What is Good Housing Design

SAM RASHKIN
Chief Architect
Building Technologies Office
Zero is the Future:
What, Why, and How
Signs Zero is Here: ZERH Growth
1000's Certified Homes
10,000+ Homes in Pipeline
~400 Builder Partners
Fully Vetted National Program Requirements
Marketing/Sales Resources
Technical Resources
Signs Zero is Here: States with ZERH
Signs Zero is Here: Zero Residential Unit Growth

Source: “To Zero and Beyond, Zero Energy Residential Buildings Study, 2016 Inventory of residential projects on the path to zero in the U.S. and Canada, Net Zero Energy Coalition, June 2017, call with Shipa Sankaran, February 16, 2018
Signs Zero is Here: Zero Residential Unit Growth

Zero net energy home construction increases 75% from 2016 to 2017

New industry report examines energy-efficiency investments by builders

A new industry report from international research firm Parks Associates shows that construction of zero net energy (ZNE) homes increased by 75% from 2016 to 2017. According to Home Energy Management: Road to Net Zero, this growth aligns with increases in expressed consumer demand, as Parks Associates’ consumer segmentation regarding energy efficiency estimates 42% of all U.S. consumers classify as energy-efficient techies.
Signs Zero is Here: Builder Commitments

Built or Plan to Build a Net Zero, Near Net Zero, or Net Zero Ready Home

Source: Dodge Data & Analytics, October 2017
Mayors from 19 cities around the world signed a pledge to enact regulations and/or planning policy to ensure new buildings operate at net zero carbon by 2030 and all buildings by 2050.

Source: Smart Energy Decisions, August 28, 2018
A NEW METRIC FOR TRACKING ENERGY CODES DRIVING TOWARD ZERO

October 10, 2017 / Zero Net Energy / Energy Codes

ACEEE’s 2017 State Energy Efficiency Scorecard was released in late September with Massachusetts leading based on six categories including utility programs, transportation, building energy codes, combined heat and power, state initiative and appliance standards, according to ACEEE. Looking ahead, there are changes afoot for the 2018 Scorecard ranking methodology that will incorporate a new metric: the zEPI Jurisdictional Scores.
Zero Context: Rigorous Codes

EUI
(1975 = 100)

Improve in Code
(1975-2015)

Risk Zone

Risk 1: Water Protection

Colder Surface

More Efficient Enclosure

Cold Side

Less Efficient Enclosure

Warm Side

Thermal/Air Flow

> Moisture:
  • Small Drying Potential
  • Large Wetting Potential

< Moisture:
  • Large Drying Potential
  • Small Wetting Potential
Risk 1: Ensured Comfort

More Efficient Enclosure

Thermal/Air Flow

Less Efficient Enclosure

Cold Side

Small Loads:
- Small Air Flow
- Long Swing Seasons

Big Loads:
- Large Air Flow
- Short Swing Seasons
Risk 3: Indoor Air Quality

More Efficient Enclosure

Cold Side

Less Efficient Enclosure

Thermal/Air Flow

Less Dilution

More Dilution
What is Zero: Risk Management

- Resilience
- Water Conservation

- Optimized Enclosure
- Efficient Components
- Water Protection
- Ensured Comfort
- Indoor Air Quality
- Solar Ready

Energy Efficiency

Performance

Zero Ready
What is Zero: 2025 Vision

- Natural Comfort Design
- Smart Grid Interactive Home
- Smart Comfort w/Onboard Diagnostics
- Solar Electric Zero Energy
- Electric Vehicle Charging
- Renewable Energy
- Advanced Thermal Protection Construction
- Ultra-Efficient Windows
- Battery Storage
- Disaster Resilient Design
- Comprehensive Indoor Air Quality Measures
- Smart Home Controls and Dashboard
- What is Zero: 2025 Vision

Why Zero: Superior Homebuyer Experience

• Better Experience
  – Health
  – Comfort
  – Peace-of-Mind
  – Quality
  – Future Ready

• Lower Ownership Cost
  – Monthly Cash-Flow
  – Maintenance Expenses
  – Health Expenses
Why Zero: Superior Builder Experience

• **Greater Customer Satisfaction**
  – Better Living Experience
  – Lower Ownership Costs

• **Less Liability**
  – Customer Service Costs
  – Quality Management (3rd party verification)

• **Market Differentiation**
  – Zero Leadership
  – New Sales Force (homebuyers)
Why Zero: Superior Societal Experience

~$150 Billion Utility Bill Savings

~1 Million Job-Years of Work

~1,100 MMTCe <Carbon Emissions = Cleaner Air/Water

~$Billions Local Government Revenue

* Impacts based on internal DOE analysis assuming 30% high-performance new homes by 2030
How Zero: Integrate with Disruption Ahead

• 3 New Realities
• 5 Housing Crises
• 3 Housing Disruptions

Subject for Another Time
Zero is a Superior Consumer Experience…. 

- $100,000+ Savings
- Cozy Indoors
- Total Comfort
- Healthy Living
- Peace-of-Mind
- Quality Assurance
- Enhanced Future Value
…But It’s Not Enough!
Zero Energy Ready Home Builders
Executive Workshop:

Module 2: Design Experience

Sam Rashkin
Module 2 – Design Experience

Optimizing Housing Design

**What**

- Optimize Location
- Optimize Nature
- Optimize Space
- Optimize Form
- Optimize Function

**How**

- Fit to Site
- Natural Comfort
- Right Size Right Way
- Architectural Integrity
- Integrated Systems

**Why**

How You Live Matters
- Outside
- Inside
- Details
<table>
<thead>
<tr>
<th>Fit to Site</th>
<th>5 Concepts</th>
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<tbody>
<tr>
<td>Natural Comfort</td>
<td>5 Concepts</td>
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<tr>
<td>Right Size, Right Way</td>
<td>2 Strategies – 10 Concepts</td>
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<tr>
<td>Architectural Integrity</td>
<td>3 Concepts</td>
</tr>
<tr>
<td>Integrated Systems</td>
<td>12 Systems in 3 Groups</td>
</tr>
</tbody>
</table>
Fit to Site: 5 Concepts

1. Optimized View
2. Effective Drainage
3. Regionally Appropriate Materials
4. Regionally Appropriate Resilience
5. Community Connection

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Falling Water – Fit to Site?

Fit to Site

- Natural Comfort
- Right Size, Right Way
- Architectural Integrity
- Integrated Systems
Philip Johnson Glass House – Fit to Site?

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Optimized View Created

Fit to Site

- Natural Comfort
- Right Size, Right Way
- Architectural Integrity
- Integrated Systems
Effective Drainage Ignored

Fit to Site

Natural Comfort

Right Size, Right Way

Architectural Integrity

Integrated Systems
Effective Drainage Ignored

Fit to Site

Natural Comfort

Right Size, Right Way

Architectural Integrity

Integrated Systems
Regionally Inappropriate Materials

Fit to Site
- Natural Comfort
- Right Size, Right Way
- Architectural Integrity
- Integrated Systems

Santa Fe, NM
Regionally Appropriate Materials

Fit to Site

Natural Comfort
Right Size, Right Way
Architectural Integrity
Integrated Systems

Santa Fe, NM
Regionally Inappropriate Materials

Ceramic Tile Roof in Cold Climates

Fit to Site
- Natural Comfort
- Right Size, Right Way
- Architectural Integrity
- Integrated Systems
Regionally Inappropriate Materials

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Melbourne, Australia
Regionally Appropriate Materials

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Bermuda
Regionally Inappropriate Resilience

Fit to Site

Natural Comfort

Right Size, Right Way

Architectural Integrity

Integrated Systems

Oakland Hills, CA Fire Storm - 1991
Regionally Appropriate Resilience

Fit to Site

Natural Comfort

Right Size, Right Way

Architectural Integrity

Integrated Systems

Oakland Hills, CA Fire Storm - 1991
Regionally Inappropriate Resilience

New Jersey after Hurricane Sandy

Fit to Site
- Natural Comfort
- Right Size, Right Way
- Architectural Integrity
- Integrated Systems
Regionally Appropriate Resilience

Kiawah Island, SC

Fit to Site
Natural Comfort
Right Size, Right Way
Architectural Integrity
Integrated Systems
Community Connection Missing

Fit to Site

Natural Comfort

Right Size, Right Way

Architectural Integrity

Integrated Systems
Community Connection

Fit to Site

Natural Comfort

Right Size, Right Way

Architectural Integrity

Integrated Systems
Community Connection

Alley Garage Entrance

Large Community Courtyard

Courthouse Square, Wheaton, IL
Community Connection

Courthouse Square, Wheaton, IL

Fit to Site

- Natural Comfort
- Right Size, Right Way
- Architectural Integrity
- Integrated Systems
### Community Connection

#### Fit to Site

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Community Connection

Fit to Site

Natural Comfort

Right Size, Right Way

Architectural Integrity

Integrated Systems
Cliff Dwellings of Mesa Verde, CO

Natural Comfort: Ancient Origins

Fit to Site

Natural Comfort

Right Size, Right Way

Architectural Integrity

Integrated Systems
Natural Comfort: Ancient Origins

Taos Pueblo, Taos, NM

Fit to Site
Natural Comfort
Right Size, Right Way
Architectural Integrity
Integrated Systems
Natural Comfort Ignored

Fit to Site

Natural Comfort

Right Size, Right Way

Architectural Integrity

Integrated Systems
Natural Comfort Experience

1. Glare-Free Views
2. Free Heating and Cooling (~25%)
3. Superior Comfort (Radiant)
4. Natural Light
5. Fresh Air
Glare-Free Views

Fit to Site

Natural Comfort

Right Size, Right Way

Architectural Integrity

Integrated Systems
Superior Comfort (Radiant)

Fit to Site

Natural Comfort

Right Size, Right Way

Architectural Integrity

Integrated Systems
Free Heating and Cooling (~25%)

Solar Orientation Savings: California Single-Family Homes

Natural Light

Fit to Site

Natural Comfort

Right Size, Right Way

Architectural Integrity

Integrated Systems
Natural Comfort: 5 Concepts

1. Natural Heating
2. Natural Cooling
3. Natural Fresh Air
4. Natural Comfort Control
5. Natural Lighting

*$0*

*Possibly small added resources for design/planning

Fit to Site

Natural Comfort

Right Size, Right Way

Architectural Integrity

Integrated Systems
Natural Comfort: 5 Design Tools

1. Solar Orientation
2. Solar Shading
3. Thermal Mass Storage
4. Cross Ventilation
5. Prevailing Breeze Orientation

*$0*

*Possibly small added resources for design/planning*
## Natural Comfort Design

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<tr>
<td>Natural Heating</td>
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<tr>
<td>Natural Cooling</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Natural Fresh Air</td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<td>Nat. Comfort Control</td>
<td></td>
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<td>Natural Lighting</td>
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</table>

**Fit to Site**

**Natural Comfort**

Right Size, Right Way

Architectural Integrity

Integrated Systems
Solar Orientation

- Fit to Site
- Natural Comfort
- Right Size, Right Way
- Architectural Integrity
- Integrated Systems
Solar Orientation/Solar Shading Missing

Fit to Site

Natural Comfort

Right Size, Right Way

Architectural Integrity

Integrated Systems
Solar Orientation/Solar Shading

Fit to Site

Natural Comfort

Right Size, Right Way

Architectural Integrity

Integrated Systems

Torcellini House – Winter: Eastford, CT
Solar Orientation/Solar Shading

Fit to Site

Natural Comfort

Right Size, Right Way

Architectural Integrity

Integrated Systems

Torcellini House – Summer: Eastford, CT
Solar Orientation/Solar Shading

Fit to Site

Natural Comfort

Right Size, Right Way

Architectural Integrity

Integrated Systems
Thermal Mass Storage

Fit to Site

Natural Comfort

Right Size, Right Way

Architectural Integrity

Integrated Systems
Thermal Mass Storage

Fit to Site

Natural Comfort

Right Size, Right Way

Architectural Integrity

Integrated Systems
Thermal Mass Storage

Fit to Site

Natural Comfort

Right Size, Right Way

Architectural Integrity

Integrated Systems
Thermal Storage

Fit to Site

Natural Comfort

Right Size, Right Way

Architectural Integrity

Integrated Systems
Prevailing Breeze Orientation/Cross Ventilation

Plan Orientation

- Single Opening
- Two Openings - Same Wall
- Two Openings - With Wings
- Two Openings - Adjacent Walls
- Two Openings - Opposite Walls

Fit to Site
Natural Comfort
Right Size, Right Way
Architectural Integrity
Integrated Systems
Prevailing Breeze Orientation/Cross Ventilation

High-Low Cross Ventilation
Prevailing Breeze Orientation/Cross Ventilation

- Fit to Site
- Natural Comfort
- Right Size, Right Way
- Architectural Integrity
- Integrated Systems
Natural Comfort Design Tools Applied

- South Orientation
- Prevailing Breeze Orientation
- South Winged Walls
- Block low E/W sun
- Extensive Thermal Mass
- South Roof Future Solar
- Overhangs & Trellises Shade
- South Windows

Fit to Site
- Natural Comfort
  - Right Size, Right Way
  - Architectural Integrity
  - Integrated Systems
## Average Size New Single-Family Home in U.S.

<table>
<thead>
<tr>
<th></th>
<th>1970</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Size</strong></td>
<td>1,500 ft²</td>
<td>2,689 ft²</td>
</tr>
<tr>
<td><strong>Avg. # Occupants</strong></td>
<td>3.14</td>
<td>2.54</td>
</tr>
<tr>
<td><strong>Sq. Ft./Occupant</strong></td>
<td>478 ft²</td>
<td>1,059 ft²</td>
</tr>
</tbody>
</table>

- 79% Increase
- 19% Decrease
- 120% Increase

### Sources:
- U.S. Census Bureau (2015) 2015 Quarterly Starts and Completions by Purpose and Design
## Right Size, Right Way: 2 Strategies - 10 Concepts

<table>
<thead>
<tr>
<th>Leverage Space:</th>
<th>Enhance Space:</th>
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<tbody>
<tr>
<td>1. Open Layouts</td>
<td>6. Varied Ceiling Heights</td>
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<tr>
<td>2. Eliminate or Combine Rooms</td>
<td>7. High-Quality Trim, Hardware, Finishes</td>
</tr>
<tr>
<td>3. Built-in Furniture</td>
<td>8. Effective Use of Colors</td>
</tr>
<tr>
<td>5. Indoor-Outdoor Linkages</td>
<td>10. Artificial Lighting</td>
</tr>
</tbody>
</table>

### Fit to Site
- Natural Comfort

### Right Size, Right Way
- Architectural Integrity
- Integrated Systems
Leverage Space/Enhance Space

- Open Layouts
- Eliminate or Combine Rooms
- Indoor-Outdoor Linkages
- Varied Ceiling Heights
- Quality Trim, Hardware, Finishes
- Effective Use of Colors
- Daylighting
- Effective Lighting Design

Fit to Site

Natural Comfort

Right Size, Right Way

Architectural Integrity

Integrated Systems
Indoor-Outdoor Linkages

Fit to Site

Natural Comfort

Right Size, Right Way

Architectural Integrity

Integrated Systems
Indoor-Outdoor Linkages

Fit to Site

Natural Comfort

Right Size, Right Way

Architectural Integrity

Integrated Systems
No Built-in Furniture = Clutter

Fit to Site

Natural Comfort

Right Size, Right Way

Architectural Integrity

Integrated Systems
Built-in Furniture

Fit to Site

Natural Comfort

Right Size, Right Way

Architectural Integrity

Integrated Systems
Built-in Furniture

Fit to Site

Natural Comfort

Right Size, Right Way

Architectural Integrity

Integrated Systems
Built-in Furniture

- Fit to Site
- Natural Comfort
- Right Size, Right Way
- Architectural Integrity
- Integrated Systems
Trim and Finish – Consistent Packages

Fit to Site

Natural Comfort

Right Size, Right Way

Architectural Integrity

Integrated Systems
Trim – Base Quality

Drawings by: Bud Dietrich
From *Fine Homebuilding*253, pp. 92-94 July 11, 2015
Trim – Better Quality

Crown provides a transition between wall and ceiling, connecting the two elements into a whole. Two rules of thumb can apply here: Use crown that’s at least as tall as the casing is wide, or use crown that is about 1/4 in. tall for each foot of ceiling height. You’ll have to gauge this with specific moldings, because each will project into the room differently.

Shoe molding eases the transition between wall and floor and provides a tailored, finished look.

The window casing is still installed in a picture-frame manner, but the larger dimension yields a more robust visual element.

The 3 1/4-in.-wide casing is about half the height of the baseboard, visually differentiating the two. This contrast emphasizes the casing’s narrowness, and we tend to respond favorably to vertical elements that are not overly wide.

The 7 1/2-in.-tall baseboard is about 8% of the height of an 8-ft.-high room. Like cuffed pant legs, this tall baseboard provides a strong base, anchoring the wall to the floor.

Drawings by: Bud Dietrich
From Fine Homebuilding253 , pp. 92-94 July 11, 2015
Trim – Best Quality

Depending on the height of the ceiling and the size of the crown, a picture rail can be placed above the windows, at the top of the windows, or slightly below the top, as pictured here. The key is to place it high enough that it engages with the crown, but not so high that it crowds the crown.

A chair rail splits the wall into sections. The rule of thumb is to set the chair rail at one-third of the wall height. For an 8-ft. (96-in.) ceiling, the chair rail would be 32 in. above the floor.

Space between the crown molding and the picture rail is painted the same color as the ceiling to visually lower the ceiling and create a more intimate room.

Rather than a simple picture-frame installation, the window trim incorporates a 3/4-in. apron and a stool that projects about an inch beyond the casing. This provides a strong base for the window and a more three-dimensional character to the trim.

Drawings by: Bud Dietrich
From *Fine Homebuilding*253, pp. 92-94 July 11, 2015
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Color, Trim, Built-in Furniture

Fit to Site
Natural Comfort
Right Size, Right Way
Architectural Integrity
Integrated Systems
HOUSES WITH COOL, NEUTRAL WALL COLORS SELL FOR MORE MONEY, ZILLOW DATA FIND

A new report from real estate firm Zillow finds that houses with rooms painted in shades of light blue or pale bluegray can sell for as much as $5,440 more than expected.

The firm’s 2017 Paint Color Analysis looked at more than 32,000 photos from sold homes around the country to see how certain paint colors impacted their sale price on average when compared to similar homes with white walls.
Homes With Blue Bathrooms Sell for $5,440 More Than Expected

For-sale listings with cool, neutral wall colors sell for more money, according to Zillow analysis.

A fresh coat of paint in the right color may help sell a home for more money.

Homes with rooms painted in shades of light blue or pale blue/gray can sell for $5,440 more than homes with neutral colors.
Lighting is Transformational

Fit to Site

Natural Comfort

Right Size, Right Way

Architectural Integrity

Integrated Systems
Lighting and Color Are Transformational

Fluorescent to LED Switch in Los Angeles Parking Garage Saves $167K Annually

Fit to Site

Natural Comfort

Right Size, Right Way

Architectural Integrity

Integrated Systems
Lighting is Transformational

Fit to Site
Natural Comfort
Right Size, Right Way
Architectural Integrity
Integrated Systems
Lighting is Transformational

Fit to Site

Natural Comfort

Right Size, Right Way

Architectural Integrity

Integrated Systems
Right Size, Right Way Concepts Applied

3 Bedroom
1,480 sq. ft.

South Elevation

Fit to Site
Natural Comfort
Right Size, Right Way
Architectural Integrity
Integrated Systems
Right Size, Right Way Concepts Applied

3 Bedroom
1,480 sq. ft.
Open Layout

South Elevation

Fit to Site
Natural Comfort
Right Size, Right Way
Architectural Integrity
Integrated Systems
Right Size, Right Way Concepts Applied

3 Bedroom
1,480 sq. ft.
Open Layout
Compact Circulation

Fit to Site
Natural Comfort
Right Size, Right Way
Architectural Integrity
Integrated Systems
Right Size, Right Way Concepts Applied

3 Bedroom
1,480 sq. ft.
Open Layout
Compact Circulation
Built-in Furniture

South Elevation

- Fit to Site
- Natural Comfort
- Right Size, Right Way
- Architectural Integrity
- Integrated Systems
Right Size, Right Way Concepts Applied

3 Bedroom
1,480 sq. ft.
Open Layout
Compact Circulation
Built-in Furniture
Varying Ceiling Height

Fit to Site
Natural Comfort
Right Size, Right Way
Architectural Integrity
Integrated Systems

South Elevation
Right Size, Right Way Concepts Applied

3 Bedroom
1,480 sq. ft.
Open Layout
Compact Circulation
Built-in Furniture
Varying Ceiling Height
Outdoor/Indoor Linkages

South Elevation

Fit to Site
Natural Comfort
Right Size, Right Way
Architectural Integrity
Integrated Systems
1. Simple and Functional Exterior
2. Efficient and Functional Floor Plan
3. Expert Materials/Details/Color
Simple and Functional Exterior

Portofino, Italy

Fit to Site

Natural Comfort

Right Size, Right Way

Architectural Integrity

Integrated Systems
Not So Simple and Functional Exterior

Fit to Site
Natural Comfort
Right Size, Right Way
Architectural Integrity
Integrated Systems
Not So Functional Exterior: Fake Shutters

Fit to Site

Natural Comfort

Right Size, Right Way

Architectural Integrity

Integrated Systems
Functional Exterior Shutters

Fit to Site

Natural Comfort

Right Size, Right Way

Architectural Integrity

Integrated Systems
Functional Exterior Shutters

Fit to Site

Natural Comfort

Right Size, Right Way

Architectural Integrity

Integrated Systems
Simple and Functional Exterior

Fit to Site
Natural Comfort
Right Size, Right Way
Architectural Integrity
Integrated Systems
Fake and Nonfunctional Exterior

Fit to Site

Natural Comfort

Right Size, Right Way

Architectural Integrity

Integrated Systems
Fake and Nonfunctional Exterior

- Fit to Site
- Natural Comfort
- Right Size, Right Way
- Architectural Integrity
- Integrated Systems
More Simple Exterior

- Fit to Site
- Natural Comfort
- Right Size, Right Way
- Architectural Integrity
- Integrated Systems
More Simple and Functional Exterior

Fit to Site
Natural Comfort
Right Size, Right Way
Architectural Integrity
Integrated Systems
Efficient and Functional Floor Plan

- Integrated Furniture
- Open Layout
- Eliminate/Combine Rooms
- Indoor/Outdoor Linkages
- Minimal/Generous Circulation
- Side Entrance

Quiet Side
Active Side

Fit to Site
Natural Comfort
Right Size, Right Way
Architectural Integrity
Integrated Systems
Nonfunctional Floor Plan

Typical Townhouse Configuration
Nonfunctional Townhome Backyard

Fit to Site

Natural Comfort

Right Size, Right Way

Architectural Integrity

Integrated Systems
Nonfunctional Townhome Backyard

- Fit to Site
- Natural Comfort
- Right Size, Right Way
- Architectural Integrity
- Integrated Systems
Functional Townhome Floor Plan

Lawn Area Repurposed for Development

Quiet Side

Active Side

Townhouse Optimized for Daylight/Outdoor Linkages

Fit to Site
Natural Comfort
Right Size, Right Way
Architectural Integrity
Integrated Systems
The Waters, Pike Road, AL, Andrew P. Kulp, AIA
Functional Townhome Floor Plan Applied

The Waters, Pike Road, AL, Andrew P. Kulp, AIA
Functional Townhome Floor Plan Applied

Fit to Site
Natural Comfort
Right Size, Right Way
Architectural Integrity
Integrated Systems
Functional Townhome Floor Plan Applied

- Fit to Site
- Natural Comfort
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- Integrated Systems
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Expert Materials, Details, Color Missing

Fit to Site

Natural Comfort

Right Size, Right Way

Architectural Integrity

Integrated Systems
Expert Materials, Details, Color Integrated

Fit to Site

Natural Comfort

Right Size, Right Way

Architectural Integrity

Integrated Systems
Expert Materials, Details, Color

Fit to Site

Natural Comfort

Right Size, Right Way

Architectural Integrity

Integrated Systems
12 Systems in 3 Groups Need to be Integrated

| Infrastructure | 1. Structural  
| 2. HVAC  
| 3. Plumbing  
| 4. Electric |
| Liveability | 5. Furniture  
| 6. Storage  
| 7. Lighting  
| 8. Smart Home/Controls |
| Performance | 9. Water Management  
| 10. Water Conservation  
| 11. Solar  
| 12. Disaster Resistance |
Structural System Integration

WHY NOT 4.87/12 VS. 5/12 SLOPE?

Multiple of 2' or 4"
Zero Waste

Fit to Site
Natural Comfort
Right Size, Right Way
Architectural Integrity
Integrated Systems
Structural System Not Integrated

Fit to Site
Natural Comfort
Right Size, Right Way
Architectural Integrity
Integrated Systems
HVAC System Integrated

Fit to Site

Natural Comfort

Right Size, Right Way

Architectural Integrity

Integrated Systems
Plumbing System Not Integrated

Fit to Site

Natural Comfort

Right Size, Right Way

Architectural Integrity

Integrated Systems
Plumbing System Not Integrated

Fit to Site

Natural Comfort

Right Size, Right Way

Architectural Integrity

Integrated Systems
Plumbing System Integrated

Air Admittance Valves

Mandalay Homes

Fit to Site
Natural Comfort
Right Size, Right Way
Architectural Integrity
Integrated Systems
<table>
<thead>
<tr>
<th>Fit to Site</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Comfort</td>
</tr>
<tr>
<td>Right Size, Right Way</td>
</tr>
<tr>
<td>Architectural Integrity</td>
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<tr>
<td>Integrated Systems</td>
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</tbody>
</table>
Plumbing System Integrated

Pampering the pups: Why dog-washing stations are a must-have in multifamily developments

Self-serve dog-washing stations are reinforcing strong bonds between multifamily residents and their beloved canines.

The 240-sf dog spa at Seattle’s AMLI Arc apartment tower has two stainless-steel washbasins, a hydraulic grooming table, a pet dryer, and a hair vacuum system. “We chose a no-frills aesthetic to blend with the building’s deconstructed interior design concept,” says Interior Designer Camilla Watson, ZGF Architects. Photo: © Benjamin Benschneider

There’s a construction boomlet under way in dog-washing facilities at U.S. and Canadian apartment and condominium communities.

Fit to Site
Natural Comfort
Right Size, Right Way
Architectural Integrity
Integrated Systems
Plumbing System Integrated

Fit to Site

Natural Comfort

Right Size, Right Way

Architectural Integrity

Integrated Systems

Dog Wash Station
Electric System Integrated

Need Floor Outlet

Fit to Site
Natural Comfort
Right Size, Right Way
Architectural Integrity
Integrated Systems
Furniture System Integrated

Fit to Site

Natural Comfort

Right Size, Right Way

Architectural Integrity

Integrated Systems
Furniture System Integrated

Fit to Site

Natural Comfort

Right Size, Right Way

Architectural Integrity

Integrated Systems
Storage System Integrated in My Car

- CDs/MP3 Player
- Change
- Maps/Papers
- Owners Manual
- Pens
- Sun Glasses
- Drink Cups
- Tools
- Garage Door Opener

- Tissues
- Dry Cleaning (hooks)
- Arm Rests
- Long Items (e.g., skis)
- Wallet
- Safety Kit
- Spare Fuses
- Spare Key
- Spare Tire

Fit to Site

Natural Comfort

Right Size, Right Way

Architectural Integrity

Integrated Systems
### Storage System Integration Missing in Homes

#### Bedrooms:
- ReasonableAmt. Shoes
- ReasonableAmt. Clothes
- Belts
- Ties
- Handbags
- Winter Blankets
- Flat Screen TV/Set box
- Books
- Pictures

#### Entertainment
- Flat Screen TV/Set box
- Electronics
- Electronic Media
- Manuals
- Speakers
- Books

#### Work:
- Important Papers
- Mail/Bills
- Computer/Printer
- Books
- Owners Manuals
- Gift Wrap
- Pictures

#### Arriving/Leaving:
- Umbrellas
- Keys
- Wallets
- Shoes
- Coats
- Bags

#### Cleaning:
- Ironing Board
- Vacuum Cleaner
- Brooms/Dust Pans
- Recycling Center

#### Garage:
- Garbage Cans
- Sports Gear
- Bikes
- Yard Tools
- Work Tools
- Luggage

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**Fit to Site**

**Natural Comfort**

**Right Size, Right Way**

**Architectural Integrity**

**Integrated Systems**
Storage System Integrated

Fit to Site

Natural Comfort

Right Size, Right Way

Architectural Integrity

Integrated Systems
Storage System Integrated

Fit to Site

Natural Comfort

Right Size, Right Way

Architectural Integrity

Integrated Systems
Lighting System Integrated

Fit to Site

Natural Comfort

Right Size, Right Way

Architectural Integrity

Integrated Systems
Lighting System Integrated

Fit to Site

Natural Comfort

Right Size, Right Way

Architectural Integrity

Integrated Systems
Smart Home/Controls Integration

- **Fit to Site**
- **Natural Comfort**
- **Right Size, Right Way**
- **Architectural Integrity**
- **Integrated Systems**
Water Conservation Integrated

Fit to Site

Natural Comfort

Right Size, Right Way

Architectural Integrity

Integrated Systems
Water Management System Not Integrated

- Fit to Site
- Natural Comfort
- Right Size, Right Way
- Architectural Integrity
- Integrated Systems
Solar System Integrated

PV Not Integrated

PV Integrated

Fit to Site
Natural Comfort
Right Size, Right Way
Architectural Integrity
Integrated Systems
Benefits:
Cost
Appearance
Daylighting
Maintenance

PV Integrated

Solar System Integrated

Fit to Site
Natural Comfort
Right Size, Right Way
Architectural Integrity
Integrated Systems
Solar System Not Integrated

Fit to Site

Natural Comfort

Right Size, Right Way

Architectural Integrity

Integrated Systems
Solar System Integration

Fit to Site

Natural Comfort

Right Size, Right Way

Architectural Integrity

Integrated Systems
Solar System Integration

- Fit to Site
- Natural Comfort
- Right Size, Right Way
- Architectural Integrity
- Integrated Systems
Solar System Integration

- Fit to Site
- Natural Comfort
- Right Size, Right Way
- Architectural Integrity
- Integrated Systems
Disaster Resistance System Integrated

Disaster Resistance System Integrated

Module 2 – Design Experience
Transformation Design Summary

• Color
• Lighting: Indoor, Outdoor, Natural
• Landscaping/Hardscaping
• Finish: Materials, Trim, Hardware
• Storage/Built-ins
• Technology Integration
• Views: Natural, Designed
• Exterior Spaces

How to Pay for Transformational Design:
• Hard Cost Savings Right-Sizing the Right Way
• Simple Designs Easier to Build
Invest in Experts
    [interior design, color, lighting, technology, landscaping]

Design for Site and Region

Optimize Natural Comfort

Right-size, Than Invest Savings in Quality Design
    [built-in’s, trim, hardware, materials, colors, lighting, exterior spaces]

Simple Design Choices

Integrate Designs with all Major Systems
Focus on designs that optimize natural comfort. More built-ins. Hold designers accountable for integrated systems.
Retooling the U.S. Housing Industry
How We Got Here, Why It's Broken, and How to Fix It