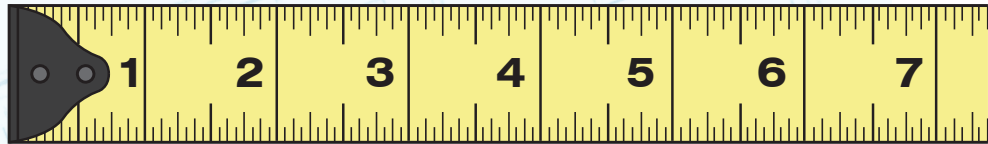


HOW TO SPEAK AND READ BUILDING

Resource Packet
Version 1: 07/04/23

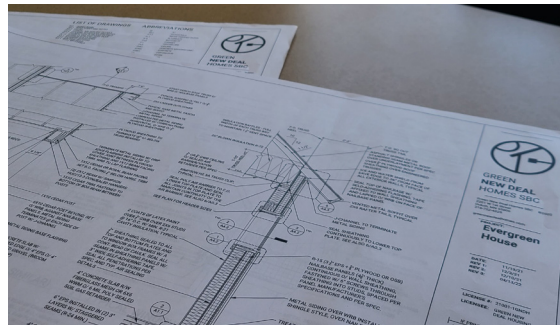


GREEN
NEW DEAL
HOUSING

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WELCOME!

Most specialized fields have specialized language and the specialized field of construction is no different. Becoming fluent in a new language takes time and practice. With this Resource Packet we try to make it easier to “speak and read building.”

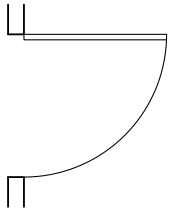
The information in this packet is geared toward residential design and construction, but will be useful to anyone entering or working in the building trades. And, because we are focused on the practices of green building and design, you’ll find information here that isn’t always included in a traditional trades education.

GOALS OF THE GREEN NEW DEAL HOUSING WORKFORCE TRAINING PROGRAM:

- **Educate effectively** about housing, health, and environmental impact
- **Create pathways** to education and employment for people experiencing barriers
- **Cultivate passion and participation** in green building, renewable energy systems, and sustainable community development
- **Develop a green collar workforce** to participate in the widespread creation of reliable energy efficient and high performance buildings
- **Transform communities** to be more equitable, resilient, and sustainable

GRAPHIC REPRESENTATION OF MATERIALS

In drawings, standardized lines and symbols denote typical materials and building elements. These graphic standards allow professionals across industries to communicate. The illustrations below show how some of the most commonly used materials in residential construction are represented in section drawings and details.



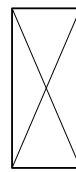
Swinging door



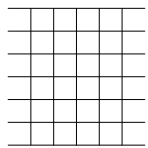
Pocket door



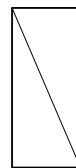
Concrete



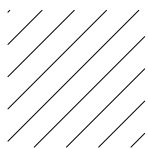
Continuous wood framing member



Rigid insulation



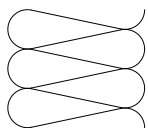
Wood blocking (not continuous)



Masonry - Brick or Concrete Block



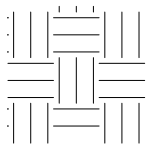
Wood finish material



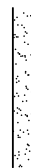
**Batt or blown insulation,
like fiberglass or cellulose**



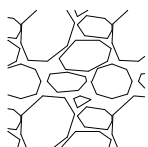
Plywood material



Soil



Gypsum wall board



Gravel or Rock



Not visible

ABBREVIATION KEY

To prevent drawings and notes from becoming visually cluttered, abbreviations are used. Refer to the following key if you come across an abbreviation you are not familiar with.

@	AT	KWH	KILOWATT HOUR
ACH	AIR CHANGES PER HOUR	MAX	MAXIMUM
ADJ	ADJUSTABLE	MECH	MECHANICAL
A.F.F.	ABOVE FINISHED FLOOR	MIN	MINIMUM
ALT	ALTERNATE	MFR	MANUFACTURER
B.O.	BOTTOM OF	NTS	NOT TO SCALE
CAB	CABINET	O/	OVER
C.L.	CENTER LINE	O.C.	ON CENTER
CLG	CEILING	OPG	OPENING
CMU	CONCRETE MASONRY UNIT	PL	PROPERTY LINE
CONC	CONCRETE	P.T.	PRESSURE TREATED
CONT.	CONTINUOUS	R/W	REINFORCED WITH
DN	DOWN	REQ	REQUIRED
DR	DOOR	RH	RELATIVE HUMIDITY
ELEV	ELEVATION	SIM	SIMILAR
ERV	ENERGY RECOVERY VENTILATOR	SHTG	SHEATHING
ETR	EXISTING TO REMAIN	T.O.	TOP OF
EXIST	EXISTING	TYP	TYPICAL
F.D.	FLOOR DRAIN	VERT	VERTICAL
FDN	FOUNDATION	W/	WITH
F.F.	FINISHED FLOOR	W/D	WASHER AND DRYER
FIN	FINISH OR FINISHED	WDW	WINDOW
FL	FLOOR	WRB	WATER RESISTIVE BARRIER
F.O.	FACE OF	ICF	INSULATED CONCRETE FORM
FTG	FOOTING		
GWB	GYPSON WALL BOARD		
HORIZ	HORIZONTAL		
HGT	HEIGHT		
HRV	HEAT RECOVERY VENTILATOR		
HPWH	HEAT PUMP WATER HEATER		
IAQ	INDOOR AIR QUALITY		
IEQ	INDOOR ENVIRONMENTAL QUALITY		
KW	KILOWATT		

DRAWING NAVIGATION SYMBOLS

Blueprints also utilize symbols to orient the reader within a specific drawing and the drawing set. Some of the symbols below, like the north arrow, denote information about a single drawing, while other symbols provide information about and navigation to other drawings. A section cut on a floor plan, for example, will tell you where the building is being “cut” and where in the drawing set you will find that section.

NAVIGATION

Elevation	
Section Cut	
Detail Cut	
Detail Call-out	

MISCELLANEOUS

Elevation Level	
North Arrow	
Scale Notation	1/4"=1'-0"
Typ. Drawing Title	

TAGS

Window Identification	
Door Identification	101B
Wall Type	
Room Identification	ROOM NAME <u>202A</u> 150 SF
Lintel Identification	

Drawing number

Sheet number

DEFINITIONS

A

Above grade

The portion of a building above the line of grade, thus exposed to air.

ACH (Air changes per hour)

ACH is a common metric used to quantify the overall rate of the exchange of air in a building, and refers to the numbers of times the entire amount of air in the conditioned space is replaced within one hour. ACH can be used to quantify controlled air flow (such as ventilation rate) or uncontrolled air flow (such as unintended air leakage).

Anchor bolt

A metal bolt connecting a structural part of a building to its foundation.

Air barrier

An assembly comprised of different materials, connected to one another, designed and constructed to control airflow between conditioned and unconditioned spaces.

Air Leakage

Air that enters or leaves the conditioned space of a building through unintended pathways.

Attic

The interior space/area just below a pitched roof, between the roof plane and the ceiling plane.

B

Backer rod

An expansive, flexible, tube-shaped material used to fill wide gaps behind caulk or sealant, to support the ability of the caulk or sealant to maintain its seal.

Bearing capacity

The ability of a component to support the components that rest upon it, often measured in pounds per square foot (psf) or pounds per square inch (psi).

Bearing wall

A wall that carries structural loads from above (as opposed to a partition wall which does not). Can be an exterior or interior wall.

Below grade

Portion of a building below the line of grade, effectively underground.

Benchmark

A reference point used to indicate relative heights or distances, such as the height between the finished ground floor and the finished second floor.

Building load

A force that the building needs to resist. Gravity, occupants, wind, earthquakes, snow, rain, flooding, and soil all exert forces on the building; so do other parts of the building. See also: dead load, live load.

Building Science

A technical and scientific practice that is concerned with explaining and understanding the physical behavior of a building in response to the forces that act upon it.

Bulk water

Liquid water that flows in, on and through buildings. Primarily driven by gravity but also by wind and pressure differences. Examples include rain, plumbing leaks, and ground water.

Blocking

Framing made of shorter pieces of dimensional lumber attached between or against other members. Blocking may provide additional support, prevent rotation of framing members, or slow the spread of fire. It is also used for structural or nonstructural attachment.

Brick mold

An exterior casing, usually around a window or door.

C

Capillary wicking/capillarity

The ability of water to travel against the pull of gravity through a porous material.

Casing

The interior trim at a window or door that typically covers the gap between a frame and the adjacent finished wall material.

Caulk

A workable material used to seal gaps between materials; see also: sealant

Cavity insulation

Insulation used between framing members.

Cantilever

A horizontal structural element that extends past its vertical support.

CFM (Cubic feet per minute)

A measurement of air flow that describes the volume of air (measured in cubic feet) moved in one minute. CFM is often used to quantify an amount of ventilation, amount of air leakage, or the capacity of a fan.

Combustion air

Air introduced into a building to assist the combustion of a fuel-fired appliance.

Condensation

The formation of liquid water when warm air comes in contact with a cold surface, causing water vapor in the air to reach its dew point and condense. *Think beads of water forming on a cold soda can during a hot summer day.*

Conditioned space

Areas of the building within the thermal boundary that are designed to be heated, cooled, and/or ventilated.

Conduction

Heat energy transferred through direct contact.

Continuous insulation

Insulation that is uninterrupted by the structure of a building, typically used to create thermal breaks.

Control joint

Joints intentionally cut or placed in a material to allow for or reduce cracking as the material expands and contracts, or to accommodate expected movement in the assembly.

Convection

Heat energy released or transferred through the motion of molecules in liquids or gases.

D

Dead load

Force acting on a building that is created from the weight of the material used in the building's construction.

Deflection (building science)

A water management strategy that directs bulk water away from the building.

Deflection (structural)

The degree to which a part of a structural element deforms in response to loads upon it.

Dew point

The temperature at which the relative humidity of air with constant water vapor reaches 100%. When the dew point is reached, the air is saturated with water and condensation will occur on a surface.

Drainage Plane

A water-repellent material/assembly located behind siding, designed and constructed to drain water that passes through the siding.

Dropped ceiling

A framed area below a structural ceiling, similar to a soffit but usually defining a larger area of lower ceiling height.

Drywall

A sheetgood material made from a flat panel of gypsum plaster sandwiched between two sheets of paper, typically used as an interior finish material for walls and ceilings. *See also: gypsum wall board*

E

Eave

The overhang projecting past a wall at the bottom or top slope of a roof.

Elevation

A scaled, two dimensional drawing that illustrates a single side of a building.

Exhaust air

Air that leaves a building intentionally, through a duct or chimney by virtue of operation of a piece of equipment, such as a clothes dryer.

Exterior wall

Wall with at least one plane exposed to the outside. Can be load bearing or non-load bearing.

F

Fascia

Finished trim along the edge of the eave or rake of a roof.

Flashing

A thin layer of impervious material designed and installed to prevent water penetration into a building and/or divert water away from or out of the building enclosure.

Footing

The wide portion at the lowermost part of a foundation that transfers the load to the soil.

Foundation

The lowermost part of a structure that safely distributes the load to the earth.

Frost line

The expected depth to which the groundwater in soil freezes. The frost line varies depending on location and soil conditions.

Furring

Strips of material installed underneath a finished surface, often used to create a nailing surface and/or a gap for drying.

G

Gable

The wall of a building that encloses the end of a pitched roof.

Grade

1. Noun: the level of the finished ground one stands upon.
2. Verb: To add or remove ground soil (or similar material) to achieve a desired slope, level, or contour to the land.

Gypsum Wall Board (GWB)

A sheetgood material made from a flat panel of gypsum plaster sandwiched between two sheets of paper. *See also: drywall*



H

Header

A structural member over a window or door opening. See also: lintel

Heat gain

The transfer of heat into a building, which can come from both external and internal sources. Sources of heat gain include the sun, appliances, mechanical equipment, lighting, and air leakage.

HVAC

Heating, ventilation, and air conditioning.

I

Impervious

Cannot be penetrated by water.

J

Jamb

The zone at the sides of a window or door, or the frame around a window or door that holds or otherwise supports the window unit or actual door.

K

L

Live load

The forces acting on a building created by the building's occupants.

Lintel

A structural member over a window or door opening. See also: header

M

Make-up air

Air required to enter a building to “make up” for air expelled in the exhaust stream of an appliance such as a wood stove, range hood, or bath fan.

N

Nailer

A framing member added to a structure for the purpose of providing an attachment surface for the other members.

Nailbase panel

Panelized continuous insulation made from a layer of rigid insulation bonded to a sheathing layer such as plywood or oriented strand board (OSB).

Nailing fin

A piece of metal or plastic along the edge of a window that helps attach and seal the window to the rough opening.

O

Oriented Strand Board (OSB)

A sheathing material typically used for exterior walls, subfloor, and roof deck.

P

Partition wall

Non-load bearing interior wall.

Peak cooling load

The calculated amount of energy required to cool a building under the established design temperature for the location, expressed in kW or BTU/hr. Typically used to size the air conditioning system capacity.

Peak heating load

The calculated amount of energy required to heat a building under the established design temperature for the location, expressed in kW or BTU/hr. Typically used to size the heating system capacity.

Pitch

The slope of an element (such as a roof), often quantified/measured in inches of vertical rise for every foot of horizontal distance. A roof pitch of 4:12 means the slope rises 4” vertically for every 12” horizontally.

Plan

A scaled, two dimensional drawing that illustrates a building, room, or building element as viewed from above.

Plan north

The north direction as indicated on a plan drawing, which is not necessarily “true north” (per a compass), but instead used to reference sides of the building or site according to approximate compass orientation.

Plate

A horizontal framing member that holds studs in place at the top and bottom of a framed wall.

Plywood

A sheathing material typically used for exterior walls, subfloor, and roof deck.

PV panel, module, or array

A device or system that captures light energy from the sun and converts it into direct current electrical energy via a process called the photovoltaic effect.

Q

R

R-value

The unit that measures the ability of a material to resist the flow of heat. R-value is the inverse of U-value. A higher R-value indicates better insulating capacity.

Radiation

Heat energy transferred through electromagnetic waves.

Rafter

The main structural component of a sloped roof framed with dimensional lumber (“stick framed”).

Raised heel truss

A truss with elongated members at the building edge, usually used to accommodate thicker ceiling insulation.

Rake

The protruding end portion of a roof that is perpendicular to the eave.

Rough opening

An opening in framing, masonry, or other structure sized in preparation for a door, window, or finish treatment.

S

Sealant

A type of caulk designed to prevent the passage of water, air, or other substance; see: caulk.

Section

A scaled, two dimensional drawing that illustrates what a building or wall would look like if you cut through it to see all its layers. *Imagine a cut piece of chocolate cake with vanilla icing, or an MRI.*

Sheathing

A layer applied to the wall, floor, or roof to stabilize and/or protect the structure, as well as provide a solid surface for attachment of materials like roofing, siding, and flooring.

Slab-on-grade

A concrete slab supported by the ground.

Solar gain

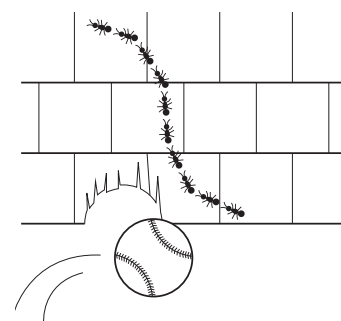
The transfer of heat energy into a building from the sun.

Siding (aka cladding)

The outermost exterior layer of a wall. In addition to influencing the “look” of the building, the siding is typically the first layer of resistance to the elements (wind, snow, rain, critters, baseballs), and affects the overall durability of the structure.

Sill

The bottom edge of a door or window, or the sloped exterior base of a door or window. Can also refer to the bottom member of a framed wall, aka “sill plate.”



Soffit

1. Exterior: a horizontal trim at the eave, extending between fascia and wall.
2. Interior: a section of ceiling “dropped” or framed below the structural ceiling, to provide visual interest, connect wall-mounted cabinets, or contain lighting and/or ductwork.

Solar panel

See PV panel.

Solar array

A collection of PV panels physically and electronically connected to work together, and mounted in configuration with one another.

Square footage a.k.a square feet

A unit of measurement used to express area. Area is calculated by multiplying length by width.

Example: A 10' x 12' room is 120 square feet. Abbreviated as sq. ft., ft², sf.

Stack effect

The movement of warm air upward created by pressure and thermal differences. *Think hot air balloons.*

Stud

A vertical structural component in a framed wall, typically dimensional lumber.

T

Truss

A pre-fabricated assembly of structural members that works efficiently to span distances.

Thermal break

An element of an assembly structure that reduces heat transfer, often between conditioned and unconditioned space in a building assembly.

Thermal bridge

An area or component of a building that has a significantly higher heat transfer than the surrounding materials, resulting in an overall reduction in the thermal resistance of the assembly.

U

Unconditioned space

Areas of the building, usually unoccupied, that are intentionally separated from the parts of the building defined by the thermal and air control boundaries. *Think attics or an open porch.*

Underlayment

A layer placed under a finish material, usually to prepare a subsurface in some way for the finish material.

U-Value/U-factor

The unit that measures the ability of a material to transfer heat. U-factor is the inverse of R-value.

V

Vapor permeability

A measurement of the ability of a material to allow water vapor to pass through it.

Vapor retarder

A material that slows the transmission of water vapor.

Ventilation air

Air that enters the building intentionally, through ducts, windows or vents, to provide oxygen for occupants.

W

Water resistive barrier

A material or finish that helps reduce water intrusion, intended to help keep a building element or assembly dry.

X

Y

Z

SHOW, DON'T TELL

Sometimes, a picture is worth a thousand words. These images illustrate many of the words defined in the definitions list.

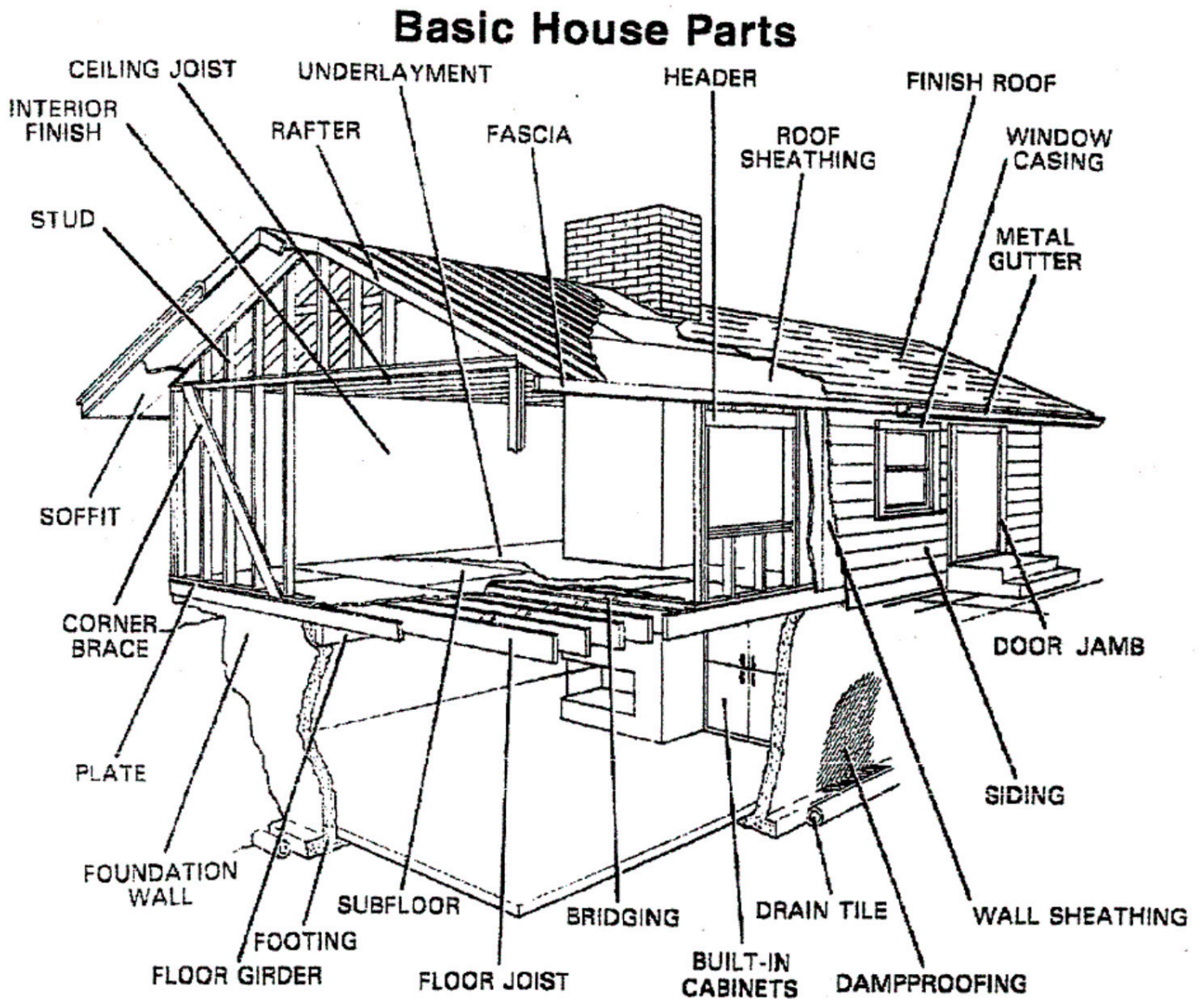


Image from davidolsonrealestate.com

ENERGY APPENDIX

The British Thermal Unit (BTU) is a unit of energy defined as the amount of heat required to raise the temperature of one pound of water by one degree Fahrenheit. It is typically used to measure thermal energy.

The watt is a unit of power (energy over time) equal to 1 joule per second. Typically, watts and kilowatts (kW) are used to measure electrical power, and kilowatt-hours (kWh) are used to measure electrical energy.

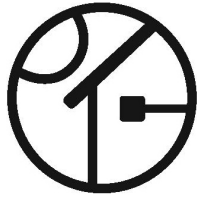
Thermal power is usually defined as Btu/hour or kBtu/hour (as in a 36,000 Btu/hr furnace), but can also be expressed in kilowatts (as in a 5 kW electric boiler).

All power (or energy) can be quantified in either watts or kilowatts (or kilowatt hours) or Btu/hour (or KBtus or MMBtus), by using conversions between the units.

Power and Energy Measurements and Conversions

1 watt	3.41 BTU/hr
1 kW	1,000 W
1 kBTU	1,000 BTU
1 MMBTU	1,000,000 BTU
1 Therm	100,000 BTU
1 Ton	100,000 BTU/hr
1 CCU	1.037 Therms

Conversion	Formula
BTU › W	Multiply BTU by 0.293
W › BTU	Multiply W by 3.414
kBTU › kW	Multiply kBTU by 0.293
kW › kBTU	Multiply kW by 3.414



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