believe that the increase in wall strength is a significant factor.

D.2.1.1. Effect of Foundation Design

As demonstrated in the 2002 study (ARA, 2002a), the failure of the foundation affects the relativities when the foundation relies only on the weight of the structure to resist the wind shear and uplift forces. Any type of rebar or anchor bolts will essentially eliminate the foundation failure's effect on the relativities. Since all foundations built according to the FBC will be restrained in some fashion, the foundation type has not been included as a variable in the new construction matrix.

D.3. Building Code Discussion and Calculation

The following subsections describe how the building code requirements were applied to buildings, including calculations where necessary, to configure the model buildings in developing the relativities. Subsections are included for:

- Opening protection
- Roof cover strength
- Secondary water resistance
- Roof deck attachment
- Roof-to-wall connection
- Design window pressure

D.3.1. Opening Protection

Opening protection requirements have varied over time for the FBC with changes to the windspeed map contours, windspeed design types (allowable stress design vs. ultimate design) and enclosed vs. partially enclosed design requirements. Table D-3 summarizes the FBC code requirements that have impacted whether opening protection is required over time. Prior to FBC 2010, design windspeeds were based on allowable stress design. From FBC 2010 onward, ultimate design windspeeds were used, which increased the windspeed for which opening protection was required. The biggest change in requirements for opening protection occurred with FBC 2006 (FBC 2004 with 2007 amendments), when the option to use partially enclosed design instead of opening protection was eliminated from the FBC. In terms of modeling the base case of buildings for this study, this resulted in building designed for FBC 2001 and 2004 to not include opening protection, whereas opening protection is required for the base case for FBC 2006 all editions that followed. Although the windspeed type changed from allowable stress to ultimate design, and the windspeeds defining the WBDR increased, the design pressures remained similar. The windspeed contours changed, which resulted in changes to the area defined as being in the WBDR, but those changes are relatively minor for the purposed of relativities. In FBC 2023, the WBDR definition to include buildings that have a design windspeed of at least 130 mph and are located within 1 mile of the mean water line where exposure D conditions are present (rather than just within 1 mile of the coast). The impact of this change is that inland areas within 1 mile of some rivers and lakes may require opening protection. This would have a significant impact on new construction in areas like Orlando. However, it is our understanding that this provision is being suspended from enforcement, which is why it is not explicitly modeled for this study.

Table D-3. Opening protection for base case homes by FBC edition

Building Code	ASCE Wind Map	WBDR Definition	Partially Enclosed Design Option?	Opening Protection Required for Base Case?
FBC 2001	7-98	≥120 mph or ≥110 mph within 1 mile of the coast(1)	Yes	No
FBC(R) 2004	7-02	≥120 mph or ≥110 mph within 1 mile of the coast(1)	Yes	No
FBC(R) 2006	7-02	≥120 mph or ≥110 mph within 1 mile of the coast	No	Yes
FBC(R) 2007	7-05	≥120 mph or ≥110 mph within 1 mile of the coast	No	Yes
FBC(R) 2010	7-10	≥140 mph or ≥130 mph within 1 mile of the coast	No	Yes
FBC(R) 2014	7-10	≥140 mph or ≥130 mph within 1 mile of the coast	No	Yes
FBC(R) 2017	7-10	≥140 mph or ≥130 mph within 1 mile of the coast	No	Yes
FBC(R) 2020	7-16	≥140 mph or ≥130 mph within 1 mile of the coast	No	Yes
FBC(R) 2023	7-22	≥140 mph or ≥130 mph within 1 mile of the mean water line where exposure D conditions exist	No	Yes

(1) For the counties of Bay, Calhoun, Escambia, Franklin, Gulf, Liberty, Okaloosa, Santa Rosa, Walton, and Washington, the WBDR was defined in the FBC 2001 and 2004 as only the area within 1 mile of the coast. This amendment, known as the Panhandle Exception, was eliminated in the July 1, 2007 supplement to FBC 2004 (designated herein as FBC 2006).

D.3.2. Secondary Water Resistance

FBCR 2014 was the first edition of the FBC that included requirements for SWR (or secondary water barrier). However, the requirement for SWR only applied to single-family homes where the roof covering was being replaced (i.e., existing construction). For new construction, an alternative was introduced to FBCR 2014 that was intended to provide SWR. However, the other options included do not provide SWR. Similarly, FBCR 2017 provides multiple options for underlayment of new construction, one of which produces SWR. The underlayment section of FBCR 2020 (Section 905.1.1) was updated to be consistent with the recommendations from IBHS to create SWR (or a "sealed roof deck"). Although this is now required by the FBC, it is difficult for homeowners to prove that SWR was installed. From conversations with inspectors in Florida, we have learned that SWR is not always being installed as permits are not acquired by all roofing contractors on every house. Because it is difficult to prove and their still seems to be some confusion over SWR requirements, we treated the base case as "no SWR" for this study as we did for previous wind mitigation studies.

D.3.3. Roof Cover Strength

As discussed in the 2008 wind mitigation study, the FBC 2006 changed requirements for asphalt shingles such that three classes of shingles were introduced to meet the ASTM D7158 requirements. The requirements for the different classes of asphalt shingles are shown in Table D-4, which has been adapted from FBCR 2023 but is consistent with the requirements from FBCR 2010 to present when ultimate windspeeds became the basis of design.

Table D-4. Classification of Asphalt Shingles (adapted from FBCR 2023)

Design Windspeed (Ultimate, mph)	Design Windspeed (Allowable Stress Design)	ASTM D7158 Shingle Class(1)
110	85	D, G, H
116	90	D, G, H
129	100	G, H
142	110	G, H
155	120	G, H
168	130	H
181	140	H
194	150	H

1) For simplicity, only ASTM D7158 shingle classifications are shown. ASTM D3161 shingle classifications are also permitted by the FBC.

D.3.4. Roof Deck Attachment

The roof deck attachment for single-family homes has been prescribed since FBCR 2006, when 8d ring shank nails spaced at 6-inches became a requirement across Florida. However, the roof pressure loads increased significantly in ASCE 7-16, which corresponds to FBC 2020. Table D-5 and Table D-6 present calculations for the roof deck attachment used for ASCE 7-22 (same as ASCE 7-16) and ASCE 7-10 (prior to changes in roof pressure coefficients for components and cladding), respectively. In the tables, roof pressures (psf) are computed for windspeeds ranging from 110-180 mph (ultimate windspeeds). ASCE 7-22 and 7-16 correspond to FBC 2023 and 2020, respectively, while ASCE 7-10 corresponds to FBC 2010, 2014, and 2017.

The design pressures shown in Table D-5 and Table D-6 are computed using the following equation:

$$p = 0.00256 K_z K_{zt} K_d K_e V^2 \left(GC_p - GC_{pi}\right)(LF) \quad (19)$$

where:

p = Design pressure, in psf

K_z = Velocity pressure exposure coefficient

K_{zt} = Topogrpahic factor, taken as 1

K_d = Directionality factor, taken as 0.85

K_e = Ground elevation factor, taken as 1. This factor was new in ASCE 7-22 and was not used in earlier editions

V = Design windspeed, in mph

GC_p = External pressure coefficient

GC_{pi} = Internal pressure coefficient, taken as 0.18 psf for an enclosed building

LF = Load factor

The design pressure calculations in Table D-5 and Table D-6 are for two-story single-family homes with a 4:12 (or ~18 degree) roof slope. Calculations were computed for both terrain B and C. The calculations show that the design roof pressures are quite a bit higher for ASCE 7-22, as expected. The highest design pressure is seen for the corner zone (zone 3) in terrain C. This design pressure is similar to the ultimate pressure we use to model an 8d common nail roof deck attachment at 6" spacing, and only about half of the ultimate pressure we use to model the 8d ring shank nail roof deck attachment at 6" spacing. Therefore, the requirement of using 8d ring shank nails at 6" or better for roof deck attachments across Florida limited the impact of the increase in pressure coefficients in ASCE 7-16.

Table D-7 shows roof deck attachment calculations using ASCE 7-05 (FBC 2007). Both the allowable stress design windspeeds and the equivalent ultimate design windspeeds are shown in the table. By comparing the design pressures in Table D-7 to Table D-6, it can be seen that although the design windspeeds increased with the change in type of windspeed, the design pressures remained similar between ASCE 7-05 and 7-10.

D.3.5. Roof-to-Wall Connection

The roof-to-wall connection is determined using calculations specific to each individual building and its properties rather than being prescribed in the FBC. We provide three options for this study: toenail, clips, and strap. We model these connections with mean failure loads of 415 lbs, 866 lbs, and 1200 lbs, respectively.

Table D-8 shows calculations for the roof-to-wall connection for a two-story single-family home with a 30-foot roof span and 2-foot spacing between roof trusses, designed to ASCE 7-22 (FBC 2023). These calculations use the same basic equation as used in the previous section for roof deck attachment but multiplied by the effective wind area to produce a design load (lbs.) rather than a design pressure. Two options for the effective wind area were computed: an end wall roof truss; and an interior (i.e., non-end wall) truss. Additionally, the pressure coefficients used for the roof-to-wall connection are for the MWFRS instead of the component and cladding loads used for roof deck attachment.

Roof-to-wall calculations were completed for terrains B and C in Table D-8. The design wind loads are much higher for in terrain C as well as for non-end wall trusses, which was expected because the effective wind area is larger. The roof-to-wall connection varies by terrain. For example, using the mean capacities that are modeled, a toenail could be used in terrain B for up to about 130 mph, but only for up to 115 mph in terrain C. The FBC states that straps must be designed for 700 lbs or more (see Section 2321.7 in FBCR). Using 700lbs, instead of the mean ultimate capacity we use for modeling, straps would be required for over 150 mph in terrain B and 140 mph in terrain C.

Table D-9 shows calculations for the roof-to-wall connection for a two-story single-family home with a 30-foor roof span and 2-foot spacing between roof trusses, designed to ASCE 7-05 (FBC 2007). Both the allowable stress design windspeeds and the equivalent ultimate design windspeeds are shown in the table. By comparing the design pressures in Table D-9 and Table D-8, it can be seen that although the design windspeeds increased with the change in the type of windspeed, the design loads remained similar between ASCE 7-10 (same as ASCE 7-22 for MWFRS) and ASCE 7-05.

D.3.6. Design Window Pressure

Design window pressures were not included in the 2002 or 2008 wind loss mitigation studies. Example calculations for the negative design pressures acting on windows are shown in Table D-10 through Table D-12. Table D-10 shows the negative design window pressure for a two-story single-family home at various windspeeds in terrain B and C using ASCE 7-22 (FBC 2023), which are the same for FBC 2020. These calculations are repeated for ASCE 7-10 (FBC 2010, 2014, 2017), where the design wind pressures are similar but slightly different due to a change in k_z in terrain B. Table D-12 shows the same calculations for ASCE 7-05 (FBC 2007) to demonstrate that the change from allowable stress design to ultimate design windspeeds did not have a significant impact on the design pressures for windows.

Table D-5. Roof deck attachment calculations for two-story single-family home with 4:12 roof slope using ASCE 7-22 (FBC 2023)[(1)]

														Wind Loads of Roofs with 4:12 slope (psf)								
Building Code	Standard	Stories	Building Height (ft)	Terrain	Kz	Kzt	Kd	Ke	Gcpi	EWA (ft^2)	Wind zone(s)	GCp	Load Factor	110	115	120	130	140	150	160	170	180
FBC/R 2023	ASCE 7-22	2	20	B	0.62	1	0.85	1	0.18	32	3	-2.75	1	-47.8304	-52.2774	-56.9221	-66.8044	-77.4773	-88.9407	-101.195	-114.239	-128.075
FBC/R 2023	ASCE 7-22	2	20	B	0.62	1	0.85	1	0.18	32	2	-2.1	1	-37.2195	-40.68	-44.2943	-51.9843	-60.2895	-69.2099	-78.7454	-88.8962	-99.6622
FBC/R 2023	ASCE 7-22	2	20	B	0.62	1	0.85	1	0.18	32	1	-1.5	1	-27.4249	-29.9747	-32.6379	-38.3042	-44.4238	-50.9967	-58.023	-65.5025	-73.4353
FBC/R 2023	ASCE 7-22	2	20	C	0.9	1	0.85	1	0.18	32	3	-2.75	1	-69.4312	-75.8865	-82.6288	-96.9741	-112.467	-129.108	-146.896	-165.831	-185.915
FBC/R 2023	ASCE 7-22	2	20	C	0.9	1	0.85	1	0.18	32	2	-2.1	1	-54.0283	-59.0516	-64.2982	-75.4611	-87.517	-100.466	-114.308	-129.043	-144.671
FBC/R 2023	ASCE 7-22	2	20	C	0.9	1	0.85	1	0.18	32	1	-1.5	1	-39.8104	-43.5117	-47.3776	-55.6029	-64.4862	-74.0275	-84.2269	-95.0842	-106.6

(1) The calculations for ASCE 7-16 (FBC 2020) are the same shown in this table.

Table D-6. Roof deck attachment calculations for two-story single-family home with 4:12 roof slope using ASCE 7-10 (FBC 2010, 2014, 2017)

														Wind Loads of Roofs with 4:12 slope (psf)								
Code	Standard	Stories	Building Height (ft)	Terrain	Kz	Kzt	Kd	Ke	Gcpi	EWA (ft^2)	Wind zone(s)	GCp	Load Factor	110	115	120	130	140	150	160	170	180
FBC/R 2010, 2014, 2017	ASCE 7-10	2	20	B	0.7	1	0.85	N/A	0.18	32	3	-2.3	1	-45.7082	-49.9579	-54.3965	-63.8404	-74.0397	-84.9946	-96.7049	-109.171	-122.392
FBC/R 2010, 2014, 2017	ASCE 7-10	2	20	B	0.7	1	0.85	N/A	0.18	32	2	-1.5	1	-30.9636	-33.8425	-36.8493	-43.2467	-50.1559	-57.577	-65.5098	-73.9544	-82.9108
FBC/R 2010, 2014, 2017	ASCE 7-10	2	20	B	0.7	1	0.85	N/A	0.18	32	1	-0.85	1	-18.9836	-20.7486	-22.5921	-26.5143	-30.7504	-35.3002	-40.1637	-45.3411	-50.8322
FBC/R 2010, 2014, 2017	ASCE 7-10	2	20	C	0.9	1	0.85	N/A	0.18	32	3	-2.3	1	-58.7677	-64.2316	-69.9384	-82.0805	-95.1939	-109.279	-124.335	-140.362	-157.361
FBC/R 2010, 2014, 2017	ASCE 7-10	2	20	C	0.9	1	0.85	N/A	0.18	32	2	-1.5	1	-39.8104	-43.5117	-47.3776	-55.6029	-64.4862	-74.0275	-84.2269	-95.0842	-106.6
FBC/R 2010, 2014, 2017	ASCE 7-10	2	20	C	0.9	1	0.85	N/A	0.18	32	1	-0.85	1	-24.4075	-26.6768	-29.047	-34.0899	-39.5362	-45.3859	-51.6391	-58.2957	-65.3557

Table D-7. Roof deck attachment calculations for two-story single-family home with 4:12 roof slope using ASCE 7-05 (FBC 2007)

														Wind Loads of Roofs with 4:12 slope (psf)							
														90	100	110	120	130	140	150	ASD wind speeds
Code	Standard	Stories	Building Height (ft)	Terrain	Kz	Kzt	Kd	Ke	Gcpi	EWA	Wind zone(s)	GCp	Load Factor	116	129	142	155	168	181	194	Ultimate wind speeds
FBC/R 2007	ASCE 7-05	2	20	B	0.7	1	0.85	N/A	0.18	32	3	-2.35	1.6	-49.9439	-61.6591	-74.6076	-88.7892	-104.204	-120.852	-138.733	
FBC/R 2007	ASCE 7-05	2	20	B	0.7	1	0.85	N/A	0.18	32	2	-1.5	1.6	-33.1643	-40.9436	-49.5418	-58.9588	-69.1947	-80.2495	-92.1231	
FBC/R 2007	ASCE 7-05	2	20	B	0.7	1	0.85	N/A	0.18	32	1	-0.85	1.6	-20.3329	-25.1023	-30.3738	-36.1474	-42.4229	-49.2006	-56.4803	
FBC/R 2007	ASCE 7-05	2	20	C	0.9	1	0.85	N/A	0.18	32	3	-2.35	1.6	-64.2136	-79.276	-95.924	-114.157	-133.976	-155.381	-178.371	
FBC/R 2007	ASCE 7-05	2	20	C	0.9	1	0.85	N/A	0.18	32	2	-1.5	1.6	-42.6399	-52.6418	-63.6966	-75.8042	-88.9646	-103.178	-118.444	
FBC/R 2007	ASCE 7-05	2	20	C	0.9	1	0.85	N/A	0.18	32	1	-0.85	1.6	-26.1423	-32.2744	-39.0521	-46.4752	-54.5438	-63.2579	-72.6175	

Table D-8. Roof-to-wall connection calculations for two-story single-family home using ASCE 7-22 (FBC 2023)[(1)]

																Roof to Wall Wind Loads (lbs)								
Code	Standard	Stori	Building Height (ft)	Terrain	Kz	Kzt	Kd	Ke	Gcpi	EWA (ft^2)	Roof Slope	Wind zone(s)	GCp	Load Factor	Dead Load (psf)	110	115	120	130	140	150	160	170	180
FBC/R 2023	ASCE 7-22	2	20	B	0.7	1	0.85	1	0.18	15	All	2E	-1.07	1	10	-210.576	-242.706	-276.264	-347.664	-424.776	-507.6	-596.136	-690.384	-790.344
FBC/R 2023	ASCE 7-22	2	20	B	0.7	1	0.85	1	0.18	30	All	2	-0.69	1	10	-211.042	-255.767	-302.479	-401.868	-509.208	-624.499	-747.741	-878.935	-1018.08
FBC/R 2023	ASCE 7-22	2	20	C	0.9	1	0.85	1	0.18	15	All	2E	-1.07	1	10	-309.312	-350.622	-393.768	-485.568	-584.712	-691.2	-805.032	-926.208	-1054.73
FBC/R 2023	ASCE 7-22	2	20	C	0.9	1	0.85	1	0.18	30	All	2	-0.69	1	10	-348.482	-405.986	-466.045	-593.831	-731.839	-880.07	-1038.52	-1207.2	-1386.1

(1) The calculations for ASCE 7-16 (FBC 2020) and ASCE 7-10 (FBC 2010, 2014, and 2017) are the same as shown in this table.

Table D-9.Roof-to-wall connection calculations for two-story single-family home using ASCE 7-05 (FBC 2007)

																Roof to Wall Wind Loads (lbs)							
																90	100	110	120	130	140	150	ASD wind speeds
Code	Standard	Stories	Building Height (ft)	Terrain	Kz	Kzt	Kd	Ke	Gcpi	EWA	Roof Slope	Wind zone(s)	GCp	Load Factor	Dead Load (psf)	116	129	142	155	168	181	194	Ultimate wind speed
FBC/R 2007	ASCE 7-05	2	20	B	0.7	1	0.85	N/A	0.18	15	4:12	2E	-1.07	1.6	10	-235.138	-321.96	-417.922	-523.022	-637.262	-760.642	-893.16	
FBC/R 2007	ASCE 7-05	2	20	B	0.7	1	0.85	N/A	0.18	30	4:12	2	-0.69	1.6	10	-245.232	-366.088	-499.667	-645.967	-804.989	-976.733	-1161.2	
FBC/R 2007	ASCE 7-05	2	20	C	0.9	1	0.85	N/A	0.18	15	4:12	2E	-1.07	1.6	10	-340.891	-452.52	-575.899	-711.029	-857.909	-1016.54	-1186.92	
FBC/R 2007	ASCE 7-05	2	20	C	0.9	1	0.85	N/A	0.18	30	4:12	2	-0.69	1.6	10	-392.441	-547.828	-719.572	-907.672	-1112.13	-1332.94	-1570.11	
FBC/R 2007	ASCE 7-05	2	20	B	0.7	1	0.85	N/A	0.18	15	7:12	3E	-0.53	1.6	10	-75.2382	-124.553	-179.059	-238.757	-303.645	-373.724	-448.995	
FBC/R 2007	ASCE 7-05	2	20	B	0.7	1	0.85	N/A	0.18	30	7:12	3	-0.43	1.6	10	-91.2543	-175.993	-269.651	-372.23	-483.728	-604.146	-733.484	
FBC/R 2007	ASCE 7-05	2	20	C	0.9	1	0.85	N/A	0.18	15	7:12	3E	-0.53	1.6	10	-135.306	-198.711	-268.791	-345.544	-428.972	-519.074	-615.851	
FBC/R 2007	ASCE 7-05	2	20	C	0.9	1	0.85	N/A	0.18	30	7:12	3	-0.43	1.6	10	-194.47	-303.42	-423.838	-555.724	-699.079	-853.902	-1020.19	

Table D-10. Design window pressure calculations for two-story single-family home using ASCE 7-22 (FBC 2023)[(1)]

														Wind Loads on 3 x 5 ft Windows (psf)								
Building Code	Standard	Stories	Building Height (ft)	Terrain	Kz	Kzt	Kd	Ke	Gcpi	EWA (ft^2)	Wind zone(s)	GCp	Load Factor	110	115	120	130	140	150	160	170	180
FBC/R 2023	ASCE 7-22	2	20	B	0.62	1	0.85	1	0.18	15	5	-1.35	1	-24.9763	-27.2984	-29.7238	-34.8842	-40.4574	-46.4435	-52.8423	-59.654	-66.8786
FBC/R 2023	ASCE 7-22	2	20	B	0.62	1	0.85	1	0.18	15	4	-1.05	1	-20.079	-21.9458	-23.8956	-28.0442	-32.5246	-37.3369	-42.4811	-47.9572	-53.7651
FBC/R 2023	ASCE 7-22	2	20	C	0.9	1	0.85	1	0.18	15	5	-1.35	1	-36.2559	-39.6268	-43.1475	-50.6383	-58.7285	-67.4179	-76.7066	-86.5946	-97.0818
FBC/R 2023	ASCE 7-22	2	20	C	0.9	1	0.85	1	0.18	15	4	-1.05	1	-29.1469	-31.8568	-34.6872	-40.7093	-47.2131	-54.1987	-61.6661	-69.6152	-78.0462

(1) The calculations for ASCE 7-16 (FBC 2020) are the same shown in this table.

Table D-11. Design window pressure calculations for two-story single-family home using ASCE 7-10 (FBC 2010, 2014, and 2017)

														Wind Loads on 3 x 5 ft Windows (psf)								
Building Code	Standard	Stories	Building Height (ft)	Terrain	Kz	Kzt	Kd	Ke	Gcpi	EWA (ft^2)	Wind zone(s)	GCp	Load Factor	110	115	120	130	140	150	160	170	180
FBC/R 2010, 2014, 2017	ASCE 7-10	2	20	B	0.7	1	0.85	N/A	0.18	15	5	-1.35	1	-28.199	-30.8208	-33.5591	-39.3854	-45.6777	-52.4362	-59.6607	-67.3513	-75.5081
FBC/R 2010, 2014, 2017	ASCE 7-10	2	20	B	0.7	1	0.85	N/A	0.18	15	4	-1.05	1	-22.6698	-24.7775	-26.9789	-31.6628	-36.7213	-42.1546	-47.9625	-54.1452	-60.7026
FBC/R 2010, 2014, 2017	ASCE 7-10	2	20	C	0.9	1	0.85	N/A	0.18	15	5	-1.35	1	-36.2559	-39.6268	-43.1475	-50.6383	-58.7285	-67.4179	-76.7066	-86.5946	-97.0818
FBC/R 2010, 2014, 2017	ASCE 7-10	2	20	C	0.9	1	0.85	N/A	0.18	15	4	-1.05	1	-29.1469	-31.8568	-34.6872	-40.7093	-47.2131	-54.1987	-61.6661	-69.6152	-78.0462

Table D-12. Design window pressure calculations using ASCE 7-05 (FBC 2007)

														Wind Loads on 3 x 5 ft Windows (psf)							
														90	100	110	120	130	140	150	ASD wind speeds
Building Code	Standard	Stories	Building Height (ft)	Terrain	Kz	Kzt	Kd	Ke	Gcpi	EWA	Wind zone(s)	GCp	Load Factor	116	129	142	155	168	181	194	Ultimate wind speed
FBC/R 2007	ASCE 7-05	2	20	B	0.7	1	0.85	N/A	0.18	15	5	-1.35	1.6	-30.2032	-37.2879	-45.1184	-53.6946	-63.0166	-73.0844	-83.8979	
FBC/R 2007	ASCE 7-05	2	20	B	0.7	1	0.85	N/A	0.18	15	4	-1.05	1.6	-24.281	-29.9766	-36.2717	-43.1663	-50.6604	-58.7541	-67.4473	
FBC/R 2007	ASCE 7-05	2	20	C	0.9	1	0.85	N/A	0.18	15	5	-1.35	1.6	-38.8327	-47.9416	-58.0094	-69.036	-81.0214	-93.9656	-107.869	
FBC/R 2007	ASCE 7-05	2	20	C	0.9	1	0.85	N/A	0.18	15	4	-1.05	1.6	-31.2185	-38.5413	-46.635	-55.4995	-65.1348	-75.541	-86.718	

Appendix E. Example Performance of Updated Building Performance Models

Example performances of the updated building models are given in Section 2 for roof cover aging and metal roofs. We include comparison of the performances for sliding glass door water intrusion model in this appendix. Sliding Glass Door Water Intrusion Modeling

The performance of the implemented sliding glass door model was tested under conditions of straight wind and hurricane scenarios. A one-story single-family home model was used, featuring only sliding glass doors as the sole fenestration. The building components were modeled to be sufficiently strong to prevent any breach of the envelope that would allow rainwater intrusion.

In 2008, a simple fenestration leakiness model was implemented, allowing rainwater to enter through the fenestration due to leaks in the assembly. In 2024, we updated the model for sliding glass doors based on the discussions presented in Section 2. Figure E-1 shows a comparison of water intrusion into the building obtained from the 2008 and 2024 models for a straight wind case, where the wind direction is perpendicular to the sliding glass door. The figure indicates that the updated model allows more water through the sliding glass door than the previous model, especially when wind speeds exceed 115 mph.

Figure E-1. Comparison of Water Intrusion using 2008 and 2024 Model for Straight winds.

Figure E-2 presents a comparison of water intrusion obtained from the updated model with those from the previous model for hurricane simulation cases across two terrain types. It is observed that the updated model produces more water intrusion compared to the previous model when wind speeds exceed 100 mph and 150 mph for Terrain C and B, respectively.

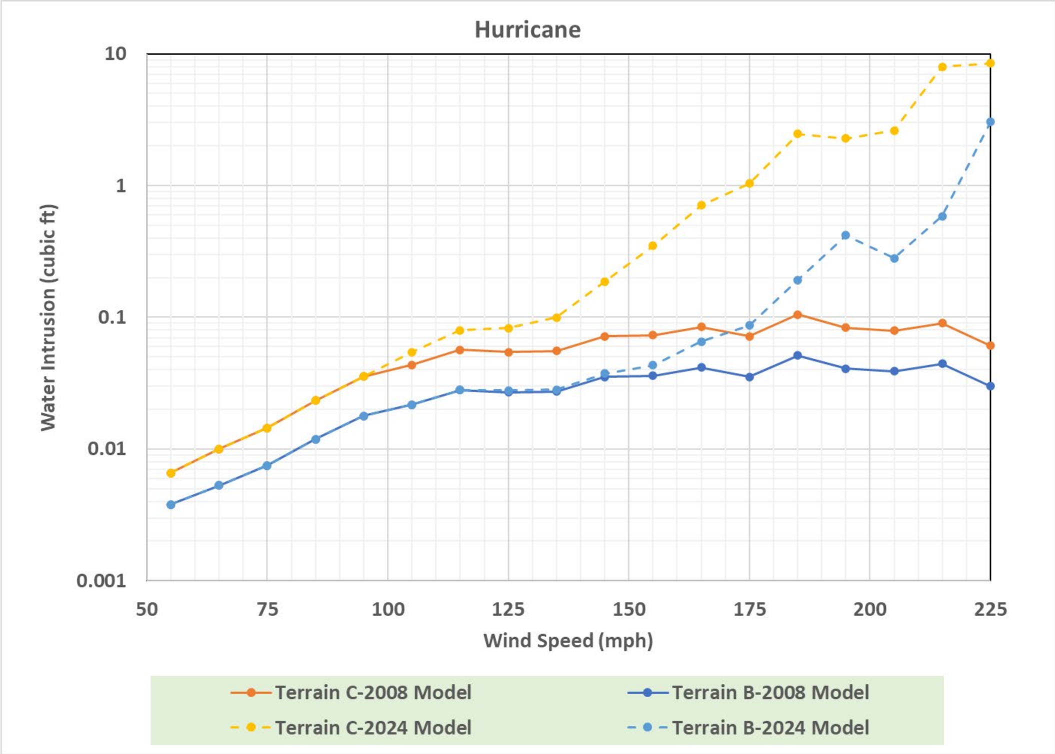


Figure E-2. Comparison of Water Intrusion using 2008 and 2024 Model for Hurricane.