

NW DUCTLESS HEAT PUMP PROJECT

The Basic Concepts Used in Calculating Heating & Cooling Requirements





START



1

Site &
Homeowner
Info Gathering



2

LOAD
CALCULATION

Option B

Option A

3

Equipment
Selection



4

Installation
Proposal



FINISH

TECH SMART HVAC SALES



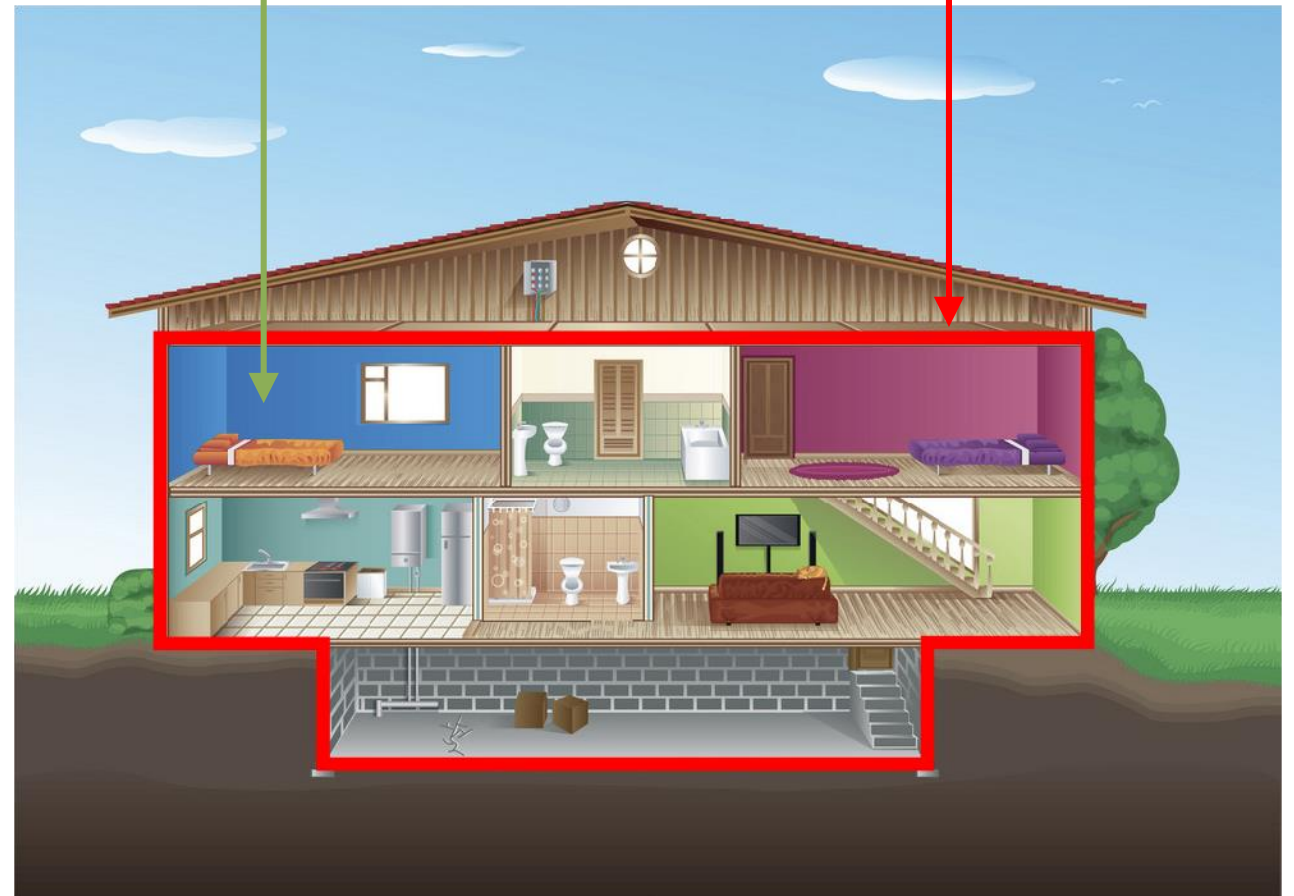
KEY CONCEPT: The Building Envelope

The **Building Envelope** is made of surfaces like walls, ceilings, floors, foundations, windows and doors.

These surfaces form the building envelope when they separate the indoor (conditioned) space from the outdoor (unconditioned) space.

Conditioned Space
Within the envelope

Building Envelope

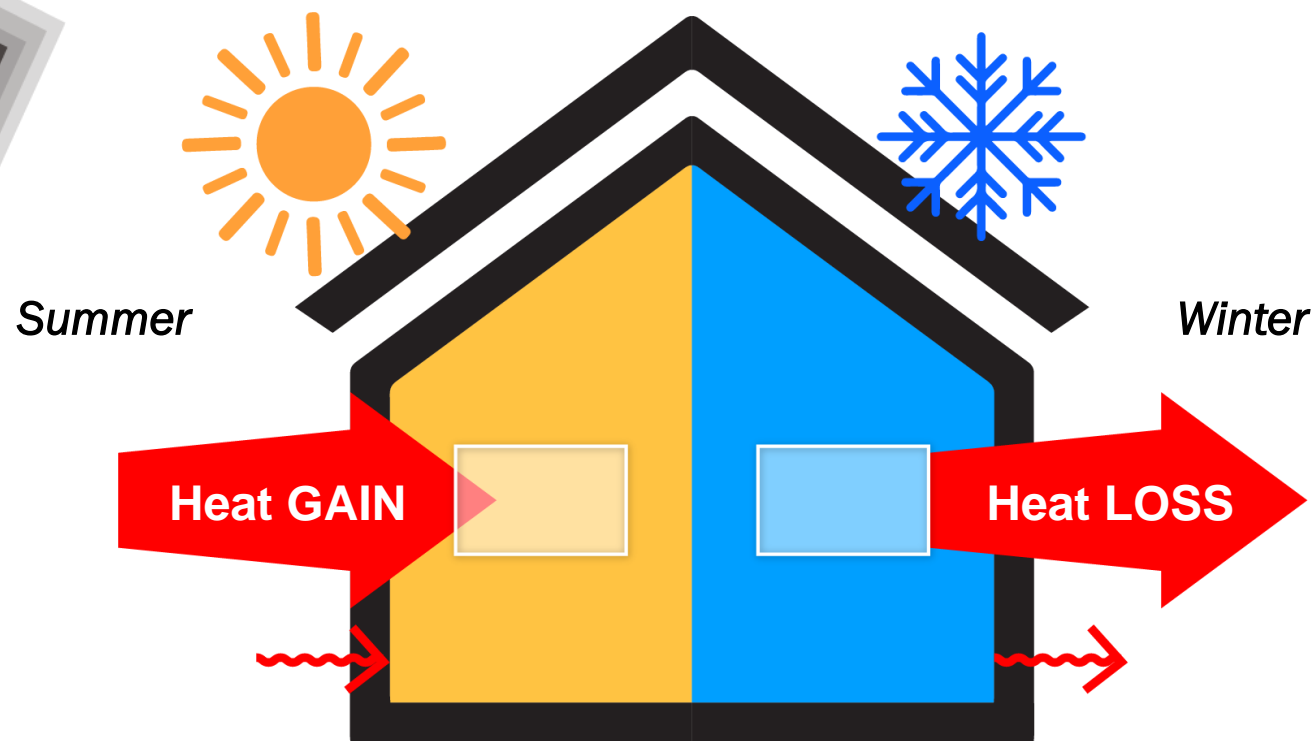


KEY CONCEPT: Heat Loss & Heat Gain

Heat is lost through the building envelope in the winter.

Heat is gained through the building envelope in the summer.

The following materials are used to minimize heat loss and heat gain:



Insulation



Image Source: US EPA

Air Sealing



Image Source: US EPA

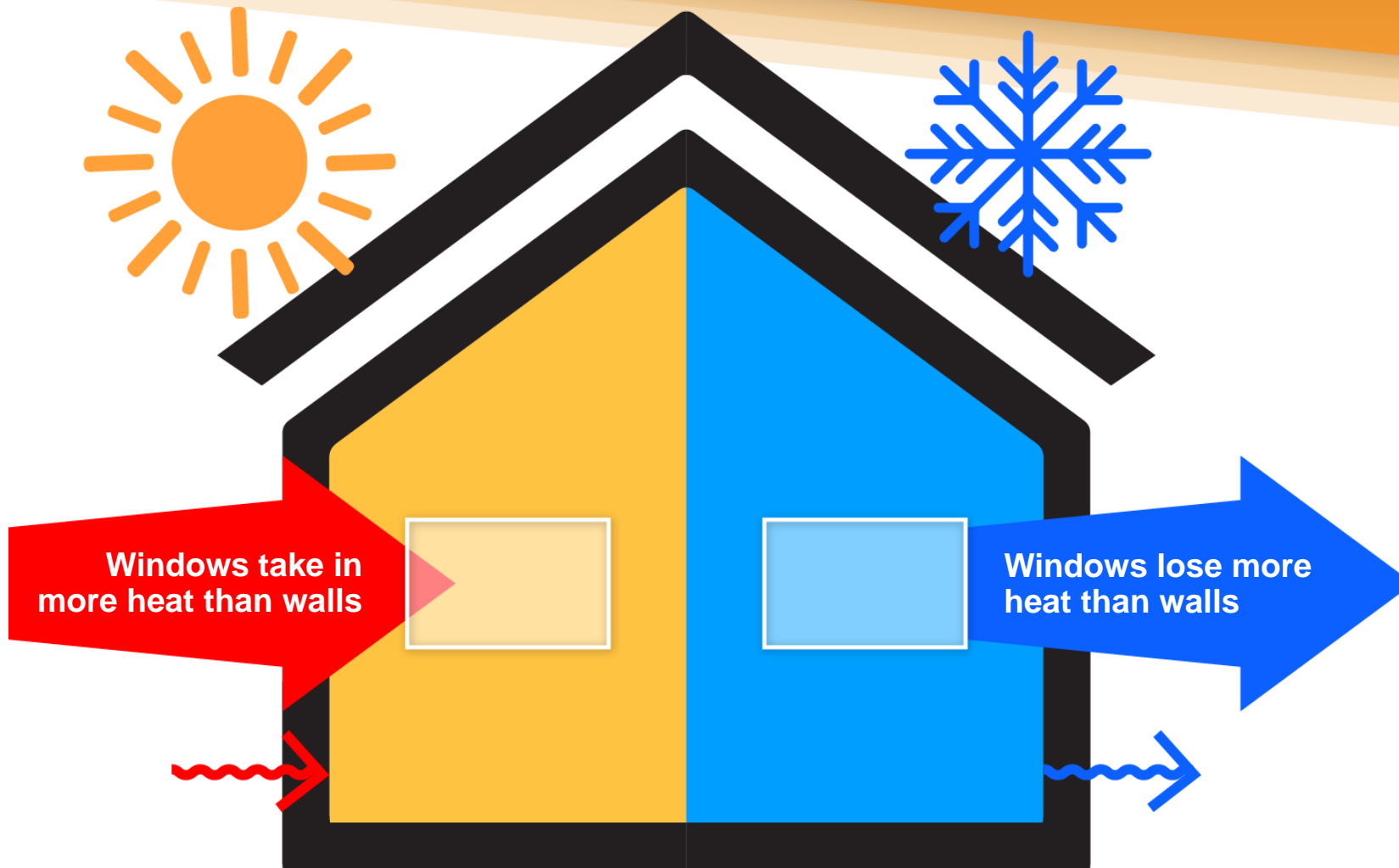
House Wrap



Hi-Performance
Windows



HEAT LOSS – HEAT GAIN CONCEPTS

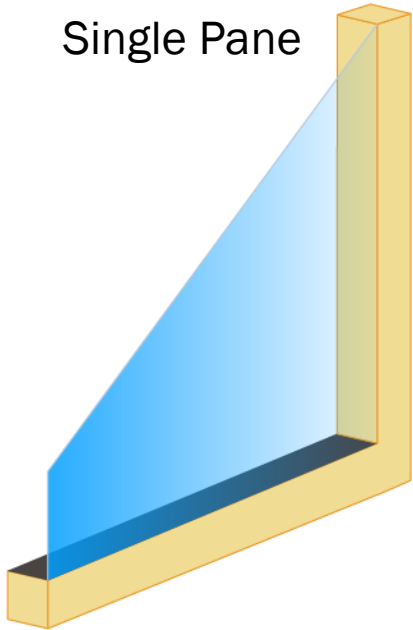


#1

Different surfaces and materials lose and gain heat differently.

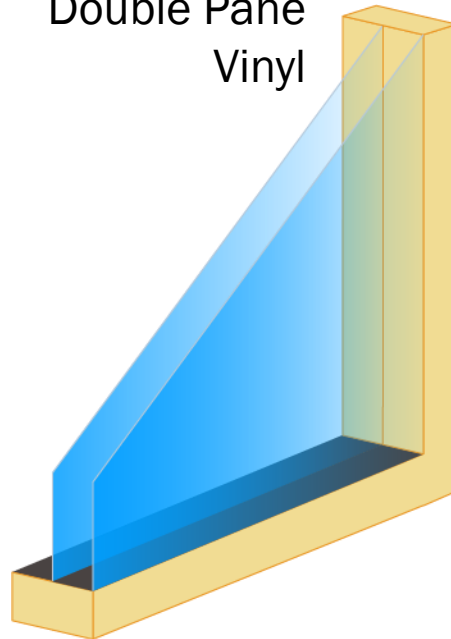
HEAT LOSS – HEAT GAIN CONCEPTS

Single Pane



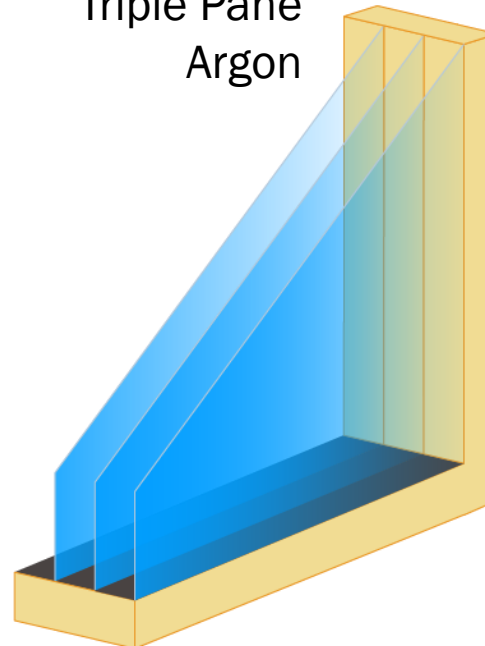
$U = 1.0$

Double Pane
Vinyl



$U = 0.35$

Triple Pane
Argon

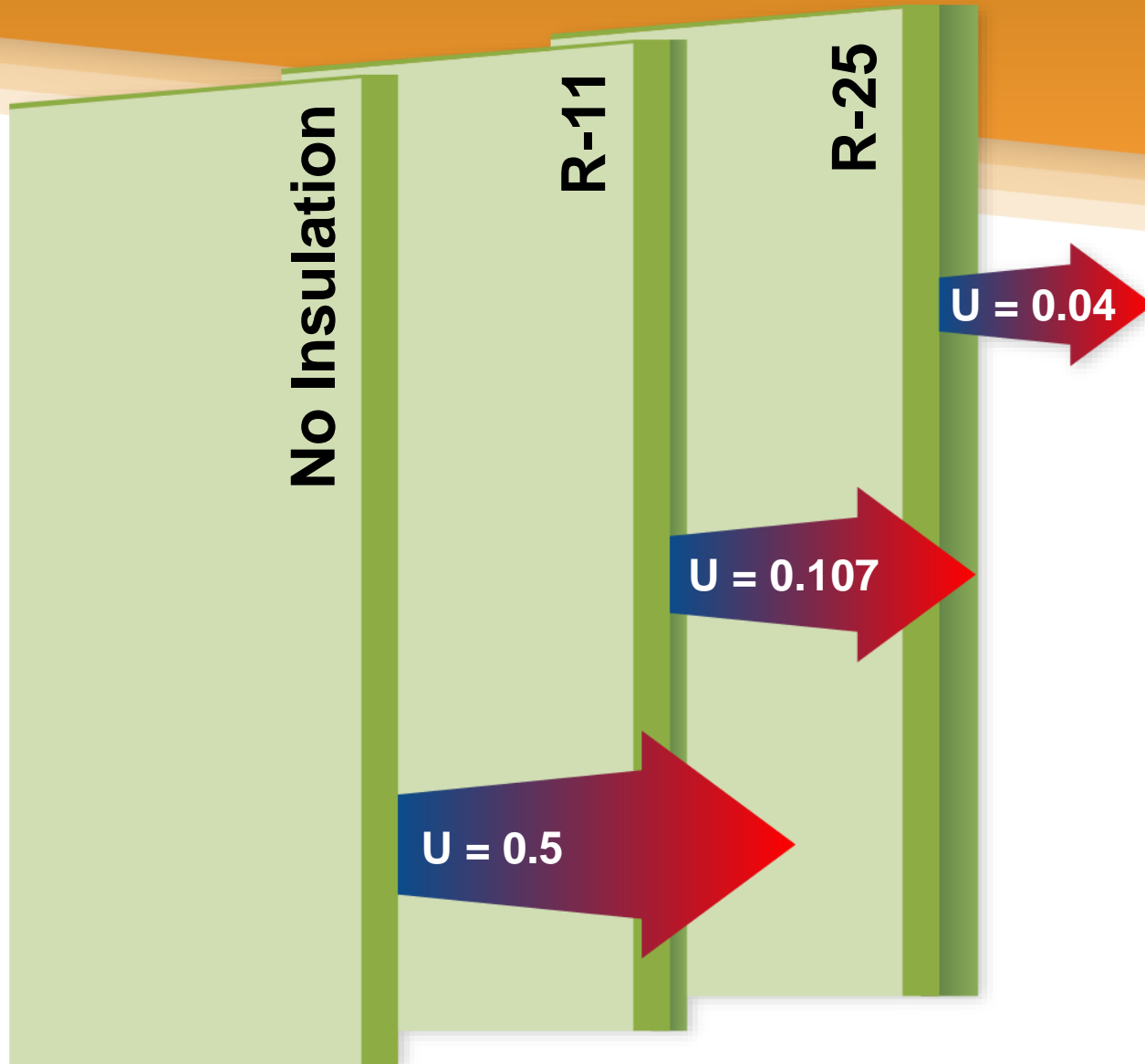


$U = 0.16$

#2

Window and door
MATERIALS have a
big impact.

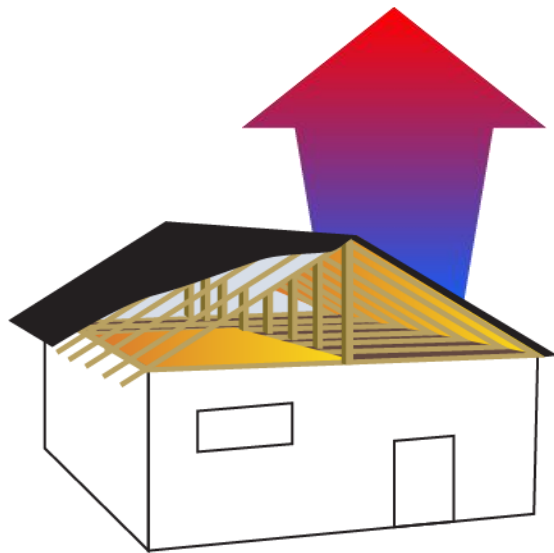
HEAT LOSS – HEAT GAIN CONCEPTS



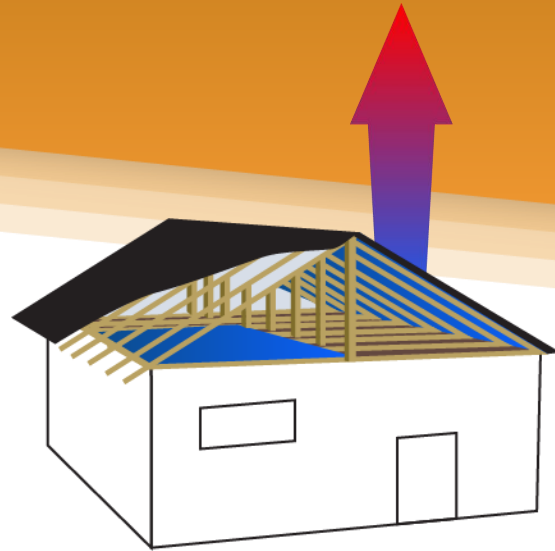
#3

INSULATION level in
walls, floors and
ceilings is a big factor.

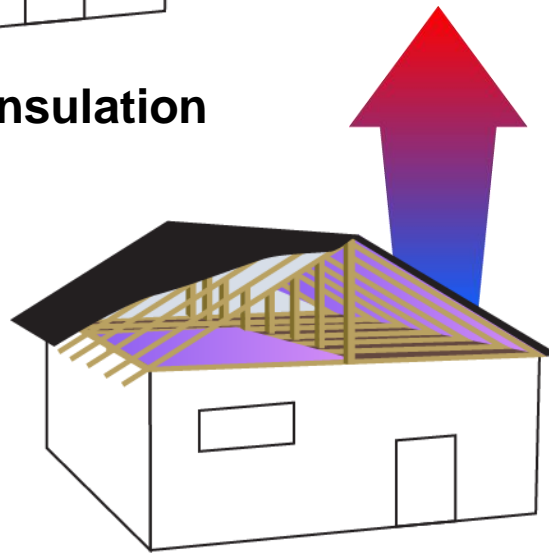
HEAT LOSS – HEAT GAIN CONCEPTS



R-11 Batt Insulation
 $U = 0.09$



R-49 DEEP Insulation
 $U = 0.02$



R-30 Loose-fill Insulation
 $U = 0.03$

#4

CIELINGS
gain and lose heat
differently than walls.

HEAT LOSS – HEAT GAIN CONCEPTS



Uninsulated Basement = Loss

*photo credit: <https://www.flickr.com/photos/jcestnik/2366730203>
under license: <https://creativecommons.org/licenses/by-nd/2.0/>, no
changes made to photo



No Loss for Conditioned Basement

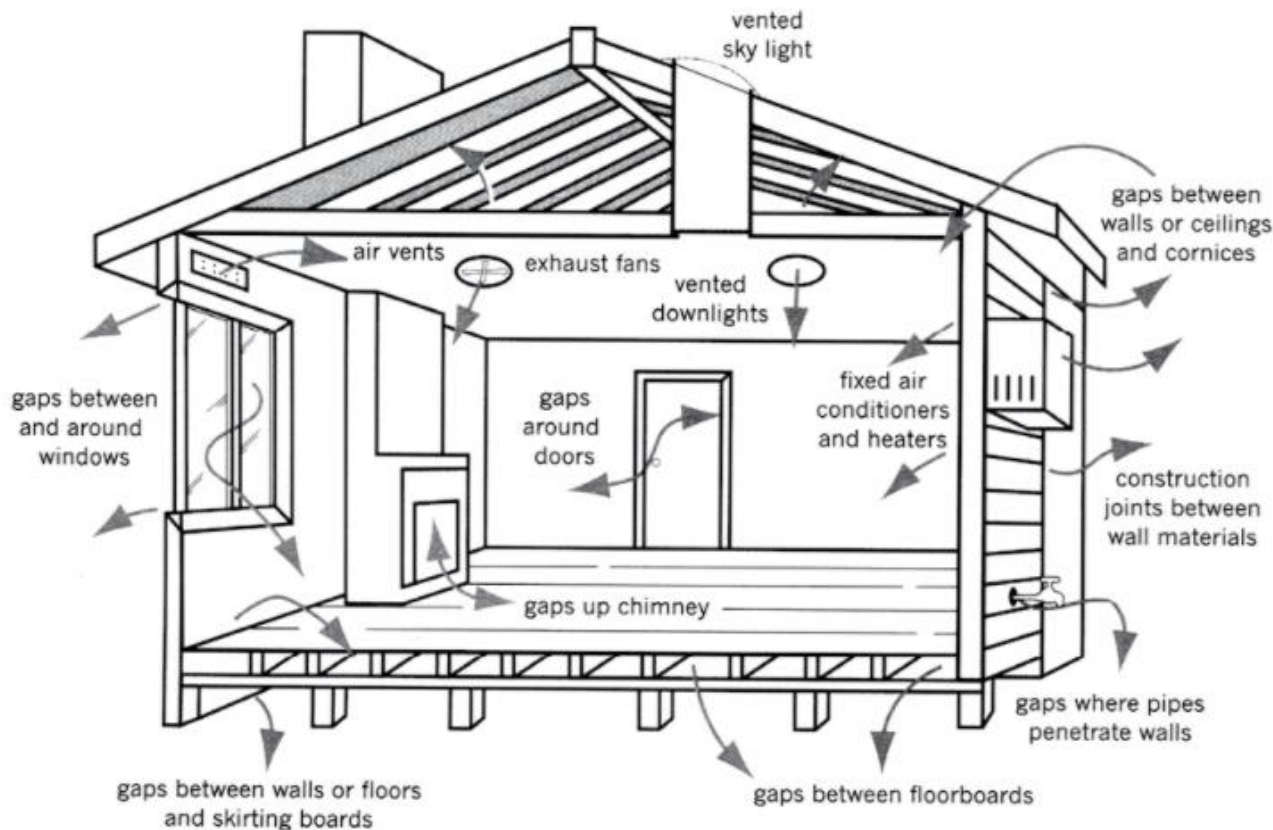


R-19 Insulation in Crawlspace

#5

FLOORS gain and
lose heat
differently than
walls.

HEAT LOSS – HEAT GAIN CONCEPTS



#6

AIR LEAKAGE and INFILTRATION at seam/joints is a factor. Air sealing can greatly influence the overall heating and cooling requirements.

HEAT LOSS – HEAT GAIN CONCEPTS

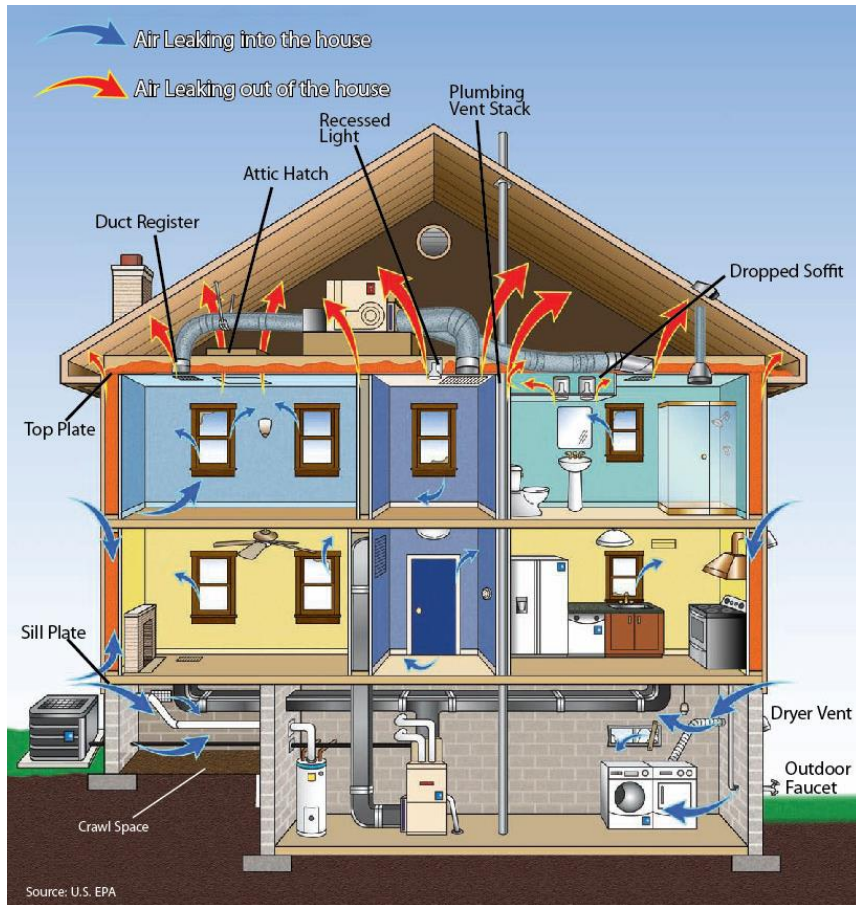


Image Source: US EPA

Attic Ductwork

Typical Loss/Gain Point

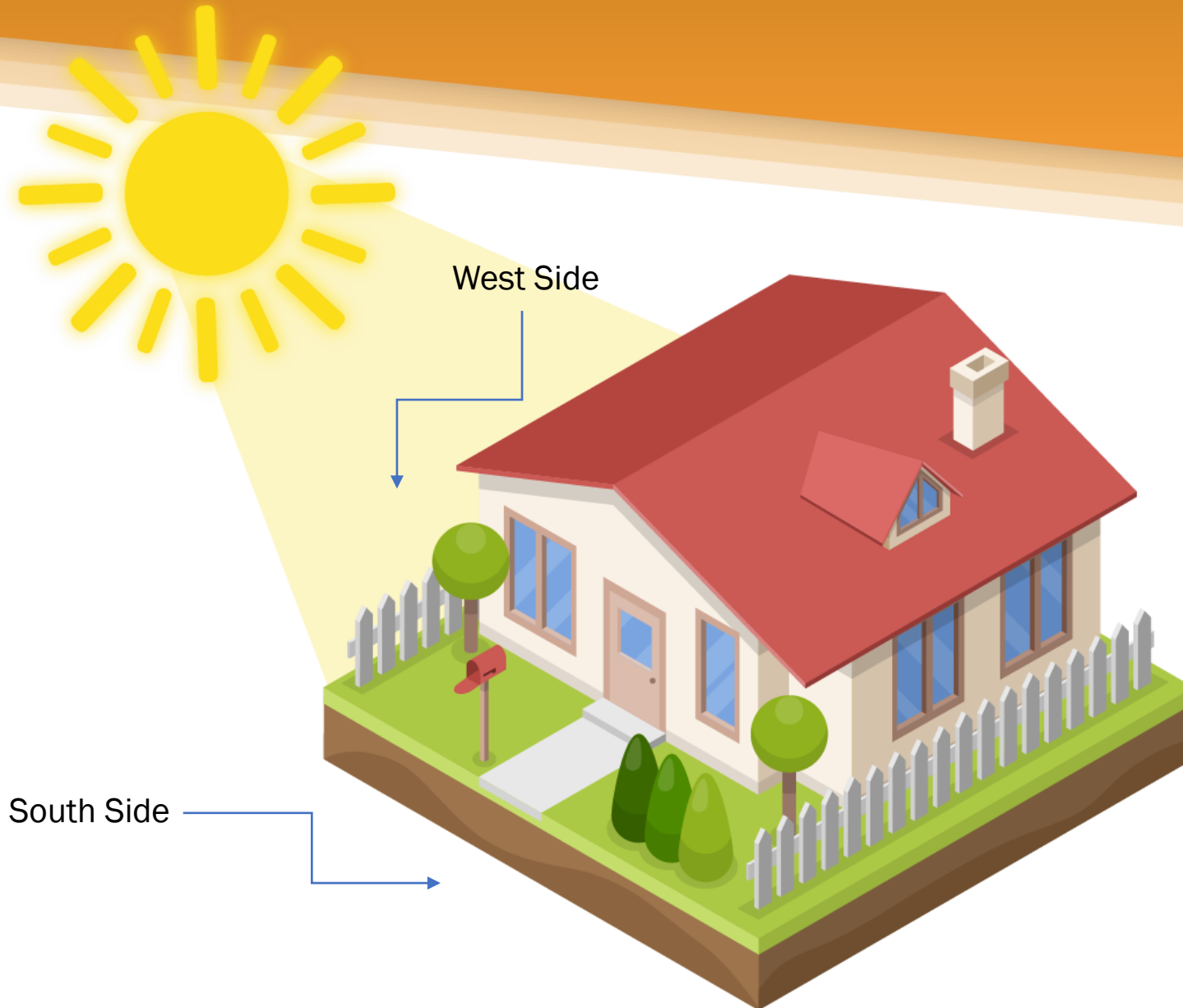
Crawlspace Basement or Ductwork

Typical Loss/Gain Point

#7

DUCTWORK, when located in attic or crawlspaces, leaks air when not sealed and loses heat when not insulated. It can also gain (absorb) heat in the summer.

HEAT LOSS – HEAT GAIN CONCEPTS



#8

SUNLIGHT on the
structure creates
heat gain.

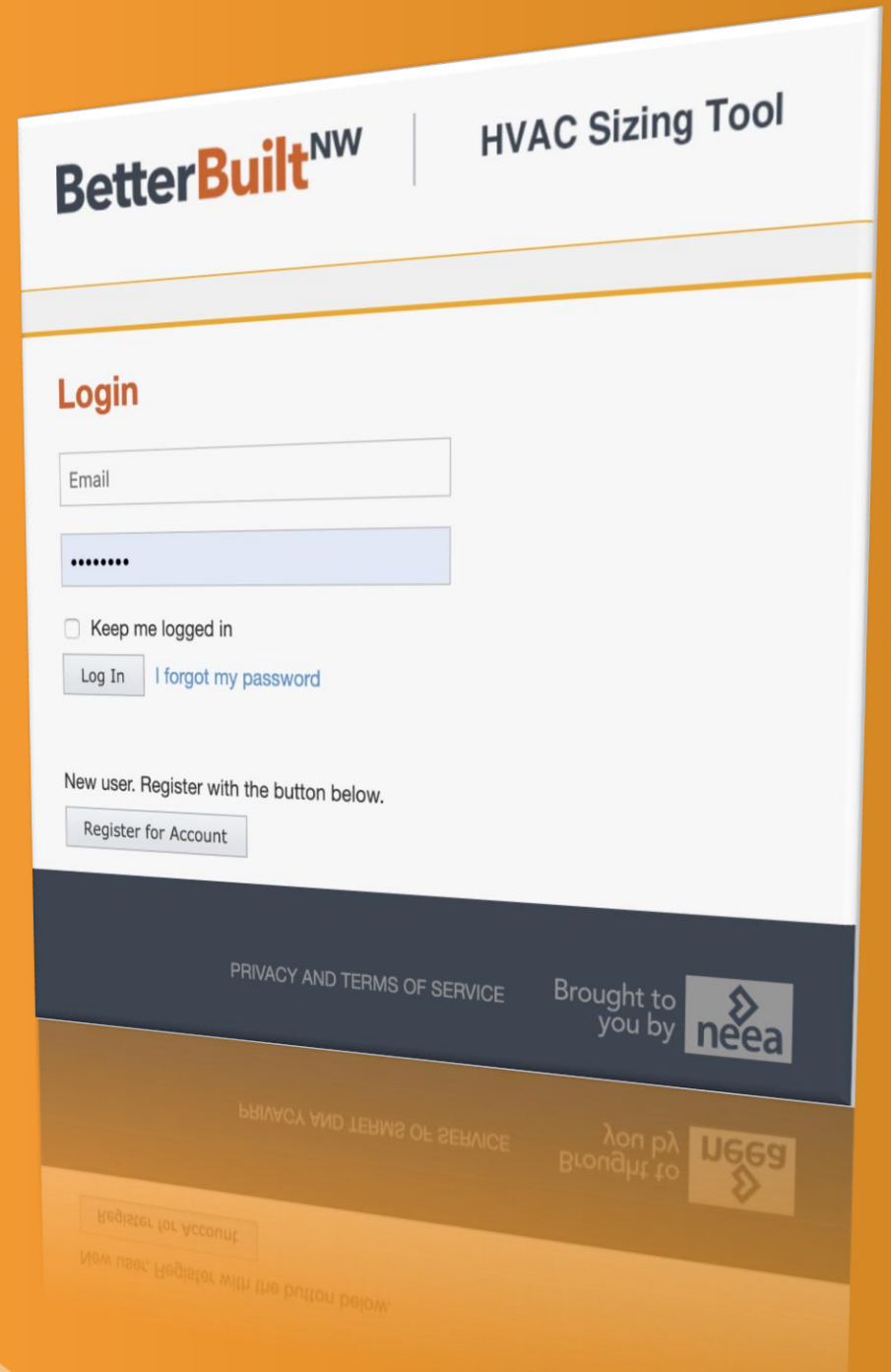
FREE LOAD CALCULATION SOFTWARE

Created for contractors by Northwest utilities. It is free and easy to use.

HVAC
SIZING TOOL

To create your account, go to:
<https://www.hvac sizing tool.com>



NW DUCTLESS HEAT PUMP PROJECT



QUICK & EASY LOAD CALCULATION FOR DISPLACEMENT APPLICATIONS

STEPS:

1. Calculate floor area of living room (or main living area).
2. Determine the Heating Load Factor (BTUs / ft²) to use.
3. Multiply floor area by the load factor to get the heating requirement.
4. Select equipment that produces at least the load.

Heating Load Factors				
INSULATION TYPE	Climate (Design Temperature F)			
	BELOW -10° F	-10° F to 5° F	5° F to 20° F	ABOVE 20° F
	Btuh/sq.ft.			
No-wall Insulation	47	41	35	27
2x4 Construction w/ Insulation	25	22	19	14
2x6 Construction w/ Insulation	18	15	13	10
New Construction (Post 2012)	16	14	12	9

NW DUCTLESS HEAT PUMP PROJECT

Lean more about:

Load
Calculation for
Displacement
Applications

Check out our video.



DUCTLESS

HEATING & COOLING SYSTEMS

For great contractor resources and
information, check out:
www.GoingDuctless.com

Check out free load calculation
software from

BetterBuilt^{NW}

<https://www.HVACsizingtool.com>

NW DUCTLESS HEAT PUMP PROJECT



*Thank
you!*