

Building Energy Performance

- Basic energy principles
- Energy terminology, units and conversions.
- Heat transfer principles
 - Conduction: R-values & U-values
 - UA concepts
 - Parallel paths
- Convection
 - Film coefficients
 - Buoyancy
 - Forced air flows
- Radiation
 - Solar (absorptance + reflectance + transmittance = 1.0)
 - Far infrared (emittance = absorptance)

Moisture Principles

- Properties
 - Dewpoint
 - Relative Humidity
 - Evaporation & condensation
- Transport Mechanisms
 - Rain and ground water
 - Capillary action
 - Air transported
 - Vapor Diffusion
 - Evaporation and condensation
- Impacts
 - Indoor Air Quality (IAQ)
 - Material and building durability
 - Human comfort
 - Energy use

Air flow in buildings

- Pressure differentials and measurement techniques
- Mechanisms and drivers
- Energy and comfort implications
- Health & safety issues

Heating, cooling, ventilation and hot water systems

- System types
 - Direct-fired systems
 - Condensing systems
 - Heat pumps and air conditioning systems
 - Air Source
 - Ground Source
 - Hydronic systems
 - Combo systems
 - Ductless systems
 - Solar thermal systems

Efficiency

- Measures of efficiency
- Determination of efficiency (nameplate, age-based defaults, etc.)
- Sizing & design
 - Impacts on energy use
 - Impacts on humidity control
- Controls
 - Standard thermostats
 - Programmable thermostats
 - Multi-zone
- Distribution systems
 - Duct types
 - Restricted returns

- Closed interior doors
- Return ducts and grills
- Leakage

Fresh air ventilation

- Supply, exhaust and balanced flow systems
- Heat exchange systems
- Energy/enthalpy exchange systems
- Exchanger efficiency, fan power and duty cycle characteristics

Renewable energy systems

- Active and passive space heating systems
- Solar hot water systems
- Photovoltaic systems
- Wind generation

Diagnostic testing procedures

- Building airtightness
 - Multipoint pressure testing C, n,)p and R2

Air distribution system airtightness

- Pressure pan threshold tests
- Duct air leakage measurements
 - cfm25_total
 - cfm25_out
- Pressure measurements
 - Operational (by home and its equipment)
 - Imposed (by blower door, etc.)
- Air heat and moisture measurements
 - Airflows
 - Temperatures

- Relative humidity

Identifying minimum rated features as defined in the Mortgage Industry National Home Energy Rating Standards:

- Identify basic home construction types; ramifications of these for energy usage.
- Produce a scaled and dimensioned sketch of a home.
- Identification of insulation defects and ability to account for them in energy analysis tool inputs.

Identifying potential building problems

- Health and safety concerns
- Building durability issues
- Potential comfort problems
- Possible elevated energy use

Rating Procedures

- Understanding construction documents
 - Building drawings
 - Specifications

Field data collection (including photo documentation)

- Physical measurements
 - Completing scaled sketches
 - Measuring building dimensions
 - Determining building orientations
 - Measuring window overhang lengths and heights
 - Determining roof slopes, gable heights, etc.
 - Calculating gross and net areas and volumes
- Energy feature documentation
 - Energy Analysis (Software) tool data requirements

- Developing and using field inspection forms
- Organizing data entry procedures
- Characterizing envelope features
 - Determining wall types
 - Determining window and door types and characteristics
 - Determining envelope insulation types, thickness, thermal characteristics and weighted average thermal values
 - Determining duct system characteristics (duct types, insulation value, location with respect to the thermal and air barrier)
- Equipment efficiencies determination
 - Nameplate data
 - ARI and GAMA guides
 - Age-based defaults
 - In situ measurements
- Performance testing
 - Envelope leakage
 - Air distribution system leakage

Local climate impacts Major

- - US climate zones
 - 97.5% and 2.5% design conditions
 - Cooling and heating design trade-offs

Utility prices

- Revenue-based pricing
- Reliable sources

Reports

- Minimum reporting requirements
- Improvement analysis

- Projected and confirmed ratings

Operating Procedures and Office Administration

- National guidelines and standards
 - Accreditation Procedures
 - Technical Guidelines
 - Training & Certification Standards

Understanding the Reference home and rating method

- Reference Home as defined in B.2 of the National Home Energy Rating Technical Guidelines (“Twin” home concept): “The reference home is the geometric twin of the rated home, configured to a standard set of thermal performance characteristics, from which the energy budget, that is the basis for comparison, is derived.”
- HERS Score computation using the Normalized Modified Loads Rating Method

Uses of a Rating

- Builder assistance
 - Cost effective building design assistance
 - Quality assurance assistance
 - Marketing
- Program qualifications
 - EPA Energy Star
 - Utility
 - Other
- Financing advantages
 - Energy Efficient Mortgages (EEM)
 - Energy Improvement Mortgages (EIM)
- Energy Code compliance
- Added appraisal value

- Consumer education

Understanding real estate, financing and economic terminology

Dealing with clients

- Understanding the business aspects of being a energy rater
- Cultivating builder, banker and real estate partner
- Knowing who the customer is
- Providing excellent service

Ethics and disclosure