Green Built Texas Multifamily Protocol Version 2.0

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

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

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 and consist of the regular design professionals/design team as determined by the owner. Each GBT project will have a GBT verifier as a defacto member of the integrated design team. Record of the meeting shall be kept in a manner that ensures the plans meet GBT protocol requirements.
    - The GBT Verifier shall be engaged as part of the Project Team before the project is submitted for a building permit. It is strongly recommended that the GBT Verifier be engaged at or before the time that the MEP is engaged.

2. The Project Team will incorporate the GBT process into its regular design, development, and construction review process. The GBT verifier will meet with the construction team and will conduct trade training during the framing stage of construction. Records of this meeting shall be kept by the GBT verifier.

3. The Green Built Texas Verifier will maintain and update the compliance checklist for the project. The Verifier will capture evidence of compliance for each selected measure and keep compliance records for a period of three (3) years after the completion of the project.

Site Planning, Management and Selection

1. Limit the site to a minimum density of 10 units per acre. The density calculation will be as follows: # of Units/ (SF / 43,560) = 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.

2. 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 for protecting site boundaries subject to water runoff and location of BMPs at the construction entrance and concrete washout area to prevent erosion and storm water pollution.

3. 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.

4. Provide a geotechnical / subsurface soils investigation for the site.

5. Implement a tree protection plan or fully comply with established local ordinance regarding tree protection.

6. Preserve and protect existing trees and plants adjacent to the construction site.

Waste Reduction Strategies (choose at least 3 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: 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 6: Set large drywall scraps aside during hanging for use as filler pieces in areas such as closets.

Strategy 7: Estimate masonry material needs carefully to avoid waste.

Strategy 8: 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 9: Implement on site grinding of wood waste for reuse.

Strategy 10: Implement construction waste recycling.

Water Efficiency

Alternative Compliance: Obtain EPA WaterSense® certification.

GBT Water Efficiency Requirements:

1. Locate water heater within 30 ft. of fixtures in at least 75% of project units (straight line method); install hot water on demand system; or provide high efficiency boiler with central loop.

2. Dishwasher, if installed, shall be ENERGY STAR.

3. Install rain and freeze sensors on sprinkler system and/or weather forecast based (ET) irrigation controller.

4. At least 90% of turf plantings shall be drought-tolerant varieties that can be expected to survive Stage 3 drought restrictions in the professional opinion of the landscape architect or specific varieties listed below.
    - 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.
    - Native and non-invasive species are acceptable to use for the selections of turf.
    - Exceptions to the turf selections in various regions of Texas where other varieties of turf and plants may be acceptable based on an appropriate native and non invasive plant list specific to that area or that soil.
5. At least 75% of shrub and tree plantings shall be those that are deemed regionally appropriate by either a horticultural authority such as the Texas A&M Horticulture Department OR in the professional opinion of the landscape architect.
    - See the Urban Landscape Guide list by region at http://aggie-horticulture.tamu.edu/earthkind/plantselector/
    - Alternative (and equivalent) landscape guides are acceptable if approved by the landscape architect.

6. Provide detailed irrigation watering plan by controller and by zone. Plan shall include total estimated annual water consumption for the total stabilized landscape. 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 or xeriscape.

8. Zone irrigation system separately for turf and slab/bedding areas.

Select from the following indoor and outdoor water conservation strategies:

Indoor Water Efficiency: (Select at least three (3) of the following strategies)

- ❑ All lavatory faucets in units shall be rated at less than or equal to 1.5 gpm.
- ❑ All kitchen & utility faucets in units shall be rated at equal to or less than 2.0 gpm.
- ❑ All showerheads in units shall be rated at less than or equal to 2.0 gpm
- ❑ All toilets in units shall be water efficient equal to or less than 1.3gpf and minimum 350 gram capacity.

Outdoor Water Efficiency: Select at least four (4) of the following strategies. If less than 4 strategies are applicable then all irrigation must fall into these strategies, OR provide a 100% drip system with bubblers allowed only for tree plantings, OR install a rainwater catchment system that provides 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
- ❑ Sprinklers heads with 4-inch or greater pop-up height and matched precipitation rate (MPR) nozzles
- ❑ Check valves to prevent drainage from pipes
- ❑ Install a weather forecast-based Evaprotranspiration (ET) Controller
- ❑ At least 90% of shrub and tree plantings shall be those that are deemed regionally appropriate by either a horticultural authority such as the Texas A&M Horticulture Department or in the professional opinion of a landscape architect.

- See the Urban Landscape Guide list by region at http://aggie-horticulture.tamu.edu/earthkind/plantselector/
- Alternative (and equivalent) landscape guides are acceptable.

Indoor Air and Environmental Quality

Alternative Compliance: Obtain EPA Indoor AirPlus (IAP) Certification. Note: Mechanical Ventilation is not required by GBT; however, mechanical ventilation is required by the 2012 International Mechanical Code when paired with the 2012 IECC.

GBT Indoor Air Measures/Comfort:

1. Perform load calculation based on planned unit design, specifications, and orientation by the use of Manual J, ASHRAE fundamentals or other equivalent load calculation tool.
2. Confirm installation follows the project design and ensure that installed equipment matches Manual J calculations. Programs that can be used include: ACCA Manual J (8^{th} Version or higher only), Carrier HAP Program, Trane Trace 700 or Department of Energy approved equivalent.
3. Verify proper refrigerant level and HVAC commissioning per manufacturer's specifications. Maintain documentation, including HVAC loads, equipment selections and charging (commissioning at start up).
4. HVAC contractor shall provide Verifier with completed copy of Green Built Texas Multifamily Protocol Version 2.0 Start Up Sheet (Exhibit A) or equivalent document that requires the same information.

GBT Indoor Air Measures/Air Quality:

1. Seal ducts during construction at vent entry and exit.
2. Install continuous weather and air barrier on exterior walls behind cladding material.
3. No vapor barrier on inside of exterior walls.
4. Ensure and document that flashing at windows and doors meets manufacturer criteria OR ENERGY STAR Thermal Enclosure Checklist OR weather/vapor barrier OEM directions.
5. 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.
6. All fuel-burning fireplaces inside the unit must provide combustion air from the outside and be enclosed with either a glass door or a fixed glass panel.
7. Use no fiberglass duct board unless sealed properly with low toxic mastic or the duct board has a mold inhibitor integrated into the product.
8. No wall-to-wall carpet in the bathroom.
9. Install vapor barrier under slab.
10. Deliver insulation to the job site in wrapped packages and store in a dry location. Remove and replace any insulation materials that get wet.
11. Install one hardwired carbon monoxide (CO) detector, compliant with NFPA Standard 720, per unit if units have attached garages or are equipped with fuel fired equipment.

Select any five (5) of the following strategies to enhance indoor air quality:

Strategy #1: Select carpet that is 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 compliant with GreenSeal GS-36.

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 the protocol.

Strategy #6: Install bath fans that are rated and field tested at the delivery of 50 CFM or greater per bathroom.

Strategy # 7: Install approved bath fan that is equipped with dedicated wall switch with a timer or dew point controller or a motion/occupancy sensor control device.

Strategy #8: Bath fan and vent must meet the requirements of ASHRAE 62.2 (2007 or later)

Strategy #9: Install kitchen and bath vanity cabinets that contain reduced levels of formaldehyde in compliance with the American National Standards Institute (ANSI) or California Air Resources Board Air Toxic Control Measure (CARB ACTM) criteria.

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

Strategy #11: Prohibit smoking in the entire project. No smoking policy must be incorporated into residential lease agreement (Equivalent to compliance with 3 strategies)

Strategy #12: Install return air ducts, jump ducts or transfer grill in all bedrooms OR pressure difference between master bedroom and adjacent interior areas (i.e. hallway) shall not exceed 6 Pascals. Testing shall be performed with all interior doors closed and all blowers operating at high speed cooling.

Strategy #13: 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 OR install a kitchen exhaust fan (at least 100 cfm) that terminates at the exterior of the building for each MF dwelling unit. (Equivalent to compliance with 2 strategies).

Strategy # 14: Pre Occupancy flush: Run HVAC system and all bath fans for 48 hours post paint and prior to occupancy

Strategy # 15: Install Merv 8 or better filter

Strategy # 16: Install thermostat with a dehumidification cycle OR add a central or room dehumidifier.

Strategy #17: Provide mechanical ventilation in compliance with ASHRAE 62.1 or 62.2 (2007 or later, as applicable)

Energy Efficiency

Alternative compliance: obtain ENERGY STAR V3 or ENERGY STAR - MFHR Certificate or LEED NC or LEED H Certificate.

Energy Efficiency Measures:

Low Rise Compliance (1 to 3 stories with exceptions for 4 and 5 story buildings within the residential (R) scope of the International Energy Conservation Code): choose one (1) of the following strategies.

1. Comply with jurisdiction's energy code requirements, inclusive of duct and unit tightness testing:
    - Mechanical ventilation, continuous exterior insulation and advanced framing are required when specified by code
    - Install an outdoor thermostat on all heat pump units
    - Unit tightness is equal to or less than 5.1 ACH50 or use tradeoffs approved by the North Central Texas Council of Governments.
    - Total duct leakage is less than or equal to 6 CFM per 100 square feet of conditioned floor area
2. Obtain whole building HERS Index of 80 or below, inclusive of duct and unit tightness testing, and/or MMBTU calculation, and the EPA Thermal Enclosure Checklist with the modifications as noted below:
    - Mechanical ventilation, continuous exterior insulation and advanced framing are required when specified by code
    - Install an outdoor thermostat on all heat pump units
    - Unit tightness is equal to or less than 5.1 ACH50 or use tradeoffs approved by the North Central Texas Council of Governments.
    - Total duct leakage is less than or equal to 6 CFM per 100 square feet of conditioned floor area

Mid and High Rise Compliance (4 stories and up within the commercial (C) scope of the International Energy Conservation Code): choose one (1) of the following alternatives

1. Comply with jurisdiction's energy code requirements and complete submission of the EPA Thermal Enclosure Checklist with the modifications as noted below:
    - Mechanical ventilation, continuous exterior insulation and advanced framing are required when specified by code.
    - Building tightness testing ≤ 0.40 cfm/ft² at a pressure differential of 0.3 inches water gauge (2.0 L/s×m² at 75 Pa) in accordance with ASTM E 779
    - Duct testing tightness $\leq$ 6cfm/100ft² of conditioned area for ducted system
    - Install outdoor thermostat on all heat pump units

2. Compliance with and Certification of project with ENERGY STAR MFHR as it exists or is may change (Compliance can be achieved through either the prescriptive or the performance path) OR, Compliance with an ASHRAE Model that is greater than or equal to 10% better than ASHRAE 90.1 – 2007 or 5% $\geq$ ASHRAE 90.1-2010.
    - Complete submission of the EPA Thermal Enclosure Checklist with the modifications as noted below
        - Mechanical Ventilation is not required by GBT (unless required by code)
        - Thermal Bridging reduction through continuous exterior insulation is not required
        - Advanced framing not required
        - Building tightness testing ≤ 0.40 cfm/ft² at a pressure differential of 0.3 inches water gauge (2.0 L/s×m² at 75 Pa) in accordance with ASTM E 779
        - Duct testing tightness $\leq$ 6cfm/100ft² of conditioned area for ducted system
    - Complete submission of the EPA MFHR compliance certification
    - Install outdoor thermostat on all heat pump units

Notes:

- Use of an approved (EPA or RESNET) Sampling Protocol for project testing is acceptable.

- Sampling protocol approved by the North Central Texas Council of Government is also acceptable.
- Some acceptable specialized Air Handling equipment (notably "pancake" air handlers) may not have an AHRI rating. Acceptable manufacturers include First Company, SunTherm and others when accompanied by third party ratings that include matched equipment, documentation, engineering and performance methods that are in compliance with DOE and AHRI guidelines.

Materials

Frame Materials:

1. Use engineered lumber products to maximum extent possible, based on the project's objectives, to include trusses and other engineered products.

2. Install exterior cladding materials with minimum 10-year warranty.

3. Keep stored materials elevated above the ground.

4. Provide proper drainage around materials as well as adequate air circulation and ventilation to keep materials dry.

5. 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. Use 19.2-inch or 24-inch on-center framing.

2. Use 24-inch on-center framing for roof systems.

3. Steel framing as long as thermal bridging is mitigated by continuous insulation product..

4. Right-sized headers or R-3 insulated headers (where appropriate).

5. Eliminate headers in non-bearing walls.

6. 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).

7. Two-stud corner framing or California Corners.

8. Engineered frame design.

General Materials Requirements:

1. Ensure that gutter downspout extensions, concrete splashguards, or proper grading provide positive drainage away from the building or tied directly into storm sewer.

2. Install metal drip edge at eaves and gable roof edges.

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. Exposed slab must be at least 6-inches above the finished grade.

Innovative Options: Employ at least one (1) of the following strategies:

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 use OSB for exterior sheathing.

6. Use 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 bioswales to remove silt and pollution from surface runoff water.*

9. *Provide one or more electric vehicle charging stations*

10. Enter into minimum two year contract to purchase 100 percent renewable power for the house meters for the project.

11. *Horizontal or vertical building envelope projections are a minimum of 18 inches in order to minimize solar heat gain and minimize water intrusion.*

12. *Install a minimum of #30 roofing felt on pitched roof for moisture protection. Installing two layers of #15 roofing felt is an acceptable means of compliance with this provision.*

13. *Use minimum class 4 roofing material.*

14. Install radiant barrier with a minimum initial reflectance of 0.90 and maximum initial emittance of 0.10 on roof deck of all buildings OR Install Energy Star certified roof product on all buildings.

Resident and Operator Education:

1. Provide onsite staff with system maintenance and operational strategies for ongoing maintenance of project.
2. Provide residents with information on local recycling programs, green energy service providers, and Green Built Texas process.

Project Registration

1. Verifier shall register the project in the Green Built Texas Home Registry system upon or prior to completion of the project.
2. Registration fees must be paid in full before the project is to be recognized by the program. Registration fees are as follows:
    - **a.** Projects with less than 200 units: $2,000
    - **b.** Projects with 200 or more units: $2,500