

Rebuilding After a Hurricane

Recommendations from the Institute for Business & Home Safety



INSTITUTE FOR
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Hurricanes are among the most destructive natural forces to strike where people live and work. As recent hurricanes have shown in Florida, the homes and commercial structures that lie in the path of the storm often are as vulnerable as we allow them to be.

The Institute for Business & Home Safety (IBHS), a national non-profit engineering, research and communications initiative of the insurance industry, provides the following recommendations for rebuilding homes and other structures to make them more resistant to hurricanes.

Partner With your Builder or Contractor

Take an active role in the re-construction of your home by asking your contractor to strengthen it with the hurricane resistant recommendations below. The construction techniques and materials required already exist and are used every day. A builder, contractor or remodeler simply has to apply known techniques using the prescribed materials and products that engineers say are vital in helping better protect a home from destruction by hurricanes.

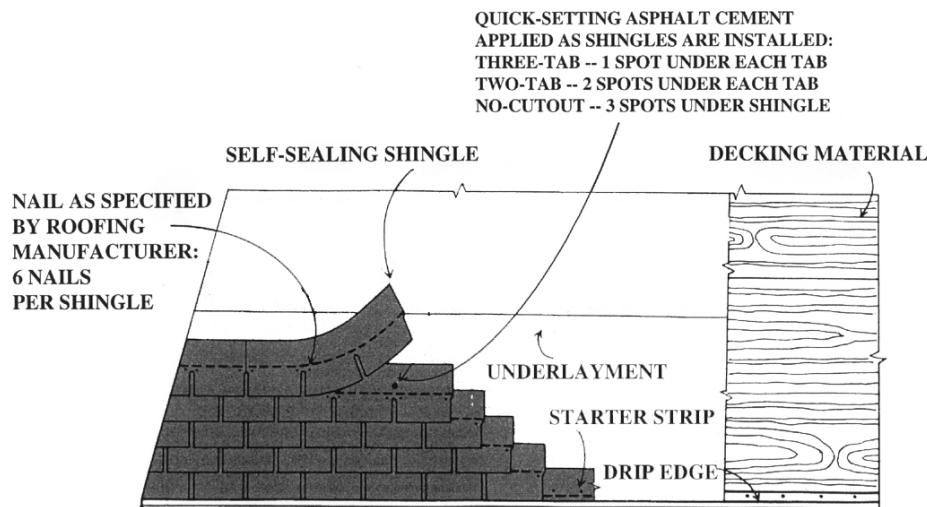
The disaster-resistant construction measures can be easily incorporated in the rebuilding effort, depending on what kind of damage your home or building suffered and the extent of repairs required. With this in mind, the recommendations are separated into different categories for different parts of the home or building.

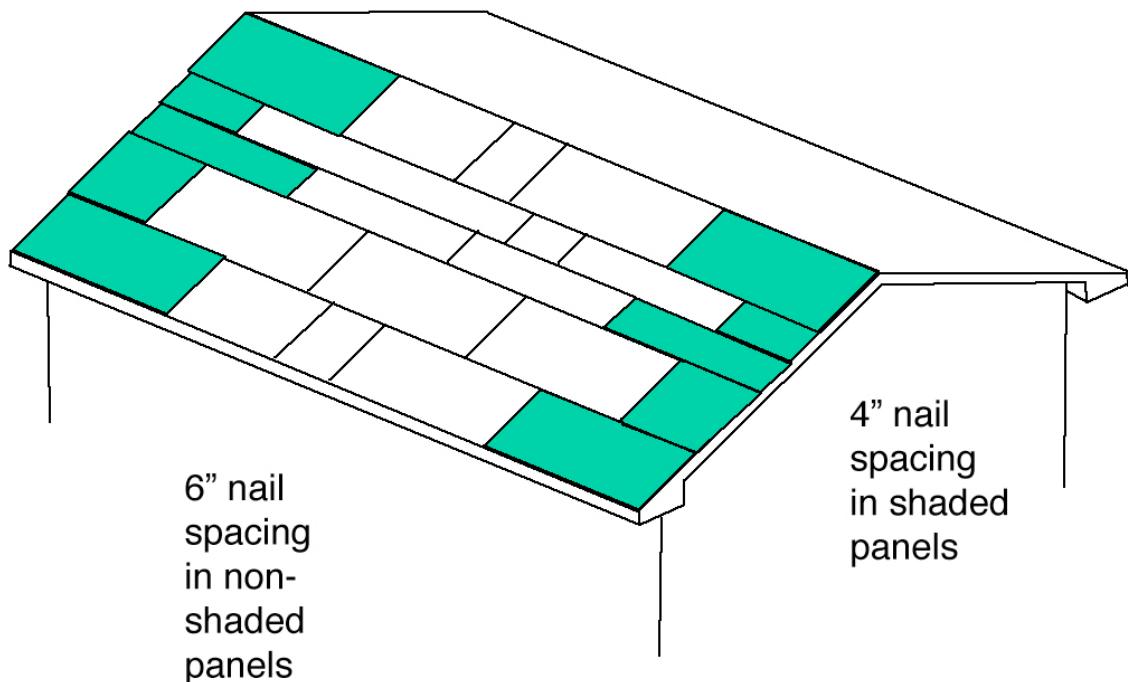
The first steps are to close up any openings in the walls and roof to prevent further water intrusion and then to get the home or building as dry as possible. Local building departments typically allow emergency repairs by both homeowners and contractors to close up and protect the buildings. Down the road you will want to make the repairs permanent and ensure that they provide protection from damage in future events. We hope that the following checklist will help you plan the rebuilding effort.

Rebuilding Checklist

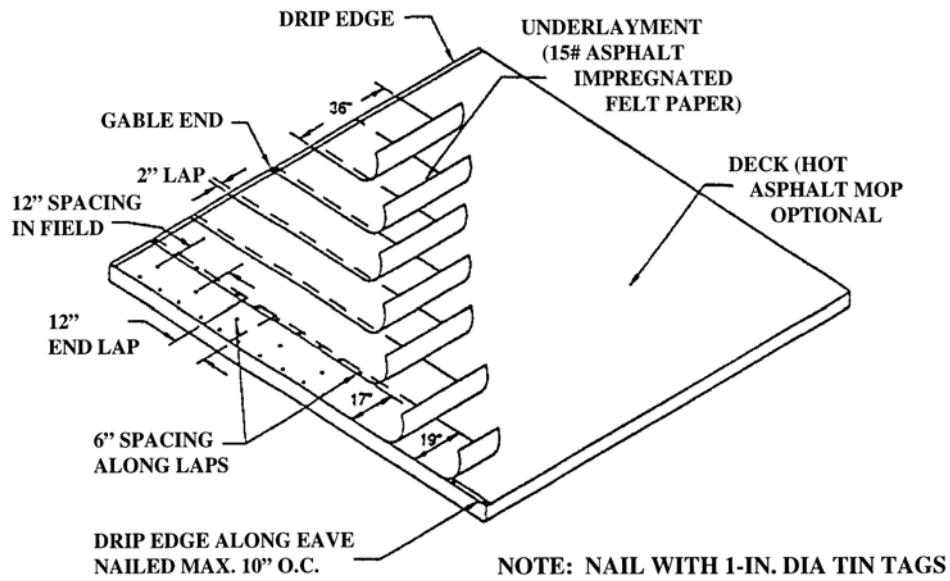
Roofs – When re-roofing in high wind areas, it is recommended that the roof covering be removed down to the roof sheathing. This is the best way to ensure that your roof covering is as wind resistant as possible. It also gives you the opportunity to improve the roof sheathing attachment and significantly improve the wind resistance of your roof.

- If you have localized damage to roof deck sheathing or roof structure that can be repaired without total removal, replace the sheathing with panels of the same thickness as that used on the rest of the roof. Attach the new sheathing and re-nail the existing sheathing with 8d ring shank (2.5" by 0.120" diameter) nails at 6 inches on center to all framing members.
- If you have to replace all the sheathing, consider using 40/20 rated roof deck sheathing (plywood or OSB) with a minimum thickness of 19/32" and a nailing pattern of 8d ring shank (2.5" long by 0.120" diameter) nails at 4" on center on any panel adjacent to a gable end. The same nails are required at 6 inches on center everywhere else. If required due to roof geometry, piecework (panels ripped lengthwise to a width less than 4 ft) should be located in a strip located at least 4' away from the ridge or eaves.
- All roof-sheathing joints should be sealed with a self-adhered asphalt/rubber tape (modified bitumen) at least 4" wide to provide a secondary moisture barrier. As an alternative, consider applying an ice and water shield type of product over the entire roof deck. These products are widely used in roof valleys and will provide an excellent backup protection from water intrusion if the primary roof covering is damaged or blown off. If you use the ice and water shield, you will not need to apply the felt paper underlayment, but you will have to ensure that your attic is vented.





- Roofing underlayment should consist of either a single layer of 30# felt with a minimum 2" overlap, or two layers of 15# felt (This should be installed in accordance with manufacturer's instructions). Both underlays require a minimum 6" end lap (note that this can be omitted if you cover the entire deck with an ice and water shield type of product).



- Select a high wind rated roof covering and, regardless of type, ensure that it is installed in accordance with the manufacturer's recommendations for high wind regions.

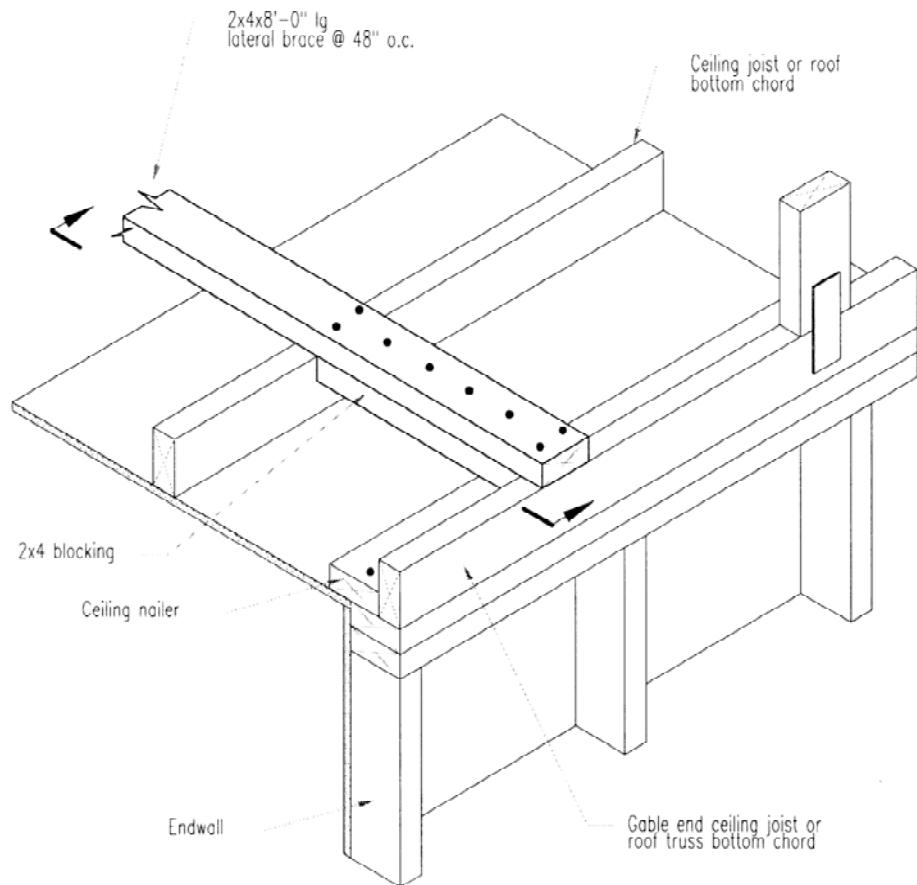
A note about roof coverings: Post-disaster inspections in areas affected by high winds revealed successes and failures of almost all roof coverings. Typically, newer roof coverings and those specifically installed using manufacturer guidelines for high wind installations performed the best. The following links provide information and guidelines for high wind installations:

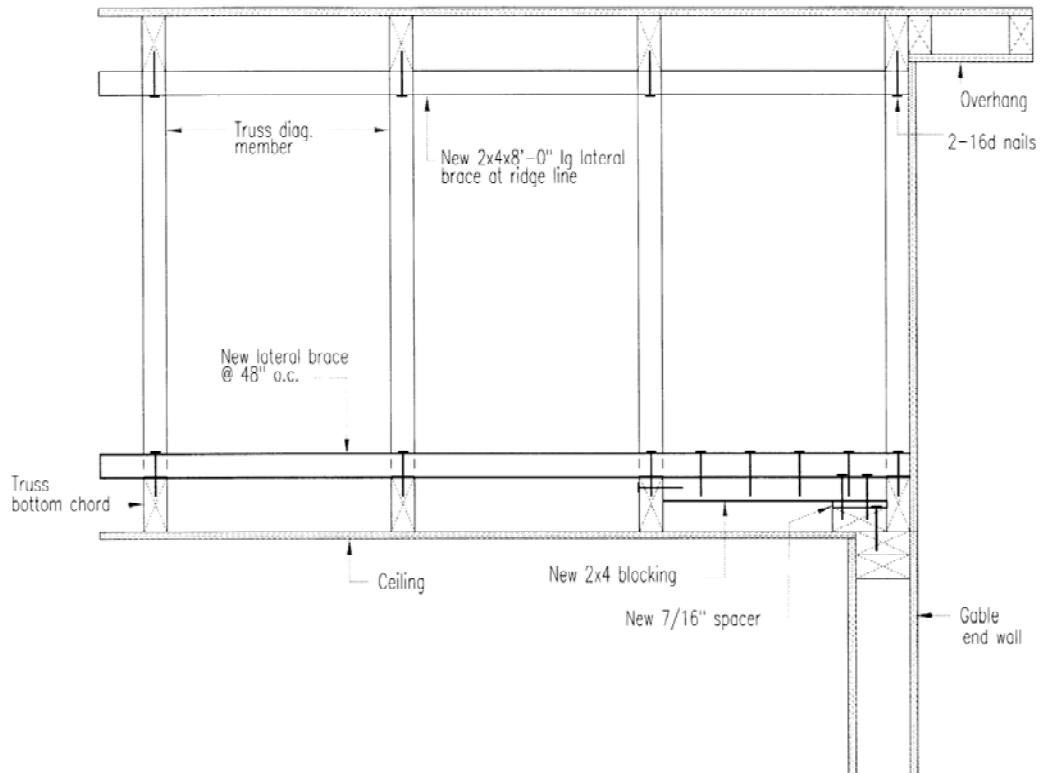
www.tileroofing.org Tile Roofing Institute
www.nrca.net National Roofing Contractors Association
www.metalroofing.com Metal Roofing Alliance
www.asphaltroofing.org Asphalt Roofing Manufacturers Association

A note about soffits: Soffits in hurricane-affected areas also performed poorly in many cases. The soffit material was rarely installed according to the manufacturer's product approval documentation. At a minimum, make sure that the contractor installs the soffit materials according to the approved installation requirements. Alternatives include using plywood, with slots for ventilation covered with metal screens that is securely anchored to wood framing members.

- For homes with gable ends, bracing should be installed in the attic as follows:
 - **Lateral Bracing of the Bottom Chord**
Install horizontal braces, running perpendicular to the bottom chords of the roof trusses, at 4 feet on center and extending back 8 feet from the gable end wall with 2x4's fastened with 2 16d nails at each truss chord or ceiling joist and 4 16d nails into blocking in gable end truss or rafter end wall assembly. Also make sure that

the bottom chord of the gable truss or end ceiling joist is anchored to the wall below (see item number 2). If you have a wood frame house and the interior finish on the wall below is being removed, try to ensure that the lateral braces are aligned with studs in the end wall below so that it is possible to connect the braces to wall studs using metal strapping. This metal strapping, when properly installed, helps to resist both lateral forces, and uplift on the gable end wall.





- **Bottom Chord Anchoring for Uplift**

For the platform styles of wall construction (wood or masonry), it is important to transfer the uplift loads from the gable truss/frame wall to the end wall below. In order to ensure complete load paths at these points, metal straps rated for a minimum tensile load of 770 lb should be installed at each lateral brace. In addition, if your wall is wood framing and the exterior sheathing has been damaged or removed, install new wall sheathing so that it overlaps the connection between the end wall and gable truss/frame by at least 12 inches.

- **Cross Bracing**

This type of bracing will transfer lateral loads from gable truss or gable framing to the ceiling and roof sheathing planes where loads can be effectively transferred to the walls. Cross-brace all gable ends with flat ceilings at the same spacing as the lateral bottom chord braces described above (every 4 feet). Keep the orientation of the X in the vertical plane, and make sure that the connection between the cross braces and trusses or rafters is made into the side of the top chord and bottom chord of the trusses or rafters.

- **Top Chord Bracing**

Install 2x4x8' blocking along the top chords of gable ends at all locations where cross bracing is installed (i.e., with a horizontal projection of not more than 48" O.C.). This bracing should be constructed in a manner that is identical to the bottom chord bracing, with the exception that the metal strapping is not required.

Openings – Failures of double entry doors and double wide garage doors continued to be frequent occurrences depending on the orientation of the building to the wind and the age and quality of the doors. Failures of these doors and of windows and sliding glass doors allows wind and water to enter the building, leading to significant increases in damage and loss. Whether or not you had damage to your windows and doors, you should check their rating and if they are not rated for debris impact resistance, you should make sure they are protected for the next storm.

- All entry doors, windows, skylights, patio doors and garage doors need to be rated and certified to meet impact resistance and pressure standards. If the units themselves are not impact resistant, then they must be protected by a system (storm shutter or screen) that meets the impact resistance standards. In order to be rated for high winds, the systems must be compliant with at least one of the following: · ASTM E 1996 · SSTD-12 · Miami-Dade County Protocol A 201 · Florida Building Code TAS 201
- The IBHS *Fortified...for safer living®* program does not specify any requirements for flashing in masonry wall construction, but wood frame walls must be flashed according to the window manufacturer's specifications. It is wise to have an accredited installer certified by AAMA (American Architectural Manufacturers Association; www.aamanet.org) or WDMA (Window and Door Manufacturers Association; www.nwwda.org) install your windows and doors.

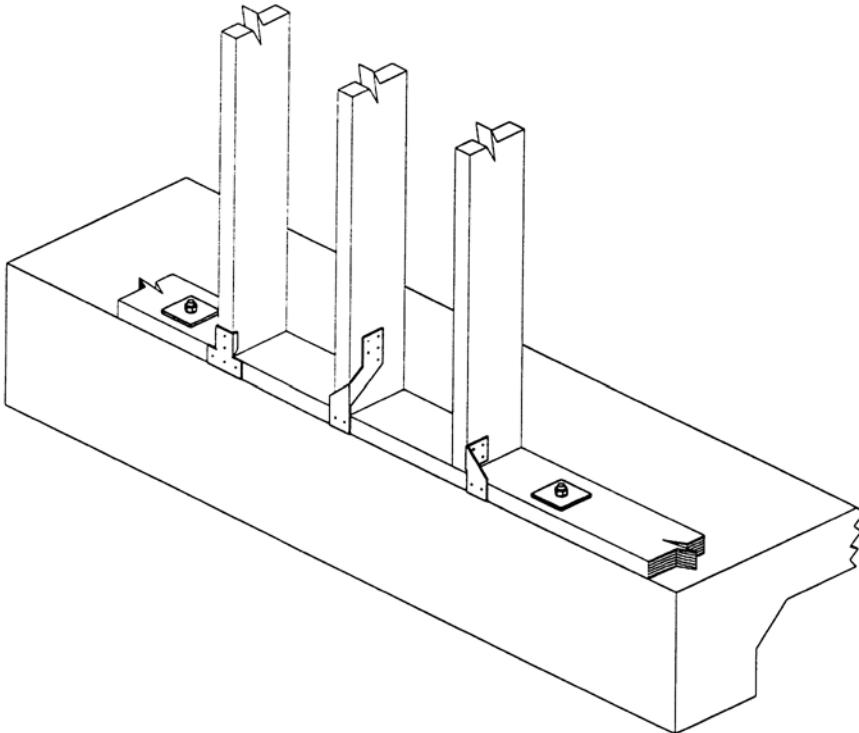
Walls – If you have to rebuild a wall or if the wall covering (interior or exterior) has been damaged and will need to be replaced, you have the opportunity to check the wall construction and anchorage of the roof to the walls and the walls to the foundation. The following recommendations will produce a high quality replacement wall and it may be possible to incorporate some of the recommendations if the wall coverings have to be removed to replace wet or damaged material.

- All exterior wood framed walls should be fully sheathed with minimum 15/32" thick 32/16 rated sheathing wood structural panels (plywood or OSB). Sheathing should overlap both top and bottom sill plates and be continuous from the plate for at least 2 feet into the wall. In two story homes, sheathing should also overlap wall framing in both stories by no less than 2 feet to provide inter-story connections. The schedule should be 10d nails at 6" spacing along the 8' edges, 6" staggered double row along the 4' edges where there is a double plate, and 12" spacing in the field of each structural panel.
- In one story wood frame walls, blocking should be provided at 48" on center in the first two framing spaces of wood framed walls from all corners and at either end of garage door openings. In two story wood frame walls, blocking should be provided where needed in all framing spaces to allow nailing around the perimeters of wall sheathing.

- All exterior walls should be constructed as “shear walls” for at least 50% of their length. Fully sheathed wall segments wider than 48 inches without any openings larger than 144 square inches are considered shear walls provided that they have hold downs at the bottom ends of each segment for the top story or a one story building and top and bottom corners for lower stories on multi-story buildings.
- Inter-story (2nd story to 1st story) details should include metal strapping every 48 inches (every 3rd stud) along exterior walls with an allowable load capacity of at least 1500 lb and be sheathed with continuous wood structural panels of at least 15/32 inches.
- Install weather resistant barrier consisting of house wrap or building paper in weatherboard fashion starting from the base of the wall and working upward. The first course of weather resistant barrier should be tucked up under the sill and loose ends of jamb flashing.
- All wood framed floors should have full depth 2x blocking in the first two spaces between the floor joists at each end of the floor diaphragm. Blocking should be spaced no more than 4 feet on center, and should correspond with the joints between subflooring panels for edge nailing purposes. Sub flooring should be nailed to floor framing using 10d common nails at 6”/12” spacing on the 1st floor and 4”/12” spacing on the 2nd floor for shear resistance. Where sub flooring overlaps the first two framing spaces at each end of the diaphragm, proper edge nailing must be used to connect the sub flooring to the blocking below.
- Hardware connectors must be provided from all roof framing members to wall frames. All connectors should wrap over the top of the roof truss or rafter on both ends and be installed according to the manufacturer’s recommendations. The minimum allowable load for these straps is 1345 lb for roof framing spaced at 24”, and 900 lb for roof framing spaced at 16”.
- Securely anchor connections for exterior attached structures such as carports and porches that attach to the main structure of the house. Stainless steel or hot dipped galvanized hardware with a minimum rating of G185 should be used for any connections that will be exposed to weathering in service. Fasteners used with such hardware shall consist of a similar metal to prevent accelerated corrosion. In Coastal A and V flood zones, all exposed hardware and fasteners should be stainless steel.

Foundation – If wall coverings are damaged or wet and have to be removed, you may have the opportunity to check the wall anchorage and improve it to provide enhanced protection in a future storm. If you find that anchors are missing or spaced very far apart, you can use the following recommendations to help improve the wall anchorage.

- All walls should be adequately anchored to the foundations. Anchor bolts should be minimum 5/8” in diameter; with 3”x3”x3/16” washers. Bolts should be embedded and epoxied into the foundation as recommended by the hardware manufacturer.



- Sill plates should have anchor bolts every four feet and within 6 to 12 inches of the end of each plate.
- For unreinforced masonry block wall construction, #5 vertical reinforcing steel should be inserted down into open cells and then grouted at each corner, on either side of each opening, and a minimum of every 4 ft thereafter.
- Homes in A and V Special Flood Hazard zones should be constructed with the lowest habitable floor and all electrical, heating, ventilation, plumbing, air conditioning equipment and other service facilities above the Base Flood Elevation (BFE) by at least 2 ft. Homes in V and Coastal A zones should be constructed with continuous piles in accordance with the FEMA Coastal Construction recommendations.

Many of these recommendations come from the IBHS *Fortified...for safer living*® program, which is a national, all-peril approach to building stronger homes. Details about this inspection-based “code-plus” new residential construction designation are available at www.ibhs.org.

Other valuable information and construction guidance is available in the FEMA Coastal Construction Manual at www.fema.gov.

Disclaimer

The purpose of this document is to provide homeowners with guidance on ways to retrofit and build homes to reduce losses from hurricane damage. It contains suggestions and recommendations based on professional judgment, experience and research and is intended to serve only as a guide. The authors, contributors and publisher disclaim all warranties and guarantees with respect to the information in the document and assume no liability or responsibility with respect to the information.