



Green Building Materials

Successes & Future Focus

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TO SAFELY DELIVER CLEAN, AFFORDABLE, RELIABLE ENERGY AND EXCELLENT CUSTOMER SERVICE





Background





Austin Energy Green Building (AEGB)

MISSION

To cultivate innovation in building and transportation for the enrichment of the community's environmental, economic and human well-being.

Single Family
Production & Custom



Multi-family
Residential < 7 Stories



Commercial
& Residential ≥ 7 Stories

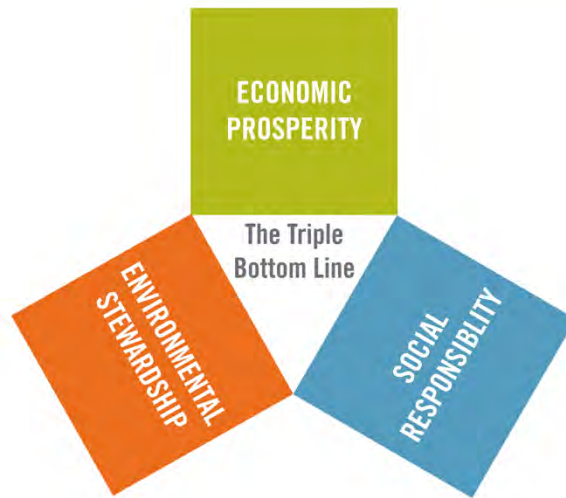


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1. The Green Building program is broken up into three different market sectors.
2. The Single Family program covers both production and custom homes.
3. The MF program covers residential construction under seven stories
4. The Commercial program covers both commercial projects and residential projects over seven stories.
5. Also pictured is our rating plaque designed by Trophyology and manufactured locally. It is constructed with sustainable materials and has a non-toxic exterior grade oil finish. Be on the lookout for this plaque around town.



Triple Bottom Line



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1. Another way this is presented is: People, Profit, Planet.
2. A project isn't truly sustainable unless it addresses all three of these factors.



AEGB Sustainability Goals

- Delay the need for new power plants, water treatment plants, waste water treatment plants and landfills
- Contribute to energy security and the success of local Climate Protection Plan
- Safeguard the local environment and air quality and community culture
- Make green building the industry standard in Austin
- Foster green material and job markets



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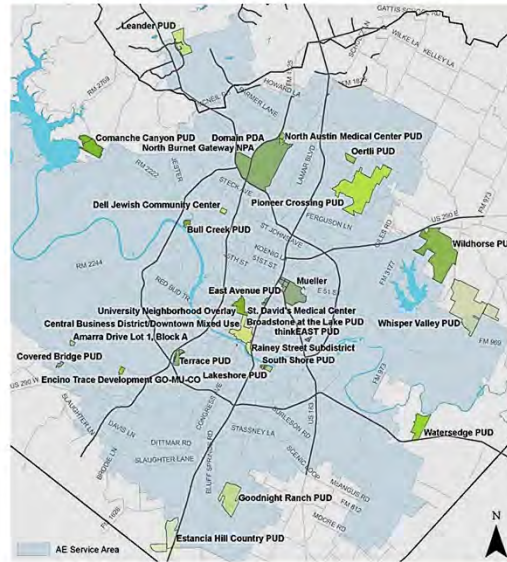
AEGB Sustainability goals demonstrate this triple bottom line approach and extend well beyond energy.



Austin Energy Green Building

Market Penetration

	Rated	Underway
Commercial		
Projects	241	88
Million (sf)	25.4	18.3
Res Units	7,878	8,335
Multifamily		
Res Units	22,927	8,994
Single Family		
Homes	13,240	850



Note the distribution of Austin Energy Green Building required areas around town. Note that the volume of work is way up compared to historic levels and that Commercial projects are larger on a square footage basis. Also, we see a lot of low and high rise multi-family construction underway now.

Codes | Ordinances | Standards | Initiatives

Climate Protection Plan, City Initiatives & Austin Energy Goals (2025)

- Imagine Austin
- Zero Waste Plan
- Watershed Protection
- Water Conservation
- Vision Zero
- 800 MW Conservation Goal with 100 MW of DR
- 950 MW Solar Goal with 110 MW of Local Solar
- 55% Renewables Goal
- 10 MW Storage Goal
- 20% Emissions Reduction



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Austin Energy Green Building points and initiatives are developed to support COA goals and initiatives such as:

Vision Zero (to eliminate pedestrian and bicycle deaths in Austin)

The Austin Energy Generation Resource Plan



Materials Successes and Future Focus

OVERVIEW

- **Sustainably Sourced Materials**
- Health
- Operational Recycling
- Construction Waste
- Urban Design
- Affordability
- Materials and the Occupant Experience



AEGB 25th Anniversary Charrette

We will now discuss 7 specific areas within the local Materials Economy where Austin Energy has seen some success, and will detail the work ahead in that area. We will begin with the topic of Sustainably Sources Materials.



Sustainably Sourced Materials

BACKGROUND

Regional

- Within Texas or 500-mile radius
- Reduced emissions from transportation
- Local/regional job creation

Recycled

- Post-Consumer has higher value than Pre-Consumer
- Less use of virgin materials
- Less waste in landfills

Both

- Manufacturer disclosure



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Building materials create environmental impact through their extraction, manufacturing, and disposal. Some of the environmental impacts associated with raw materials extraction and manufacturing include air & water pollution, habitat destruction, and soil erosion.

Two environmentally positive materials attributes that seen often in projects pursuing the AEGB Commercial rating are Regional Materials and Recycled Content. By disclosing recycled and regional information for the products, manufacturers make it easy for projects to select materials with those characteristics.

Benefits:

Reduced emissions from transportation:

- Transportation accounts for 27% of U.S. greenhouse gas emissions
- Reducing transportation can also reduce costs for fuel.

Local/Regional job creation:

- Cement and concrete industries contribute \$3.1 billion to Texas state revenue and we're one of the leading states in gypsum production for drywall.
- Studies have shown that in retail, purchases from local businesses have a greater economic impact than similar purchases from big box stores. This concept applies in materials production as well. When the money for our purchases stays in our community, we all benefit.

Less use of virgin materials, less energy use and associated emissions:

- 95% less energy to recycle aluminum than to make it from raw materials
- Recycled steel saves 60% production energy
- Using scrap steel instead of virgin ore takes 40% less water and creates 97% mining waste
- Reduces environmental impact from resource extraction like mining and deforestation – impacts include air/water pollution, habitat destruction, soil erosion.

Less waste in landfills:

- Better use of resources.



Sustainably Sourced Materials

SUCCESS

Recycled Content	Texas-Sourced
<ul style="list-style-type: none">• Concrete• Steel• Insulation• Drywall• Flooring• Tile• Restroom Partitions• Acoustic Tile	<ul style="list-style-type: none">• Concrete• Steel• Brick/Stone• Aluminum Storefront• Drywall• Tile• Landscaping Materials

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This slide lists typical examples of Recycled and Texas Sourced Materials:

- Concrete and Steel are highlighted in bold text because it's very easy to find regional sources for these materials in Central Texas, and in the case of steel, we're also likely to see high recycled content options.
- We need to encourage similar success for other materials, in terms of both materials availability and manufacturer disclosure. This is especially needed for finish materials. At the same time, it is also important to create new opportunities to improve the environmental impact of materials like concrete and steel that are the standards for Recycled and Regional content.

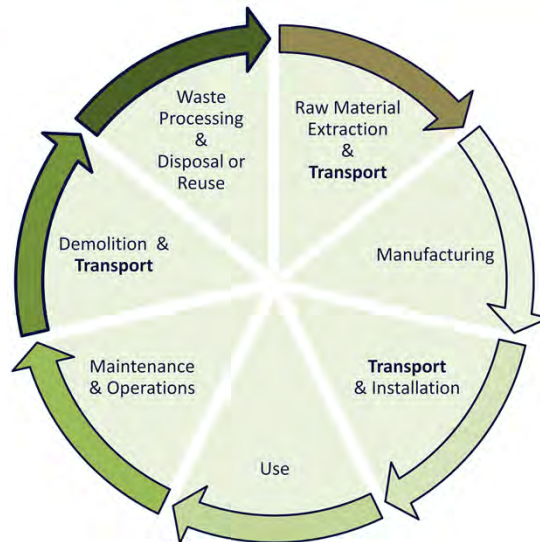


Sustainably Sourced Materials

FUTURE FOCUS

Materials Life Cycle

- Greenhouse gases
- Ozone depletion
- Acidification
- Eutrophication
- Tropospheric ozone
- Non-renewable energy sources



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This diagram shows the basic components of the life of a material and lists typical environmental impacts assessed through life cycle analysis. Each life cycle phase has its own inputs and outputs in terms of resource use and environmental impact.

Life cycle analysis is the compilation and evaluation of the inputs and outputs and potential environmental impacts of a product or building throughout its life cycle.

- Life cycle analysis is important because it is a tool that measures many environmental impacts throughout the life of a material and can tell us more about the environmental impact of materials than can be conveyed through individual traits like recycled or regional content.
- Life cycle analysis doesn't always take into account health impacts of materials

Transportation comes up frequently in the materials life cycle. Moving from regionally sourced materials to locally sourced materials (100 mile radius) can help to decrease the environmental impact from materials transport.



Continuing to think in terms of materials life cycle, it's important to select materials that encourage manufacturer responsibility at the beginning and end of a product's life.

At the beginning of life, we can prioritize materials that have independent third party certification for their source

- One example of third party certification for materials is wood certified by the Forest Stewardship Council and other organizations
- Similarly, non-wood bio based products can be grown on farms that have been certified by the Sustainable Agriculture Network
- Examples of bio-based, farm-grown materials that can be used in buildings include straw, cotton, and rubber

At the end of life, it's important to choose materials with a manufacturer that takes extended responsibility by participating in a product take-back program, either recycling their own products or by using a third party program.

- We know that that influencing manufacturers to take responsibility for their products can be effective. Many states have laws requiring producers to take back various types of products, with the best example being beverage container recycling.

Finally, we can continue to support reuse of materials and whole buildings.



Professionals in the design & building trades typically have a lot of factors to consider when choosing materials. For example: budget, schedule, health, maintenance, etc.

When manufacturers are more transparent about their processes, and provide information in consistent formats, project teams can better prioritize their purchases to match their sustainability objectives.

Third Party Verification and standard reporting formats are two important components in improving manufacturer disclosure.

Third Party Verification is important because it reduces green washing and can help support consistent reporting of information.

- The office in this slide is the ASSA ABLOY headquarters here in Austin. ASSA Abloy manufactures door hardware and participates in the Declare product declaration program that uses third party assessment and provides detailed information about materials used to manufacture their products.

Standardized Reporting frameworks help create a consistent format for communicating about materials.

An established standard format is the Safety Data Sheet (formerly Materials Safety Data Sheet or MSDS)

Environmental Product Declarations and Health Product Declarations are examples of two standardized formats that are gaining popularity.

- Environmental Product Declaration (EPD): a verified standardized way of communicating and comparing the environmental impacts, such as energy, water, and transportation associated with manufacturing a product
- Health Product Declaration (HPD): an ingredient inventory that lists all of the ingredients of a finished product and the associated health information.



It's also important to encourage manufacturers to disclose raw material source locations and commitments to long-term ecologically responsible land use and reducing environmental harms from extraction and/or manufacturing processes

Similar to reporting on materials, this disclosure should be based on standard frameworks for Corporate Sustainability Reports (see examples below) and manufacturers should be encouraged to engage independent third party verification.

- Global Reporting Initiative (GRI)
- Organisation for Economic Co-operation and Development (OECD)
- UN Global Compact: Communication of Progress
- ISO 26000: 2010 Guidance on Social Responsibility



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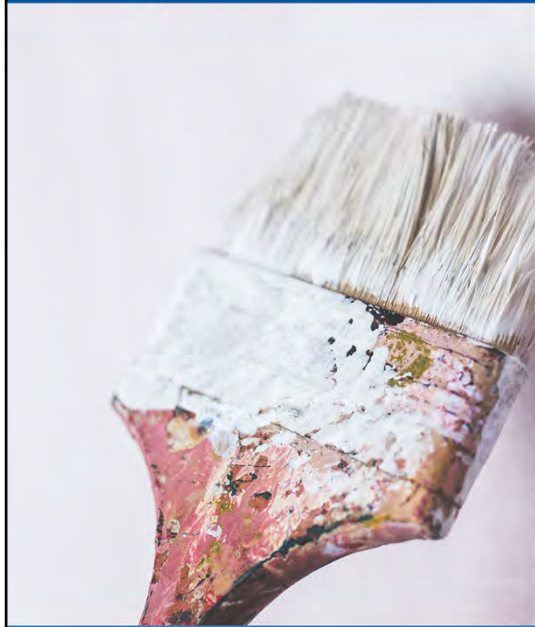
AEGB 25th Anniversary Charrette

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Next we will discuss the topic of health.



Health



BACKGROUND

- Chemicals with known health risks are found in many parts of the built environment
 - VOCs in paint
 - Formaldehyde in woodwork
 - PVC and BPA in plastics
 - Halogenated flame retardants in furniture
- The health effects include asthma, endocrine and reproductive system disruption, and cancer
- Poor air quality also leads to reduction in productivity

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According to the EPA, we spend 90% of our time indoors.

Recognize that indoor air quality can affect human health.

Short-term effects include Headaches and dizziness

Reduced cognitive function leads to reduced productivity

However, we have known for some time that the chemicals contained in many of the materials used to create our built environment have detrimental health effects in humans.



Health

SUCCESS

- Development of standards with VOC limits
- Zero VOC Paints
- Low VOC options for many categories
- Formaldehyde-free Cabinetry and Furniture
- Easy to find and no added cost



Foundation Communities
Bluebonnet Studios
★★★★★

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The first step in reducing the amount of harmful chemicals in our materials was to create testing standards and guidelines, and certifications

South Coast Air Quality Management District (SCAQMD) Rules 1113 and 1168

California Department of Public Health (CDPH) Standard Method v1.1-2010

ANSI/BIFMA Standard Method M7.1-2011

Also includes emissions evaluation

Greenguard, SCS Indoor Advantage, FloorScore

AEGB has basic requirement for low VOC paints and coatings

“In 2010, consumer products are projected to account for about 250 tons per day (tpd) of VOC emissions, which is about 12 percent of the total VOC emissions statewide. If consumer products had never been regulated, we calculate emissions would have exceeded 450 tons per day by 2010.”

VOC content of standard paint is 200 g/L. Market contains many 0 g/L paint. This is truly a market transformation, led by people who were concerned for the health of their families. Industry has been able to remove formaldehyde from wood products.



Health

FUTURE FOCUS

Expanded Lists of Chemicals of Concern



INTERNATIONAL
LIVING FUTURE
INSTITUTESM



TRANSPARENCY.PERKINSWILL.COM

Declare.

CECO Door Regent/Omega Honeycomb
Core Steel Door
ASSA ABLOY

Final Assembly: Milan, TN, USA
Life Expectancy: 30 Years
End of Life Options: Recyclable (99%), Salvageable/
Reusable in its Entirety, Take Back Program

Ingredients:

Steel; Kraft Paper; Henkel 318B Water Based
Adhesive; Resin (Polymer With Phenol),
Toluene, Zinc Oxide, Diethanolamine, Water;
Henkel 563R Adhesive Primer; Acetone,
Solvent Naphtha (Petroleum, Light Aliphatic),
Heptane, N-Hexane, Toluene, Phenolic Resin,
Cyclohexane, N-Heptane, Magnesium Oxide,
Zinc Oxide, Resin; Gray Primer; Ethylene
Glycol Monobutyl Ether, Diethylene Glycol
Butyl Ether, Carbon Black, Titanium Dioxide,
Talc, Limestone, Water, Alloy Resin, Acrylic
Resin; #3500 Epoxy Part A: Bisphenol A -
Epichlorohydrin Polymer; #3500 Epoxy Part
A: Bisphenol A - Epichlorohydrin Polymer,
Amorphous Fumed Silica, Calcium Carbonate;
#3500 Epoxy Part B: Triethylenetriamine,
Kaolin, Amorphous Fumed Silica

Living Building Challenge Criteria:

ASA-1006	Exp. 09/01/2017
VOC Compliant: N/A	VOC Emissions: CDPH Compliant
Declarative Status:	<input type="checkbox"/> LBC Red List Free
	<input type="checkbox"/> LBC Compliant
	<input checked="" type="checkbox"/> Declared

INTERNATIONAL LIVING FUTURE INSTITUTE

Although there are many entities that are concerned with health and the built environment, two leaders have been the International Living Future Institute and Perkins+Will.

Perkins+Will is an architecture firm that has a focus on healthcare, and other vulnerable populations.

- Created Precautionary List of chemicals with known harmful effects, Asthma Triggers, and Flame Retardants

- Nearly 100 chemicals

International Living Future Institute

- Organization that oversees the Living Building Challenge, which is another rating system, but that goes beyond reducing harm and aims to promote good, and in this case improve health.

- Also oversees the Declare product database.

- Transparency

- What is in it, where it comes from, what to do with it at the end of its life

- Maintains Red list of over 815 chemicals



Red List Chemicals

- P-(1-Methyloctyl)Phenol
- 4-(1-Ethyl-1,3-Dimethylpentyl)Phenol
- P-Isononylphenol
- Polyethylene Glycol Mono(Branched P-Nonylphenyl) Ether
- 4-T-Nonylphenol Diethoxylate
- Nonylphenol Phosphite (3:1)
- 2-Nonylphenol
- 3-Nonylphenol
- Nonylphenol (Mixed Isomers)
- Cadmium Oxide
- Cadmium Sulfide
- Cadmium Hexafluorosilicate
- Tris(2-Chloroethyl) Phosphate (Tcep)
- Dechlorane Plus (Dp)
- Tris(1-Chloro-2-Propyl)Phosphate (Tcpp, Tmcp)
- Chlorinated Tris (Tdcp, Tdcp)
- 1,3-Dichlorobenzene
- 1,1,3-Trichloro-1,2,2,3,3-Pentafluoropropane (Cfc-215)
- 1,1,1,3-Tetrachloro-2,2,3,3-Tetrafluoropropane (Cfc-214Cb)
- Tetrachlorotetrafluoropropane (Cfc-214)
- Tetrachlorobenzene
- Hexachlorodifluoropropane (Cfc-212)
- 4-Nonylphenol (Linear)
- 4-(1-Ethyl-1,4-Dimethylpentyl)Phenol
- 1,2,3,4-Tetrachlorobenzene
- Barium Chromate
- Chromium (VI) Oxide
- Basic Lead Chromate
- Barium Dichromate
- Zinc Chromate
- Calcium Chromate
- Melamine Formaldehyde
- Urea Formaldehyde
- Sodium Polynaphthalenesulfonate
- Formaldehyde Cyanohydrin
- Formaldehyde, Polymer With Phenol, Potassium Salt
- 4-Toluenesulfonamide Formaldehyde
- Resorcinol Formaldehyde
- 2,2',4,4',6-Pentabromodiphenyl Ether (Bde-100)
- 2,2',3,4',5,6'-Heptabromodiphenyl Ether (Bde-183)
- Tris (Tribromoneopentyl) Phosphate
- 2-Hydroxy-Propyl-2-(2-Hydroxy-Ethoxy)-Ethyl-Tbp
- Copper (exterior)
- Polystyrene
- Neoprene
- Chlorendic Acid



Biophilia: Human's connection to nature



Idea that connects human biology to the built environment. Humans have a positive neurologic/psychologic response to natural elements that can be incorporated into the built environment.

Comes from the idea that environment that humans evolved in was not concrete skyscrapers, but out in nature instead.

Currently rating systems recognize a few specific aspects of biophilia. Providing a view to the outdoors allows some connection to nature – in that you can see it. But even that connection provides some benefit.

Now we have a system that highlights ways architects and engineers can bring nature into buildings:

- Dynamic & Diffuse Light
- Non-rhythmic sensory stimuli
- Biomorphic forms & patterns

Health benefits:

- Lowered blood pressure and heart rate
- Reduced stress hormones
- Improved alertness and concentration
- Positive cognitive performance
- Better memory retention
- Reduced boredom
- Increased tranquility and happiness

Also, by using natural elements in the design, reducing the amount of chemicals



Another way buildings can help improve health is through increased physical activity. Here the progression has been from designing buildings to provide alternate ways to getting to the building – providing showers and bicyclist parking spaces for those who can ride their bikes – to providing human activity within the building.

Design for Active Occupants credit

Designing an engaging stairway with good lighting or artwork

Visible before an elevator is visible

Exercise room

In Restoration Hardware, there are no cashiers, employees are on their feet, have mobile ordering and pay stations



Health

FUTURE FOCUS

Buildings that Support Human Health

Seton Healthcare Family
Dell Children's Medical Center
★★★★★



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Materials Successes and Future Focus

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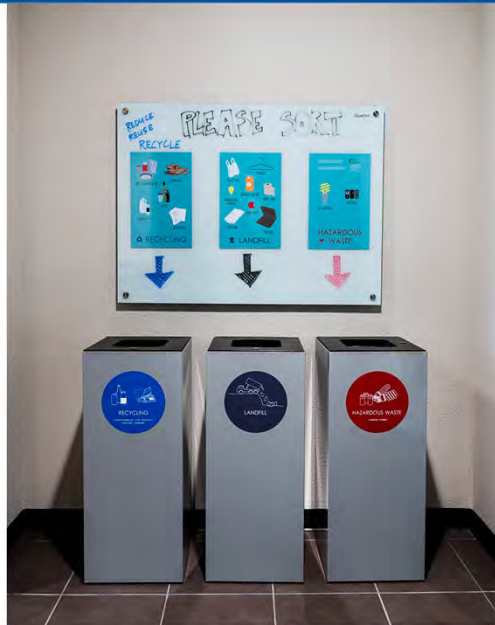
Next we will discuss Operational Recycling.



Operational Recycling

BACKGROUND

- Required since inception
- Projects must design for collection and storage
- 2010: Recycle four or more material types & compost
- 2011: ARR rolls out the Universal Recycling Ordinance
- 2013: Added requirements for lamps and batteries



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Recycling for Commercial Buildings in Austin is a relatively new thing. Austin's Zero Waste Plan was adopted in 2010 and starting in 2012, the ordinance began effecting large commercial buildings. Prior to that, recycling was voluntary for Commercial Buildings and wasn't very common. Austin Energy Green Building, however has been requiring operational recycling for buildings since our program's inception. Specifically, we have been requiring that projects consider where and how waste is generated. How much waste is generated and how much space is required to store it? Who is responsible for moving waste from collection points to pick up points and how often does that occur? How could thoughtful design help promote reduced waste and increased cleanliness?

Current AEGB requirements for operational recycling includes collecting lamps and batteries in an effort to help prevent heavy metals from polluting our local soil and water.



Operational Recycling

SUCCESS

- AEGB piloted an initiative for the City of Austin
- AEGB worked with ARR to develop requirements
- ARR rolled out requirements incrementally
- ARR now enforcing requirements

The ordinance requires affected property owners to provide:

- 

1. Recycling services for plastics #1 & #2, paper, cardboard, glass and aluminum
- 

2. Sufficient capacity and convenient location
- 

3. Informational signage in English and Spanish
- 

4. Regular tenant and employee education
- 

5. Annual Recycling Plan Forms

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Austin Energy Green Building considers the implementation of local recycling mandates to be one of our biggest local successes and a great demonstration for Austin Energy can work best for the City

AEGB piloted commercial recycling initiatives for COA in our rating. We developed local education programs, and our projects created the local demand for recycling services. Small businesses developed and grew to meet demand, and continued to grow with the market when Austin Energy Green Building requirements became a local code requirement. We saw haulers start with just a few employees and a pick up truck grow into large companies. Buildings now have many choices when it comes to recycling services in Austin and our work in this area has come a very long way.

When Operational Recycling comes up in Austin Energy Green Building meetings now, it is a very different conversation than the one we were having 5 years ago.



Operational Recycling

FUTURE FOCUS

- Zero Waste Business Certification
(through Zero Waste™ or other)
- Distributed/On-Site Recycling (i.e.: compost, take backs)



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Areas for Future Focus:

Operational Zero Waste Certifications such as the USGBC's "Zero Waste"
Distributed On-Site Recycling Opportunities such as on-Site Composting at Commercial Buildings
Or Take-Back Programs- for items like pallets.



Operational Recycling

FUTURE FOCUS

Zero Waste Operations



*Will Work for Food
House Pizzeria*
★ ★ ★ ★

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Opened 9 years ago- Zero Waste Operations since day one- designed to prevent waste: Uses a single 96 gallon residential trash bin for all landfill waste- usually less than half full- waste collected in restrooms.

The restaurant purchasing policy that prefers package free, reusable, or recyclable packaging (Example: kegged beer preferred over cans or bottles). Filters and carbonates water on site to prevent shipping and purchasing of water.

The employees have learned from the philosophy- they take what they have learned home.



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AEGB 25th Anniversary Charrette

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Next we will cover Construction Waste.



Construction Waste

BACKGROUND

- Required since inception
- 2003: Required 50% diversion
- 2009: LEED Regional Priority Credit
- 2013: At least four materials
- 2016: Implementation of Construction & Demolition Recycling Ordinance



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“Construction and demolition waste constitutes about 40% of the total solid waste stream in the United States.”

This is another story where AEGB was ahead of its time- requiring projects consider construction waste recycling and reuse for the past 25 years.

When these requirements were first implemented, staff spent a lot more of our time in dumpsters, performing on-site bin inspections.

When construction lot lines became too tight for on-site sorting, Austin Energy leased property to one of the original local off-site sorters.

Things changed a lot in 2009 when the local USGBC made 75% diversion a regional priority credit- upping the local incentives and creating additional market demand for Construction Waste diversion.

In 2013 we added the 4-material requirement- because recycling steel, asphalt, concrete and cardboard is frankly too easy, and we need to add increased pressure to address recycling drywall and wood (more difficult waste streams).

In 2016 the Construction and Demolition Recycling Ordinance took effect and we look forward to working with ARR to address any issues that come up with enforcement.



Construction Waste

SUCCESS

- More than 305k tons diverted
- Averaging +80% diversion
- Competitive market with job creation



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305k tons diverted doesn't include SF and MF



Construction Waste

FUTURE FOCUS

- New metrics: #/sf in lieu of %
- Prioritize salvage and reuse over recycling
- Waste reduction through planning and design
- Beyond structural and enclosure materials
- Independent third-party verification



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Our future focus:

defining new goals with new metrics- We hope that we can reduce the total amount of waste being generated per square foot and do a better job of prioritizing salvage.

We need increased educational efforts:

- to help designers consider standard dimensions to eliminate waste and work
- with contractors prevent on site waste do to poor habits and improper storage

We need to address more difficult to recycle waste streams- so working on the materials marketplace at events like these.

And perhaps some of most of the exciting work is creating a market demand for recycling transparency through promoting projects that elect recycling facilities that have independent 3rd party verification. If we can create market demand for audited services, we are asking for the type of transparency Mary mentioned in her slides.



Padrón Elementary School is the District's largest elementary school and the first adaptive reuse project undertaken by the District. In addition to its AEGB 4-Star Rating the project also achieved a LEED® (Leadership in Energy and Environmental Design) for Schools Gold Certification.

Large outdoor loading dock areas have been adapted to shading outdoor dining and play spaces that allows students to be outdoors during inclement weather in ways that is not possible elsewhere.

BUILDING REUSE REDUCES:

Site disturbance
Cost for demolition and construction
Waste in landfills
Energy used for recycling
Use of virgin materials

Building Reuse

Former Warehouse

Recycled Materials

Steel: Rebar, Structural, Light-Gauge Framing, Ceiling Tile Suspension, Hollow Metal Doors and Frames
Insulation: Polyisocyanurate and Fiberglass Batt
Fiberglass Skylights
Aluminum Curtain Wall

Regional Content

Concrete
Steel: Rebar and Light-Gauge Framing
Brick
Concrete Masonry Unit (CMU)
Roof Board (concrete)
Drywall
Insulation: Fiberglass Batt and Sprayed Cellulose
Aluminum Curtain Wall

Recycled and Texas-Sourced Materials

- Reinforcing Steel: 80% Post-Consumer, 20% Pre-Consumer
- Structural Steel: 75% Post-Consumer, 15% Pre-Consumer
- Polyisocyanurate and Fiberglass Batt Insulation: 16.9% Post-Consumer, 9.6% Pre-Consumer
- Fiberglass Batt Insulation: 41% Post-Consumer, 24% Pre-Consumer
- Fiberglass Skylights: 11.0% Post-Consumer, 32.3% Pre-Consumer
- Hollow Metal Doors and Frames: 53.7% Post-Consumer, 6.8% Pre-Consumer
- Aluminum Curtain Wall: 10/20%



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AEGB 25th Anniversary Charrette

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Next we will discuss Urban Design



Outside of buildings, it is also important to consider the impact of landscape materials, including living materials like plants/trees, that make up our urban environment.

Urban sprawl results in asphalt surface parking, and with it:

- Increased heat island effect
- Increased run-off that contributes to flooding
- Not very much plant life in this landscape – As mentioned in earlier slides, biophilia has many positive benefits and this is the opposite of a biophilic landscape. It's ugly, has no shade, and it doesn't foster pedestrian transportation.



By allowing parking reductions and creating incentives for dense development, the City of Austin has encouraged parking structures instead of surface parking.

Asphalt surface parking replaced by structured parking reduces:

- stormwater runoff
- heat island effect
- When the structure includes options for ground floor retail, it fosters a safer pedestrian environment by creating walkable streetscapes and promoting more 'eyes on the street'.

Designing parking structures for reuse also creates opportunities for reuse of the structure instead of demolition.



Continued improvement in public transportation and bicycle/pedestrian access (especially safe routes for bicycles and pedestrians) will allow building projects to reduce or eliminate parking – advancing the same benefits that come from reducing surface parking, **with the added benefit of healthier, more affordable transportation options**



- City of Austin requires urban tree preservation and planting of trees
- Watershed protection requires native/adapted and drought-tolerant species to foster a healthy, resilient landscape



Austin has a toolkit of stormwater management controls that focus on reducing flooding and protecting water quality.

- Landscape integrated stormwater features, like the Mueller Lake Park shown in the slide, are both a success and an area where we can improve by continuing to integrate stormwater management into our landscape.
- It's also important to take measures to curb heat island effect and stormwater runoff at both neighborhood scale AND at the scale of individual sites and buildings



Continue to find opportunities to increase planted area in denser areas by layering landscape elements such as ground-cover and trees and incorporating vegetated roofs and walls.

Improve landscape health by providing adequate soil:

- Making sure that it's high quality and regionally appropriate, and also providing adequate depth and volume to support trees.
- Structural Soil Cell Systems to protect roots by reducing soil compaction from vehicle traffic



Materials Successes and Future Focus

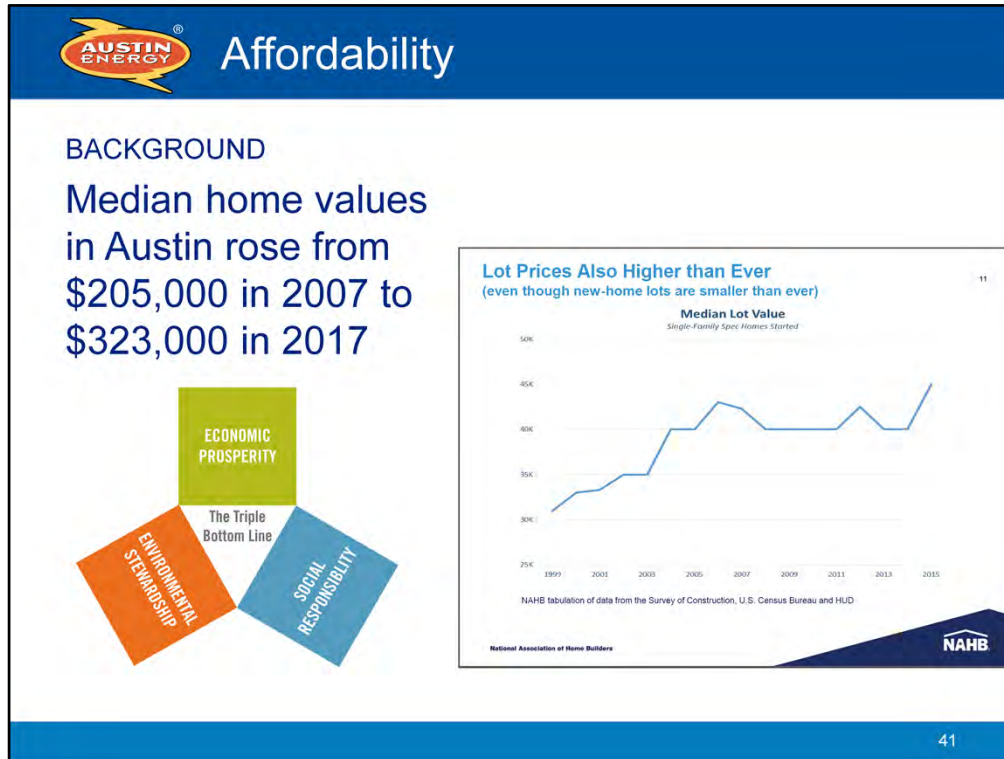
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Next we will discuss Affordability



[Austin Named #1 Best Place to Live in the USA](#) (U.S. News and World Reports, February 2017)

[Austin Named No. 2 'Sweet Spot' for Affordability and Job Opportunity](#) (LinkedIn, March 2017)

Factors affecting increase in prices

- Shortage of workers

- Lot prices increasing

The initial home purchase price is not the only factor in determining affordability. You have to be able to afford to live in the home as well.

Triple Bottom Line

- Not upholding the economic prosperity component of the triple bottom line if people cannot afford to live in their homes

- Not upholding the social responsibility component of the triple bottom line



Affordability

SUCCESS

- S.M.A.R.T. Housing program requires participation in AEGB program.
- Green building is key to affordable housing. Home utilities and transportation must be affordable.



*Foundation Communities
Homestead Oaks*

★★★★★

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1. Green Building can be part of the answer to more affordable housing in Austin.
2. Green Building is key to being able to live in the home. Improved energy efficient HVAC and lighting can lead to lower utility bills.
3. Improved Indoor Air Quality can also lead to less poor health effects and perhaps even trips to the doctor.
4. Building with materials that can be cleaned and have high durability means that you are renovating less often.
5. The SMART Housing program – which stands for Safe, Mixed-Income, Accessible, Reasonably-priced, Transit Oriented – started in 2001 and is designed to stimulate production of housing for low to moderate income residents in Austin. In exchange for designating a certain percentage of the dwellings as SMART housing, developers can get certain bonuses, such as fee waivers and fast-track reviews. By having this designation, the city is recognizing that sustainability and energy efficiency play major roles in the cost of living.
6. The 'T' in SMART housing means that these apartments have access to public transportation. Not only are you eliminating a car payment, but you are reducing the amount of greenhouse gases released by most vehicles.



Co-working locations offer office space that doesn't have to be dedicated to a single person.
Ride sharing also offers transportation options without having to own a car.

AUSTIN ENERGY Affordability

*City of Austin and Catellus
Mueller Row Homes*
★ ★ ★


FUTURE FOCUS
Shared Walls Reduce Materials and Cost

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Looking forward, there are many more opportunities to provide affordable housing. Row houses offers a way to reduce the amount of materials used, and can reduce labor costs.

Also, there is less heat gain, which can lead to lower energy use.

The Mueller Development was a great opportunity that the City of Austin had to provide a neighborhood in a closely urban setting. By providing more dense housing, we can accommodate more people in a space. There is a diverse mix of housing options at various price points.



Affordability

FUTURE FOCUS

Shared Yards Reduce Cost

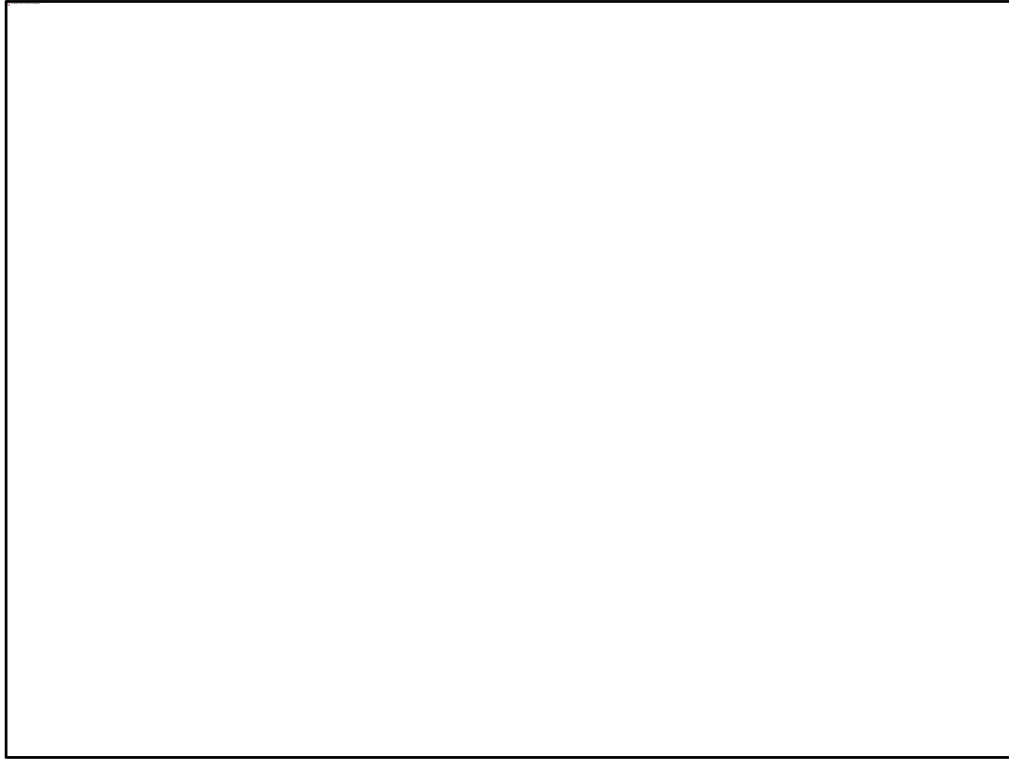
*City of Austin and Catellus
Mueller Garden Homes*
★★★★★

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The Garden Court Homes in Mueller concept places houses around a central shared lawn area.

The amount of open space is maximized per home.

A sense of community is also increased because people are more likely to see each other.



Shared pools, playgrounds, and community gardens allow people access to these features without having to own them.
Operational and upkeep costs are shared.



Materials Successes and Future Focus

OVERVIEW

- Sustainably Sourced Materials
- Health
- Operational Recycling
- Construction Waste
- Urban Design
- Affordability
- **Materials and the Occupant Experience**

AEGB 25th Anniversary Charrette

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Finally, Materials and the Occupant Experience



Materials & the Occupant Experience

BACKGROUND

Attempts to qualify human comfort have progressed from

- Subjective
- Prescriptive
- Performance



Cattleman Drive House

★★★★★

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Desire for Subjective Outcomes:

- Beauty
- Durability
- Clean-ability
- Comfort

FUTURE FOCUS

- Employee productivity and wellness
- Lighting and Acoustics



Materials & the Occupant Experience

SUCCESS

Beauty – Living Building Challenge

Beauty and spirit

The project must contain design features intended solely for human delight and the celebration of culture, spirit and place.

Inspiration and education

Educational materials about the operation and performance of the project must be provided to the public to share success and motivate others. Areas of the project must be open to the public at least one day per year.



Living Building Challenge petals.

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Living Building Challenge

- Further definition for the desired outcomes

AUSTIN ENERGY Materials & the Occupant Experience

FUTURE FOCUS
Prescriptive Approach: Biophilic Design

14 PATTERNS OF BIOPHILIC DESIGN FOR HEALTH AND WELL-BEING IN THE BUILT ENVIRONMENT

NATURE IN THE SPACE

1. Visual Connection with Nature
2. Non-Visual Connection with Nature
3. Non-Rhythmic Sensory Stimuli
4. Access to Thermal & Airflow Variability
5. Presence of Water
6. Dynamic & Diffuse Light
7. Connection with Natural Systems

NATURAL ANALOGUES

8. Biomorphic Forms & Patterns
9. Material Connection with Nature
10. Complexity & Order

NATURE OF THE SPACE

11. Prospect
12. Refuge
13. Mystery
14. Risk/Peril

TERRAPIN



Seton Healthcare Family
 Dell Children's Medical Center
 ★ ★ ★ ★ ★



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Prescriptive requirements such as Terrapin's 14 Patterns of Biophilic Design provide great design tools to achieve desired outcomes

Image of Dell Children's Hospital Healing Gardens

 Materials & the Occupant Experience		
	AIR	Quality standards including filtration, cleaning protocols, microbe control, material safety
	WATER	Testing and monitoring to control public water additives and system contaminants
	NOURISH- MENT	Promotion of healthy food options, nutrition labeling, safe food preparation and sourcing
	LIGHT	Glare free and circadian lighting design, effects of surfaces & contrast, light quality, daylighting
	FITNESS	Active design, enhanced ergonomics, activity incentives, and structured fitness programs
	COMFORT	Physical and visual ergonomics; thermal, olfactory, and acoustic comfort
	MIND	Organizational policies and transparency, biophilic design, flexible and adaptable spaces
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Well goes further with these prescriptive requirements to ensure design for occupant wellness and productivity



Outcome/performance based approaches to allow all buildings (not just new construction) to participate in this effort and identify deficiencies.



*Serving the City of Austin
for over 25 years*





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Thank You!