



**Green Built™
TEXAS**

Multifamily Protocol Version 1.0

**In order to be recognized by Green Built Texas, each unit/building must be verified, under the process established by the program, to meet the following requirements.*

**Applicable requirements, as they are written or interpreted by the jurisdiction, take precedence over any provision contained herein.*

Scope: A building is eligible for recognition under this Protocol if at least 50% of the square footage of planned occupied space is for residential dwelling and that square footage is leased/finished out independently.

Site Planning, Management and Waste Reduction

Project Planning

1. The Green Built Texas Verifier will hold a preliminary meeting with the Project Team to address Protocol compliance demands and procedures. The Project Team will be determined by the owner's representative/developer and may consist of the professionals listed below.
 - Project Owner's Representative
 - Developer
 - MEP Field Engineer
 - Onsite Builder Leader (Superintendent and/or Assistant Superintendent),
 - Architect
 - Landscape Architect
 - Project Manager
 - Energy Rating Company
 - Green Built Texas Verifier
2. The Project Team will hold monthly progress meetings to address compliance with the program.
3. The Green Built Texas Verifier will conduct a post job review of the successes, failures and lessons learned from the project. This information will be distributed and reviewed as part of the builder's ongoing green building effort. As part of the initial pilot program, Verifiers and builders are strongly encouraged to share this information with the HBA.

Site Planning and Selection

1. Limit the site to a minimum density of 10 units per acre. Non-buildable areas and permeable surface areas set aside for permanent storm water management, parks or natural vegetation are exempt from this calculation. Master planned communities that will be built out in phases must have a site plan delineating the phase boundaries. The density calculation will apply on a per phase basis.

Site Management and Preparation

1. Implement an erosion control plan, developed by an authorized professional, that identifies the following:
 - Boundaries of the project site.
 - Details on best management practices (BMPs) required to protect all existing and planned storm sewer system inlets and outfalls that will require erosion control.
 - Details on best management practices (BMPs) required to protect site boundaries subject to water runoff and identify location(s) of BMPs at construction entrance and concrete washout area to prevent erosion and storm water pollution.

2. Install and maintain erosion control measures on any area disturbed on the site until permanent vegetation has been reestablished in these areas. Projects required to obtain a TCEQ storm water permit may submit the site's Storm Water Pollution Prevention Plan (SWPPP) as evidence of compliance.
3. Provide a Geotechnical / subsurface soils investigation for the site.
4. Implement a tree protection plan or fully comply with established local ordinance regarding tree protection.
5. Preserve and protect existing trees and plants adjacent to the construction site.
6. *(Optional Consideration) Use bioswales to remove silt and pollution from surface runoff water.*

Waste Reduction Strategies (choose at least 2 of the following).

Strategy 1: Reuse form board on slabs and flatwork

Strategy 2: Optimize building dimensions to correspond to standard lumber dimensions.

Strategy 3: Develop detailed framing layouts to avoid waste when ordering lumber.

Strategy 4: Set aside lumber and plywood/OSB cut-offs that can be used later as fire blocking, spacers in header construction, etc.

Strategy 5: Use larger pieces of leftover lumber (6' or more in length) for other jobs.

Strategy 6: Order drywall in optimal dimensions to minimize cut-off waste. Drywall is available in different lengths, and designed dimensions should correspond to standard sizes.

Strategy 7: Set large drywall scraps aside during hanging for use as filler pieces in areas such as closets.

Strategy 8: Estimate masonry material needs carefully to avoid waste.

Strategy 9: Salvage usable bricks, blocks, slate shingles, tile and other masonry materials from remodeling and construction. Store for future jobs or divert to salvage operations.

Strategy 10: Implement on site grinding of wood waste for reuse.

Water Efficiency

1. Locate water heater within 30 ft. of fixtures in at least 75% of project units, or install hot water on demand system, or install parallel piping system that originates from a central manifold (i.e. PEX Home-Run).
2. Install an ENERGY STAR dishwasher in each unit.
3. Install rain and freeze sensors on sprinkler system or weather forecast based (ET) irrigation controller.
4. Limit 90% of turf plantings to drought-tolerant varieties that can be expected to survive stage 3 drought restrictions.
 - Acceptable turf varieties include: Bermuda, Big Blue Stem, Blue Grama, Buffalograss, Deer Lindheimer Muhly, Little Blue Stem, Prairie Dropseed, Sideoats Grama, Switch Grass Muhly and Indian Grass
5. Limit 75% of shrub and tree plantings to those that are deemed regionally appropriate by a horticultural authority such as the Texas A&M Horticulture Department.
 - See the Urban Landscape Guide list by region at <http://aggie-horticulture.tamu.edu/earthkind/plantselector/>
6. Provide a written irrigation watering plan by controller and by zone. Plan shall include total estimated annual water consumption for the total stabilized landscape and an estimated water consumption during construction. Plan should follow required jurisdictional irrigation restrictions, typical controller settings by zone, and appropriate planting (tree, turf, and shrub) type, soil type and gradient slope to mitigate runoff.
7. Install 2" deep mulch in landscape beds.
8. Zone irrigation system separately for trees, turf and slab/bedding areas.

Select any one (1) of the following water conservation strategies or install rainwater catchment system to provide for a minimum of 50% of landscape irrigation needs:

Strategy 1: Select high performance fixtures. Choose any two (2) of the following:

- All lavatory faucets rated at less than or equal to 2.0 gpm.
- All kitchen & utility faucets rated at equal to or less than 2.2 gpm.
- All showerheads rated at less than 2.5 gpm.

Strategy 2: Select water efficient (at least 1.6 gpf) toilets that work with first flush (min. 350 grams).

Strategy 3: Install a water-conserving, irrigation system. Choose any three (3) of the following strategies or install rainwater catchment system to provide for a minimum of 50% of landscape irrigation needs:

- Drip irrigation for shrub beds or for areas within six (6) feet of pavements
- Bubblers
- Drip emitters
- Soaker hose
- Subsurface irrigation
- Use no irrigation system
- Sprinklers heads with 4-inch or greater pop-up height and matched precipitation rate (MPR) nozzles
- Check valves to prevent drainage from pipes

Indoor Air Quality

1. Perform load calculation based on actual unit design, specifications and orientation and ensure that installed equipment matches Manual J calculations (or approved software). Verify proper refrigerant level and HVAC commissioning per manufacturer's specifications. Maintain documentation, including HVAC loads, equipment selections and charging (commissioning), through warranty period.
 - Programs that can be used include: ACCA Manual J (8th Version), Carrier HAP Program, Trane Trace 700 or approved equivalent.
2. Seal ducts during construction at vent entry and exit.
3. Install continuous weather and air barrier on exterior walls behind cladding material.
4. No vapor barrier on inside of exterior walls.
5. Ensure proper flashing at windows and doors.
6. Avoid attached garage or isolate garage from the living space by providing a tightly sealed, gasketed door between the garage and conditioned space and provide a continuous air barrier between walls and ceilings separating the garage from the conditioned living space.
7. Provide combustion air for wood-burning fireplaces from outside.
8. Use no fiberglass duct board unless sealed properly with low toxic mastic.
9. No wall-to-wall carpet in the bathroom.
10. Install vapor barrier under slab.
11. Install one hardwired carbon monoxide (CO) detector, compliant with NFPA Standard 720, per unit if units have attached garages or are equipped with gas fired equipment.
12. Install kitchen range hood (at least 100 CFM) to vent range to the outside if range hood location is greater than 25 feet from the closest exterior opening.

Select any two (2) of the following strategies to enhance indoor air quality:

Strategy #1: Select carpets, that are compliant with emission levels in accordance with the Carpet and Rug Institute's (CRI) Green Label or Green Label Plus indoor air quality program.

Strategy #2: Use zero-VOC architectural coatings as determined by EPA Method 24 (VOC content below the detection limit for the method).

Strategy #3: Use low-VOC adhesives and sealants.

Strategy #4: Install capillary break under bottom plate of exterior walls.

Strategy #5: Install one hardwired carbon monoxide (CO) detector, compliant with NFPA Standard 720, per unit where this is not required by Item #11.

Strategy #6: Install bath fans that are rated at 50 CFM per bathroom and equipped with dedicated wall switch, timer and humidistat. Fan must meet ENERGY STAR performance specifications.

Strategy #7: Bath fan and vent must meet the requirements of ASHRAE 62.2 table 7.1.

Strategy #8: Install kitchen and bath vanity cabinets that contain reduced levels of formaldehyde.

Strategy #9: Install glass door on wood-burning fireplace.

Strategy #10: Prohibit smoking in common areas. Signage must be displayed in all common areas.

Strategy #11: Install return air ducts, jump ducts, or transfer grills in all bedrooms or test master bedroom to 0.3 Pascals of pressure at 25 CFM (of each duct type).

Energy Efficiency

Insulation

1. Deliver insulation to the job site in wrapped packages and store in a dry location. Remove and replace any insulation materials that get wet.
2. Install insulation to meet or exceed Grade 2 performance as outlined by RESNET Guidelines.
3. Seal (poly seal, if appropriate) all penetrations through exterior walls or plates.

Soffit and Roof Venting

1. Install soffit vents with “vent tubes” or baffles having sufficient length to extend above the attic insulation.
2. Roof vents to be installed water tight and according to manufacturer’s written instructions.
3. *(Optional Consideration) Use ridge vents*

Tenant Areas

1. Install an ENERGY STAR dishwasher and refrigerator.
2. Ducts in the attic must be a minimum of R-8.
3. Install ceiling fans that meet or exceed ENERGY STAR specifications (listed in table below). Please note that both minimum airflow and efficiency requirements must be met for all three speeds for acceptability.

Air Flow Efficiency Requirements		
Fan Speed	Minimum Airflow	Efficiency Requirement
Low	1,250 CFM	155 CFM/watt
Medium	3,000 CFM	100 CFM/watt
High	5,000 CFM	75 CFM/watt

4. *(Optional Consideration) Use alternative refrigerant (R 410A)*

Common Areas

1. Install ENERGY STAR light fixtures or CFL bulbs in 60% of the common area fixtures.

Provisions Specific to Low-Rise Multifamily (as defined by the International Energy Conservation Code)

Compliance with the energy aspects of this section must be performed by a RESNET Approved Energy Rating Company or engineering firm. Energy Rating Company, in conjunction with an approved Green Built Texas Verifier, must affirm compliance with the provisions of this protocol.

For commercial space separately developed within the project, GBT proposes that builder developer propose an envelope finish specification equal to or superior to the balance of the building. The building should encourage green elements for the tenant finish out but GBT recognizes that the building financing and/or the contract documents may specifically prohibit control of the build out space.

Performance Path: For the purposes of this pilot project, compliance for energy efficiency in Low-Rise projects will meet or exceed at least one (1) of the following performance requirements:

- a. Achieve ENERGY STAR Version 2.5 certification as described in the ENERGY STAR Guidelines for Attached Housing, ENERGY STAR Builder Option Package, OR
- b. Achieve HERS Index of 75 or below (as proven by RemRate software supporting ENERGY STAR **Version 2.0**) and obtain compliance with Chapters 3 and 5 of the ENERGY STAR Version 3.0 Thermal Enclosure System Checklist.
- c. Achieve compliance with an Investor-owned utility (i.e. Oncor, Centerpoint, etc.) “Above Energy Code” Program if different from ENERGY STAR

Provisions Specific to Mid-Rise Multifamily (as defined by the International Energy Conservation Code)

Compliance with the energy aspects of this section must be performed by a RESNET Approved Energy Rating Company or qualified engineering firm. Energy Rating Company, in conjunction with an approved Green Built Texas Verifier, must affirm compliance with the provisions of this protocol.

For commercial space separately developed within the project, GBT proposes that builder developer propose an envelope finish specification equal to or superior to the balance of the building. The building should encourage green elements for the tenant finish out but GBT recognizes that the building financing and/or the contract documents may specifically prohibit control of the build out space.

Performance Path: For the purposes of this pilot project, compliance for energy efficiency in Mid-Rise projects will meet or exceed performance of at least **14%** better than base energy code using ASHRAE Standard 90.1 (2004) or comply with ENERGY STAR standards for low or high rise projects using REM/Rate software or approved equal for projects up to five (5) stories.

Prescriptive Path: In lieu of Provision #1 of the Performance Path, builder developer may choose one of the following prescriptive paths to performance.

Required testing for All Prescriptive Options shall include:

- CFM flow analysis for each unit type
- Must model to ASHRAE 90.1 by the end of the project and report percentage greater than code performance achievement back to task force. No percentage score above code is required for the pilot.

Prescriptive Option 1:

- HVAC 14 SEER
- Attic R-38 insulation
- Window U .5, SHGC .25, SC .28
- Walls: R-13
- R410A HVAC refrigerant. This refrigerant is a NON CFC refrigerant that does not contribute to ozone depletion
- Unit tightness of at least .35 or 6 ACH 50
- Ducts sealed and tested to ≤ 6 cfm to outdoors / 100 sq. ft. of conditioned floor area.

Prescriptive Option 2:

- 13 SEER Heat Pump
- Minimum R13 Wall Insulation
- Minimum R-30 Attic Insulation
- Windows .52 R value/.35 SHGC
- At least 5 Energy Star lights and/or appliances and one (1) of the following:
 - Programmable thermostat
 - R-38 Upgrade to Attic Insulation
 - Radiant barrier
 - R-15 Upgrade to Wall Insulation
 - R410A
- Unit tightness at least .35 or 6 ACH 50
- Ducts sealed and tested to ≤ 6 cfm to outdoors / 100 sq. ft. of conditioned floor area.

Materials

Frame Materials:

1. Use engineered lumber products to maximum extent possible, based on the project's objectives, to include trusses, joists and finger-jointed dimensional lumber.
2. Install exterior cladding materials with minimum 10-year warranty.
3. Keep stored materials elevated above the ground.
4. *(Optional Consideration) Provide proper drainage around materials as well as adequate air circulation and ventilation to keep materials dry.*
5. *(Optional Consideration) Stack and move forward all loose and usable frame material after completion of each framed building.*

Advanced Framing Techniques: Choose any two (2) of the following techniques or use advanced wall systems such as SIPs or ICF:

1. 19.2-inch or 24-inch on-center framing for floor system and/or load bearing walls.
2. 24-inch on-center framing for roof systems and/or interior partitions.
3. Single top plate walls.
4. Steel framing as long as thermal bridging is mitigated by foam core panels on the outside or blown in foam insulation that covers the studs.
5. Right-sized headers or insulated (box) headers (where required).
6. Eliminate headers in non-bearing walls.
7. Ladders blocking at interior-wall-to-exterior wall intersections (i.e. Ladder T's at perpendicular wall intersection) and double rim joist in lieu of header (2X6 or deeper wall framing).
8. Two-stud corner framing or California Corners.
9. Engineered frame design.

General Materials Requirements:

1. Provide gutter downspout extensions or concrete splashguards and provide positive drainage away from the building or into storm sewer.
2. Install metal drip edge at eaves and gable roof edges.
3. *(Optional Consideration) Provide minimum 12-inch roof overhangs based over at least 90 percent of exterior walls to protect the building envelope.*
4. *(Optional Consideration) Install a minimum of # 30 roofing felt on entire roof for moisture protection.*
5. *(Optional Consideration) Use minimum class 4 roofing material.*

Termite Prevention: Pre-treat the subgrade for subterranean termites with an EPA approved chemical insecticide prior to placement of the foundations and choose one (1) of the following termite prevention strategies

1. Install a continuous, physical, non-chemical foundation termite barrier.
2. Use termite-resistant materials for structural components and exterior claddings of walls, floors, or exterior decks.
3. Entire exposed slab must be at least 6-inches above the finished grade.

Innovative Options: can be used in lieu of no more than one (1) of the program's optional requirements

1. Utilize a temporary "tree farm" by relocating trees and other vegetation during construction for re-planting at a later date.
2. Provide common area recycling for tenants with "recycling only" containers
3. Provide dedicated recycling areas in all units.
4. Use Fly Ash or Slag Cement to reduce the amount of Portland cement on a project (can be used in stucco mix as well)
5. Use Recycled materials including at least 50% recycled steel and OSB for exterior sheathing.
6. Reduce the Heat Island Effect by using grey or white concrete or paving materials with a Solar Reflectance Index of 29 or greater for at least 50% of the site hardscape.
7. Use water retention ponds for irrigation
8. Use pervious concrete and permeable pavers to increase the infiltration of storm water.