



**AUSTIN ENERGY
GREEN BUILDING**

**MULTIFAMILY
GUIDEBOOK**

V2009_02

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Introduction

Austin Energy Green Building (AEGB) promotes buildings that are efficient, healthy and well-constructed. AEGB's Multifamily Program provides resources to residential and mixed-use developments up to six stories above grade in the Austin Energy service area. Whether the project is voluntary or required by City ordinance, we promote an integrated team approach that involves AEGB staff and project architects, engineers and general contractors. Our goal is that the Rating Packet, Guidebook, and various other resources will assist design teams in meeting their green building goals.



Achieving an Austin Energy Green Building Rating will confirm that your project has:

- Lower utility bills and reduced energy and water use
- Improved indoor air quality and occupant health
- Reduced operation and maintenance costs
- Increased durability
- Lasting value and benefits for our community and planet

ABOUT THE RATING PACKET

The AEGB Multifamily Rating assesses the design, construction, and performance of new multifamily and mixed-use developments according to a set of Basic Requirements and the extent to which they incorporate other recommended green building measures for additional points. Additional points are available in the following categories: site, energy, water, indoor environmental quality, materials and resources, and innovation. We highly encourage design teams to select measures in all categories so that the project encompasses all attributes of a green building.

The rating assesses a project and awards it a “star” level (one star is the entry level rating and five stars is the highest rating) determined by total points achieved. All of the Basic Requirements must be met in order for a project to qualify for a rating. By fulfilling all the Basic Requirements, a project will receive a one star Rating. Following are the point requirements for the star levels:

1 star	Basic Requirements
2 stars	29-35 points*
3 stars	36-42 points
4 stars	43-56 points
5 stars	57 points or more

***Note:** For developments working toward an AEGB Rating as part of a Planned Unit Development (PUD) that requires two (2) or more Stars, certain measures need to be included and accomplished in addition to the basic requirements and the accumulated points. These measures are purple-highlighted in the Rating and in this Guidebook.

Residential Uses and Non-Residential Uses

Notice that the Worksheet tab in the Rating Packet contains two columns, one for Residential Uses and one for Non-Residential Uses. This is to accommodate mixed-use buildings with non-residential space and allow design teams to use one Rating for the entire development/building. “Residential” criteria are for multifamily dwellings and their common spaces, such as hallways, leasing office, gym, media room or clubhouse. “Non-residential” criteria are for mixed-use buildings, where part of the building is dedicated to non-residential uses, such as retail businesses or offices. If you are designing and constructing a mixed-use multifamily building with non-residential spaces, you must meet both the requirements. If your building is only serving residential needs, then just use the Residential Uses criteria.

Calculators

Calculators are used to demonstrate and track how some measures are being achieved. These calculator tabs are included in the Rating Packet and must be completed and submitted to AEGB in order to achieve the proposed points. Calculators that are included are:

- Building Water Use Reduction
- Construction Waste
- Irrigation Water Use Reduction
- Rainwater and Condensate Collection
- Building Reuse
- Building Materials (salvaged, recycled content, Texas sourced - % dollar value of total project building materials cost)
- Low Emitting Materials
- Certified Wood (% dollar value)

Performance Option and Prescriptive Option Points

Some of the points in the Rating give you the option to choose between a Performance or Prescriptive path for accomplishing credits. With the Prescriptive Option you are told exactly what is required to meet that point. With the Performance Option, you choose other ways to meet the required performance measure but will need to demonstrate savings, for example using the calculators listed above, COMcheck or building energy modeling. For point categories that offer Prescriptive or Performance Options, the project must meet either Prescriptive or Performance criteria, not both.

An example is Basic Requirement #8, Building Water Use Reduction. The Prescriptive Option lists maximum flow-rates allowed for lavatory fixtures, showerheads, and kitchen fixtures, and the choice of either no clothes washer in each unit or only clothes washers that use less than 31 gallons per cycle. With the Performance Option, use the Building Water Use Reduction Calculator by selecting a variety of fixtures of your choice to reduce indoor water consumption below the baseline water use by at least 15%.

Required Verification

In each Required Verification section of the Guidebook, use the following key to determine what documentation or required action is required for Conditional Approval or Final Approval:

- Needed for Conditional Approval
- Needed for Final Approval

Tenant Improvement Agreements

In mixed-use developments that include leased non-residential spaces finished-out by the tenants, a tenant lease agreement to adhere to Austin Energy Green Building requirements must be implemented. The lease should clearly identify the Star Rating to be achieved and, to the greatest extent possible, spell out all rating criteria that shall be met. For instance, if tenants install their own water fixtures, the tenant lease agreement shall list the flow rate limits they must follow in order to accomplish the desired percentage of water conserved.

A draft of the tenant lease agreement shall be submitted with the documentation for Conditional Approval. A copy of the final tenant lease agreement must be submitted as verification to Austin Energy Green Building for Final Approval. The agreement shall include the process for completing the Austin Energy Green Building Rating for each tenant space, including plan review and construction verification.

WHO SHOULD USE THE 2009 MULTIFAMILY RATING?

The 2008 Multifamily Rating is applicable for multifamily and mixed-use developments six stories or less in height above grade. The exception is that Townhouses (that meet the definition of the IRC) must use the Single-Family Home Rating. Multifamily and mixed-use developments taller than six stories shall use the Commercial Rating.

ABOUT THE PROCESS AND REQUIRED SUBMITTALS

Contact AEGB as soon as you know that an Austin Energy Green Building Rating is either required or desired. Early communication is essential to learn about all available options for your development so you and your team can make informed choices about design decisions. Integrated design team meetings increase the likelihood that all project team members understand the green building goals of the project.

At Your Earliest Opportunity:

- ❖ Complete the first two tabs of the Rating Packet. If you have not yet identified all of the members of your team feel free to leave those Project Team fields blank in your initial submittal then complete it later as your team is finalized. The preferred method of keeping up with the Rating is to post the Rating Packet on an FTP site and provide access to AEGB staff and all team members, including the general contractor. All current information, including any outstanding issues that need attention, can be posted in real time. The project team and AEGB staff should be notified when updates are made to the Rating Packet or calculators.

- ❖ When zoning or other City of Austin criteria requires an AEGB Rating, please execute and return the AEGB Letter of Intent (LOI). **Upon receipt of the populated first two tabs of the Rating Packet, we will sign and return the LOI. You will need to include the executed LOI in the project's application to Land Use Review in order to receive a Site Development Permit.**
- ❖ Throughout the project, keep AEGB up to date with the project schedule, including major deadlines, so that AEGB staff can work with the project team to assure that the green building goals are met.

Early in Pre-schematic Design: We request a meeting with the entire design team. This will provide an opportunity to introduce features of the AEGB Rating and Rating Process and provide an opportunity to answer any questions you may have about how it relates to your development. This meeting is a great way to set the tone for a successful project.

As you complete Schematic Design: Provide AEGB with:

- Updated Rating Packet. Please comment in the Strategies and Comments column within the Worksheet. This will provide an opportunity to see how ideas from the planning meeting are developing.

At 100% Design Development: Provide to AEGB:

- ½ size set of drawings
- Draft Project Specifications
- Updated Rating Packet (Strategies / Comments and first 2 tabs)

This review is crucial to ensure green building systems, materials and goals are integrated into bid documents, providing for more accurate cost estimates and project assessment.

At 50% Construction Documents: Provide to AEGB:

- ½ size set of drawings
- Project Specifications
- Updated Rating Packet, with a first pass at the water calculator
- If Basic Requirement #3 (Building Envelope) Performance Option is chosen, a first pass at the Envelope REScheck or COMcheck or energy model.
- Non-residential Uses: a first pass at the COMcheck for lighting and envelope or alternatively, a first pass at the energy modeling.
- First pass at the Manual Js, and

As you complete the Building Permit Set: Provide to AEGB:

- ½ size set of the drawings that demonstrate compliance with the Basic Requirements
- Project Specifications that demonstrate compliance with the Basic Requirements and other measures to be achieved, including Testing/Commissioning (Cx) specs
- Updated Rating Packet with the applicable calculators complete
- Manual J load calculations performed according to AEGB guidelines (see pages 14 – 15) and construction documents
- If applicable, final REScheck or COMcheck for lighting and envelope, or final energy model
- Non-residential Uses that will be completed separately: draft tenant agreement
- Non-residential Commissioning: Owners Project Requirements

Upon satisfactory review that the documentation provided demonstrates how each Rating item will be achieved, AEGB will issue Conditional Approval. All documents necessary for Conditional Approval should be submitted at least four weeks prior to the planned date for receiving Conditional Approval. When zoning or other City of Austin criteria require an AEGB Rating, the **AEGB Conditional Approval letter must be attached to the front of the building permit set at the time of intake with Watershed Protection and Development Review Department.**

As you prepare for Construction: Provide to AEGB:

- Updated Rating Packet, if changes have been made
- Construction Waste Management Plan
- Testing / Commissioning (Cx) Plan
- Non-residential Commissioning: Basis of Design

Now is the time to ensure contract documents, submittal forms, and team meetings include information that will lead to a successful green building development. Ask for Energy Star labels, recycled content, or volatile organic compounds (VOC) content, etc., as required.

During Construction: Provide monthly updates of:

- All relevant Rating Packet updates and related submittals *upon request only*
- Demolition and Construction Waste Management Calculations
- In addition, AEGB staff will need to perform regular site visits for mechanical rough and other necessary inspections. Please call us to schedule visits.

At Substantial Completion: Provide to AEGB:

- The final inspection should be scheduled prior to planned move-in date of first occupants (and another prior to the move-in of last occupants if different).
- Final Rating Packet, including all the finalized calculators and updated first 2 tabs
- Testing / Commissioning (Cx) Report draft including pre-functional test results (use standard testing forms available from AEGB for duct leakage testing and balancing)
- To-date Construction Waste Management report and back-up (pdfs preferred)
- Submittals requested, or those demonstrating each measure has been achieved

Upon satisfactory review, AEGB will issue a Final Approval. When zoning or other City of Austin criteria require an AEGB Rating, this **Final Approval is necessary to acquire a Certificate of Occupancy.**

At Post Construction: Provide to AEGB:

- Final Construction Waste Management report
- Final Commissioning (Cx) Report
- Relevant cut sheets and product specifications to document compliance

This will enable our team to generate your project's final Rating, and issue Rating Certificates.

Austin Energy Green Building Multifamily Program: Introduction

If you have any questions regarding any of these deliverables, please feel free to contact your AEGB representative. We are here to help you through every step in the process.

With the exception of the ½ size set of plans, electronic submittals are preferred. Any hard copy documents or CDs should be delivered to:

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Austin Energy Green Building
Physical Address: 811 Barton Springs Road, 3rd Floor
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Austin, TX 78704
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Disclaimer

AEGB does not make any warranty (expressed or implied) or assume any liability or responsibility, to you or any third parties for the accuracy, completeness or use of, or reliance on, any information contained in the AEGB Multifamily Guidebook and Packet. Any discrepancies between the AEGB Multifamily Guidebook and Packet are unintentional and will be resolved by AEGB. The information presented within is up-to-date, to the best of our knowledge, upon release of this Guidebook. If you locate incorrect or incomplete information, kindly alert us so we can do our best to keep this information useful for you.

BASIC REQUIREMENTS

1. Current Regulations

PUD

Intent

The project must meet all applicable codes and local ordinances based on the building type and project location. These codes are in place to assure energy efficient quality buildings and protect the health and safety of building occupants, our community and our natural environment.

Requirements (*Residential and Non-Residential Uses*)

Meet current City of Austin Codes with local amendments (including energy, building, mechanical, plumbing, electrical, and current drainage and water quality standards applicable in project watershed).

Required Verification

- Include schedule of applicable codes in Construction documents
- COMcheck or REScheck applicable for building
- Letter from Civil Engineer confirming current water quality standards are met

Strategies

- ✓ Review references for possible strategies.

Resources

For Run-off: Environmental Criteria Manual – Section 1.9.0

For Water Quality: Environmental Criteria Manual – Land Development Code [25-8-211]

Online Code Library - City of Austin:

[austintech.amlegal.com/nxt/gateway.dll/?f=templates\\$fn=default.htm\\$3.0\\$vid=amlegal:austin_all_mc\\$anc=](http://austintech.amlegal.com/nxt/gateway.dll/?f=templates$fn=default.htm$3.0$vid=amlegal:austin_all_mc$anc=)

Edwards Aquifer Recharge Zone Map:

www.tceq.state.tx.us/compliance/field_ops/eapp/mapdisclaimer.html

Drainage or Environmental Criteria Manuals - City of Austin:

www.amlegal.com/austin%5Ftechmanuals/

Watershed Ordinances Regulations Summary Table - City of Austin:

www.ci.austin.tx.us/watershed/ordinance_table.htm

Watershed Ordinance Summary Map - City of Austin:

www.ci.austin.tx.us/watershed/ordinance_map.htm

2. Transportation Alternatives - Bicycle Use

PUD

Intent

Reduce pollution and development impact from automobile use and improve public health by encouraging bicycle use. Ensure safety of tenants and their property.

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

Requirements (*Residential and Non-Residential Uses*)

Provide covered bicycle parking for 15% of residents and permanent building occupants and provide a safe path from property entrance to bike parking.

Required Verification

- Calculations demonstrating total building occupancy and required quantity of securing areas (include in parking count schedule).
- Building and/or site plans indicating bicycle rack locations (include the capacity of each) and safe bicycle/pedestrian routes.
- Specifications of bicycle securing systems.
- Verification of installed path and bicycle securing device.

Strategies

- ✓ Estimate the number of occupants based on the number of dwelling units and number of bedrooms in each unit, as well as permanent occupants of non-residential uses in building.
- ✓ Outdoor bicycle racks must be well-lit and securely anchored to the surface or structure.
- ✓ Protect bicycles from weather and minimize the risk of theft.
- ✓ Place bicycle racks in locations with high foot traffic and good visibility, such as near a building entrance or gathering place. If the development has multiple buildings or entrances, consider placing separate racks at each location to increase convenience.

Resources

City of Austin Bicycle and Pedestrian Program including Bicycle Route Map:

www.ci.austin.tx.us/bicycle/

Bicycle Austin discusses bicycle transportation issues in Austin:

bicycleaustin.info/

Oregon Bicycle and Pedestrian Planning and Design Manual:

www.oregon.gov/ODOT/HWY/BIKEPED/planproc.shtml

3. Building Envelope Design

PUD

Intent

The Energy Code establishes minimum regulations for energy-efficient buildings. Exceeding these standards further reduces building energy consumption and load and contributes to the reduction of conventional power plant construction, green house gas emissions, and utility costs.

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

Requirements (*Residential and Non-residential Uses*)

For buildings four to six stories above grade:

Select ONE of the following options:

Option A1: Exceed the current Austin Energy Code's Building Envelope requirement by 15% demonstrated via COMcheck.

Option A2: Use a building performance model to demonstrate that the building exceeds the ASHRAE 90.1-2004 Appendix G Performance Rating Method code building by 15% by using Building Energy Hourly Simulation and Load Software such as: Energy Plus1, Carrier HAP1, Trane Trace1, EnergyGauge Summit1, Energy10, eQUEST, DOE-2.

For buildings less than four stories above grade:

Select ONE of the following options:

Option B1: Exceed current Austin Energy Code's Building Envelope requirement by 15% demonstrated via REScheck.

Option B2: Solar Heat Gain Coefficient (SHGC) on all glazing does not exceed 0.30 and U-factor does not exceed 0.4.

Option B3: All vertical fenestration on west, south, & east* is shaded by permanent projections that have a projection factor of not less than 0.5 and that will last as long as the building.

**The building can be rotated up to 45 degrees to the nearest cardinal orientation.*

Required Verification

- Indicate which option is chosen in the Strategies/Comments column of the Worksheet tab in Rating Packet.

Option A1 and B1

- COMcheck™ Envelope Code Compliance Certificate
- Window and door schedule, elevations, wall sections, floor plans
- Final Envelope COMcheck

Option A2

- Narrative describing the building envelope, systems and energy saving measures incorporated into building.
- Energy model
- Inputs and results recorded in the AEGB Energy Analysis Summary Form.
- Window and door schedule, elevations, wall sections

Option B2 (Only for Residential Buildings less than four stories)

- Window specifications and schedule
- NFRC sticker, cut sheet or submittal

Option B3 (Only for Residential Buildings less than four stories)

- Details of overhangs over vertical fenestration and building elevations
- Verification of installed overhangs

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

Strategies

- ✓ A projection factor of at least 0.5 will fully shade a south facing window during the summer (Spring Equinox thru Fall Equinox).
- ✓ By minimizing SHGC and the U-factor, the heat gain and convective heat transfer through windows will be minimized.
- ✓ Use REScheck for buildings three stories or less above grade and COMcheck for buildings four to six stories and commercial portions of buildings to demonstrate that the building(s) exceeds current City of Austin energy code. If there are multiple buildings in a project, each individual building must meet this requirement.
- ✓ Demonstrate that the building exceeds the ASHRAE 90.1-2004 Appendix G Performance Rating Method code building by using a Building Energy Hourly Simulation and Load Program such as: Energy Plus1, Carrier HAP1, Trane Trace1, EnergyGauge Summit1, Energy10, wQUEST, DOE-2 (baseline building vs. proposed design building). Consider modeling during the design phase to assess how different design options will impact the building's energy use and estimate the cost-effectiveness of energy saving measures.
- ✓ In addition to the vertical envelope elements, the building(s) should include a roofing strategy to reduce the urban heat island effect. Urban Heat Islands are characterized by increased temperatures which affect the formation of ground-level ozone or smog, local weather patterns and the performance of air conditioning and refrigeration equipment. Select reflective roofs with a Solar Reflectance Index (SRI) higher than 78 for roofs with less than or equal to 2:12 slope or an SRI higher than 29 for roofs greater than 2:12 slope or vegetative roofs, which also reduce the rate and quantity of storm water runoff.
- ✓ The Solar Heat Gain Coefficient (**SHGC**) is the fraction of the heat from the sun that enters through a window. The SHGC provides a measurement of how well a window blocks heat from sunlight. The lower the SHGC, the less solar heat it transmits and the greater its shading ability. The rate of heat loss is indicated in terms of the **U-factor** (U-value) of a window assembly. The lower the U-value, the greater a window's resistance to heat flow and the better its insulating value

References

REScheck™

www.energycodes.gov/rescheck/

COMcheck™:

www.energycodes.gov/COMcheck/

Energy Code Ordinance and Amendments - City of Austin:

www.cityofaustin.org/edims/document.cfm?id=109740

IRS Qualified Energy Modeling Software List for Energy Efficiency Tax Deduction:

www1.eere.energy.gov/buildings/qualified_software.html

Energy Star Qualified Roofing Products:

www.energystar.gov/ia/products/prod_lists/roof_prods_prod_list.pdf

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

Energy Star Roof Savings Calculator:

www.roofcalc.com/RoomCalcBuildingInput.aspx

Cool Roof Rating Council and product directory:

coolroofs.org/aboutthecrrc_owners.html

Green Roof Directory:

www.greenroofs.org

Lawrence Berkley National Laboratory:

eetd.lbl.gov/HeatIsland/CoolRoofs/

National Fenestration Rating Council

www.nfrc.org/

Windows Fact Sheet – Austin Energy Green Building

www.austinenergy.com/Energy%20Efficiency/Programs/Green%20Building/Resources/Fact%20Sheets/windows.pdf

4. Residential Mechanical Systems

PUD

Intent

A right-sized air conditioner is an important part of an energy-efficient residence. Air conditioners must be sized carefully to match the cooling needs of the dwelling unit for tenant comfort, improved indoor air quality and energy savings.

Requirements (*Residential Uses*)

Systems meet ALL of the following requirements:

1. Dwellings served by split or individual systems are sized according to the Air Conditioning Contractors Association (ACCA) Manual J Residential Load Calculation Procedure and installed according to code.
2. Air conditioning system components are matched according to AHRI (Air-Conditioning, Heating and Refrigeration Institute).

Required Verification

- A complete and accurate Manual J for each unit type (see description below)
- Mechanical schedule, complete with air conditioner system sizing matching the Manual J–designed systems
- AHRI reference numbers or other documentation for equipment match
- Final system cut sheets, AHRI reference numbers
- Verification by site inspection

Strategies

- ✓ Perform load calculations using the Air Conditioning Contractors Association (ACCA) approved Manual J (or commercial load calculation software for buildings four stories or greater).
- ✓ Perform load calculations according to AEGB guidelines.
- ✓ A complete set of Manual J calculations, as well as unit plans and elevations, should be submitted at least four weeks prior to the date the project plans to receive Conditional Approval in order to accommodate edits and re-submittals.

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

Manual J:

Manual J is the accepted industry standard, approved by ANSI, for the proper sizing and selection of HVAC equipment in residential homes. Green Building will accept any of the tools approved by ACCA that meet Manual J standards.

AHRI:

Air conditioning equipment must be matched according to AHRI Directory of Certified Product Performance (Ahrdirectory.org). The directory offers a convenient source for showing certified efficiencies and capacity ratings for the listed products. By comparing product performance ratings, the appropriate product for a particular job can be selected with the assurance that the product will perform as indicated in the directory.

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

The following language is from Manual J regarding right-sizing of systems:
Air Conditioning Contractors of America, Manual J, 8th ed., Introduction pp. i – iii

On undersizing heating and cooling equipment:

“The obvious problem with significantly undersized equipment is that it will not maintain the desired set-point temperature when a passing weather system imposes a design load on the heating and cooling equipment. However, slightly undersized cooling equipment – by a margin of 10% or less – may actually provide more comfort at a lower cost...”

On oversizing heating and cooling equipment:

“Excessively oversized equipment causes short-cycles, marginalizes part-load temperature control, creates pockets of stagnate air (unless the blower operates continuously), degrades humidity control during the cooling season..., requires larger duct runs, increases the installed cost, increases the operating cost, increases the installed load on the utility system and causes unnecessary stress on the machinery.”

On humidity control during the cooling season:

“Sensible and latent cooling loads are imposed on dwellings located in climates that have a substantial amount of moisture in the air during the cooling season. When the summer design condition occurs, properly sized equipment will operate continuously or almost continuously, both loads will be completely neutralized, and the occupants will be comfortable.”

“The total capacity (sensible plus latent) of the cooling equipment should not exceed the total load (sensible plus latent) by more than 15 percent for cooling-only applications and warm-climate heat pump applications...”

On safety factors:

“Manual J calculations should be aggressive, which means that the designer should take full advantage of legitimate opportunities to minimize the size of the estimated loads. In this regard, the practice of manipulating the outdoor design temperature, not taking full credit for efficient construction features, ignoring internal and external window shading devices and then applying an arbitrary “safety factor” is indefensible.

Research studies and the experience of knowledgeable system designers indicate that aggressive use of Manual J procedures provides an adequate factor of safety. No additional safety factors are required when load estimates are based on accurate information pertaining to envelope construction and duct system efficiency.”

Manual J Inputs:

City of Austin Energy Code requires calculations based on actual design, specifications and orientation and according to the Air Conditioning Contractors of America (ACCA) Manual J or equivalent computer analysis. AEGB will only accept Manual J calculations performed using tools approved by ACCA (see ACCA website www.acca.org/software). Buildings between four and six stories above grade may use a commercial load calculation program; however the inputs must meet AEGB guidelines. AEGB requires separate calculations for each unit type. Printouts showing all input and output values are required with submittals for review.

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

Manual J calculations must be done according to the AEGB guidelines below. Most requirements are based on ACCA's Manual J or ASHRAE *Handbook of Fundamentals*.

AEGB Multifamily Guidelines for Residential System Sizing Calculations:

- When multiple units of different orientations are present, the Manual J calculation only needs to be done for the unit with the highest gain. Typical “worst case” characteristics include: on the top floor; with the most west-facing glazing; on the southwest corner; with the most exterior walls; adjacent to unconditioned spaces like stairwells, elevators, garages, etc.).
- A list of the exact units modeled (unit numbers or descriptions) must be included with Manual J submittal
- Air infiltration rates of 0.20-0.36 air changes per hour (ACH) for summer; 0.20 to 0.46 ACH for winter must be used.
- Ventilation is defined as outdoor air that is mechanically introduced into the conditioned space through the heating and cooling equipment. Exhaust fans are not considered mechanical ventilation, and the effect of these devices on the cooling/heating loads is accounted for in the infiltration above.
- Ductwork located in furrdowns or interstitial space should not have heat gain/loss in the load calculations. Only ductwork located outside the thermal envelope, such as a vented, unconditioned attic, may show a heat gain/loss associated with the ductwork.
- Indoor and outdoor design temperatures should be per Austin Amendments to the 2006 IECC (302.2 exterior design conditions) and Manual J standards.
- Occupancy estimates should be based on ASHRAE recommendations, however up to two people per bedroom is acceptable.
- Manual J people load values must be used, i.e. 230 BTUH sensible, 200 BTUH latent per person.
- Walls, floors and ceilings which separate one apartment from another do not contribute a cooling load. Only walls, floors and ceilings which separate conditioned space from unconditioned space contribute to a heat load.
- Walls separating conditioned space from interior unconditioned space, such as a garage, are specified as partition walls. Unlike exterior walls, partition walls do not have a solar load. Walls adjacent to breezeways or otherwise shaded must be input as partitions.
- Internal loads for all appliances and lighting shall not exceed 2,400 BTUH total. This load is less than the installed load in a typical apartment, but is an ASHRAE estimate of the load due to appliances which are actually operating at peak time.
- The total cooling load must be based on no less than 75% Sensible Capacity.
- The installed capacity of the cooling equipment (as specified in the mechanical schedule) must meet the sensible and latent load as calculated by the Manual J procedure **AND** shall not exceed the total load calculated by more than a half ton (5,999 BTUH). Exception: AEGB does not require split system air conditioner or air source heat pump sizes less than 1.5 tons.
- A commercial system sizing analysis may be submitted in place of Manual J for buildings over three stories in height. Commercial analyses must also be done according to these guidelines.
- HVAC systems must be sized based on Manual J calculations and split systems must be matched per AHRI.

Resources:

Air Conditioning Contractors of America

www.Acca.org

ACCA Approved Manual J Software

www.acca.org/software/

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

Air-Conditioning, Heating and Refrigeration Institute

www.ahrinet.org/

Cooling System Fact Sheet – Austin Energy Green Building

www.austinenergy.com/Energy%20Efficiency/Programs/Green%20Building/Resources/Fact%20Sheets/coolingSystems.pdf

5. High Efficacy Lighting

\$, PUD

Intent

Provide quality lighting while reducing building energy consumption and cooling load and contribute to the reduction of conventional power plant construction, green house gas emissions, and building operating costs.

Requirements (*Residential Uses*)

Dwellings:

Select ONE of the following options:

Option A: At least 50% of all indoor lamps in high use areas* are Energy Star-compliant, high-efficacy lamps. Energy Star lamps can be fitted into conventional light fixtures.

Option B: Install 3 Energy Star labeled fixtures in high use areas*.

**High use areas include Kitchen, Dining Room, Living Room, Family Room, Bedrooms, Bathrooms and Halls/Stairway(s). (Lamps in closets are excluded from the calculation).*

Common Spaces**

At least 25% of all indoor lamps are Energy Star-compliant, high-efficacy lamps.

***Common spaces include but are not limited to Halls, Stairways, Leasing/Management office, Clubhouse, Fitness Center, Media Room, Mail Room, Business Center, and all space shared by the tenants.*

Requirements (*Non-Residential Uses*)

Exceed current City of Austin Lighting requirements by 15% each or exceed building performance model by 15%.

Required Verification

- Indicate which option is chosen in the Strategies/Comments column of the Worksheet tab in Rating Packet.
- Residential Uses: Lighting plans and fixture schedule or specifications showing Energy Star Compliant lamps and fixtures
- Non-residential Uses: lighting plans, fixture schedule or specifications, and lighting COMcheck or a first pass at the energy modeling
- Residential Uses: Lighting cut sheets demonstrating Energy Star-compliant lamps and/or fixtures and inspection
- Non-residential Uses: Final COMcheck for lighting or final energy model if lamp/fixture wattage changed and inspection

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

TABLE BR5 High Efficacy Lamps

<u>Lamp Power</u>	<u>Required Lamp Efficacy</u>
< 15 watt	40 lumens/watt
15 - 40 watts	50 lumens/watt
> 40 watts	60 lumens/watt

Source: Local amendments for IECC 2006 Energy Code

Strategies

- ✓ Select high efficiency lighting for both common areas and dwelling units.

- ✓ Energy Star light fixtures have earned the government’s Energy Star seal. They use high efficacy bulbs and they use less electricity than standard fixtures. They come in hundreds of decorative styles including portable fixtures — such as table, desk and floor lamps — and hard-wired options such as front porch, dining room, kitchen ceiling and under-cabinet, hallway ceiling and wall, bathroom vanity fixtures, and more.

- ✓ For non-residential space, use COMcheck to demonstrate that the building exceeds current City of Austin building lighting requirements by 15% each; or demonstrate that the building exceeds the ASHRAE 90.1-2004 Appendix G Performance Rating Method code building by 15% using a Building Energy Hourly Simulation and Load Program such as: EnergyPlus1, Carrier HAP1, Trane Trace1, EnergyGauge Summit1, Energy 10, eQuest, DOE-2 (building baseline vs. proposed design building).

Resources

Energy Star

www.energystar.gov

COMcheck™:

www.energycodes.gov/COMcheck/

Energy Code Ordinance and Amendments - City of Austin:

www.cityofaustin.org/edims/document.cfm?id=109740

ASHRAE/IESNA 90.1-2004, *Energy Standard for Buildings Except for Low-Rise Residential Buildings*:

www.realread.com/prst/pageview/browse.cgi?book=1931862664

IRS Qualified Energy Modeling Software List for Energy Efficiency Tax Deduction:

www1.eere.energy.gov/buildings/qualified_software.html

Lighting Fact Sheet – Austin Energy Green Building

www.austinenergy.com/Energy%20Efficiency/Programs/Green%20Building/Resources/Fact%20Sheets/lighting.pdf

6. Testing/Building Systems Commissioning (Cx)

PUD

Intent

Building Commissioning is a systematic approach to improving system performance, operation & maintenance, indoor air quality & thermal comfort, and energy efficiency, resulting in improved occupant comfort, health & welfare, and productivity.

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

Commissioning activities are not, as many owners and managers believe, part of the typical design and construction process or part of standard operation & maintenance service contracts. Commissioning goes beyond testing, adjusting and balancing (TAB) and traditional inspections. Commissioning involves functional testing to determine how well the building systems work, and how well they work together. Commissioning is also used to determine whether the installed building equipment meets the facility's goals or whether equipment needs to be adjusted to improve the efficiency and overall performance, consistent with the Owner's Project Requirements (also known as the Design Intent)

The intent of the Testing/Building Systems Commissioning basic requirement is to ensure a comfortable and healthy environment for building occupants and minimize energy use. Reduce building operating costs by keeping mechanical and electrical building systems compliant with warranties and operating as designed. Reduce potential for mold or other damage that can be caused by poor indoor air quality.

For residential spaces using split systems, shall assure that mechanical systems are operating properly, efficiently, and according to their design intent through inspection, testing and follow-up that will ensure proper airflow and minimal duct leakage. Non-residential spaces and residential spaces that are not using split systems for cooling shall assure that mechanical and electrical systems are operating properly, efficiently, and according to the Owner Project Requirements (OPR) (similar to the Commissioning Basic Requirement in AEGBs Commercial Program).

Requirements (*Residential Uses*)

Split mechanical systems:

ALL of the following tests must be conducted:

1. Visual inspection of mechanical rough-ins: 100% of dwellings*
2. Duct leakage testing: 25% of dwellings*
3. Air balancing: 25% of dwellings*
4. Static pressure: 25% of dwellings*

*See Inspection Procedures, Installation Guidelines, and Testing Protocol below. Though only 25% of units must be initially tested, any recurring problems must be addressed in all other systems likely to have the same issues. Testing requirements are in accordance with the Austin Amendments to the 2006 IECC Sections 403.2.2.1, 403.8, 403.8.1, and 405.

Requirements (*Non-Residential Uses*)

Commission* Mechanical and Electrical systems:

All of the following documentation must be provided:

1. Cx specification included in construction documents, **including air-side testing as per residential requirements**
2. Owner's Project Requirements and Basis of Design documents
3. Cx Plan
4. Installation verification
5. Cx Report including testing data

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

*An independent commissioning authority with documented commissioning experience on at least two other building projects will verify and ensure that mechanical and electrical systems are installed and calibrated to operate according to the Owner Project Requirements (OPR) and Basis of Design (BOD).

Required Verification

Residential Uses:

- Testing / Commissioning Specification in construction documents
- Pre-construction Submittal: Testing Plan
- Rough-in Inspections
- Final Report including testing data

Non-Residential Uses:

- Owner's Project Requirements
- Testing / Commissioning Specification
- Preconstruction Submittal: Basis of Design, and Commissioning Plan
- Rough-in Inspections
- Final Report including testing data

Strategies for Residential Uses

- ✓ Specification: The project specification should include the required testing. The testing requirements may also be included on the mechanical plans. Be sure to involve the testing company early.
- ✓ Testing Plan: Prior to construction, a testing plan must be submitted that narrates what testing is to be done, the criteria for acceptable performance, and the management protocols for follow-up particularly in the event that testing demonstrates that there may be problems across all or a subset of systems.
- ✓ Testing Report: The testing report must include what was done for testing, common problems encountered, solutions used to meet performance criteria, problems that were not solved, and lessons learned. Field and summary data must be submitted with the Final Report. Contact your AEGB representative for template forms for reporting testing results.
- ✓ Be sure to review the Installation Guidelines, Inspection Procedures and Testing Protocol below. It is highly suggested that duct test leaking be performed after ductwork is installed and before the gypsum board is installed. It is also recommended to involve all trades affecting the plenum in mock-up unit inspections.

INSTALLATION GUIDELINES FOR RESIDENTIAL USES:

New HVAC installations will be installed as follows in addition to compliance with all applicable codes and specifications:

- a) **All gaps, joints, seams, etc. between the supply buckets and wallboard MUST BE SEALED with approved materials.**
- b) Provide return air opening of 1 square foot of net free area per ton of air conditioning. The return air system must provide enough air to maintain proper

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

- Freon pressures and supply adequate airflow to meet manufacturer's specifications.
- c) Seal all furrdown penetrations with mastic, or silicone caulk.
 - d) **If return air plenums are located in a ceiling furrdown, the following guidelines apply:**
 - 1. The preferred method is to construct the furrdown at least 16" deep, or such that the sidewalls of the furrdown extend at least 1-1/2" below the bottom 2" x 4" nailer.
 - 2. Or, you may construct the sidewalls to the typical depth (14") and install the 2" x 4" nailer flush with the bottom of the sidewalls; however, the joint between the nailer and the bottom of the wall board must be caulked along the entire perimeter of furrdown.
 - 3. All gaps, joints, seams, etc. between wood framing and wallboard must have an air tight seal using caulk, mastic etc. This includes "knock-outs" between two sections of the return plenum and the return grill opening if located in the sidewall of the furrdown plenum.
 - e) If the air handler is in a closet, the door must be weather-stripped, with door sweep and threshold.
 - f) All seams between the air handler/furnace, the return plenum and the supply plenum must be sealed with either hard cast tape or mastic.
 - g) Using pure silicone caulk, seal the perimeter of the air handler to the platform.

INSPECTION PROCEDURES

1. Visual Inspection of Mechanical Rough-ins: 100% of Dwellings

- a) Mechanical inspections of new construction projects participating in the Green Building Multifamily Program will be handled by the Building Inspections Division of the Development Review and Inspections Department. AEGB will conduct quality control inspections immediately before the mechanical inspection has been obtained on each building. **The project superintendent, or designee, is responsible for contacting the AE Green Building Multifamily Program Coordinator to schedule a quality control inspection immediately prior to both rough and final inspections on each building.**
- b) The superintendent, or designee, must walk through the units with the inspector so that any problems can be addressed on the spot. The construction representative should carry necessary materials (caulk, mastic, etc.) to repair any unsealed areas of the air duct system (i.e. ducts, fan coil unit, and return air plenum).

2. Duct leakage testing: 25% of Dwellings

- a) Leakage of the duct system shall not exceed 10% of total design airflow. The testing procedure shall be based on ASTM E1554, Standard Test Methods for Determining External Air Leakage of Air Distribution Systems by Fan Pressurization, ASHRAE 152-2004, Method of Test for Determining the Design and Seasonal Efficiencies of Residential Thermal Distribution Systems, or a generally accepted equivalent method. Testing shall be performed by an independent third-party technician approved by the building official. Documentation verifying duct leakage of less than 10% shall be submitted with the Final Testing or Commissioning Report.

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

- b) Documentation shall include the following:
 1. Data of final test
 2. Name and company of technician performing duct testing.
 3. Type of test performed (duct pressurization method or blower door subtraction method).
 4. Test results in percentage of airflow CFM.

3. Air Balancing: 25% of Dwellings

- a) Volumetric airflow in cubic feet per minute (CFM) shall meet the design/application requirements. Airflow testing shall be performed by an independent third party technician approved by the building official, with all interior doors closed and all blowers turned on at cooling speed.
- b) Documentation shall be provided verifying that: 1) individual room supply airflows are within +/-20% of the design/application requirements; 2) that the pressure difference between each room and open area adjacent to that room does not exceed 3 Pascals; and 3) that the pressure difference between the open area and the outside does not exceed 3 Pascals.
- c) Documentation shall also verify that total system CFM airflow is within +/-10% of 360 CFM airflow per ton of air conditioning installed. All documentation shall be submitted with the Final Testing or Commissioning Report.
- d) Documentation shall include the following:
 1. Address of building
 2. Name and company of technician performing the testing.
 3. Date of final test
 4. Procedure used for the test
 5. Results of room-by-room airflow tests, including design/application CFM airflow required, design/application CFM airflow required as a percentage of total CFM airflow required, actual measured CFM airflow, actual percentage of total CFM airflow measured, and percentage of design/application CFM airflow required actually attained.
 6. Results of room-by-room pressure tests, including Pascal difference between room and open area adjacent to room and between open area and the outside.
 7. Results of static pressure test (See 403.8.1) and manufacturers' blower data table identifying total rated CFM airflow.
- e) Measurement of room airflow may be by one of the following procedures:
 1. Flow hood used per the manufacturer's instructions.
 2. Traverse with anemometer (hotwire or rotary) used per manufacturer's instructions.
 3. Pitot tube and slant manometer procedure as specified by the Associated Air Balancing Council, National Environmental Balancing Bureau, or the American Society of Heating, Refrigeration and Air Conditioning Engineers.

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

4. Static Pressure Testing: 25% of dwellings

- a) The 2006 IECC Austin Amendments 403.8.1 System Static Pressure state that total system static pressure (with filters in place) shall not exceed .8" water column on gas furnaces and .6" water column on electric air handlers. Static pressure testing using a digital manometer or magnehelic shall be performed by an independent third party technician approved by the building official. Documentation verifying static pressure testing results within the allowed ranges shall be submitted with the final Mechanical Code compliance package on the jobsite.
- b) Documentation shall include the following:
 - 1. Address of building
 - 2. Name and company of technician performing the testing
 - 3. Date of final test
 - 4. Procedure used for the test
 - 5. Results of the test listing static pressure for applications tested.

TESTING PROTOCOL

- a) A minimum of 25% of the dwelling units in a multifamily project must be tested. The dwellings selected for testing should be apportioned among floor plan types and among all building structures. Though only 25% of units must be initially tested, any recurring problems must be addressed in additional systems. Additional testing due to failure to meet code should be followed according to 2006 IECC Austin Amendments Section 405.4.

Strategies for Non-Residential Uses

- ✓ Be sure to refer to the following Commissioning Checklist for details on what to include in the Commissioning submittals.

COMMISSIONING CHECKLIST

I. Owner's Project Requirements

The Owner's Project Requirements (also known as the Design Intent) should be prepared by the Owner with assistance from the Commissioning Agent. This document should provide a narrative on what features the building will have and what needs the building needs to fill. The California Commissioning Collaborative (www.cacx.org) has a good template for the Owners Project Requirements (OPR) and Basis of Design.

II. Testing/Commissioning Specification

The specification should include the specific commissioning tasks and tests that will be conducted and who will conduct them. This could be a separate specification or the commissioning and testing specifications can be included in the mechanical and electrical specifications. The Building Commissioning Association (www.bcxa.org) has a Master Commissioning Specification provides a good model for what to include in a Commissioning Specification.

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

III. Basis of Design (BOD)

The Basis of Design should be prepared by design team with assistance from the commissioning agent and should include:

- Narrative on how the proper functioning of the mechanical and electrical systems relate to the OPR
- What calculations, standards, protocols, programs, etc. are used to design electrical and mechanical systems? (ex. Manual J, Manual D, Manual S, CHVAC, Trace, etc.)

IV. Commissioning Plan

Projects meeting the Residential Commissioning Requirement need only submit a Testing Plan that outlines who will do what testing, when, and how follow-up and re-testing will be done (as per Batch Testing Procedures laid out in Section 405 of Austin Amendments to the 2006 IECC).

For projects meeting the Non-Residential Commissioning Requirement, the Commissioning Plan should be prepared by the Commissioning Agent and design team and should include:

- Team members
- Tasks for team members
- Periodic reviews and a schedule of planned reviews
- What will be included in the Final Report

Systems to be Commissioned

- List of systems to be commissioned
- Forms that will be used to collect data
- Forms that will be used to track deficiencies
- What % of HVAC units will be commissioned?
- What constitutes satisfactory/passing performance?
- Contingency plan for addressing deficiencies
- What protocols, standards and calculations will be used for testing and data analysis? (references from BOD in addition to functional testing, duct leakage, TAB, etc.)
- How will equipment (HVAC, electrical, etc) contractors/installers be trained?

Training

- How will training be implemented
- Who will be trained
- What materials will be provided for O and M and training purposes

Appendices

- Task Matrix or Task List (including who will lead and who will be involved in task)
- Blank Pre- and Functional Testing Forms
- Commissioning Checklist
- Blank Deficiency/Corrective Action Report

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

V. Final Report

For projects meeting the Residential Commissioning Requirement, the Final Report should give a narrative of what testing was done, what problems were encountered, and how were they addressed. The Final Report should include test data.

For projects meeting the Non-Residential Commissioning Requirement, the Final Report should be prepared by the Commissioning Agent with input and documentation provided by the design team and contractors.

- Narrative comparing tasks performed against Cx Specification
- Narrative comparing tasks performed against Cx Plan
- Narrative describing any findings, recommendations, and actions resulting from Design Review
- Completed testing checklists and data forms
- Issues Log
- Corrective Action Reports
- Project Schedule showing when reviews and tests were performed
- Narrative on what was done as part of the commissioning process
- Narrative on deficiencies and how they were addressed
- Narrative describing why any testing or other procedures called forth in the Cx Plan were not carried out and how this may impact meeting the Owners Project Requirements
- Data summary tables (ex. showing exhaust fan design cfm next to measured cfm)

References

ACG Commissioning Guideline (focus on HVAC commissioning)

www.commissioning.org/commissioningguideline/

Building Commissioning Association

www.bcxa.org

California Commissioning Collaborative Tools and Templates

www.cacx.org/resources/cxtools/

Commissioning Site and Functional Testing and Design Guides - Portland Energy Conservation, Inc.:

www.peci.org/cx_resources.html

www.peci.org/ftguide/

Commissioning guidance and procurement - Energy Design Resources:

www.energydesignresources.com/category/commissioning/

Association of Certified Commissioning Authorities AABC Commissioning Group (ACG):

www.commissioning.org

“The Commissioning Process” ASHRAE Guideline 0-2005: ISSN 1049-894X.

National Institute of Building Sciences - Whole Building Design Guide:

www.wbdg.org/index.php

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

7. Building Water Use Reduction – Metering

PUD

Intent

Give residents the ability to monitor their own consumption of utilities and be rewarded for conserving behaviors on an individual basis.

Benefits

A recent study found that sub-metering and charging residents for water instead of including it in rental rates results in an 18 to 39 percent drop in water use. (Source: Sub-metering, RUBS, and Water Conservation, Industrial Economics, Inc., June 1999).

Requirements (*Residential Uses*)

All dwellings are individually metered (or sub-metered) for water and are billed individually for water usage.

Required Verification

- Plumbing plans showing meter locations
- On-site verification by AEGB staff

Strategies

- ✓ It is becoming more common for multifamily residential units to have individual water meters. New, relatively inexpensive in-line metering devices are now available.

Resources

City of Austin Water Conservation Department:
www.ci.austin.tx.us/watercon/

8. Building Water Use Reduction

PUD, \$

Intent

High efficiency plumbing fixtures reduce consumption of water for indoor use thus lessening the impact on the potable water supply and treatment facilities as well as reducing building operating costs by saving water and associated energy use. Low-flow plumbing fixtures including toilets, faucet aerators and showerheads as well as residential water using appliances have been developed that save substantial amounts of water compared with conventional fixtures and appliances while providing the same utility.

Requirements (*Residential Uses*)

Option A (Prescriptive Option): Each dwelling includes **ALL** of the following:

1. Lavatory fixtures (max. 1.0 gpm)
2. Showerheads (max. 2.0 gpm) (no more than one showerhead installed per shower)
3. Kitchen fixtures (max. 2.2 gpm)
4. Either no clothes washer is installed in each unit OR washer uses fewer than 28 gallons / regular cycle.

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

Option B (Performance Option): Reduce planned indoor potable water consumption below the baseline by at least 15%. The volume and flow rates for standard plumbing fixtures used to establish the baseline are set by the current ASME/ANSI Standards and City of Austin Ordinance No. 20071018-086 Section 411.3.1.

Requirements (Non-Residential Uses)

Reduce planned indoor potable water consumption below the baseline by at least 15% (see Option B above).

Required Verification

- Indicate which option is chosen in the Strategies/Comments column of the Worksheet tab in Rating Packet.
- Plumbing fixture specifications and water-using appliance schedule
- For Option B and Non-Residential Uses, calculations from the AEGB Building Water Use Reduction Calculator (yellow tab in rating packet)
 - Installed fixture and water-using appliance submittals including water use
 - Updated Water Use Reduction Calculator, if applicable

Strategies

- ✓ All developments can reduce indoor water usage by either installing the specified water fixtures (lavatory, showerheads and kitchen fixtures) with maximum flow rates from Option A and by installing low-water using dishwashers and clothes washers or by demonstrating that through a variety of fixtures (and flow rates) that total water consumption is reduced by at least 15%.
- ✓ Contact City of Austin Water Conservation early to arrange to get free low-flow aerators and shower heads (link below).

References

City of Austin Water Conservation Department:
www.ci.austin.tx.us/watercon/

9. Irrigation Water Reduction

PUD

Intent

Minimize potable water use for landscape irrigation by designing water-wise landscapes to reduce the treatment and energy used by municipal water systems, saving water and energy and lower building operating costs.

Requirements (Residential and Non-Residential Uses)

Site meets **ALL** of the following requirements:

1. 90% of new plants on COA Grow Green list (Native and Adapted Landscape Plants).
2. Plant-based mulch covers non-turf planting beds to a minimum 4-inch depth.
3. Install a minimum of 6 inches of soil below all turf areas.

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

Required Verification

- Landscaping design drawings, plant list and planting details
- Drawings and narrative describing the captured rainwater system or the recycled site water system with the capacity of the system highlighted (if applicable)
- On-site verification by AEGB staff

Strategies

Potable water used for irrigation can be reduced through a number of methods.

- ✓ Retain existing established plant material on a site to drastically reduce the amount of irrigation required to get new plant material healthily established in the site.
- ✓ Minimize use of manicured grass.
- ✓ Landscape design and plant material choices that are appropriate to the climate will reduce the amount of water required by depending more on the natural rain systems than the irrigation system.
- ✓ High-efficiency irrigation systems that include moisture sensors, clock times and weather database controllers are widely available. These technologies ensure that plant material is being watered only when required and eliminate the waste associated with over-watering.
- ✓ Rainwater systems can be used to recover stormwater from roof and impervious site surfaces. This water will not be potable but can be used with no or minimal further treatment for irrigation purposes.

Resources

Water Conservation Program provides information and assistance – City of Austin:

www.ci.austin.tx.us/watercon/

Landscaping for water quality protection - Grow Green City of Austin:

www.ci.austin.tx.us/growgreen/

Sustainable Building Sourcebook – Austin Energy Green Building:

www.austinenergy.com/Energy%20Efficiency/Programs/Green%20Building/Sourcebook/water.htm

The Irrigation Association:

www.irrigation.org/

Guide to Rainwater Harvesting - Texas Water Development Board:

www.twdb.state.tx.us/assistance/conservation/Alternative_Technologies/Rainwater_Harvesting/Rain.htm

Rainwater Harvesting (including calculator) - Texas A & M:

rainwaterharvesting.tamu.edu/why.html

Texas Evapotranspiration:

texaset.tamu.edu/

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

10. Low VOC Interior Paints and Coatings

PUD

Intent

Low VOC (volatile organic compound) interior paints and coatings reduce toxic pollution and waste. They conserve natural resources and habitats, minimize global warming and ozone depletion, and contribute to good indoor air quality, improved health, and productivity of building occupants.

Requirements (*Residential and Non-Residential Uses*)

All paints, primers, and anti-corrosive coatings applied on-site to the building interior must not exceed the VOC limit of Green Seal Environmental Standard GS-11 as shown below. All coatings applied on-site to the building interior must not exceed the current VOC limit of SCAQMD Rule 1113.

I. All paints, primers, and anti-corrosive coatings applied on-site to the interior of the building must not exceed the VOC limit of Green Seal Environmental Standard GS-11.

Topcoat Paints, Primers, and Anti-Corrosive Coatings:

<u>Paint Type</u>	<u>VOC Limit (g/L)*</u>
Non-flat Topcoat	100
Flat Topcoat	50
Primer	100
Anti-Corrosive Coating	250

* The calculation of VOC shall exclude water and colorants added at the point-of-sale.

II. Coatings applied on-site to the interior of the building must not exceed the current VOC limit of SCAQMD Rule 1113. For clear wood finishes, floor coatings, stains, sealers and shellacs, and all other applicable coatings:

Clear wood finishes, floor coatings, stains, sealers and shellacs:

<u>Coating Type</u>	<u>VOC Limit (g/L)*</u>
Floor Coating	50
Wood finish/varnish/sanding sealers/lacquer	275
Mastic Coating	300
Non-flat coatings/high gloss	50
Primers, sealers	100
Shellac clear	730
Shellac pigmented	550
Interior stains	100
Waterproof/Concrete sealers	100

* The calculation of VOC shall exclude water and colorants added at the point-of-sale.

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

Required Verification

- Product specifications
- Tabulation using the AEGB Low Emitting Materials Form
- Product submittals with VOC content highlighted

Strategies

- ✓ Review references for possible strategies.

References

Green Seal GS-11, Paints and Coatings, 2nd Edition May 12, 2008:

www.greenseal.org/certification/standards/paints_and_coatings.pdf

SCAQMD Rule 1113, Coatings:

www.aqmd.gov/rules/reg/reg11/r1113.pdf

Low and No VOC Paints Fact Sheet – Austin Energy Green Building

www.austinenergy.com/Energy%20Efficiency/Programs/Green%20Building/Resources/Fact%20Sheets/paint.pdf

11. Filtration for Indoor Air Quality

PUD

Intent

Proper air filtration plays an important role in keeping the coils and heat exchangers clean, which helps the HVAC system to work most efficiently, as well as prolong the life of the system. Air filters also help maintain good indoor air quality resulting in improved occupant health.

Requirements (*Residential and Non-Residential Uses*)

Filters installed in ventilation systems shall have a minimum efficiency reporting value (MERV*) rating of 7 or greater.

**MERV is the industry standard rating for air filters that measures their ability to trap particles. The higher the rating, the more efficient the air filter is at trapping particles. A MERV rating of 7 will capture particles as small as 3 microns.*

Required Verification

- Product specifications
- On-site verification by AEGB staff

Strategies

- ✓ Review references for possible strategies.

Resources

EPA's Indoor Air Quality:

www.epa.gov/iaq/index.html

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

Air Filters Fact Sheet – Austin Energy Green Building

www.austinenergy.com/Energy%20Efficiency/Programs/Green%20Building/Resources/Fact%20Sheets/airFilters.pdf

12. Moisture Prevention

PUD

Intent

Protect against building moisture infiltration through direct rainwater intrusion, water vapor transmission, and negative pressurization. Avoid mold and other potentially damaging results of condensation that may occur within an exterior wall system. Proper moisture prevention affects the health of the occupants, air conditioning costs, and building integrity and durability.

Requirements (*Residential and Non-Residential Uses*)

The site must meet ALL of the following requirements:

1. No vinyl wall coverings or vapor barriers for surface treatments on interior of exterior wall (also include in tenant agreements).
2. Install building envelope drainage plane systems, including flashing and overhang systems.
3. For buildings with mechanical ventilation systems that bring in outside air, document building will be pressurized.

Required Verification

- Plan notes or specifications requesting no vinyl wall coverings.
- Plans showing typical building details of building envelope drainage systems, including flashing and overhang systems, and wall sections for each exterior wall type indicating all materials.
- Mechanical schedule showing building is pressurized, if applicable.
- Photos of installed drainage plane and flashing details with location and date notes.
- Copy of tenant agreement
- On-site verification by AEGB staff

Strategies

- ✓ Review references for possible strategies.

References:

ASHRAE's Handbook – Fundamentals

www.ashrae.org

Building Science Corporation

www.buildingscience.com

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

13. Storage and Collection of Recyclables

PUD

Intent

The collection of recyclables reduces waste generated by building occupants and building operations that is directed to the landfill, extending the life of the landfill and saving energy and resources through the recycling process.

Requirements *(Both Residential and Non-Residential Uses)*

Provide an easily accessible, well-marked area(s) that serves the entire building/complex, dedicated to the separation, collection, and storage of materials for recycling. A minimum of four materials must be recycled. Building loading dock or pick-up location(s) must be sized appropriately to handle the recycling material volumes generated by the building occupants.

Required Verification

- Site plan indicating location of recycling collection center(s)
- On-site verification by AEGB staff of recycling containers and labeled recycling center

Strategies

- ✓ Check with City of Austin Solid Waste Services for a current list of garbage and recycling providers.
- ✓ The City of Austin Solid Waste Services Department may have free educational materials to help apartment managers educate their tenants.
- ✓ Include information about the recycling program (location, materials accepted, etc.) in the move-in packet.

References

City of Austin Recycling Ordinance:

www.ci.austin.tx.us/sws/recyclerules.htm

Sustainable Building Sourcebook – Austin Energy Green Building:

www.austinenergy.com/Energy%20Efficiency/Programs/Green%20Building/Sourcebook/commercialRecycling.htm

Home Recycling Fact Sheet – Austin Energy Green Building

www.austinenergy.com/Energy%20Efficiency/Programs/Green%20Building/Resources/Fact%20Sheets/homeRecycling.pdf

14. Construction Waste Management

PUD

Intent

Construction waste management includes recycling or salvaging construction, demolition/deconstruction, and land clearing waste to reduce the amount of waste destined for the landfill. Construction Waste Management programs extend the life of the landfill, and save energy, resources, and material costs in their reuse.

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

Requirement (*Residential and Non-Residential Uses*)

Recycle and/or salvage at least 50% (by weight) of non-hazardous construction and demolition waste, excluding excavated soil and stone.

Required Verification

- Specifications for Construction Waste Management
- Demolition Waste Management Plan submitted prior to demolition, if applicable
- Construction Waste Management Plan submitted prior to beginning construction
- Monthly CWM updates during construction using summary matrix
- Completed AEGB Construction Waste Calculator
- Digital copies (preferred) of weight tickets for recycling, salvage and landfill

Strategies

- ✓ To ensure you have the inputs required for the AEGB Construction Waste Calculator, weight tickets or recycling reports should list:
 1. Date
 2. Hauler or subcontract hauler
 3. Destination (landfill or recycler)
 4. Amount of each material recycled, salvaged or reused (sheetrock, wood, concrete, cardboard, plastics, etc.)
 5. Amount of materials not recycled, such as rejected loads of contaminated recycling and dumpsters of garbage
- ✓ To convert pounds to tons, one ton equals 2,000 pounds.
- ✓ The AEGB Construction Waste Calculator contains a volume to weight calculator for converting cubic yards of various materials to pounds. This is especially useful for converting land clearing vegetation mulched on site to pounds, since this material is not weighed.
- ✓ Rejected loads due to contamination must be counted as landfill waste instead of recycling even though the intention was to recycle.
- ✓ Do not include hazardous materials, i.e. lead and asbestos, or soil and stone removed from site in either total materials removed from site or recycled/landfilled total.

References

Construction and Demolition Waste Recycling – Environmental Protection Agency:

www.epa.gov/epawaste/conservation/rrr/imr/cdm/index.htm

Construction Industry Compliance Assistance Center

www.cicacenter.org

Sustainable Building Sourcebook – Austin Energy Green Building:

www.austinenergy.com/Energy%20Efficiency/Programs/Green%20Building/Sourcebook/constructionWasteManagement.htm

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

S I T E

Sustainability Through Site Selection

1. Site Selection

Intent

As the population of Central Texas increases two-fold in the next two to three decades, effectively manage the impact of growth through site selection for new developments and buildings that utilizes the existing municipal infrastructure and preserves our natural resources.

1a. Environmental Sensitivity

2 points

Requirements (*Residential and Non-residential Uses*)

Project site is not in the Drinking Water Protected Zone which includes the Barton Springs Zone, Barton Creek Watershed, Edwards Aquifer Recharge and Contributing Zone, and Balcones Canyon Land. Also, project site is not a Greenfield defined as a parcel of land not previously developed beyond that of agriculture or forestry use.

Required Verification

- Print-out of the GEO Profile identifying site location and Watershed Classification from the City of Austin Development GIS Viewer. Include site address.
- Pre-construction description of site as a non-Greenfield site.

Strategies

- ✓ Avoid building on undeveloped lands and in environmentally sensitive areas.

References

Watershed Development Map GIS Viewer - City of Austin:
coagis1.ci.austin.tx.us/website/COAViewer_dev/viewer.htm

Watershed Classification Report using the GIS Viewer. First, select *Address* from the Viewer Tools menu on the left menu bar. Enter the address or street name and intersection. The Development GIS will bring up the map. To see on the map the Watershed Regulation Area, select *Austin Watershed Regulation Areas* from the Layers Menu on the right, then refresh map. Select the LEGEND tab on the right to see if the address is located in the Suburban or Urban (Site 1b) Watershed Regulation Area. To get a report of the Watershed Classification, (set browser to allow pop-ups), Select *Geo Profile* from the left menu bar and point and click to the location on the map and a GeoProfile Search Results page will open. Scroll down to page 2 to see Watershed Classification. If the SDE Waterreg. Watername is Suburban or Urban, this address qualifies for Site1a. Urban also qualifies for Site1b. BSZ, Water Rural and Water Supply Suburban do not qualify for Site1a or Site1b.

Watershed Ordinance Map - City of Austin:

www.ci.austin.tx.us/watershed/ordinance_map.htm

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

1b. Desired Development Area

4 points

Requirements (*Residential and Non-residential Uses*)

Project site is located within the Urban Watershed Desired Development Zone.

Required Verification

- Print out of the GEO Profile identifying site location and Watershed Classification from the City of Austin Development GIS Viewer. Include site address.

Strategies

- ✓ Select a site within the Urban Watershed Desired Development zone.

References

City of Austin Development Map Viewer:

coagis1.ci.austin.tx.us/website/COAViewer_dev/viewer.htm

City of Austin Watershed Ordinance Summary Map:

www.ci.austin.tx.us/watershed/ordinance_map.htm

2. Brownfield Redevelopment

1 point

Intent

Rehabilitate sites where development is complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant as defined by CERCLA §104(k) the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 to revitalize communities, utilize existing infrastructures taking development pressures off of undeveloped, open land, and improve and protect the environment.

Requirements (*Residential and Non-residential Uses*)

Project demonstrates effective remediation of site contamination (using established technologies that have minimal disruption on the site's natural features above and below ground).

Required Verification

- Documentation on the Brownfield classification and verification of remediation efforts

Strategies

- ✓ Rehabilitate and build on Brownfield sites.

References

EPA Preliminary Remediation Goals:

www.epa.gov/region09/waste/sfund/prg/index.html

EPA Sustainable Redevelopment of Brownfields Program, legal definition, grants and loans:

www.epa.gov/brownfields/

City of Austin – Brownfields Redevelopment Office Services:

www.ci.austin.tx.us/watershed/brownfields.htm

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

TCEQ Brownfields Site Assessment Program:

www.tceq.state.tx.us/remediation/bsa/bsa.html

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA):

www.epa.gov/superfund/policy/cercla.htm

3. Site Characteristics Study

1 point

Intent

Reduce the impact of the structures on the environment and optimize building placement on a site.

Requirements (*Residential and Non-residential Uses*)

Map the proposed site's environmental characteristics (include all that are applicable):

- Existing water elements
- Soil conditions
- Ecosystems and natural habitats
- Slope
- Trees and other vegetation
- Seasonal wind and daylight availability
- Traffic and other pollution sources

Create a plan to minimize disturbance and maintain or restore existing site features.

Develop recommendations for building placement on site to minimize impact on the environment and to take advantage of site characteristics.

Required Verification

- Site characteristics map should be completed prior to design development documenting all applicable elements listed in Requirements
- Document including recommendations for maintaining or restoring existing site features as well as for building placement to minimize environmental impact

Strategies

- ✓ Use existing site characteristics research to select the best possible building site to take advantage of features and minimize development impacts.

References

Sun Path Chart useful in passive design considerations:

solar.dat.uoregon.edu/SunChartProgram.html

Austin's Climate Fact Sheet – Austin Energy Green Building

www.austinenergy.com/Energy%20Efficiency/Programs/Green%20Building/Resources/Fact%20Sheets/austinClimate.pdf

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

4. Transportation Alternatives

Intent

Reduce pollution and development impact from automobile use and encourage use of alternative forms of transportation that minimize emissions and land use.

4a. Public Transportation

1 point

Requirements (Residential and Non-residential Uses)

Main building entrance is located within 1/4 mile of the stops for at least two Capital Metro bus lines or within 1/2 mile of a rail stop (or future rail stop with proposed completion within 5 years).

Required Verification

- Area site plan highlighting the public transportation stops. Indicate walking distance from the building's main entry to each indicated.

Strategies

- ✓ Select a site near public transportation options.

References

Austin Capital Metro Transit identifies services near a given location:

www.capmetro.org/riding/trip_info.asp

Transit Oriented Development Districts – objectives and locations:

www.ci.austin.tx.us/planning/tod/default.htm

ftp://coageoid01.ci.austin.tx.us/GIS-Data/planning/TOD/tod_districts.pdf

Envision Central Texas:

www.envisioncentraltexas.org

Gmaps Pedometer

www.gmap-pedometer.com

4b. Parking Capacity

1 point

Requirements (Residential and Non-residential Uses)

Parking does not exceed minimum local zoning requirements.

TABLE OF OFF-STREET PARKING REQUIREMENT

Use Classification	Minimum Off-Street Parking Requirement
Residential Uses	Efficiency dwelling unit: 1 space 1 bedroom dwelling unit: 1.5 spaces
Condominium and Multifamily	Dwelling unit larger than 1 bedroom: 1.5 spaces plus 0.5 space for each additional bedroom

City of Austin Land Development Code Ch 25-6, Appendix A: Tables of Off-street Parking and Loading Requirements (partial listing). For non-residential and additional residential uses see Appendix A in References below. Note: Off-street parking may be subject to multipliers based on project location (central business district, for example).

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

Required Verification

- Schedule associated with the site plan showing the number of parking spaces required and number provided.
- Confirm number of parking spaces installed.

Strategies

- ✓ Be sure to check if any parking multipliers apply to your project based on location or investigate other opportunities available (i.e. car sharing programs, etc).

References

City of Austin Land Development Code Ch 25-6-471, Off-street parking and loading:
[www.amlegal.com/austin_nxt/gateway.dll/Texas/austin/title25landdevelopment/chapter25-6transportation?f=templates\\$fn=altmain-nf.htm\\$3.0#JD_25-6-471](http://www.amlegal.com/austin_nxt/gateway.dll/Texas/austin/title25landdevelopment/chapter25-6transportation?f=templates$fn=altmain-nf.htm$3.0#JD_25-6-471)

City of Austin Land Development Code Ch 25-6, Appendix A: Tables of Off-street Parking and Loading Requirements:
[www.amlegal.com/austin_nxt/gateway.dll?f=id\\$Id=Austin%20City%20Code%3Ar%3A7670\\$cid=texas\\$t=altmain-nf.htm\\$an=JD_APPENDIXA.TABLESOFF-STREETPARKINGANDLOADINGREQUIREMENTS.\\$3.0#JD_APPENDIXA.TABLESOFF-STREETPARKINGANDLOADINGREQUIREMENTS](http://www.amlegal.com/austin_nxt/gateway.dll?f=id$Id=Austin%20City%20Code%3Ar%3A7670$cid=texas$t=altmain-nf.htm$an=JD_APPENDIXA.TABLESOFF-STREETPARKINGANDLOADINGREQUIREMENTS.$3.0#JD_APPENDIXA.TABLESOFF-STREETPARKINGANDLOADINGREQUIREMENTS)

5. Site Disturbance

1 point

Intent

Limit site disturbance or restore damaged open areas to provide habitat and promote biodiversity.

Requirements (Residential and Non-residential Uses)

Greenfield sites: *Site not previously developed or graded.*

Plan to limit disturbance to 40 ft beyond the building perimeter; 10 ft beyond walkways, patios, and surface parking; 15 ft beyond roadways and utility trenches; and 25 ft beyond any pervious areas that require additional staging.

Previously developed sites: *Site previously contained buildings, roadways, parking lots, or was graded.*

At least 50% of the post-development open area (site area minus building footprint) is vegetated using native/adapted plants. Vegetated roof areas may be included in the open area calculations, if the plants meet the definition of native/adapted.

Required Verification

Greenfield sites:

- Site plan clearly indicating limits of construction (site disturbance boundaries) as indicated above and locations of planned development within those constraints.
- On-site verification by AEGB staff

Previously developed sites:

- Landscaping plan including plant list and open area calculations demonstrating that at least 50% is vegetated.
- On-site verification by AEGB staff

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

Strategies

- ✓ Choosing native plants will also help reduce outdoor water consumption.
- ✓ Clearly define limits of construction visually on site during construction.
- ✓ Consider including limits of construction in individual sub-contracts and regular site meetings. Some developments have placed a penalty for working outside the agreed upon limits.

References

City of Austin Grow Green Guide:
www.ci.austin.tx.us/growgreen/plants.htm

6. Heat Island Reduction

1 point, PUD

Intent

Urban Heat Islands are characterized by increased temperatures which affect the formation of ground-level ozone or smog, local weather patterns and the performance of air conditioning and refrigeration equipment. Heat island effects can be reduced by minimizing site impervious surfaces, including vegetated open-grid pavement systems, maximizing vegetative shading, and installing high albedo roofing and other impervious surfaces. The resulting reduction in the heat island effect for the microclimate surrounding the building contributes to improved air quality and building cooling energy savings.

Requirements* (Residential and Non-residential Uses)

Site meets ONE of the following measures:

- Vegetated open-grid pavement system (at least 50% pervious) for 50% of the non-structured parking area.
- Locate 50% of parking underground or in structured parking.
- High-albedo paving materials [Solar Reflective Index (SRI) of 29 or above] on at least 30% of non-roof impervious surfaces.
- Vegetative shading of at least 30% of non-roof impervious surfaces within five years.

***NOTE: Required credit for two-star PUDs**

TABLE S6: Solar Reflectance Index (SRI) for Standard Paving Materials

MATERIAL	Emissivity	Reflectance	SRI
Typical New Gray Concrete	0.9	0.35	35
Typical Weathered* Gray Concrete	0.9	0.20	19
Typical New White Concrete	0.9	0.7	86
Typical Weathered* White Concrete	0.9	0.4	45
New Asphalt	0.9	0.05	0
Weathered Asphalt	0.9	0.10	6

*Reflectance of surfaces can be maintained with cleaning. Typical pressure washing of cementitious materials can restore reflectance to close to original value. Weathered values are based on no cleaning.

Source: LEED for New Construction Version 2.2, pg. 91

<p><u>Key to Required Verification</u></p> <ul style="list-style-type: none"> ○ Needed for Conditional Approval • Needed for Final Approval

Required Verification

- Indicate in Strategies/Comments column of Worksheet in Rating Packet which option is chosen.
- Copy of site plan indicating method utilized at various locations and their associated areas.
- Area calculations for the entire site demonstrating that the minimum requirements are met.
- Product specifications.
- On-site verification by AEGB staff

Strategies

- ✓ Choose high-albedo paving materials that have a Solar Reflective Index (SRI) of 29 or above.
- ✓ A subsurface portion of a parking structure with ground cover may be counted as pervious cover if it meets requirements of City of Austin Land Development Code 23-1-23[b].
- ✓ Fire lanes constructed of pervious pavement are not counted as impervious cover if: the lanes are gated for fire access only and are accessible by pedestrians as a walkway, AFD approves of the structure of the driving surface, and the pervious paving detail is in the construction notes.

References

Design strategies and benefits to mitigating Heat Island affect:

eetd.lbl.gov/HeatIsland/

Environmental Protection Agency:

www.epa.gov/heatisland/index.html

City of Austin Grow Green Guide:

www.ci.austin.tx.us/growgreen/plants.htm

“Albedo: A Measure of Pavement Surface Reflectance”, American Concrete Pavement Association:

www.pavement.com/Downloads/RT/RT3.05.pdf

Cool Roof Fact Sheet – Austin Energy Green Building

www.austinenergy.com/Energy%20Efficiency/Programs/Green%20Building/Resources/Fact%20Sheets/coolRoofs.pdf

7. Light Pollution Reduction

1 point

Intent

Design efficient outdoor lighting systems to reduce light pollution and adverse effects of artificial light including sky glow, glare, light trespass, and light clutter to preserve nocturnal environments.

Requirements (*Residential and Non-residential Uses*)

Development site achieves BOTH:

- Exterior lighting meets the standards of the City of Austin Code – Subchapter E of Chapter 25-2: *Design Standards and Mixed Use, Article 2.5 Exterior Lighting.*

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

- Exterior lighting meets the maximum initial illuminance values at the site boundary and beyond and the fixtures meet the percentage of lumens emitted above full cut-off requirements as outlined in Table 1 below for the appropriate zone as defined in IESNA RP-33.

Table 1: Light Trespass Criteria per Lighting Zone

Zone	Initial Illuminance (fc)	Calculated at Location relative to site boundary	Initial Lumens Emitted above Full Cutoff ¹
LZ1 – Dark (Park & Rural Setting)	0.01 horizontal & vertical	Site boundary	0%
LZ2 – Low (Residential Areas)	0.10 horizontal & vertical	Site boundary	2%
LZ3 – Medium (Commercial/Industrial, High-Density Residential)	0.01 horizontal	10 ft beyond site boundary	5%
	0.20 horizontal & vertical	Site boundary	
LZ4 – High (Major City Centers, Entertainment Districts)	0.60 horizontal & vertical	Site boundary	10%
	0.01 horizontal	15 ft beyond site boundary	

¹Full Cutoff is defined as an angle of 90 degrees from nadir (straight down).

Exterior lighting levels of illuminance meet the horizontal foot candles for the facilities listed in Table 2 as defined in the City of Alpine, TX Outdoor Lighting Ordinance adopted May 23, 2000. Minimum levels shall be consistent with safety and security.

Table 2: Levels of Illuminance at Specific Facilities

Parking Lots and areas	Average 2.0 fc; minimum 0.5 fc
Entry areas near buildings	Maximum 5.0 fc

Required Verification

- Exterior lighting plan and schedule
- A narrative including specific information regarding the light trespass analysis
- Photometric plan showing illuminance levels at intervals no greater than 10 feet between each point across the entire site
- Product specifications
- Product submittals
- As-built exterior lighting plan, if applicable

Strategies

- ✓ Preservation of the view of the night sky is necessary to maintain the circadian rhythm for humans and also protects nocturnal creatures.
- ✓ Select full cut-off exterior fixtures.
- ✓ Look for opportunities to place lights under overhangs and vegetation.

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

References

City of Austin Code – Subchapter E of Chapter 25-2: *Design Standards and Mixed Use, Article 2.5 Exterior Lighting*:

www.ci.austin.tx.us/development/downloads/final.pdf

International Dark-Sky Association:

www.darksky.org

“Lighting for Exterior Environments” - IESNA RP-33-99, Illuminating Engineering Society of North America:

www.iesna.org

Texas Light Ordinance as demonstrated in ‘An Ordinance to improve outdoor lighting in the City of Alpine, Texas:

www.iesnanjacinto.org/Ordinances/Alpine_5-23-05.pdf

8. Accessibility

1 point

Intent

Accessibility is an integral part of designing and constructing better buildings that serve occupants’ needs over the life of the building without requiring future costly and resource-intensive renovations. Accessibility allows persons with temporary or permanent disabilities a wide range of housing options, as well as the ability to visit and mingle with neighbors, and to allow visitors easy access to the building. Accessibility reduces the need and cost for disabled persons to make requests for reasonable modifications and allows residents to “age in place” – that is, to be able to stay in their home as they grow older or as their mobility abilities change. Improved accessibility also results in improved accommodations for residents and guests who are temporarily disabled due to illness or injury.

Requirements (*Residential Uses Only*)

Site meets BOTH of the following:

- 100% of units are either adaptable or visitable.
- Door handle levers installed on 100% of units.

Adaptability (defined by 24 CFR 8.3) is the ability of certain elements of a dwelling unit, such as kitchen counters, sinks, and grab bars, to be added to, raised, lowered or otherwise altered, to accommodate the needs of persons with or without disabilities, or to accommodate the needs of persons with different types or degrees of disability.

A *Visitable* dwelling unit is one that provides:

- At least one entrance at-grade (no steps), approached by an accessible route, such as a sidewalk. While the front entrance is preferable, a side or back entrance is workable
- An entrance door and all interior passage doors that are at least three feet wide, offering 32 inches of clear passage space.

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

Required Verification

- Plan notes include location of blocking, receptacle height, minimum height of levers, plugs, switches, etc.
- On-site verification of blocking and lever handles by AEGB staff.

Strategies

- ✓ Blocking should be installed in the walls of one bathroom wall to allow for the installation of grab bar
- ✓ Use scrap lumber for blocking in the bathroom walls. Grab bars do not have to be installed until resident or future resident requests installation.
- ✓ Ensure an accessible path of travel from parking spaces to an accessible door of the dwelling and common areas.
- ✓ Design at least one no-step entry with a roof over the entrance.
- ✓ Design dwelling with the main living areas on a single accessible story, including a full bath.
- ✓ Install elevator(s) if building is more than one story in height.
- ✓ Provide a 5-foot by 5-foot clear/turn space in living area, kitchen, a bedroom and a bathroom.
- ✓ Multi-story dwellings, where necessary areas for living are located upstairs, can provide either a pre-framed shaft (i.e. stacked closets) for future elevator, or a stairway with a minimum of 4 feet width to allow space for a lift.
- ✓ Specify low-pile carpeting or non-slip flooring.

References

City of Austin S.M.A.R.T. Multi-Family Accessibility Standards

www.ci.austin.tx.us/ahfc/downloads/Web%20version%20SMART%20Guide%203-16-07.pdf

Americans with Disabilities Act

www.ada.gov

Fair Housing Act (FHA) design manual –

www.Huduser.org/publications/destech/fairhousing.html

Federal Disability Information Resource

www.disabilityinfo.gov

Disability Law Resource

www.dlrp.org

United States Access Board

www.access-board.gov

Institute for Human Centered Design

www.adaptiveenvironments.org/index.php?option=Content&Itemid=3

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

9. Outdoor Environmental Quality

1 point

Intent

Provide community-oriented, outdoor places on site to enable building occupants and visitors to connect to and enjoy the natural environment.

Requirements (*Residential and Non-residential Uses*)

Provide shaded, outdoor seating that is accessible to all building occupants for 10% or more of the building's occupants.

Required Verification

- Site plan and details indicating location of outdoor areas, seating capacities, and types of shading provided.
- On-site verification by AEGB staff

Strategies

- ✓ Review references for possible strategies.

References

10. Integrated Pest Management

1 point, PUD

Intent

Provide environmentally-sound buildings and sites that minimize the impact of unwanted pests using long-term, least-toxic approaches. Preserve the site's ecological integrity, enhance biological diversity, protect wildlife and worker/public health and safety, and reduce maintenance costs.

Requirements* (*Residential and Non-residential Uses*)

Develop and implement an Integrated Pest Management Plan and practices appropriate for both site and building use. Plan should include two sections as outlined in memo [IPM Plan Requirements 9-4-06](http://www.ci.austin.tx.us/growgreen/downloads/ipm-plan-requirements-9-4-06.pdf), www.ci.austin.tx.us/growgreen/downloads/ipm-plan-requirements-9-4-06.pdf. The memo gives guidance on the content and format of the overall IPM plan. Part A should include a description of the project and Part B should include anticipated pest problems, pest-specific IPM Plans, and a public education program. The plan should include a system of controlling pests (weeds, diseases, insects or others) in which:

- Pests are identified
- Action thresholds are considered
- All possible control options are evaluated
- Selected control(s) are implemented
- Control options--which include biological, cultural, manual, mechanical and chemical methods--are used to prevent or remedy unacceptable pest activity or damage

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

- Choice of control option(s) is based on effectiveness, environmental impact, site characteristics, public health and safety, and economics

***NOTE: Required credit for two-star PUDs**

Required Verification

- Draft of the Integrated Pest Management Plan
- Verify IPM plan in Operation & Maintenance (O&M) documents
- If applicable, verification of installed systems (either product submittals or site visit).

Strategies

- ✓ IPM takes advantage of all appropriate pest management options.
- ✓ The use of native and adapted plants that are naturally resistant to pests and diseases, as well as physical barriers to prevent termite infestation are examples of ways to control pests over the life of the building and landscape.
- ✓ For a good example of handouts for tenants, staff and contractors, see the link below for the Massachusetts IPM Kit for Building Managers.

References

Integrated Pest Management Reference Plan, City of Austin:

www.ci.austin.tx.us/watershed/ipm.htm

Grow Green Guide, City of Austin:

www.ci.austin.tx.us/growgreen/plantguide/searchplant.cfm

Massachusetts Integrated Pest Management Kit for Building Managers:

www.mass.gov/agr/pesticides/publications/docs/IPM_kit_for_bldg_mgrs.pdf

IPM Fact Sheet – Austin Energy Green Building

www.austinenergy.com/Energy%20Efficiency/Programs/Green%20Building/Resources/Fact%20Sheets/integratedPestMgmt.pdf

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

ENERGY

Save Energy, Use Clean Energy

1. Energy Efficient Building – Performance Option 1 - 12 points, \$, PUD

Intent

The energy code establishes minimum regulations for energy-efficient buildings using prescriptive and performance-related provisions. It is founded on broad-based principles that make possible the use of new materials and innovative techniques that conserve energy. Recognizing the inter-related properties and benefits of various energy-saving measures can lead to improved building performance at minimal cost. Utilizing an energy modeling program as a design tool enables effective analysis of design strategies which may result in lower operating costs, increased occupancy comfort and lower carbon dioxide emissions.

Requirements (Residential and Non-residential Uses)

Buildings four to six stories must exceed the ASHRAE 90.1-2004 Appendix G Performance Rating Method (PRM) code building by 17.5% or more. One point is earned for each additional 2.5% savings.

Percent Savings	17.5	20*	22.5	25	27.5	30	32.5	35	37.5	40	42.5	45
Points	1	2	3	4	5	6	7	8	9	10	11	12

***NOTE: Required credit for two-star PUDs**

Residential buildings three stories and less may use Energy Gauge USA to demonstrate above code savings.

Required Verification

- Narrative describing the building envelope, systems, and energy saving measures incorporated into building.
- Submit energy model inputs and results recorded in the AEGB Energy Analysis Summary Form. The energy model demonstrates building design performance over Energy Code baseline building using Building Energy Hourly Simulation and Load Software such as: Energy 10, eQUEST, DOE-2, Energy Plus, Carrier HAP, Trane Trace, EnergyGauge Summit.
- Residential buildings three stories and less may perform modeling using Energy Gauge USA.
- Product specifications and cut sheets for envelope materials, mechanical and lighting systems.
- Final energy model
- Submittals for mechanical and lighting systems and windows (NFRC sticker)

Strategies

- ✓ Modeler should have a copy of ASHRAE Standard 90.1-2004 Appendix G Performance Rating Method (PRM) and become familiar with it. In addition, the User’s Manual for the ASHRAE Standard 90.1-2004 is very helpful.

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

- ✓ Resources are available. Ask us to e-mail the modeler a copy of the Energy Analysis Summary Form and Sample Summary Form, and a Sample Energy Analysis Narrative.
- ✓ Begin a base model as early as design allows and update it as needed.
- ✓ Use the model to determine energy and cost saving envelope, mechanical, and lighting system measures (particularly during the value engineering process).

References

City of Austin Energy Code Ordinance and Amendments:

www.cityofaustin.org/edims/document.cfm?id=109740

“Advanced Energy Design Guide for Small Office Buildings” ASHRAE (2004): ISBN 1-931862-55-9.

Austin Climate Fact Sheet – Austin Energy Green Building

www.austinenergy.com/Energy%20Efficiency/Programs/Green%20Building/Resources/Fact%20Sheets/austinClimate.pdf

2. Energy Efficient Building – Prescriptive Options 2a-2f

2a. Envelope and Mechanical Systems (Energy Efficient Building – Prescriptive Option)

1-3 points

Requirements (*Residential and Non-residential Uses*)

Select one of the following options using the Roofing, Ductwork and Envelop Lists below:

Option A: Include 1 item from Roofing, 2 items from ductwork and 1 item from envelope and demonstrate with Manual J calculations (min. 600 sq ft/ton). (1 point)

Option B: Include 2 items from Roofing, 3 items from ductwork and 1 item from envelope and demonstrate with Manual J calculations (min. 650 sq ft/ton). (2 points)

Option C: Include 3 items from Roofing, 4 items from ductwork and 2 items from envelope and demonstrate with Manual J calculations (min. 700 sq ft/ton). (3 points)

Roofing List

Flat or low-slope (2:12 or less):

- Building is 3 stories or fewer above grade & roofing product is Energy Star listed.
- Roofing product >75% reflective for >90% of roof area
- Raised heel roof truss allows for a minimum of 8” insulation at the exterior wall face OR sealed attic.
- Insulation – minimum of R32
- Green/vegetated roof 50% minimum

Steep Slope (greater than 2:12):

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

- Building is 3 stories or fewer above grade & roofing product is Energy Star listed.
- Roofing product >45% reflective for >90% of roof area
- Emissivity > 90%
- Raised heel roof truss allows for a minimum of 8" insulation at the exterior wall face OR sealed attic.
- Insulation – minimum of R32
- Radiant barrier system installed next to air space AND 1:150 ventilation.

Ductwork List

- Located within the thermal envelope
- Ducts are cut to exact length, original diameter maintained, no change in direction in any single duct greater than 180 degrees and no single turn greater than 90 degrees.
- Duct systems are sized according to Manual J.
- Supply and return ductwork insulation outside the thermal envelope > R-10.
- Bedrooms have dedicated return air duct OR pressure relief for all bedrooms is provided by means of jump ducts, transfer grills, or ducted returns.
- Maximum length of any flex duct take-off is 10 feet.

Envelope List

- "Total fill" insulation in exterior walls (e.g. wet-blown cellulose, BIBS, open-cell foam, cementitious foam)
- East and west glazing is less than 10% of façade.
- Use airtight building systems such as structural insulated panels (SIPs) or insulating concrete form (ICF).
- All south windows are shaded with overhangs – must demonstrate glazing is 100% shaded at 10 AM and 3 PM on September 21.

Required Verification

- Indicate in Strategies/Comments column of Worksheet in Rating Packet which options are chosen
- Construction documents clearly indicate measures to be achieved
- Manual Js demonstrating square feet per ton of air conditioning
- Narrative describing energy saving measures incorporated into building
- Product submittals
- On-site verification by AEGB staff

Strategies

- ✓ Since the Manual J designated air conditioning size is based on building and dwelling unit characteristics, calculate system size early and use it to help make design decisions.
- ✓ Include overhangs in Manual J calculations

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

References

City of Austin Energy Code Ordinance and Amendments:

www.cityofaustin.org/edims/document.cfm?id=109740

Ladybird Johnson Wildflower Center Native Green Roof research:

www.wildflower.org/greenroof/

Austin Climate Fact Sheet – Austin Energy Green Building

www.austinenergy.com/Energy%20Efficiency/Programs/Green%20Building/Resources/Fact%20Sheets/austinClimate.pdf

Cool Roof Fact Sheet – Austin Energy Green Building

www.austinenergy.com/Energy%20Efficiency/Programs/Green%20Building/Resources/Fact%20Sheets/coolRoofs.pdf

Insulated Concrete Form Fact Sheet – Austin Energy Green Building

www.austinenergy.com/Energy%20Efficiency/Programs/Green%20Building/Resources/Fact%20Sheets/ICFs.pdf

Structural Insulated Panel Fact Sheet – Austin Energy Green Building

www.austinenergy.com/Energy%20Efficiency/Programs/Green%20Building/Resources/Fact%20Sheets/basicSIPs.pdf

Windows Fact Sheet – Austin Energy Green Building

www.austinenergy.com/Energy%20Efficiency/Programs/Green%20Building/Resources/Fact%20Sheets/windows.pdf

2b. Equipment / Appliances – Cooling Equipment Efficiency

(Energy Efficient Building – Prescriptive Option)

1 point, \$

Requirements (*Residential and Non-residential Uses*)

Prescriptive Option

Select one of the following options:

Option A: Dwellings served by split or individual systems: 14 SEER

Option B: Chillers: 10% better than Code

Option C: Water-source heat pumps: 10% better than Code

Required Verification

- Indicate in Strategies/Comments column of Worksheet in Rating Packet which option is chosen.
- Specifications
- HVAC submittals indicating installed system in each unit type

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

2c. Equipment / Appliances – Water Heaters **1 point, \$**
(Energy Efficient Building – Prescriptive Option)

Requirements (*Residential and Non-residential Uses*)
Prescriptive Option

Water heater meets at least ONE of the following:

- Gas – minimum Energy Factor (EF): 0.63 (<50 gallon tank), 0.60 (>50 gallon tank)
- Gas tankless
- Solar thermal
- Gas boilers are Energy Star labeled

Required Verification

- Indicate in Strategies/Comments column of Worksheet in Rating Packet which option is chosen
- Specifications
- Product submittals

2d. Equipment / Appliances – Gas Furnaces **1 point, \$**
(Energy Efficient Building – Prescriptive Option)

Requirements (*Residential and Non-residential Uses*)

Gas furnaces are Energy Star labeled. If gas is not available, heat pump is Energy Star labeled.

Required Verification

- Specifications
- Product submittals

2e. Equipment/Appliances – Ceiling Fans **1 point**
(Energy Efficient Building – Prescriptive Option)

Requirements (*Residential and Non-residential Uses*)

Ceiling fans installed in all main rooms and bedrooms (not required in dining rooms/kitchens) AND are Energy Star listed.

Required Verification

- Lighting schedule with Energy Star fixtures labeled
- Specifications
- Product submittals

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

2f. Equipment/Appliances – Lighting
(Energy Efficient Building – Prescriptive Option)

1-3 points

Requirements (Non-residential Uses)

Option A: 75% of all indoor lamps are Energy Star-compliant high efficacy lamps (1 point).

Option B: 100% of all indoor lamps are Energy Star-compliant high efficacy lamps (2 points).

Option C: 100% of all indoor fixtures are Energy Star-compliant (3 points).

Required Verification

- Indicate which option is chosen in the Strategies/Comments column of the Worksheet tab in Rating Packet.
- Lighting schedule and plans with Energy Star fixtures labeled
- Product submittals
- On-site verification by AEGB staff

Strategies

- ✓ Review references for possible strategies.

References

City of Austin Energy Code Ordinance and Amendments:

www.cityofaustin.org/edims/document.cfm?id=109740

Energy Star

www.energystar.gov

Lighting Fact Sheet – Austin Energy Green Building

www.austinenergy.com/Energy%20Efficiency/Programs/Green%20Building/Resources/Fact%20Sheets/lighting.pdf

3. Green Energy

1 point

Intent

Green Power, electricity generated from clean, renewable sources such as wind, solar, and biomass, lowers fossil fuel burning emissions which cause global warming and pollution. Purchasing green power, including Renewable Energy Credits (RECs), supports the development of renewable power in Texas and nationwide. Additionally, Austin Energy GreenChoice® fixed rate rider may result in lower operation costs as fossil fuel prices fluctuate throughout the term.

Requirements (Residential* and Non-residential Uses)

Subscribe to Austin Energy GreenChoice® for 100% of building's electricity use for at least a 10-year term (*dwelling units excluded).

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

If GreenChoice® subscriptions are not available choose one of the following RECs options:

OPTION 1: Obtain a 2-year contract for Texas RECs for 100% of the building's annual electricity use.

OPTION 2: Obtain a 2-year contract for Green-e certified National RECs for 100% of the building's annual electricity use.

The building's electricity use shall be estimated using a Building Energy Hourly Simulation and Load program OR using the electricity intensity factors per building type from the DOE Commercial Buildings Energy Consumption Survey 2003 in the table below.

Building Type	Median Electricity Intensity (kWh/sf-yr)
Food Sales	48.0
Food Service	37.4
Lodging	11.9
Retail (other than mall)	9.4
Office	11.5
Corridors of residential buildings	6.1

Required Verification

- Indicate which option is chosen in the Strategies/Comments column of the Worksheet tab in Rating Packet.
- Copy of the agreement with Austin Energy GreenChoice®.
- Copy of the RECs contract including name of REC vendor and value of RECs purchased (kWh) and total annual electricity consumption projection (kWh).

Strategies

- ✓ Austin Energy GreenChoice® subscriptions may sell out during the year. Contact your AEGB representative to see if subscriptions are available.

References

GreenChoice® - Austin Energy Renewable Power Program:
www.austinenergy.com/Energy%20Efficiency/Programs/Green%20Choice/
 General guide to purchasing green power and RECs – EPA & Green Power Partnership:
epa.gov/greenpower/buygp/guide.htm
 Companies selling Green-e certified RECs in Texas:
www.green-e.org/

<p><u>Key to Required Verification</u></p> <ul style="list-style-type: none"> ○ Needed for Conditional Approval ● Needed for Final Approval

4. On-Site Renewable Energy

1 - 4 points, \$

Intent

On-site generation of energy through the use of renewable energy technologies such as solar photovoltaic (PV) panels and wind turbines for electricity production or solar thermal for hot water heating will lower operating costs and fossil fuel emissions. Substantial local and federal rebates and incentives are available for the installation of renewable energy technologies.

Requirements (*Residential* and Non-residential Uses*)

On-site renewable energy system installed for:

Option A: 10 kW min. OR generate 25% of annual kWh usage (1 point).

Option B: 15 kW min. OR generate 50% of annual kWh usage (2 points).

Option C: 20 kW min. OR generate 75% of annual kWh usage (3 points).

Option D: >20 kW min. OR generate 90% of annual kWh usage (4 points).

*Note: Residential dwelling units excluded.

The building's electricity use shall be estimated using a Building Energy Hourly Simulation and Load program OR using the electricity intensity factors per building type from the DOE Commercial Buildings Energy Consumption Survey 2003 in the table shown above in Energy Credit 2.

PV and Solar Thermal systems must meet the performance requirements of the Austin Energy PV Solar Rebate and Solar Water Heater Programs in order to receive rebates from the Austin Energy.

Required Verification

- Indicate which option is chosen in the Strategies/Comments column of the Worksheet tab in Rating Packet.
- Construction documents and specifications of renewable energy system(s) to be installed
- Calculations indicating the annual electricity requirements and amount of energy to be generated by on-site renewable energy technology
- Product submittals
- Documentation renewable energy system(s) have been commissioned

Strategies

- ✓ Coordinate early with Austin Energy staff to assure that your project meets these requirements.
- ✓ Most participating installers (link below) will have information on federal incentives for renewable energy technologies.

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

References

Austin Energy PV Solar Rebate Guidelines:

www.austinenergy.com/Energy%20Efficiency/Programs/Rebates/Solar%20Rebates/guidelines.htm

Austin Energy Solar Water Heater Program Guidelines:

www.austinenergy.com/Energy%20Efficiency/Programs/Rebates/Solar%20Rebates/Solar%20Water%20Heater/index.htm

Learn about renewable energy - National Renewable Energy Laboratory:

www.nrel.gov/

Participating Installers for Austin Energy rebates

www.austinenergy.com/Energy%20Efficiency/Tools%20and%20Tips/participatingCompanies.htm

5. Additional Commissioning (Cx)

1 point

Intent

The intent of Additional Commissioning is to expand the basic testing/commissioning requirement to include design review, mechanical, electrical, building structure and envelope commissioning in order to demonstrate that systems are performing to meet the Owner's Project Requirements.

Requirements (*Residential and Non-residential Uses*)

If the building only uses split systems for mechanical systems then the testing performed as part of the Basic Requirement is sufficient to meet the mechanical systems' functional testing requirements for commissioning those split systems. A Commissioning Authority (CxA) with documented commissioning experience on at least two other building projects will verify and ensure that mechanical, electrical, structural, and envelope systems are installed and calibrated to operate according to the Owner Project Requirements (OPR) and Basis of Design (BOD).

In order to accomplish this, all of the following are completed:

- Commissioning agent provides design review prior to 50% completion of Construction Documents
- Commissioning specifications included throughout construction documents
- Provide Owners Project Requirements, Basis of Design, and Commissioning Plan
- Demonstrate that the mechanical and electrical systems operate in accordance with the Owner's Project Requirements.
- Demonstrate building structure & envelope performance in accordance with Owner's Project Requirements.
- Provide seasonal re-commissioning throughout the warranty period.
- Submit a final commissioning report.

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

Required Verification

- Submit Cx design review prior to 50% CDs
- Commissioning specifications including seasonal re-commissioning
- Owner's Project Requirements
- Basis of Design
- Commissioning Plan
- Commissioning report demonstrating that the energy systems, building structure and envelope all operate according to Owner's Project Requirements
- Signed letter of certification by the commissioning authority confirming that the commissioning plan has been successfully executed and the Owner's Project Requirements have been achieved

Strategies

- ✓ Refer to the Commissioning Checklist included under the Testing/Commissioning Basic Requirement for details on what to include in the Commissioning submittals.
- ✓ The Commissioning Agent (CxA) should be brought into the design team as early as possible. The Additional Commissioning point cannot be achieved if the CxA does not perform a design review prior to 50% CDs.

References

Building Commissioning Association

www.bcxa.org

California Commissioning Collaborative Tools and Templates

www.cacx.org/resources/cxtools/

Commissioning Site and Functional Testing and Design Guides - Portland Energy Conservation, Inc.:

www.peci.org/Cx_resources.html

www.peci.org/ftguide/

Commissioning guidance and procurement - Energy Design Resources:

www.energydesignresources.com/category/commissioning/

"The Commissioning Process" ASHRAE Guideline 0-2005: ISSN 1049-894X.

National Institute of Building Sciences - Whole Building Design Guide:

www.wbdg.org/index.php

Envelope Commissioning

www.closerlookinspection.com/envelope.htm

Envelope Commissioning: Proceedings from 2005 National Conference on Building Commissioning, see reports by Tseng and Turner

www.peci.org/nbc/proceedings/2005/

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

6. District Cooling

1 point

Intent

A district cooling plant distributes chilled water from a central plant to individual buildings through a network of underground pipes. A single district cooling plant can satisfy the cooling needs of several buildings and customers. District cooling contributes to the reduction of conventional power plant construction, associated greenhouse emissions, and building operating costs.

Austin Energy chilled water plants may use a combination of thermal storage, heat recovery driven absorption chillers, and high efficiency electric chillers to reduce electric consumption and peak demand.

Requirements (*Residential and Non-residential Uses*)

Tie into an Austin Energy district cooling loop.

Required Verification

- Drawings demonstrating the tie from the building into an Austin Energy district cooling loop
- Copy of signed contract with Austin Energy District Cooling
- On-site verification by AEGB staff

Strategies

- ✓ Contact Austin Energy District Cooling early (email below) for assistance in determining how district cooling can meet your chilled water needs.
- ✓ Any building within a few blocks of an existing chilled water plant should consider district cooling.

Benefits

Operational benefits of district cooling are proven reliability, convenience, simplicity and risk mitigation. Building costs are reduced initially by substantially reducing the capital investment for cooling systems. Throughout the life of the building the use of district cooling offers lower operational and energy expenses for the entire facility and stable, predictable cooling costs over the long term which will increase the net operating income. In addition, the use of district cooling will conserve space by eliminating the need for a chiller plant, reduce noise and potential environmental hazards, and improve facility comfort.

References

Austin Energy District Energy Services, On-Site Energy Resources:

www.austinenergy.com/Commercial/Other%20Services/On-Site%20Energy%20Systems/districtcooling.htm

E-mail: Sue.Arthur@austinenergy.com

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

7. Equipment/Appliances

Intent

Energy Star appliances use less energy, save money and help protect the environment. Energy efficient choices can save families about a third on their energy bills, with similar savings of greenhouse gas emissions, without sacrificing features, style or comfort.

Requirements (*Residential and Non-residential Uses*)

7a. Energy Star Labeled Appliances

1-3 points

Install Energy Star labeled appliances. One point is available for each of the following groups of appliances:

- Refrigerators
- Dish Washers*
- Clothes Washers*

*Note: Must also be listed on the City of Austin Water Conservation WashWise list (see links in References section below).

Required Verification

- Product specifications documenting appliances to be installed
- Product submittals with Energy Star label highlighted

7b. Central Laundry (*Residential and Non-residential Uses*)

1 point, \$

Central laundry site participates in the City of Austin's Water Conservation Multifamily Rebate program for coin-operated equipment AND equipment is Energy Star labeled.

Required Verification

- Product specifications
- Plans showing location of central laundry facility
- Copy of WashWise Multifamily Washer Rebate Program Letter of Intent
- Product submittals with Energy Star label highlighted

Strategies

- ✓ Check that the Energy Star clothes washers and dish washers are also on the Water Conservation Rebate list.

References

Energy Star

www.energystar.gov

Single-family Clothes Washer Rebates

www.cityofaustin.org/watercon/sfwasher.htm

Multifamily Clothes Washer Rebates

www.cityofaustin.org/watercon/mfwasher.htm

City of Austin Water Conservation Efficient Dishwashers

www.cityofaustin.org/watercon/dishwashers.htm

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

8. Lighting

1-4 points

Intent

Reduce building energy consumption and load while contributing to the reduction of conventional power plant construction, greenhouse gas emissions, and building operating costs.

Requirements (*Residential Uses*)

Option A: At least 75% of all indoor lamps in high use areas* are Energy Star-compliant high-efficacy lamps (1 point).

Option B: 100% of all indoor lamps in high use areas* are Energy Star-compliant high-efficacy lamps (1 point, plus 1 point from Option A).

Option C: 100% of all indoor fixtures in high use areas* are Energy Star-compliant (1 point, plus 2 points from Option B).

Option D: Common space** exterior lighting is controlled by automatic daylight controls or controlled by an astronomical time switch in series with a photo sensor (1 point).

* *High use areas include kitchen, dining room, living room, family room, bedrooms, bathrooms and halls/stairway(s). Closets are excluded.*

** *Common space includes but is not limited to halls, stairways, leasing/management office, clubhouse, fitness center, media room, mail room, pool, business center, and all space shared by the tenants.*

Required Verification

- Indicate which option is chosen in the Strategies/Comments column of the Worksheet tab in Rating Packet.
- Lighting plan and fixture specifications
- Product submittals indicating the number of each fixture type installed and location
- As-built reflected ceiling plan, if changes were made from original design
- On-site verification by AEGB staff

Strategies

- ✓ Look for opportunities to provide quality lighting with reduced wattage by selecting Energy Star labeled lamps and fixtures.
- ✓ Keep in mind that Energy Star labeled fixtures are pin-type fixtures that will accommodate only Energy Star labeled lamps.

Resources

Energy Star

www.energystar.gov

Lighting Fact Sheet – Austin Energy Green Building

www.austinenergy.com/Energy%20Efficiency/Programs/Green%20Building/Resources/Fact%20Sheets/lighting.pdf

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

W A T E R

Better Water Quality, Water Conservation, Rainwater Catchment

1. Outdoor Potable Water Use Reduction

1 - 3 points, **PUD**

Intent

Minimize potable water use for landscape irrigation by designing WaterWise landscapes, using drip irrigation and “smart” technology irrigation systems, and utilizing rainwater catchment systems and other non-potable water sources to reduce the load on municipal water systems saving water, energy, and building operating costs.

Requirements (*Residential and Non-residential Uses*)

Do not include plants listed on the City of Austin Grow Green “Invasive Plants to Avoid” list **AND**

Option A*: Reduce outdoor potable water consumption by at least 50% of total water required for irrigation over baseline (1 point).

***NOTE: Option A is a required credit for two-star PUDs**

Option B: Reduce outdoor potable water consumption by at least 75% of total water required for irrigation over baseline (2 points).

Option C: Reduce outdoor potable water consumption by 100% of total water required for irrigation over baseline (3 points).

Required Verification

- Indicate which option is chosen in the Strategies/Comments column of the Worksheet tab in Rating Packet.
- Drawings indicating plant selection and location and irrigation system
- Drawings and narrative describing the rainwater harvesting system or recycled site water system with the capacity of the system highlighted, if applicable
- Draft calculations from the AEGB Irrigation Calculator.
- Updated AEGB Irrigation Calculator
- On-site verification of installed plants, irrigation, and catchment systems by AEGB staff

OR

- For Option C, design narrative of the landscape design and describe why a permanent landscape irrigation system is not necessary.

Strategies

- ✓ Potable water use reductions may be based on landscaped area, vegetation species factor water usage (low, medium, high), density factor (low, medium, high), and/or irrigation technology (drip, sprinkler, other) efficiency. Use the Irrigation Water Calculator to determine % reduction.
- ✓ Retaining existing established plant material on a site will drastically reduce the amount of irrigation required to get new plant material healthily established in the site.

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

- ✓ Minimizing use of manicured grass.
- ✓ Landscape design and plant material choices that are appropriate to the climate will reduce the amount of water required by depending more on the natural rain cycles than the irrigation system.
- ✓ High-efficiency irrigation systems that include moisture sensors, clock timers and weather data-base controllers are widely available. These “smart” technologies ensure that plant material is being watered only when required and eliminate the waste associated with over-watering.
- ✓ Rainwater and greywater systems can be used to recover stormwater from roof and impervious site surfaces as well as water from building waste water. This water will not be potable but can be used with no or minimal further treatment for irrigation purposes.

References

Water Conservation Program provides information and assistance – City of Austin:

www.ci.austin.tx.us/watercon/

Landscaping for water quality protection – Grow Green City of Austin:

www.ci.austin.tx.us/growgreen/

Sustainable Building Sourcebook – Austin Energy Green Building:

www.austinenergy.com/Energy%20Efficiency/Programs/Green%20Building/Sourcebook/water.htm

The Irrigation Association:

www.irrigation.org/

Guide to Rainwater Harvesting - Texas Water Development Board:

www.twdb.state.tx.us/iwt/rainwater.asp

Rainwater Harvesting (including calculator) - Texas A & M:

rainwaterharvesting.tamu.edu/

Texas Evapotranspiration:

texaset.tamu.edu/

Texas Commission on Environmental Quality: Use of Graywater Systems:

www.tceq.state.tx.us/assets/public/legal/rules/rules/pdflib/210f.pdf

Rainwater Harvesting Fact Sheet – Austin Energy Green Building

www.austinenergy.com/Energy%20Efficiency/Programs/Green%20Building/Resources/Fact%20Sheets/rainwaterHarvesting.pdf

2. Indoor Potable Water Use Reduction

1- 3 points, PUD

Intent

High efficiency plumbing fixtures reduce consumption of water for indoor use thus lessening the impact on the water supply and treatment facilities and reducing building operating costs by saving water and associated energy use.

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

Requirements (*Residential and Non-Residential Uses*)

Option A*: Reduce planned indoor potable water consumption below the baseline by 20% (1 point).

***NOTE: Option A is required credit for two-star PUDs**

Option B: Reduce planned indoor potable water consumption below the baseline by 25% (2 points).

Option C: Reduce planned indoor potable water consumption below the baseline by 30% (3 points).

The volume and flow rates for standard plumbing fixtures used to establish the baseline are set by the current ASME/ANSI Standards and City of Austin Ordinance No. 20071018-086 Section 411.3.1.

Required Verification
<ul style="list-style-type: none"> ○ Indicate which option is chosen in the Strategies/Comments column of the Worksheet tab in Rating Packet. ○ Draft of AEGB Building Water Use Reduction Calculator ○ Plumbing fixtures specifications or flow limits in specifications ● Updated AEGB Building Water Use Reduction Calculator ● Product submittal with flow rates highlighted for all water-using fixtures and appliances ● On-site verification by AEGB staff

Strategies

- ✓ Faucet aerators or flow restrictors can be used to further decrease water consumption.
- ✓ Contact City of Austin Water Conservation early to arrange to get free low-flow aerators and shower heads (link below).
- ✓ Rainwater and condensate collection systems can also be of use in reducing the amount of potable water used.

TYPES OF WATER SAVING FIXTURES				
TOILETS	URINALS	SINKS AND LAVATORIES	SHOWERS	APPLIANCES
Power-Assisted Low Flush	Waterless	Low-Flow Faucets	Low-Flow Showerheads	Clothes Washers
Dual Flush	Pint Flush	Electronic Sensor Faucets		Dishwashers
Power-Assisted Dual Flush	Low Flush			
Composting Toilets				

<p><u>Key to Required Verification</u></p> <ul style="list-style-type: none"> ○ Needed for Conditional Approval ● Needed for Final Approval

References

Toilet listings and rainwater harvesting - City of Austin Water Conservation:

www.ci.austin.tx.us/watercon/

Energy Star Appliances:

www.energystar.gov/index.cfm?c=appliances.pr_appliances

EPA **WaterSense** labeled High Efficiency Toilets and Faucets:

www.epa.gov/watersense

Texas Guide to Rainwater Harvesting:

www.twdb.state.tx.us/iwt/rainwater.asp

3. Central Laundry

1 point, \$

Intent

Decrease demand for water and electricity or gas by providing centralized laundry facilities. Residents with in-unit washers do many more, smaller and less-efficient loads of laundry than residents utilizing a common-area laundry facility. In-unit laundry washers use 3.3 times more water while electricity usage of in-unit applications is close to 5 times higher compared to common-area laundry rooms and gas usage is 5.2 times higher. (Source: 2002 Study: A National Study of Water and Energy Consumption in Multifamily Housing).

Requirements (*Residential and Non-residential Uses*)

The development does not include clothes washer hook-ups in dwellings.

Required Verification

- Plans showing dwellings without laundry hook-ups and, if applicable, location of centralized laundry facility
- On-site verification by AEGB staff

Strategies

- ✓ If central laundry facilities are planned, check to see which washers are available for a rebate from the City of Austin.

- ✓ Reference credit Energy 7b

References

Multifamily Clothes Washer Rebates

www.cityofaustin.org/watercon/mfwasher.htm

Laundrywise Website

www.laundrywise.com/

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

INDOOR ENVIRONMENTAL QUALITY

Better indoor environmental quality, humidity control, comfort

1. Indoor Air Quality Monitoring

1 point

Intent

Assure good indoor air quality by controlling ventilation rates using carbon dioxide monitors.

Requirements (*Non-residential Uses*)

Install permanent carbon dioxide monitoring system interlocked with the ventilation system that provides feedback in a useable form to make adjustments for ventilation system.

Commission all systems to the preferred set point parameters and optimal performance for all operating conditions.

Required Verification

- Narratives describing the preferred set point parameters and optimal performance requirements of the monitoring and control system.
- Monitoring and control system specifications
- Cut sheets
- Documentation of the commissioning efforts associated with the monitoring and control system

Strategies

- ✓ Review references for possible strategies.

References

Indoor Air Quality guidance tools - EPA:
www.epa.gov/iaq/index.html

2. Indoor Chemical & Pollutant Sources

1 point

Intent

Minimize indoor pollutants generated by certain types of equipment and chemical use inside a building that affect the health, comfort, and performance of occupants.

Requirements (*Residential* and Non-residential Uses*)

Identify and isolate pollution point sources which may include: copy rooms, print shops, janitorial closets/rooms, laboratories, chemical storage, etc. *Dwelling units are excluded. (Complete all below)

- Provide ventilation directly to the outside of the building and provide drains for appropriate disposal.

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

- Between these areas and occupied spaces construct a full height deck to deck partition or construct a hard lid ceiling enclosure.
- Operate at a negative pressure relative to surrounding areas under all operating conditions.

Required Verification

- Plans locating copy rooms, print shops, laboratories, and janitorial chemical storage rooms.
- Details and partition schedule indicating types of full height partitions used.
- Mechanical and plumbing construction documents demonstrating ventilation, drainage and pressure requirements.
- On-site verification of installed partitions and ventilation / drainage systems.

Strategies

- ✓ Review references for possible strategies.

References

Indoor Air Quality in Large Buildings guidance tool - EPA:

www.epa.gov/iaq/largebldgs/i-beam/index.html

Indoor Pollution Prevention Fact Sheet – Austin Energy Green Building

www.austinenergy.com/Energy%20Efficiency/Programs/Green%20Building/Resources/Fact%20Sheets/indoorPollution.pdf

3. Daylighting

1 point

Intent

Integrate effective daylighting systems, electric lighting systems and controls to optimize daylighting strategies and minimize energy consumption and heat generation.

Requirements (*Residential* and Non-residential Uses*)

Provide adequate daylighting and integrate daylighting systems with electric lighting systems and controls. *Dwelling units are excluded.

Required Verification

- Lighting plan and sections showing daylighting penetration and electrical controls and photoelectric sensors.
- A narrative highlighting the methods used to provide sufficient daylighting for the task, shading strategies, depth of daylight, quality and quantity of daylight, surface colors, and contrast ratio < 4:1, percentage of building day lit, and orientation.
- Specifications for the calibration of controls and calibration logs to be submitted by the contractor.
- Documentation the daylighting systems, lighting and controls, have been commissioned

Strategies

- ✓ Involve a commissioning agent early in planning.

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

- ✓ Include in the specifications the requirement for calibration of controls and calibration logs to be submitted by the contractor.
- ✓ Include daylighting systems in the commissioning plan.
- ✓ Consider wiring light fixtures (along the building perimeter) independently of the others in a space so they can be switched off when daylight is adequate.

References

Daylighting design guide - U.S. Department of Energy EERE:

www1.eere.energy.gov/buildings/commercial/lighting.html

Daylighting - Whole Building Design Guide:

www.wbdg.org/resources/daylighting.php

Electric Lighting Controls - Whole Building Design Guide:

www.wbdg.org/resources/electriclighting.php

Austin Climate Fact Sheet – Austin Energy Green Building

www.austenergy.com/Energy%20Efficiency/Programs/Green%20Building/Resources/Fact%20Sheets/austinClimate.pdf

4. Views to Outside

1 point

Intent

Create a connection between the indoor and outdoor environments by providing visual access to windows from regularly occupied spaces.

Requirements (*Residential and Non-residential Uses*)

Glazing systems and interior partitions allow for a minimum of 75% of regularly occupied spaces a view of vision glazing (between 2'-6" and 7'-6" from finished floor height) and a view of the outdoors.

Required Verification

- Window schedule and building elevations
- Plans and sections demonstrating the lines of sight from within the building to the vision glazing.
- Submit a view calculation indicating that areas with uninterrupted views to the outside encompass 75% of regularly occupied space (not including copy rooms, storage areas, mechanical, laundry, bathrooms and other support areas).

Strategies

- ✓ Review references for possible strategies.

References

US Green Building Council, LEED-NC v2.2 Reference Guide, Environmental Quality Credit 8.1, Daylight and Views

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

5. Thermal Comfort

1 point

Intent

Provide an environment that controls temperature, humidity and air movement for the comfort and performance of the occupants.

Requirements (*Residential and Non-residential Uses*)

Install mechanical systems (thermal, ventilation, and dehumidification) and controls to provide thermal comfort for all operating conditions according to ASHRAE 55-2004.

Required Verification

- Documentation from the mechanical engineer addressing the Owner Project Requirements for thermal comfort including components described in ASHRAE 55-2004 Section 6.1.1 Documentation.
- Documentation of commissioning efforts for components of thermal, ventilation, dehumidification and monitoring systems.

Strategies

- ✓ Review references for possible strategies.

References

ASHRAE 55-2004 *Thermal Environmental Conditions for Human Occupancy*:
www.ashrae.org/

6. Low-Emitting Materials

Intent

Low-emitting building materials reduce toxic pollution and waste thus conserving natural resources and habitats and minimizing global warming and ozone depletion. They contribute to good indoor air quality, benefiting of the health and productivity of building occupants.

6a. Sealants and Adhesives

1 point

Requirements (*Residential and Non-residential Uses*)

All interior installed sealants and adhesives meet South Coast Air Quality Management District (SCAQMD) standards Rule 1168. For spray adhesives, meet the Green Seal standard for Commercial Adhesives GS-36.

Required Verification

- Specifications for all sealants and adhesives, including volatile organic compound (VOC) limits
- Cut sheet and MSDS sheet for each sealant and adhesive with VOC content highlighted
- Tabulation using the AEGB Low Emitting Materials Form

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

Strategies

- ✓ Clearly identify VOC limits for specific sealants and adhesives in each applicable specification section.

- ✓ Specifications and General Contractor should require VOC content to be highlighted on submittals for all sealants and adhesives

References

South Coast Air Quality Management District Rule #1168

www.aqmd.gov/rules/reg/reg11/r1168.pdf

Green Seal Standard for Commercial Adhesives GS-36

http://www.greenseal.org/certification/standards/commercial_adhesives_GS_36.cfm

6b. Flooring System

1 point

Requirements (*Residential and Non-residential Uses*)

All flooring systems meet the requirements of IEQ 6a above AND at least ONE of the following:

- All installed carpets meet Carpet & Rug Institute's (CRI) Green Label Plus minimum standards.
- All installed carpet pads meet CRI Green Label minimum standards.
- All resilient flooring products, including linoleum, laminate flooring, wood flooring, ceramic flooring, wall base, and rubber flooring must be FloorScore certified.

NOTE: If all finish flooring is concrete, this credit is achieved.

Required Verification

- Indicate in Strategies/Comments column of Worksheet in Rating Packet which option is chosen.
- Specifications
- Cut sheets for carpets and pads with the CRI Green Label highlighted
- Cut sheets for non-carpet flooring with listed FloorScore certification
- Confirm IEQ 6a is achieved (see verification above).
- Tabulation using the AEGB Low Emitting Materials Form

Strategies

- ✓ Clearly identify Label or Certification criteria required in flooring systems specifications.

- ✓ Specifications and General Contractor should require Label or Certification to be highlighted on submittals for all flooring systems.

References

Green Label Plus approved products - Carpet & Rug Institute:

www.carpet-rug.org/drill_down_2.cfm?page=8&sub=17&requesttimeout=350

Certified hard flooring – Floor Score:

www.scs-certified.com/iaq/floorscore_1.html

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

Concrete Floors Fact Sheet – Austin Energy Green Building

<http://www.austinenergy.com/Energy%20Efficiency/Programs/Green%20Building/Resources/Fact%20Sheets/concreteFloors.pdf>

6c. Composite Wood and Agrifiber Products

1 point

Requirements (*Residential and Non-residential Uses*)

All composite wood and agrifiber products used on the interior of the building (defined as inside of the weatherproofing system) shall contain no added urea-formaldehyde resins.

Composite wood and agrifiber products are defined as: particle board, medium density fiberboard (MDF), wheatboard, straw board, panel substrates, door cores, and plywood. Furniture and equipment are not considered base building elements and are not included.

Required Verification

- Specifications
- Cut sheets and MSDS for composite wood and agrifiber products with urea-formaldehyde levels highlighted.
- Tabulation using the AEGB Low Emitting Materials Form

Strategies

- ✓ Clearly identify composite wood and agrifiber products in specifications that do not contain added urea-formaldehyde. Ensure, if the specification allows for “or equal”, that “no added urea-formaldehyde” is included in product specifications.
- ✓ Specifications and General Contractor should require composite wood and agriboard product submittals and/or MSDS with urea-formaldehyde quantity highlighted..

References

Particleboard and Medium Density Fiberboard - Green Seal Report:

www.greenseal.org/resources/reports/CGR_particleboard.pdf

Cabinets Fact Sheet – Austin Energy Green Building

www.austinenergy.com/Energy%20Efficiency/Programs/Green%20Building/Resources/Fact%20Sheets/cabinets.pdf

6d. Insulation

1 point

Requirements (*Residential and Non-residential Uses*)

All installed insulation (excluding piping) contains no added urea-formaldehyde.

Required Verification

- Specifications
- Cut sheets and MSDS for insulation with urea-formaldehyde levels highlighted.
- Tabulation using the AEGB Low Emitting Materials Form

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

Strategies

- ✓ Clearly identify insulation products in specifications that do not contain added urea-formaldehyde. Ensure, if the specification allows for “or equal”, that “no added urea-formaldehyde” is included in product specifications.
- ✓ Specifications and General Contractor should require insulation submittals and/or MSDS with urea-formaldehyde quantity highlighted..

References

Greenguard IAQ Certified Products - Greenguard:

www.greenguard.org/

Products meeting CHPS Low-Emitting Materials criteria - Collaborative for High Performance Schools (CHPS):

www.chps.net/manual/lem_table.htm

7. Humidity Control

1 point

Intent

Regulate indoor humidity at the source to help prevent mold and mildew growth and improve thermal comfort.

Requirements (*Residential Uses*)

Humidity is controlled by BOTH the following measures:

1. Exhaust fans are vented to the outside for at least 50% of all dwellings in all of the following locations:
 - above cooktop/stove
 - any room with a tub or shower
2. Bathroom (with shower or tub) fan connected to a timer or humidistat.

Note: It is not sufficient to rely on natural ventilation for this credit.

Required Verification

- Plans showing locations of exhaust fans to the outside
- Exhaust fan specifications
- Documentation of commissioning efforts for components dehumidification systems
- On-site verification by AEGB staff on final inspection

Strategies

- ✓ Review references for possible strategies.

References

Austin Climate Fact Sheet – Austin Energy Green Building

www.austinenergy.com/Energy%20Efficiency/Programs/Green%20Building/Resources/Fact%20Sheets/austinClimate.pdf

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

Indoor Humidity Fact Sheet – Austin Energy Green Building

www.austinenergy.com/Energy%20Efficiency/Programs/Green%20Building/Resources/Fact%20Sheets/indoorHumidity.pdf

8. Acoustic Quality

1 point

Intent

To provide a building environment free from disturbing mechanical equipment noise and vibration and excessive sound reverberation that is designed with sufficient acoustical privacy and adequate sound isolation. To minimize tonal noise and intermittent noise sources in occupied spaces, as these noise sources are particularly troublesome.

Requirements (*Residential and Non-residential Uses*)

Achieve all of the following measures:

- Define appropriate background sound levels, reverberation decay times, speech intelligibility, and sound isolation for the building use. Identify spaces where impact noises are likely and address the potential problem.
- Provide mechanical and duct systems designed to meet guideline Room Criteria (RC), Noise Criteria (NC) or Balanced Noise Criteria (NCB) provided by current copy of ASHRAE Applications Design Guidelines for HVAC Sound and Vibration Control Chapter.
- Provide appropriate vibration isolation for mounted equipment.
- Select equipment that could not be characterized as “tonal”.
- Specify surface finishes and/or masking systems to provide appropriate sound intelligibility and privacy.
- Specify partitions, ceilings, floor/ceiling assemblies, building layouts, and vestibules to provide adequate sound isolation between spaces.
- Mitigate intermittent noise sources such as footfall and loading dock noise.

Required Verification

- Narrative of the acoustical Owner’s Project Requirements and Basis of Design
- One-third octave band sound data submittals for the following:
 - air handling equipment inlets, discharges, and casing radiation
 - exhaust fan bare fan sound levels
 - generators
 - pumps
 - chillers
- Vibration isolation schedule.
- Surface finish schedules including Noise Reduction Coefficient (NRC) and Ceiling Attenuation Class (CAC) Ratings as applicable
- Schedule of partition and floor/ceiling assembly cross sections. Indicate Sound Transmission Class (STC), CAC and Impact Insulation Class (IIC) ratings of partitions, ceilings and floor/ceilings on plans
- On-site verification by AEGB staff of assemblies and isolation devices

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

Strategies

- ✓ Clearly define all items from the first bullet in “Requirements” section in the Owners Project Requirements and Basis of Design

References

“A Practical Guide to Noise and Vibration Control for HVAC Systems” and “Applications of Manufacturers Sound Data” by Mark E. Schaffer

Acoustics.com – acoustic considerations and strategies

www.acoustics.com/

Acoustical Society of America Store

asastore.aip.org/

9. Outdoor Pollutant Sources

1 point

Intent

Avoid exposure of building occupants to hazardous particulates and chemical pollutants (vehicle exhaust, pollens/allergens, etc.) that can enter the building through air intakes and entryways.

Requirements (*Residential and Non-residential Uses*)

Minimize and control outdoor pollutant sources by ALL of the following measures:

1. Entrances, operable windows and fresh air intakes shall be located a minimum 30 feet away from designated smoking areas.
2. Install appropriate signage to clearly designate where smoking is permitted and not permitted.
3. Install permanent entryway systems to the main building (grills, grates, mats), a minimum 6 feet long (10 feet recommended), in the primary direction of travel to capture dirt from entryways directly connected to the outdoors.
4. Specify effective filters for intake, return and re-circulation air.

Required Verification

- Plans indicating the location of the smoking sections, the 30 foot radius around the areas and all entrances, operable windows and air intakes.
- Entrance plans showing the entryway system.
- Narrative including: 1) identified contaminants that may be of concern if allowed to enter the building, as observed during a 24 hr survey of the building site and its immediate surroundings, and 2) design strategies that can be used to mitigate identified air borne contaminants from the outdoors
- Specifications of filters from intake, return and recirculation (or filter matrix).
- On-site verification by AEGB staff of filters, entryway systems and designated smoking areas.

Strategies

- ✓ Design entryway systems to include permanently installed grates, grilles, or slotted systems that allow for cleaning underneath. Roll-out mats are only acceptable when maintained on a weekly basis by a contracted service organization.

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

- ✓ Site survey should include:
 - Description of nearby facilities
 - Observation of odors or irritants
 - Description of visible plumes
 - Description of particulate or chemical air contaminants (i.e. dust, allergens, vehicle exhaust, etc)
 - Direction of prevailing winds

References

City of Austin Smoking in Public Places Ordinance:

[www.amlegal.com/austin_nxt/gateway.dll/Texas/austin/title10publichealthservicesandsanitation/chapter10-6smokinginpublicplaces?f=templates\\$fn=altmain-nf.htm\\$3.0#JD_10-6-8](http://www.amlegal.com/austin_nxt/gateway.dll/Texas/austin/title10publichealthservicesandsanitation/chapter10-6smokinginpublicplaces?f=templates$fn=altmain-nf.htm$3.0#JD_10-6-8)

IAQ Design Tools for Schools Graphic – U.S. EPA:

www.epa.gov/iaq/schooldesign/controlling.html

Fundamentals of IAQ in Buildings - U.S. EPA – I-BEAM Text Modules:

www.epa.gov/iaq/largebldgs/i-beam/text/

ASHRAE 62.1 2007, Sections 4.2 and 4.3

www.ashrae.org/pressroom/detail/16298

Air Filters Fact Sheet - Austin Energy Green Building

www.austinenergy.com/Energy%20Efficiency/Programs/Green%20Building/Resources/Fact%20Sheets/airFilters.pdf

Indoor Pollution Prevention Fact Sheet – Austin Energy Green Building

www.austinenergy.com/Energy%20Efficiency/Programs/Green%20Building/Resources/Fact%20Sheets/indoorPollution.pdf

10. Construction Indoor Air Quality

1 point

Intent

Prevent indoor air quality problems that result from the construction process in order to protect the health of construction personnel and future occupants.

Requirements (*Residential and Non-residential Uses*)

Develop and implement a Construction Indoor Air Quality Management Plan that meets or exceeds the recommended control measures of the Sheet Metal and Air Conditioning National Contractor's Association (SMACNA) *IAQ Guidelines for Occupied Buildings Under Construction*. The plan should include each of these key areas of IAQ protection: Scheduling, Source Control, HVAC Protection, Pathway Interruption, and Housekeeping.

Protect stored on-site or installed absorptive materials from moisture damage.

If permanently installed air handlers are used during construction, filtration media with a minimum MERV of 8 shall be used at each return grille. Replace all media filters immediately prior to occupancy.

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

Required Verification

- Copy of the Construction IAQ Management Plan, highlighting the five requirements of the SMACNA *IAQ Guidelines for Occupied Buildings Under Construction*
- Photographs of on-site construction IAQ measures, such as duct protection and on-site storage of absorptive materials and installed filtration used during construction
- On-site verification by AEGB staff, as schedule permits

Strategies

- ✓ Review references for possible strategies.

References

IAQ Guidelines for Occupied Buildings Under Construction - Sheet Metal and Air Conditioning National Contractor's Association:

www.smacna.org/bookstore/

Indoor Pollution Prevention Fact Sheet – Austin Energy Green Building

www.austinenergy.com/Energy%20Efficiency/Programs/Green%20Building/Resources/Fact%20Sheets/indoorPollution.pdf

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

MATERIALS & RESOURCES

Sustainable Material Choices, Use and Disposal

1. Additional Construction Waste Management 1 point

Intent

Divert construction, demolition, and land clearing debris from landfill disposal. Redirect reusable and recyclable material back to the manufacturing process.

Requirements (*Residential and Non-residential Uses*)

Recycle and/or salvage at least 75% of non-hazardous construction waste (by weight) of construction, demolition, and land clearing waste excluding excavated soil and stone.

The following table shall be used to calculate percentage of construction waste diverted when weight tickets are not available:

SOLID WASTE CONVERSION FACTORS	
MATERIAL	DENSITY, (lbs/CY)
Mixed Waste	350
Wood	300
Cardboard	100
Gypsum Wallboard	500
Rubble	1400
Steel	1000

Required Verification

- Specifications for Construction Waste Management in the Contract Documents.
- Construction Waste Management Plan submitted before construction begins (if applicable, submit Demolition Waste Management Plan before demolition begins).
- Monthly updates to Construction Waste Management summary matrix.
- Copies of weight tickets for recycling, salvage and landfill (electronic copies preferred).
- Completed AEGB Construction Waste Management Calculator.

Strategies

- ✓ To ensure you have the inputs required for the AEGB Construction Waste Calculator, weight tickets or recycling reports should list:
 1. Date
 2. Hauler or subcontract hauler
 3. Destination (landfill or recycler)
 4. Amount of each material recycled, salvaged or reused (sheetrock, wood, concrete, cardboard, plastics, etc.)

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

5. Amount of materials not recycled, such as rejected loads of contaminated recycling and dump
- ✓ To convert pounds to tons, one ton equals 2,000 pounds.
 - ✓ The AEGB Construction Waste Calculator contains a volume to weight calculator for converting cubic yards of various materials to pounds. This is especially useful for converting land clearing vegetation mulched on site to pounds, since this material is not weighed.
 - ✓ Rejected loads due to contamination must be counted as landfill waste instead of recycling even though the intention was to recycle.
 - ✓ Do not include hazardous materials, i.e. lead and asbestos, or soil and stone removed from site in either total materials removed from site or recycled/landfilled total.

References

The Waste Reduction Assistance Program is available to assist with all aspects of solid and hazardous waste management through the on-site waste reduction assessment service, materials exchange, and business information-clearing house. Have a waste reduction assessment conducted for facility operation; contact City of Austin Solid Waste Services Waste Reduction Assistance Program at 974-WRAP.

www.ci.austin.tx.us/sws/wrap_assessment.htm

Sustainable Building Sourcebook – Austin Energy Green Building:

www.austinenergy.com/Energy%20Efficiency/Programs/Green%20Building/Sourcebook/constructionWasteManagement.htm

2. Building Reuse

Intent

Extend the life cycle of the existing building stock, conserve resources, retain cultural resources, reduce waste, and reduce environmental impacts of new buildings as they relate to materials, manufacturing, and transport.

2a. Envelope and Structure

1 - 2 points

Requirements (*Residential and Non-residential Uses*)

Option A: Incorporate at least 40% (surface area) of existing building envelope (including exterior skin and framing, excluding window assemblies and non-structural roofing material) and structure (including structural floor and roof decking) in the new building. (1 point)

Option B: Incorporate at least 80% (surface area) of existing building envelope (including exterior skin and framing, excluding window assemblies and non-structural

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

roofing material) and structure (including structural floor and roof decking) in the new building. (2 points)

Required Verification

- Indicate which option is chosen in the Strategies/Comments column of the Worksheet tab in Rating Packet.
- Plans and elevations indicating pre-construction existing building shell and structure and intended area to be preserved.
- Calculations from the AEGB Building Reuse Calculator.

Strategies

- ✓ For clarification, this credit includes:
 - All portions of the exterior skin and framing except for window assemblies and non-structural roofing material.
 - All structural members including structural floor and roof decking.

References

Building Reuse Case Studies - Smart Growth Network:
www.smartgrowth.org/library/bytype.asp?typ=2

2b. Interior Non-Structural Elements

1 point

Requirements (*Residential and Non-residential Uses*)

Incorporate at least 50% (surface area) of existing interior non-structural elements (walls, doors, floor coverings and ceiling surfaces) in the new building.

Required Verification

- Plans and elevations indicating pre-construction existing building interior elements and intended areas to be reused.
- Calculations from the AEGB Building Reuse Calculator.

Strategies

- ✓ Review references for possible strategies.

References

Building Reuse Case Studies - Smart Growth Network:
www.smartgrowth.org/library/bytype.asp?typ=2

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

3. Exterior Wall Materials

1 point

Intent

Use long-lasting alternatives to wood in exterior walls to decrease dependence on forest products to ensure that insulation systems are continuous, minimize opportunities for thermal transfer, and reduce air infiltration through the exterior wall.

Requirements (*Residential and Non-residential Uses*)

Exterior walls (minimum of 50% of surface area) are constructed of material other than stick frame construction (e.g. Structural Insulated Panels (SIP), Insulated Concrete Forms (ICF), Autoclaved Aerated Concrete (AAC), etc.)

Required Verification

- Plans and specifications including insulating value (R-value) of materials
- On-site verification by AEGB staff

Strategies

- ✓ Review references for possible strategies.

References

Structural Insulated Panel Association

www.sips.org/

Insulating Concrete Form Association

www.forms.org/

Autoclaved Aerated Concrete Products Association

www.aaccpa.org

Insulated Concrete Forms Fact Sheet – Austin Energy Green Building

www.austinenergy.com/Energy%20Efficiency/Programs/Green%20Building/Resources/Fact%20Sheets/ICFs.pdf

Structural Insulated Panels Fact Sheet – Austin Energy Green Building

www.austinenergy.com/Energy%20Efficiency/Programs/Green%20Building/Resources/Fact%20Sheets/basicSIPs.pdf

4. Durable Floor Materials

1 point

Intent

Floors constructed of durable, long-lasting materials, will not need replacement as often as non-durable products, thus reducing landfilled materials and future costs and time associated with flooring repair and removal between residents. Durable floors also help maintain good indoor air quality.

Requirements (*Residential and Non-residential Uses*)

Floor is durable material (e.g. concrete, stone, brick, ceramic tile) for a minimum of 75% of all flooring.

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

Required Verification

- Plans with description of flooring area
- Floor area calculation matrix including the sum of all flooring materials.
- On-site verification by AEGB staff

Strategies

- ✓ Review references for possible strategies.

References

Concrete Floors Fact Sheet – Austin Energy Green Building
www.austenergy.com/Energy%20Efficiency/Programs/Green%20Building/Resources/Fact%20Sheets/concreteFloors.pdf

5. Interior and Exterior Materials – Performance Options

5a. Salvaged Materials

1 - 2 points

(Interior and Exterior Materials – Performance Options)

Intent

Extend the life cycle of targeted building materials and reduce the environmental impacts related to materials manufacturing and transport.

Requirements (*Residential and Non-residential Uses*)

Option A: Salvaged or refurbished materials account for 5% (dollar value) of total project building materials cost. (1 point)

Option B: Salvaged or refurbished materials account for 10% (dollar value) of total project building materials cost. (2 points)

Mechanical, electrical and plumbing components as well as specialty items should not be included in the calculations. Only include materials permanently installed in the project.

Required Verification

- Indicate which option is chosen in the Strategies/Comments column of the Worksheet tab in Rating Packet.
- Specifications include 1) Submittals to include salvaged content and 2) Individual material sections include salvaged content requirement (as necessary)
- Calculations from the AEGB Building Materials Calculator.

Strategies

- ✓ Include contract language for contractors to provide salvaged material information in submittals.

References

Salvaged Building Materials Business Directory – Building Materials Reuse Association:
ubma.org/

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

Re-Store Salvaged Building Materials Outlet – Austin Habitat for Humanity:
www.re-store.com/

5b. Recycled Content **1 - 2 points**
(Interior and Exterior Materials – Performance Options)

Intent

Increase demand for building products that have incorporated recycled content materials, thereby reducing the environmental impacts resulting from the extraction of new materials.

Requirements (Residential and Non-residential Uses)

Option A: Building materials contain recycled content (the sum of post-consumer recycled content plus one-half of the post-industrial content) of at least 10% (by dollar value) of total project building materials cost. (1 point)

Option B: Building materials contain recycled content (the sum of post-consumer recycled content plus one-half of the post-industrial content) of at least 20% (by dollar value) of total project building materials cost. (2 points)

Mechanical, electrical and plumbing components as well as specialty items should not be included in the calculations. Only include materials permanently installed in the project.

Required Verification

- Indicate which option is chosen in the Strategies/Comments column of the Worksheet tab in Rating Packet.
- Specifications include 1) Submittals to include recycled content and 2) Individual material sections include recycled content requirement (as necessary)
- Calculations from the AEGB Building Materials Calculator.

Strategies

- ✓ Include contract language for contractors to provide recycled content information in submittals.

References

EPA Comprehensive Procurement Guidelines:

www.epa.gov/cpg/

Recycled Content Product Database:

www.ciwmb.ca.gov/rcp/

Recycled Content Product Database from Texas Manufacturers - Clean Texas:

www.cleantexas.org/index.cfm?fuseaction=public.resources_texasrecycle

Deck Lumber Alternatives Fact Sheet – Austin Energy Green Building

www.austinenergy.com/Energy%20Efficiency/Programs/Green%20Building/Resources/Fact%20Sheets/deckLumberAlts.pdf

Fly Ash Concrete Fact Sheet – Austin Energy Green Building

www.austinenergy.com/Energy%20Efficiency/Programs/Green%20Building/Resources/Fact%20Sheets/flyAsh.pdf

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

5c. Texas Sourced Materials
(Interior and Exterior Materials – Performance Options)

1 - 2 points, PUD

Intent

Increase demand for materials that are manufactured in Texas, thereby reducing the environmental impacts resulting from their transportation and supporting the State economy.

Requirements (*Residential and Non-residential Uses*)

Option A: Building materials and products are extracted and/or manufactured (final assembly) regionally within Texas for at least 30% (dollar value) of the project materials cost (1 point).

NOTE: Option A is required credit for two-star PUDs.

Option B: Building materials and products are extracted and/or manufactured (final assembly) regionally within Texas for at least 50% (dollar value) of the project materials cost (2 points).

Mechanical, electrical and plumbing components as well as specialty items should not be included in the calculations. Only include materials permanently installed in the project.

Required Verification

- Indicate which option is chosen in the Strategies/Comments column of the Worksheet tab in Rating Packet.
- Specifications include 1) Submittals to include Texas-sourced content, and 2) Individual material sections include Texas-sourced requirement (as necessary)
- Calculations from the AEGB Building Materials Calculator.

Strategies

- ✓ Include contract language for contractors to provide Texas-sourced materials information in submittals.

References

Recycled Content Product Database from Texas Manufacturers - Clean Texas:

www.cleantexas.org/index.cfm?fuseaction=public.resources_texasrecycle

Sustainable Building Sourcebook – Austin Energy Green Building:

www.austinenergy.com/Energy%20Efficiency/Programs/Green%20Building/Sourcebook/materials.htm

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

5d. Certified Wood **1 point**
(Interior and Exterior Materials – Performance Options)

Intent

Encourage environmentally responsible forest management.

Requirements (*Residential and Non-residential Uses*)

At least 50% (by dollar value) of new wood-based materials are certified in accordance with the Forest Stewardship Council (FSC) guidelines for wood building components.

Required Verification

- Specifications include 1) Submittals to include certified wood content and 2) Individual material sections include certified wood requirement (as appropriate)
- Submittals with FSC chain of custody information and quantity highlighted
- Calculations from the AEGB Certified Wood Calculator

Strategies

- ✓ Include contract language for contractors to provide FSC chain of custody information in submittals.

References

FSC Certified Products Database - Certification Research Center:

www.certifiedwoodsearch.org

Forest Stewardship Council:

www.fsc.org

5e. Low VOC Paints, Coatings, Adhesives and Sealants **1 point**
(Interior and Exterior Materials – Performance Options)

Intent

Reduce the quantity of air contaminants that are odorous or potentially irritating to installer and occupant health and comfort.

Requirements (*Residential and Non-Residential Uses*)

All paints, primers, and anti-corrosive coatings applied on-site to the building exterior must not exceed the volatile organic compound (VOC) limit of Green Seal standard GS-11 as shown below. All coatings, adhesives, and sealants applied on-site to the building exterior must not exceed the current VOC limits set by South Coast Air Quality Management District (SCAQMD) Rules 1113 and 1168. For spray adhesives, meet the Green Seal standard for Commercial Adhesives GS-36.

Example: Topcoat Paints, Primers, and Anti-Corrosive Coatings

<u>Paint Type</u>	<u>VOC Limit (g/L)*</u>
Non-flat Topcoat	100
Flat Topcoat	50
Primer	100
Anti-Corrosive Coating	250

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

* The calculation of VOC shall exclude water and colorants added at the point-of-sale.

Required Verification

- Specifications
 - Tabulation using the AEGB Low Emitting Materials Form
 - Product submittals and MSDS with VOC content highlighted

Strategies

- ✓ Include contract language for contractors to provide low-emitting exterior paint information in submittals.

References

Green Seal GS-11– Paints and Coatings, 2nd Edition May 12, 2008:
www.greenseal.org/certification/standards/paints_and_coatings.pdf
 SCAQMD Rule 1113 – Coatings:
www.aqmd.gov/rules/reg/reg11/r1113.pdf
 SCAQMD Rule 1168 –Adhesives and Sealants:
www.aqmd.gov/rules/reg/reg11/r1168.pdf
 Green Seal Standard for Commercial Adhesives GS-36
http://www.greenseal.org/certification/standards/commercial_adhesives_GS_36.cfm

6. Interior and Exterior Materials – Performance Options

1-3 points

Intent

Use products in construction that have environmentally preferable attributes.

Requirements (*Residential and Non-residential Uses*)

Achieve at least one attribute per material listed below:

Material	Recycled Content	Rapidly Renewable	Texas-Sourced	FSC Certified	Low-emitting / Formaldehyde-Free	Points
All cabinetry						0.5
All interior doors						0.5
All trim / molding						0.5
All studs						0.5
All flooring						0.5
All insulation						0.5

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

Required Verification

- Indicate in the matrix provided on the Worksheet tab in Rating Packet which option is chosen
- Specifications
- Submittal with selected attribute highlighted

Strategies

- ✓ Select materials that contain either or both post-consumer recycled content (PCRC) and post-industrial recycled content (PIRC).
- ✓ Select materials that have a planting – harvesting cycle of less than 10 years
- ✓ Select materials that are extracted and/or manufactured in the state of Texas
- ✓ Select materials that are Forest Stewardship Council chain-of-custody certified
- ✓ Select materials that meet standards in this Guidebook for low-emitting materials, (i.e., for materials that contain no added urea-formaldehyde reference IEQ 6c. Composite Wood and Agrifiber Products and IEQ 6d. Insulation)

References

Recycled Content Product Database from Texas Manufacturers - Clean Texas:

www.cleantexas.org/index.cfm?fuseaction=public.resources_texasrecycle

Sustainable Building Sourcebook – Austin Energy Green Building:

www.austinenergy.com/Energy%20Efficiency/Programs/Green%20Building/Sourcebook/materials.htm

EPA Comprehensive Procurement Guidelines:

www.epa.gov/cpg/

Recycled Content Product Database:

www.ciwmb.ca.gov/rcp/

FSC Certified Products Database - Certification Research Center:

www.certifiedwoodsearch.org

Forest Stewardship Council:

www.fsc.org

Greenguard IAQ Certified Products:

www.greenguard.org/

Particleboard and Medium Density Fiberboard - Green Seal Report:

www.greenseal.org/resources/reports/CGR_particleboard.pdf

Green Label Plus approved products - Carpet & Rug Institute:

www.carpet-rug.org/drill_down_2.cfm?page=8&sub=17&requesttimeout=350

Certified hard flooring – Floor Score:

www.scscertified.com/iaq/floorscore_1.html

South Coast Air Quality Management District

www.aqmd.gov/rules/reg/reg11/r1168.pdf

Cabinets Fact Sheet – Austin Energy Green Building

www.austinenergy.com/Energy%20Efficiency/Programs/Green%20Building/Resources/Fact%20Sheets/austinClimate.pdf

Fly Ash Concrete Fact Sheet – Austin Energy Green Building

www.austinenergy.com/Energy%20Efficiency/Programs/Green%20Building/Resources/Fact%20Sheets/flyAsh.pdf

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

INNOVATION

Creative, new sustainable solutions

Intent

Develop sustainable solutions that demonstrate a comprehensive approach and quantifiable environmental and /or health benefits beyond the requirements of measures defined in this program.

Requirements (*Residential and/or Non-residential Uses*)

Submit a proposal of the innovation measure to Austin Energy Green Building for approval. Include the intent of the measure, requirements for compliance, submittals to demonstrate compliance, and the design approach (strategies) that might be used to meet the requirements.

Required Verification

- Proposal of innovative measure
- Submit required documentation to demonstrate compliance.

Strategies

References

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval

APPENDIX - General Green Building Resources

IRS publications:

- *Energy Savings Modeling and Inspection Guidelines for Commercial Building Federal Tax Deductions*, 2nd edition, May 2007.

www.nrel.gov/docs/fy07osti/40467.pdf

- Notice 2006-52: *Deduction for Energy Efficient Commercial Buildings*:

www.irs.gov/pub/irs-drop/n-06-52.pdf

Energy Improvement and Extension Act of 2008 Summary including energy efficiency tax incentives for: commercial buildings, combined heat and power systems (CHP) and for plug-in hybrid purchases:

www.finance.senate.gov/sitepages/leg/LEG%202008/091708%20Staff%20Summary%20of%20the%20Energy%20Improvement%20and%20Extension%20Act.pdf

Austin Energy, Commercial and Multifamily Programs and Rebates \$:

www.austinenergy.com/Commercial/index.htm

www.austinenergy.com/Energy%20Efficiency/Programs/Rebates/Commercial/

Austin Energy Green Building:

www.austinenergy.com/go/greenbuilding

Austin Energy Green Building *Sustainable Building Sourcebook*:

www.austinenergy.com/Energy%20Efficiency/Programs/Green%20Building/Sourcebook/index.htm

Austin Environmental Directory, 2006 edition:

A sourcebook for environmental issues, products, services, and organizations in the Austin area

www.environmentaldirectory.info/Austin/

Austin Water Utility, Multifamily and Commercial Programs, Rebates \$, and *Water Efficient Equipment and Design*:

www.ci.austin.tx.us/watercon/default.htm

www.ci.austin.tx.us/watercon/downloads/EquipmentGuide.pdf

BuildingGreen, LLC:

www.buildinggreen.com

BuildingGreen publishes accurate, unbiased, and timely green design information through many publications, including Environmental Building News, the GreenSpec directory of green products, and the Building Green Suite of online tools.

Business Energy Advisor, Austin Energy and ESource:

www.austinenergy.com/Energy%20Efficiency/Tools%20and%20Tips/Commercial/energyAdvisor.htm

Center for Maximum Potential Building Systems:

www.cmpbs.org/

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Energy Design Resources:

www.energydesignresources.com

Energy Design Resources offers a valuable palette of energy design tools and resources that help make it easier to design and build energy-efficient commercial and industrial buildings in California. The goal of this effort is to educate architects, engineers, lighting designers, and developers about techniques and technologies that contribute to energy efficient nonresidential new construction.

Environmental Building News and *GreenSpec® Guide*:

www.buildinggreen.com/

<https://www.buildinggreen.com/ecommerce/gbp.cfm?>

Green Building Pages – building materials database and design tool:

www.greenbuildingpages.com

Green Building Resource Guide:

www.greenguide.com

Healthy Building Network:

www.healthybuilding.net/

Lawrence Berkeley National Laboratory *The Cost-Effectiveness of Commercial-Buildings Commissioning*:

eetd.lbl.gov/emills/PUBS/Cx-Costs-Benefits.html

New Buildings Institute:

www.newbuildings.org/

Rocky Mountain Institute:

www.rmi.org/

Smart Growth Network:

www.smartgrowth.org

Sustainable Building Sourcebook:

www.greenbuilder.com/sourcebook/

Sustainable Design Resource Guide of Colorado:

<http://www.aiasdrq.org/>

U.S. Department of Energy, Building Technologies Program Building Database: Case studies of various building types around the world with information on green building features, financial analysis, and lessons learned:

eere.buildinggreen.com/

U.S. Green Building Council:

www.usgbc.org/

Key to Required Verification

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Texas Organizations

Design-Build-Live (fka Austin Sustainable Building Coalition):
www.designbuilddlive.org

Infinite Power of TX – technology/concept fact sheets:
www.infinitepower.org

Solar Austin – advocacy group:
www.solaraustin.org/

TREIA (TX Renewable Energy Industries Assoc.):
www.treia.org

TXSES (TX Solar Energy Society):
www.txses.org

U.S. Green Building Council – Central Texas Chapter:
www.usgbc-centraltexas.org

Key to Required Verification

- Needed for Conditional Approval
- Needed for Final Approval