

**Walter Grondzik**  
**WHAT IS INTEGRATED BUILDING DESIGN?**

**1. WHAT IT IS:**

A PROCESS

A MEANS OF STRUCTURING DECISION MAKING  
COMPARED TO CONVENTIONAL LINEAR DESIGN PROCESS

CONNECTION TO BUILDING COMMISSIONING

DEFINING CHARACTERISTICS

ASHRAE

AIA

OTHER?

**2. WHAT IT IS NOT:**

A SPECIFIC OUTCOME

SUSTAINABILITY

GREEN

ENERGY EFFICIENT

BIM

A RIGIDLY PRESCRIBED METHODOLOGY

ONE SIZE FITS ALL

**3. WHY USE INTEGRATED BUILDING DESIGN?**

INCREASINGLY DEMANDING PROJECT OUTCOMES

SUSTAINABLE, GREEN, ENERGY EFFICIENT, HIGH PERFORMANCE, CARBON NEUTRAL

INCREASINGLY DEMANDING DESIGN TOOLS

PERFORMANCE SIMULATIONS

BIM

**4. WHAT IS NEEDED FOR SUCCESS?**

DESIRE TO SUCCEED

TEAM LEADERSHIP AND TEAM PLAYERS

GOOD COMMUNICATIONS

## Chuck Gulledge

### The Integrated Design Process

#### **Vision and Goals:**

- Vision
  - Big Picture Perspective
  - Subjective Definition
- Goals
  - Definition of Quantifiable Boundaries
  - Basis of Unique Team Structure
  - Basis of Applied Strategy Development
  - Objective Evaluation Metric

#### **Owner Activities:**

- Timelines
  - Schedule – Goal Relationship
- Total Ownership Costs
  - Capital Costs
  - Professional Service Fees
  - Utility Costs
  - O&M Costs
  - Replacement Costs
  - Occupancy Costs
- Financial Criteria
  - Life-Cycle Analysis
  - ASHRAE Service Life and Maintenance Cost Database

#### **Team:**

- Structure
  - Conventional
  - Integrated
- Working as a Team
  - Joint Decision Making
  - Problem Solving Relationships
  - Effective Communication
- Attributes
  - Experience
  - Optimization Skills
  - Stewardship
- Preliminary Tasks
  - Decision-Making Body

- Objective Refinement
- Information Organization
- Charrettes

### **Strategy Development:**

- Progression
  - Linear Versus Iterative
  - Iterative Loops
  - TOP-DOWN/BOTTOM-UP
- Tracking
  - Multiple Objectives
  - Linked Strategies
  - Variable Criteria
- Evaluation
  - Multi-Criteria Assessment
  - Common Ranking Systems

### **Commissioning:**

- Timing
- Goal Definition
- Developing Basis of Design

### **Summary:**

**Drury B. Crawley**  
**Achieving Net-Zero Energy Buildings**  
**Through Integrate Building Design**

**Vision and Goals:**

- Vision
  - Create net zero energy buildings
  - Need integrated design team to achieve
- Goals
  - May be a specified percent energy savings
  - May be to reduce utility costs or set a maximum annual utility bill
  - May be how green or sustainable the building design is
  - May be the construction cost budget

**Owner Activities:**

- Must stay involved throughout project
- Owner-driven processes yield the best results

**Team:**

- Help owners understand what they really want
- Needs a champion to question everything and keep the project on track

**Strategies:**

- Use simulation throughout, especially at the beginning
  - Simulated buildings are easy to model
  - Give people confidence that goals are achievable
- The building envelope should provide most of the heating, cooling, and ventilation requirements
- Determine whether orientation and windows contribute to goals
- Evaluate HVAC, plug, and miscellaneous loads
- Review all programmatic requirements
- Measure progress at key steps
- Evaluate performance

**Summary:**

Keep in mind the vision of creating a zero energy building. Key to achieving that vision is to have a team of experts work together and use the best available simulation technology to reach the individual goals and evaluate the final product.

## Paul Torcellini

### Bringing the Pieces Together – Actual Applications

#### **Vision and Goals:**

- Vision
  - Owner or project leader defines
  - Can be vague
- Goals
  - Represent the translation of the vision into something measurable
  - Must be substantiated

#### **Owner Activities:**

- Define tasks that support goals
- Implement strategies that are mapped directly to individuals on the design team
- Designate a champion (architect, green building consultant, engineer, or owner)
  - Champion must ensure that all players are kept within the vision
  - People who are left outside the vision will not complete their tasks

#### **Team:**

- Each member must be aware of and buy into the vision and goals
- Each person is responsible for coming up with strategies to meet the goals

#### **Projects:**

- **Van Geet house**
  - Owner was his own team
  - Owner had a vision to create a grid-independent house
  - Owner established a goal to have a house that uses 90% less energy
- **Zion National Park Visitor Center**
  - Vision was to protect park and enable visitors to enjoy it
  - Project arose out of a need to manage traffic
  - Goal was to use 80% less energy than a typical visitor center; 70% saving was achieved
  - Solar panels, Trombe wall, daylighting, uninterruptible power supply, and operable windows were used to achieve energy goals
- **BigHorn Home Improvement Center**
  - Owner very committed to energy efficiency goals
  - Goal was 60% energy savings over code-compliant building
  - Daylighting, radiant floors, and photovoltaic panels used

- **NREL Science and Technology Facility**
  - Vision: Match the National Renewable Energy Laboratory's image of energy efficiency and renewable energy
  - Goal: Have a LEED Gold rated laboratory building (LEED Platinum was achieved)
  - Energy savings of 40% over code
  - Building has variable-speed fume hoods, variable-speed HVAC systems, extensive daylighting, and very good insulation

### **Summary:**

The keys to successful integrated project design are to set quantifiable goals, create a team structure that encourages communication, develop strategies to meet the goals, and evaluate progress toward those goals.