BetterBuilt NW

HVAC Sizing Tool

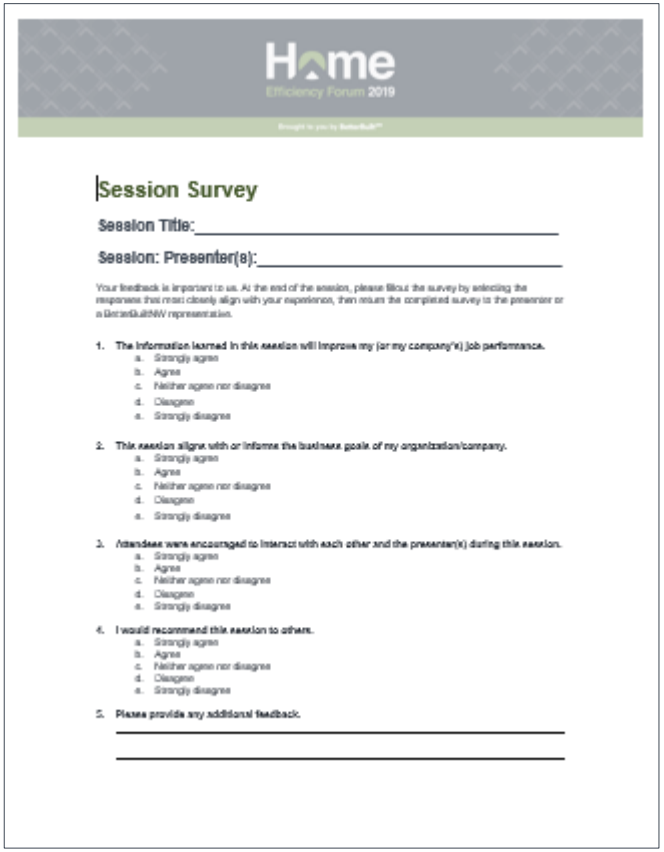
A free online HVAC system sizing and design tool for residential and small commercial buildings

June 25th, 2019

Session Survey Instructions

At the end of each session, you will be given 5 minutes to complete the session survey.

- Complete the survey using the mobile app or paper versions
- Provide the paper surveys to the room moderator or to the BetterBuiltNW table
- We appreciate your feedback



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Efficiency Forum 2019

Session Survey

Session Title:_____

Session: Presenter(s):_____

Your feedback is important to us. At the end of the session, please fill out the survey by selecting the responses that most closely align with your experience, then return the completed survey to the presenter or a BetterBuiltNW representative.

1. The information learned in this session will improve my (or my company's) job performance.
   a. Strongly agree
   b. Agree
   c. Neither agree nor disagree
   d. Disagree
   e. Strongly disagree

2. This session aligns with or informs the business goals of my organization/company.
   a. Strongly agree
   b. Agree
   c. Neither agree nor disagree
   d. Disagree
   e. Strongly disagree

3. Attendees were encouraged to interact with each other and the presenter(s) during this session.
   a. Strongly agree
   b. Agree
   c. Neither agree nor disagree
   d. Disagree
   e. Strongly disagree

4. I would recommend this session to others.
   a. Strongly agree
   b. Agree
   c. Neither agree nor disagree
   d. Disagree
   e. Strongly disagree

5. Please provide any additional feedback.

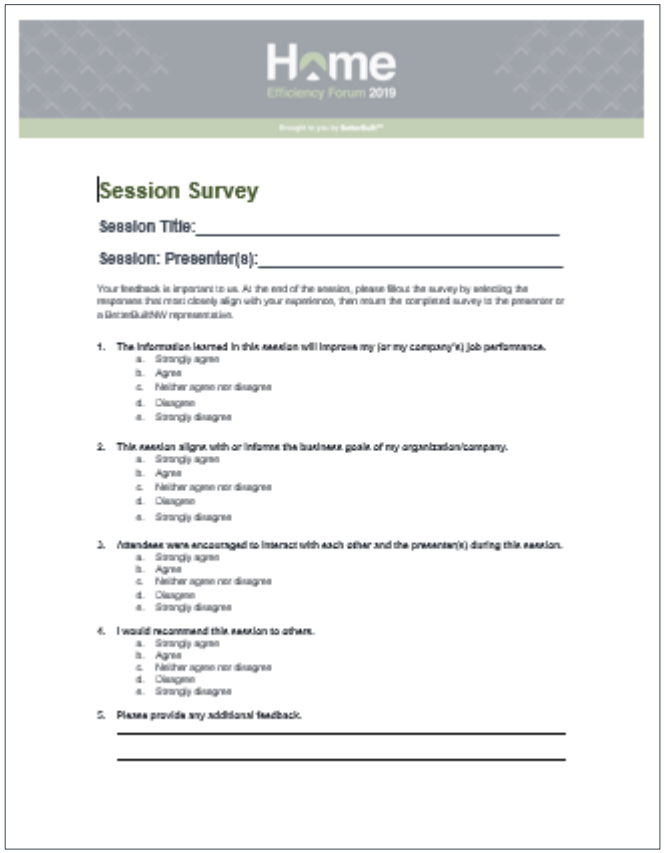
_____

_____

Complete the Session Survey

Accurately Size Your HVAC in 15 Minutes

- Christopher Dymond
- Bruce Manclark



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   _____
   _____
   _____

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June 25th, 2019

Introduction

Presenters

- Bruce Manclark – CLEAResult
- Christopher Dymond – Northwest Energy Efficiency Alliance

Funding Provided By

- Utilities of the Pacific Northwest

Learning Objectives

Basics

- Know Why Sizing Is Important
- What is HVAC ST

HVAC ST

- Create and Account
- Navigate Menus & Find Help
- Enter a Building

Demonstration Of HVAC ST

- Duct Design
- System Sizing

What is HVAC ST?

Formerly called “SpecPro” . . . . Is now called “HVAC Street”

Capabilities

- Accurate zonal heating and cooling loads
- Equipment sizing
- Simple visual duct design

Values

- Free
- Accurate
- Easy & Quick
- Detailed Results
- Online Data Management
- Reduce Project Risks

A free online tool
for
Sizing HVAC systems

residential and small commercial buildings

Why is Sizing Important

1: Provides for better room to room comfort

2: Reduces warranty claims

3: Can lower up front costs

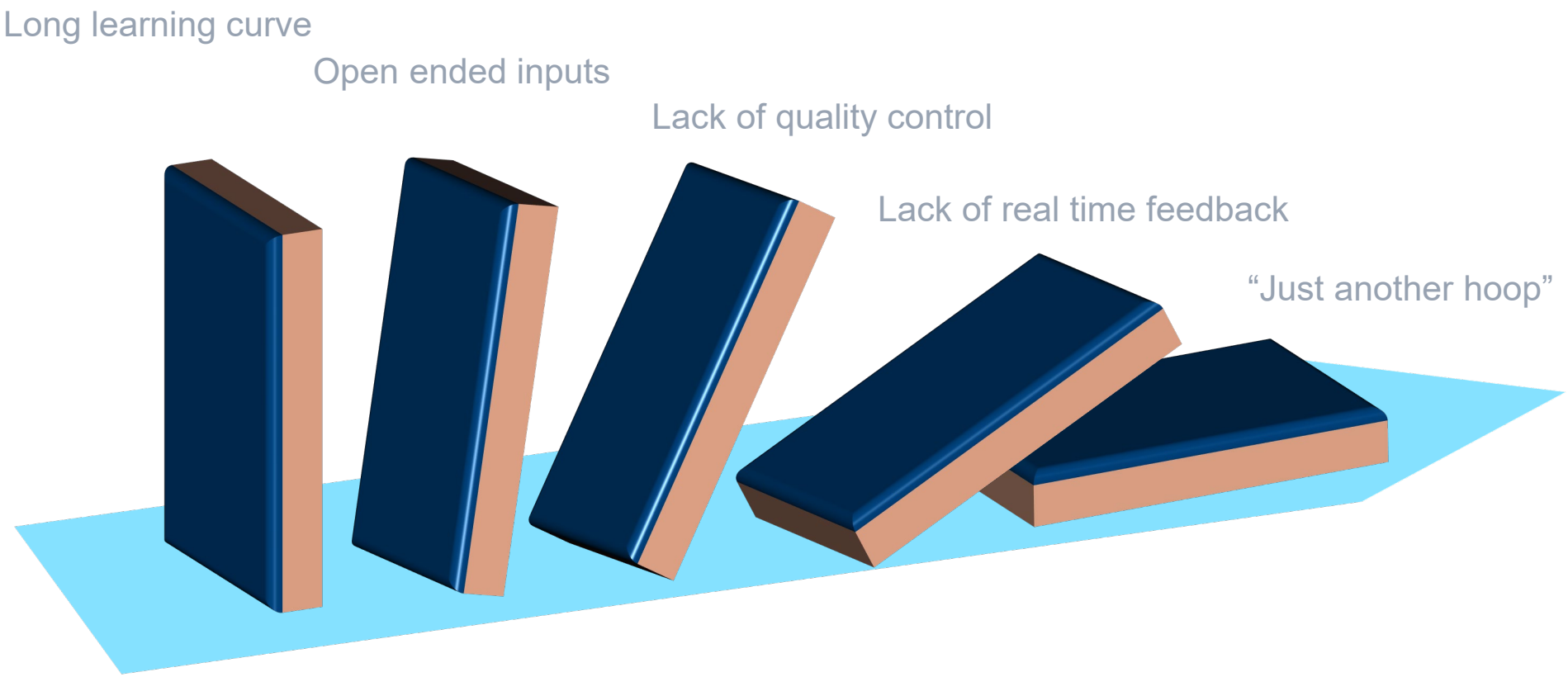
- equipment
- ducts

4: Increases the odd of having compressor based systems operating at higher levels of efficiency and capacity

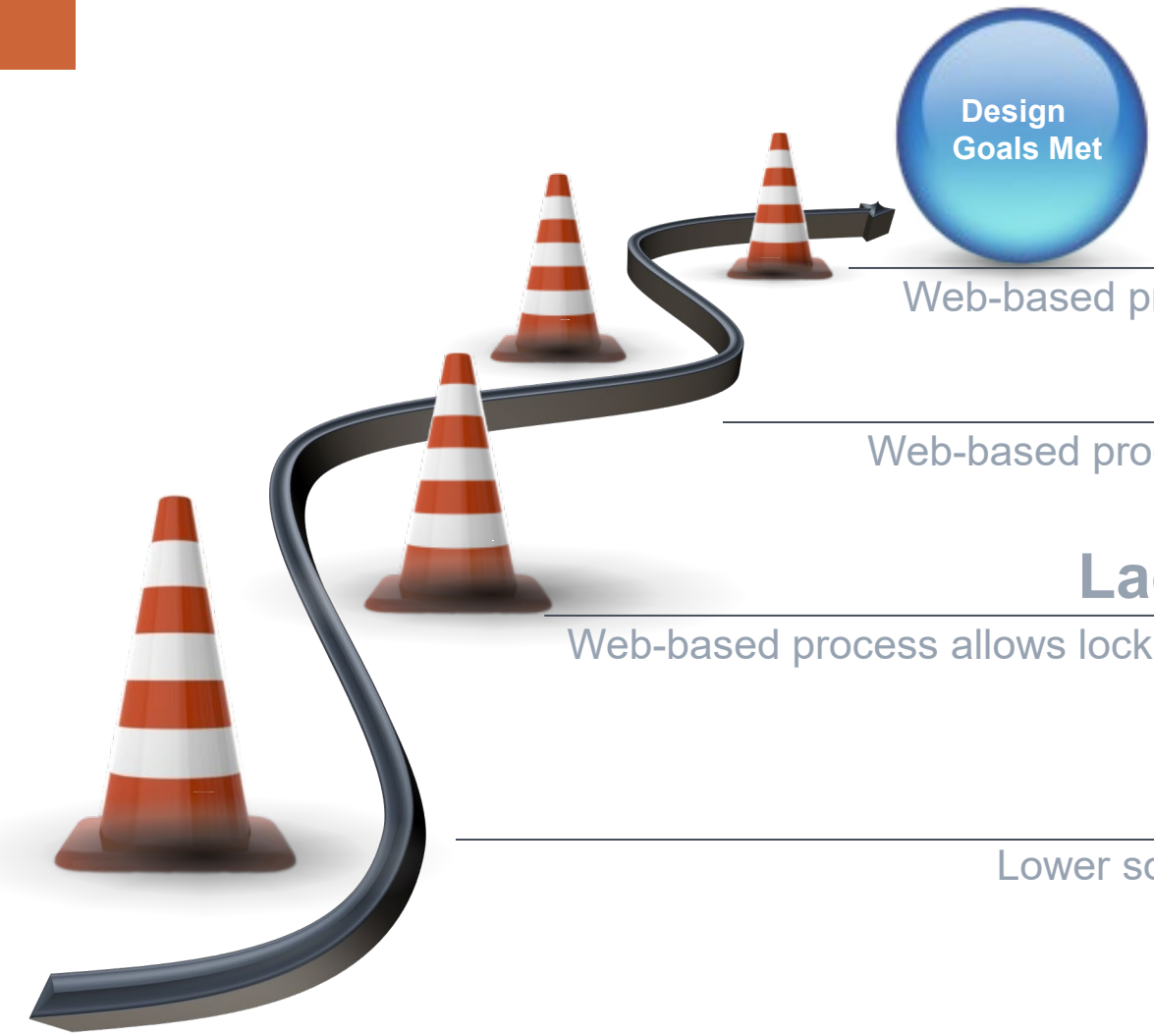
5: Smaller ducts can make it easier to get ducts inside the thermal boundary

Why HVAC ST?

HVAC Design Requirements Often Fail



HVAC ST Overcomes Problems



Difficult Data Mining

Web-based process allows for easy data analysis

Lack of QC

Web-based process allows real-time error checking

Lack of Input Validation

Web-based process allows locked down inputs at a program level

Cost of Software

Lower software costs, shorter learning curve

Disclaimer

This tutorial will not make you an expert.

To get the most out of this training you should familiar with ACCA manual J and basics of residential heating and cooling systems

The tool is based on ACCA manual J design calculation method with assumptions used to expedite small building HVAC system design. It is not ACCA certified.

This report and any values, estimates and recommendations included herein are only intended to assist the recipient in evaluating design options and should not be used in lieu of professional engineering services. Moreover, results are provided "as is" without any warranty or representation regarding quality, accuracy, non-infringement, or usefulness

Part #1

Getting Started

Create An Account

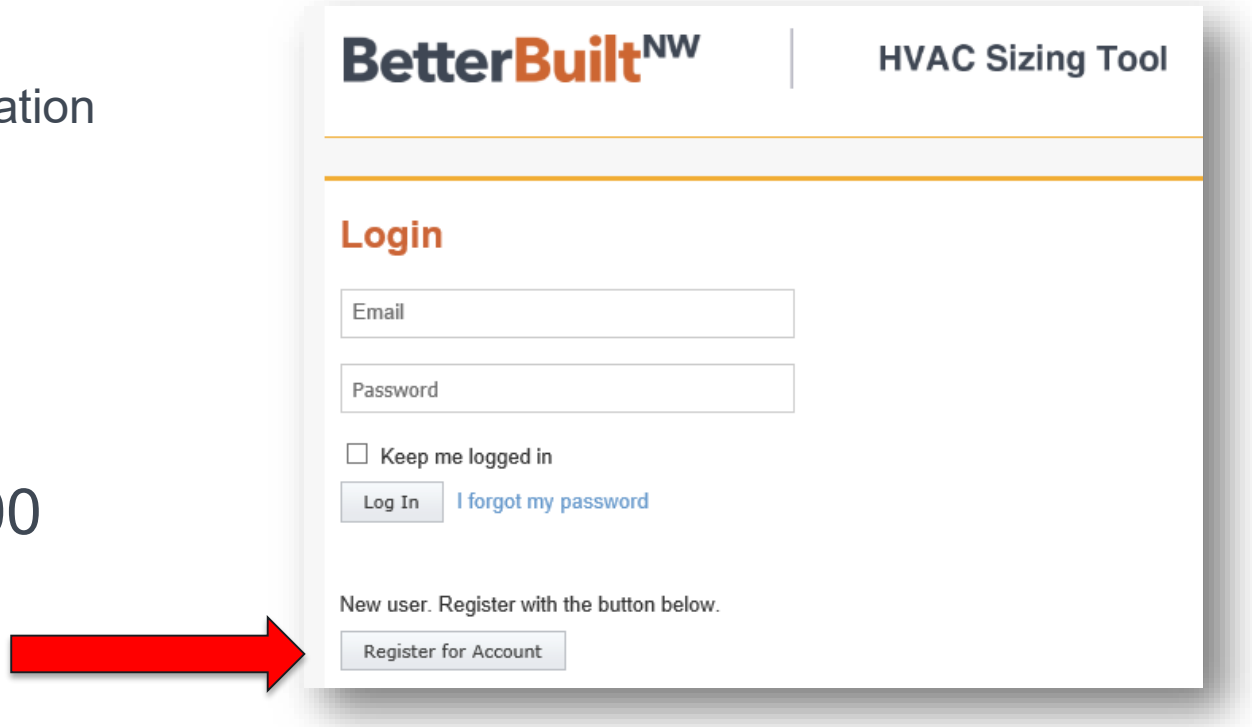
Got to www.HVAC.BetterBuiltNW.com

Register for Account

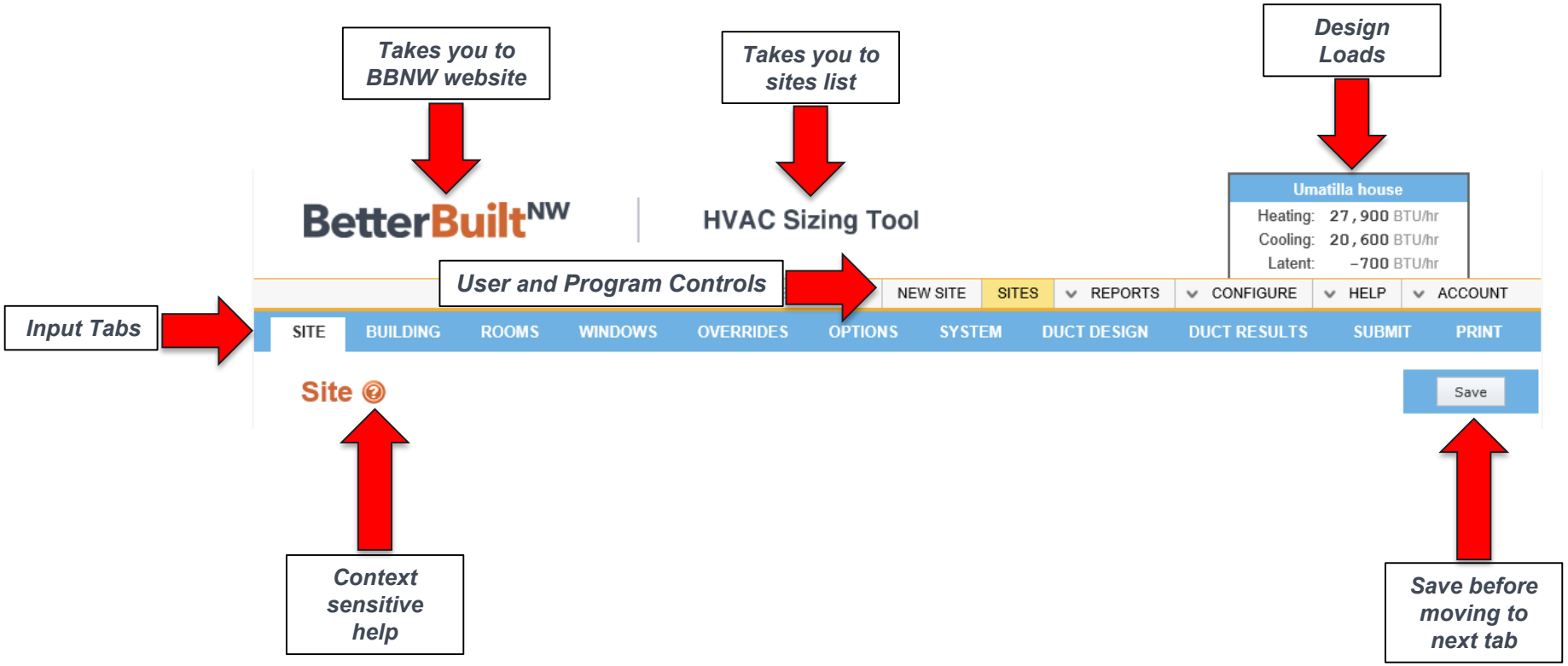
- Name
- Contact information
- Email
- Password

User Agreement

User Cost = $0.00



Basic Program Navigation

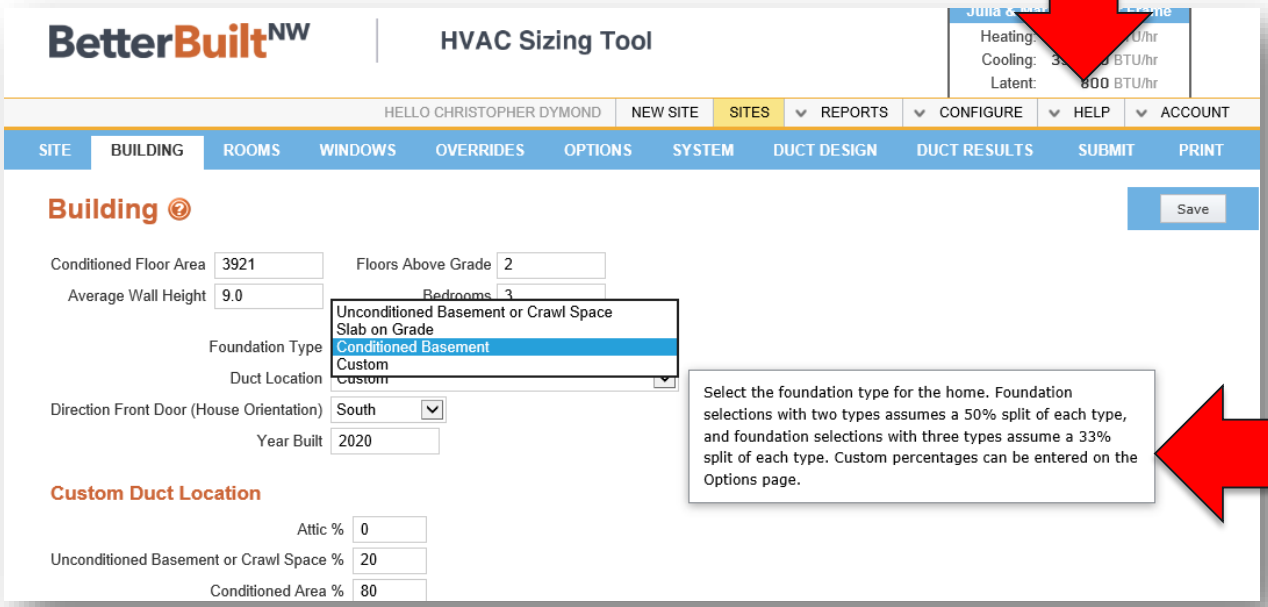


Help

HELP menu

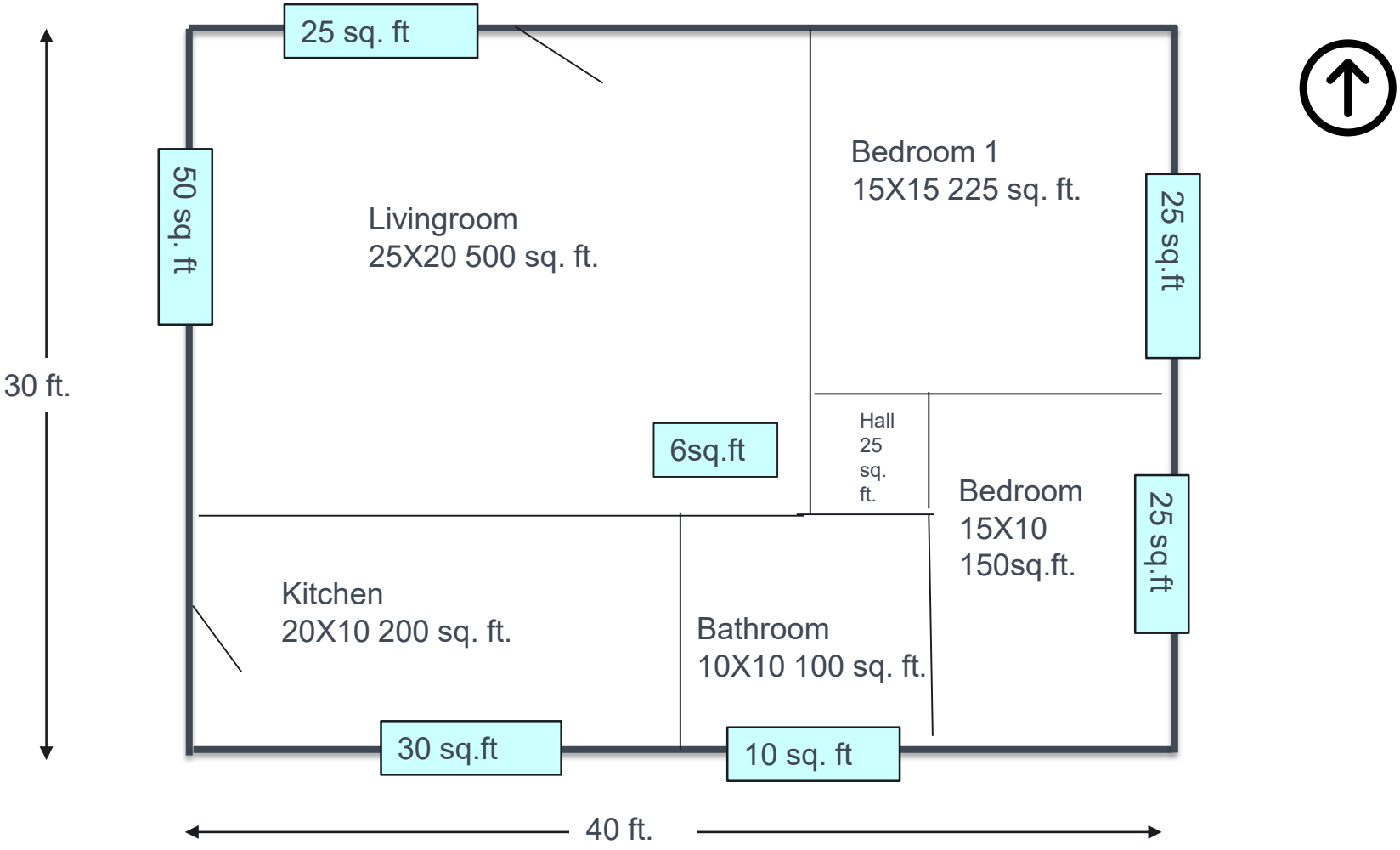
Frequently Asked Questions

You-Tube webinars



"Hover-over" Help

Tutorial House



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Tutorial House	
Heating:	28,300 BTU/hr
Cooling:	19,500 BTU/hr
Latent:	0 BTU/hr

HELLO CHRISTOPHER DYMOND | NEW SITE | SITES | REPORTS | CONFIGURE | HELP | ACCOUNT

SITE | BUILDING | ROOMS | WINDOWS | OVERRIDES | OPTIONS | SYSTEM | DUCT DESIGN | DUCT RESULTS | SUBMIT | RESULTS

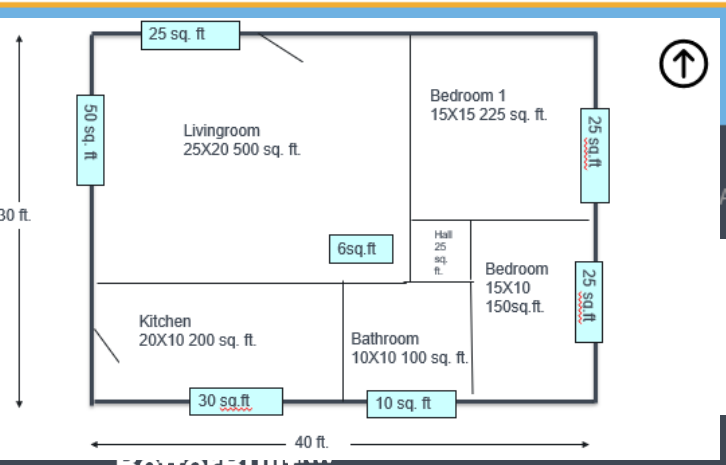
Rooms

Save

✔ Building sq ft correctly matches floor area.

Building Sqft: 1,200

New Room	Room Name	Floor Area	Exterior Length	Height Override	Unconditioned Ceiling	Unconditioned Floor	In Basement	Redistribute Room
Delete	Bedroom 1	225	30.0		100%	100%	☐	
Delete	Bedroom 2	150	25.0		100%	100%	☐	
Delete	Bathroom	100	10.0		100%	100%	☐	
Delete	hall	25	0.0		100%	100%	☐	Living Room
Delete	Living Room	500	45.0	12.0	100%	100%	☐	
Delete	Kitchen	200	30.0		100%	100%	☐	
		Total = 1,200						



Save | Cancel changes | Print

AND TERMS OF SERVICE

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BetterBuiltNW | HVAC Sizing Tool

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SITE | BUILDING | ROOMS | WINDOWS | OVERRIDES | OPTIONS | SYSTEM | DUCT DESIGN | DUCT RESULTS | SUBMIT | RESULTS

Windows

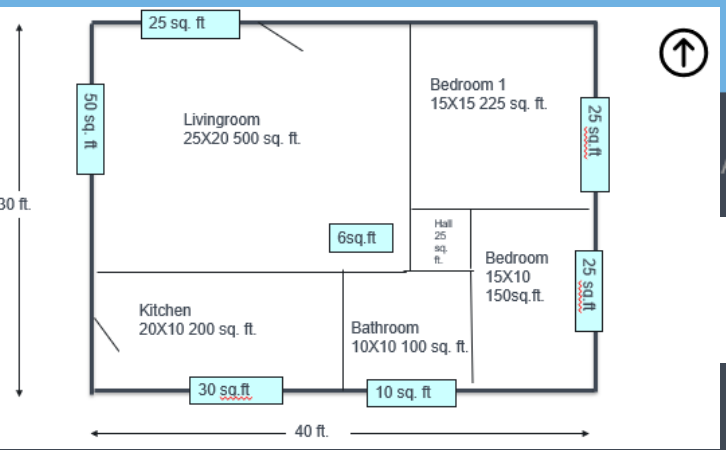
Save

✔ Window to floor ratio: 17.3%

Window U-Value 0.400 Window SHGC 0.400

Room Name	↑ N	↗ NE	→ E	↘ SE	↓ S	↙ SW	← W	↖ NW	Door	Skylight
Bedroom 1					25.0					
Bedroom 2					20.0					
Bathroom	5.0									6.0
hall										
Living Room	25.0						50.0		20.0	6.0
Kitchen					30.0				20.0	

Rotate house orientation | Rotate West 45° | Rotate East 45°



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HVAC Sizing Tool

Tutorial House

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Latent: 0 BTU/hr

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SITE | BUILDING | ROOMS | WINDOWS | OVERRIDES | OPTIONS | SYSTEM | DUCT DESIGN | DUCT RESULTS | SUBMIT | RESULTS

Overrides

Save

	Default	Rough Equiv	Override	Value
Ceiling U-Value	0.049	(R-19)	R-38	0.026
Floor U-Value	0.047	(R-20)	Default	
Wall U-Value	0.097	(R-10)	Default	
Basement Wall U-Value	0.093		Default	
Basement Floor U-Value	0.025		Default	
Slab F-Value	1.180		Default	
Door U-Value	0.500			
Window U-Value	0.400			
Window SHGC	0.580		0.400	
Duct Insulation	R-4		R-8	
Duct Leakage	Average		Tight	
Winter Infiltration ACH	0.500			
Summer Infiltration ACH	0.250			

Save | Cancel changes | Print

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Tutorial House

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SITE | BUILDING | ROOMS | WINDOWS | OVERRIDES | OPTIONS | SYSTEM | DUCT DESIGN | DUCT RESULTS | SUBMIT | RESULTS

Options

Save

Design Conditions

	Default	Override
Elevation	531	
Latitude	46	
Heating 99% Dry Bulb	11	7
Cooling 1% Dry Bulb	96	
Summer Design Grains	-11	
Winter Thermostat Setpoint	70	
Summer Thermostat Setpoint	75	
Indoor RH	50	
Daily Range	High	None

Other Options

Number Of People:	3	
Appliance / Lighting Load	2400	4500
Ventilation CFM	35	

Sizing an HVAC System

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Tutorial House	
Heating:	28,300 BTU/hr
Cooling:	19,500 BTU/hr
Latent:	0 BTU/hr

System

Save

⚠ A ductless system type was specified, but **Ductless** was not selected for the **Duct Location** value on the Building page.
⚠ Cooling output is 187% of cooling load. Outputs more than 115% of cooling load may affect comfort.

Heating Type Selection

Heating Type: Heat Pump Ductless

Select Heat Pump: Manual Entry (n/a) — Go to Heat Pump Manager

	Temp	HP Output	
Low Temp	17	17000	BTU/hr
High Temp	47	36000	BTU/hr

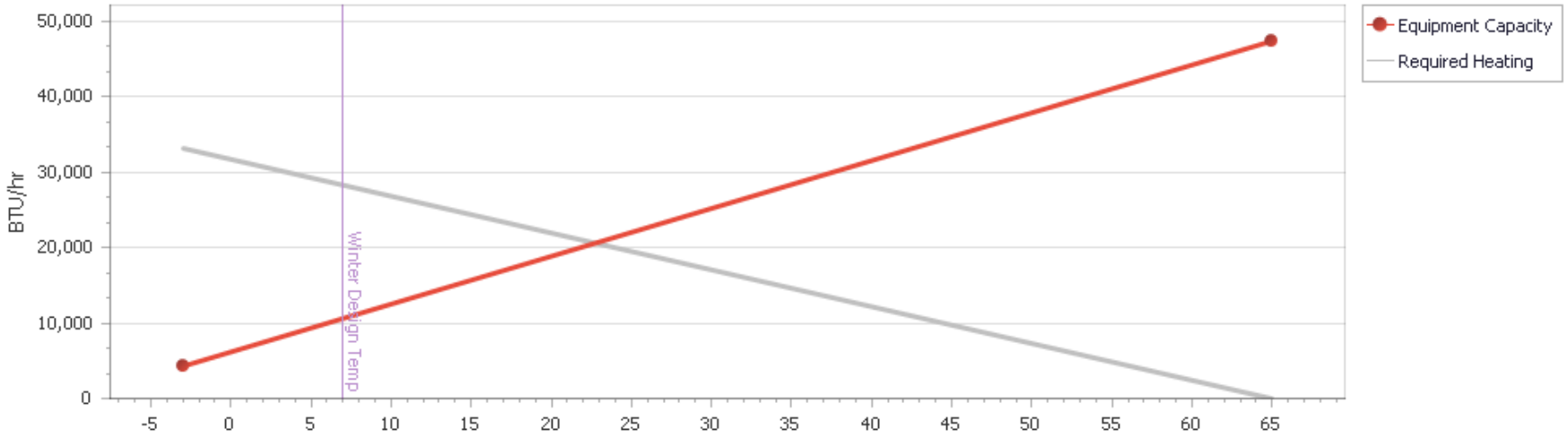
Cooling Type Selection

Cooling Type: Heat Pump

Sensible	36000	BTU/hr
Latent	1000	BTU/hr
Sensible Ratio	0.97	

Required Heating

Balance Point — Capacity balances at: **22.7°** (20,600 BTU)

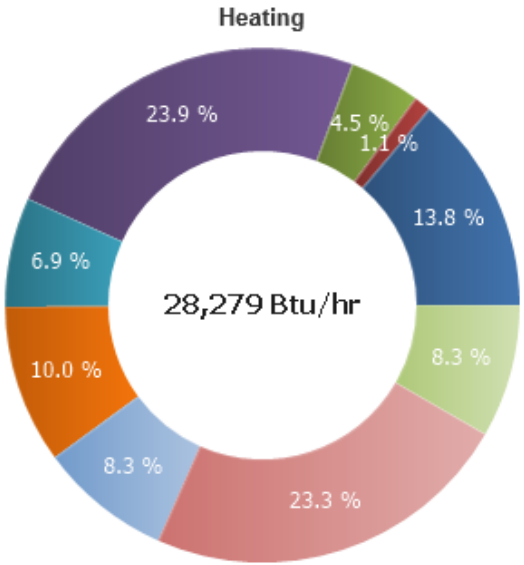


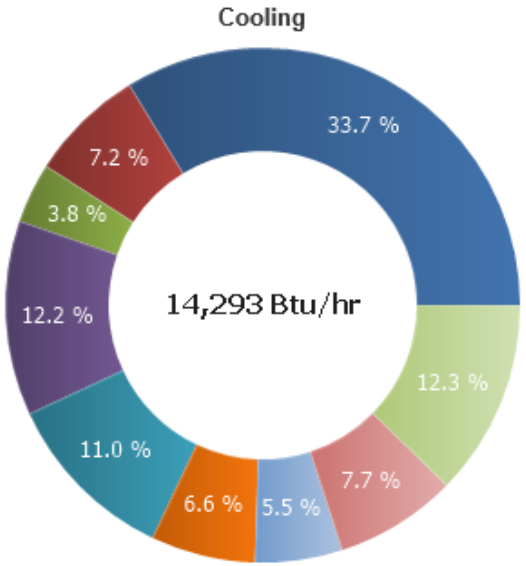
Room Data and Loads

Room Name	Suggested Ducts	Actual Ducts	Duct Size	CFM/Duct	Actual CFM Measured	Floor Area	Ext. Length	Height Override	Uncond Ceiling	Uncond Floor	Heating Load	Cooling Load
Bedroom 1	1	1	8	133		225	30.0		100 %	100 %	5,118	3,117
Bedroom 2	1	1	8	105		150	25.0		100 %	100 %	4,010	2,295
Bathroom	1	1	6	62		100	10.0		100 %	100 %	1,950	1,643
hall			3	0		25	0.0		100 %	100 %	49	124
Living Room	3	3	8	117		500	45.0	12.0	100 %	100 %	11,529	8,949
Kitchen	1	1	8	148		200	30.0		100 %	100 %	5,623	3,355
Total	7	7				1,200					28,279	19,483

Component Loads

	Heating	Cooling	Color
Windows	3,906	4,814	
Skylights	302	1,034	
Doors	1,260	540	
Walls	6,753	1,747	
Ceiling	1,946	1,575	
Floors	2,817	939	
Ventilation	2,351	784	
Infiltration	6,587	1,098	
Ducts	2,357	1,762	
Total:	28,279	14,293	





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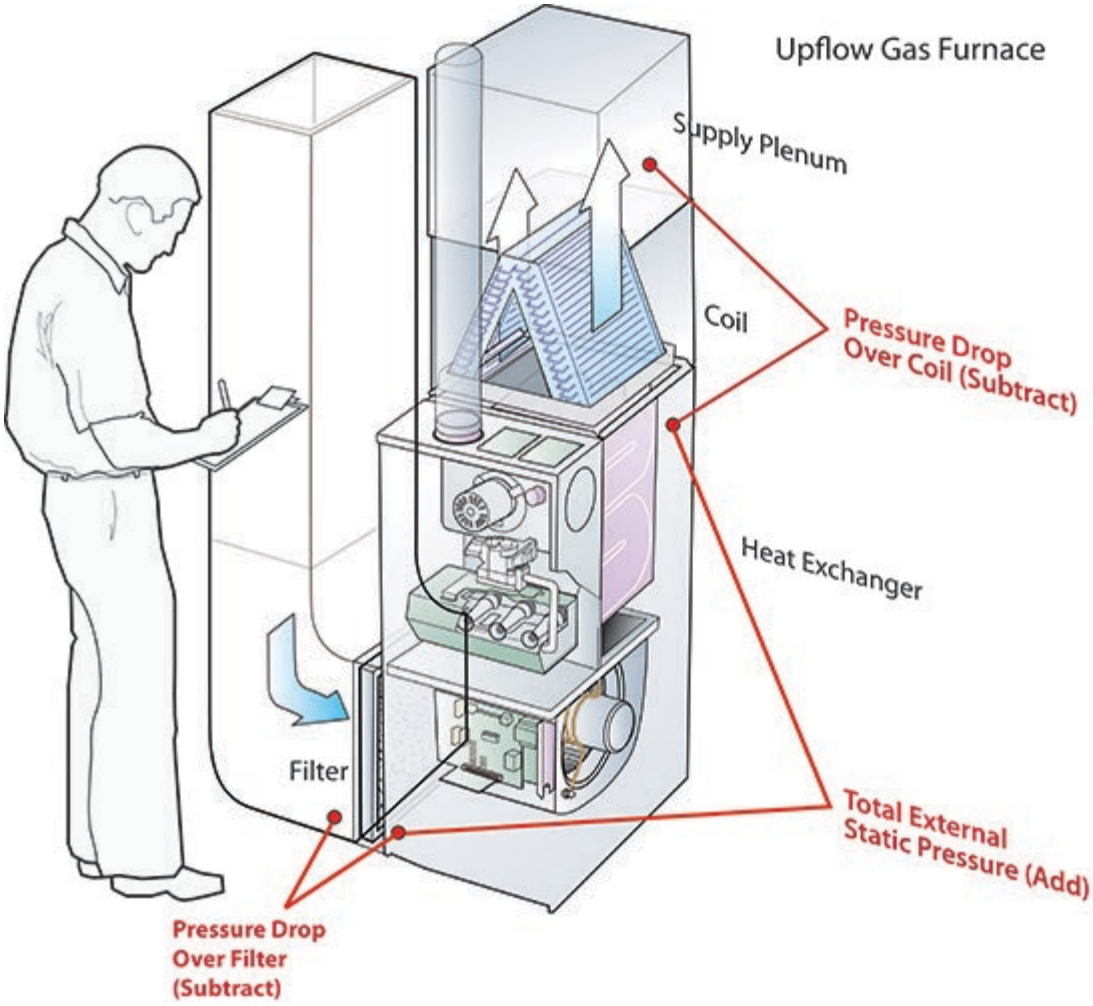
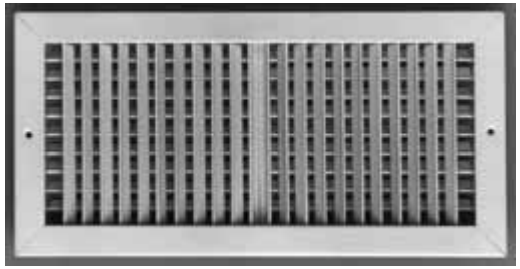
Duct Design

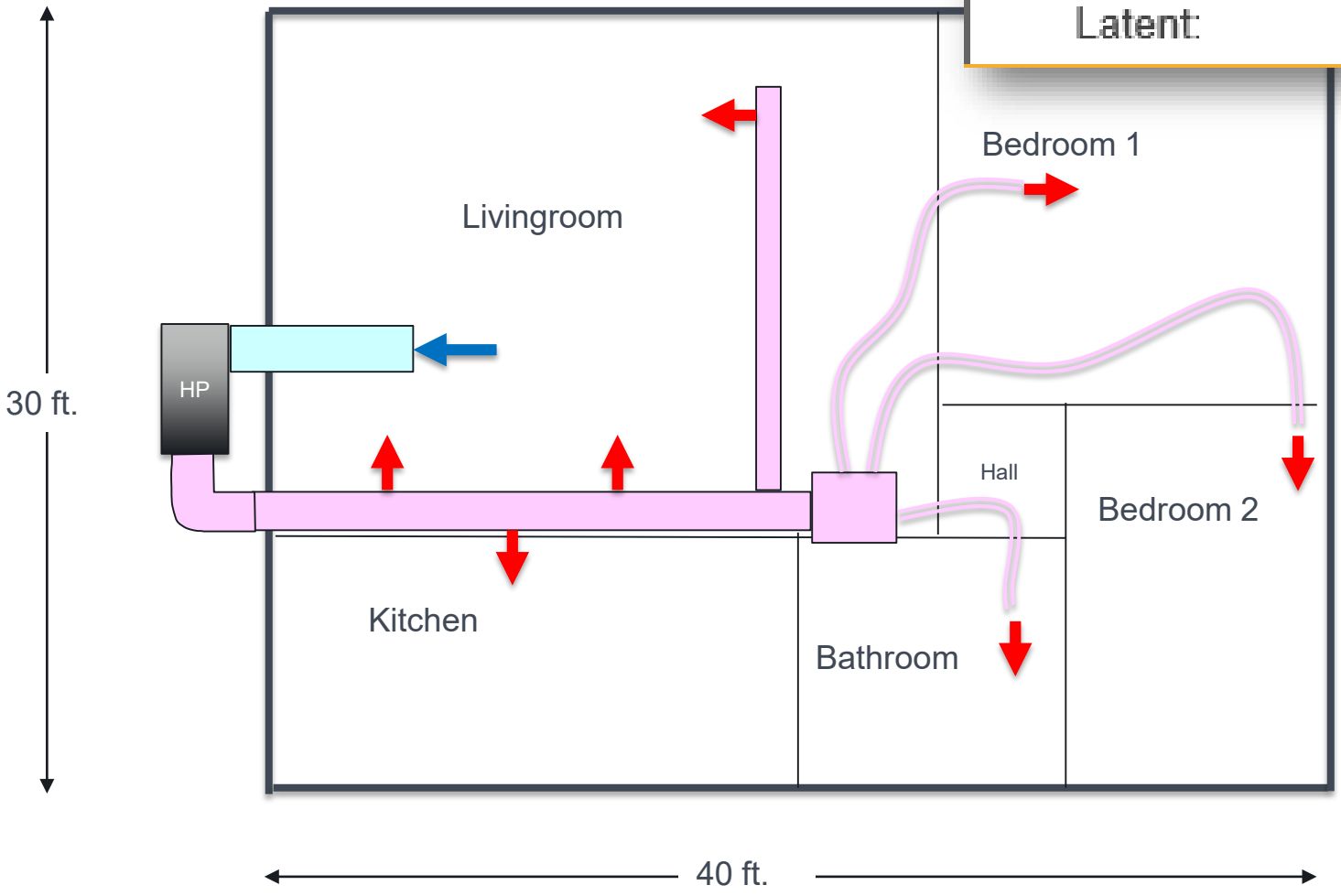
Calculating Available Static Pressure





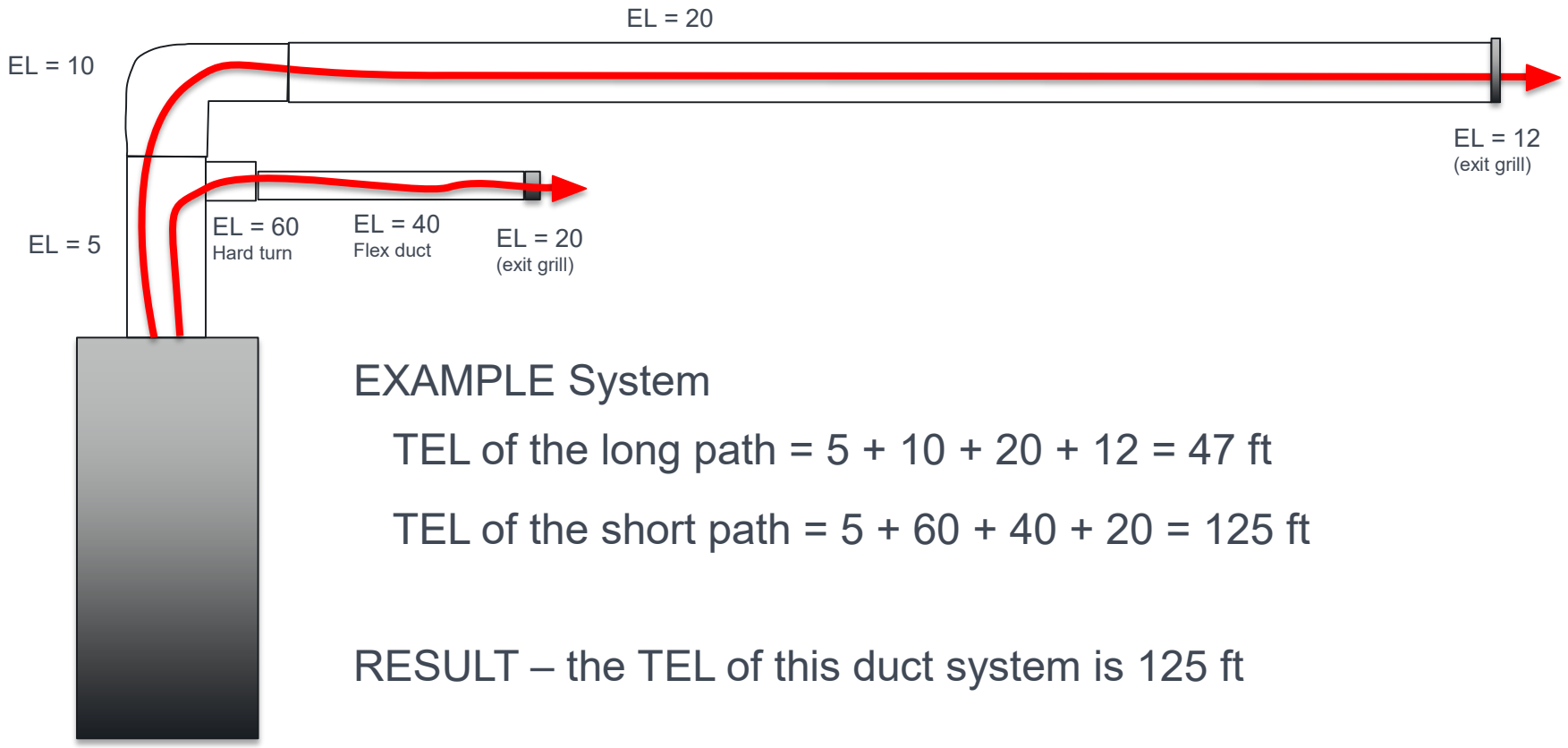
Tutorial House

Tutorial House	
Heating:	28,300 BTU/hr
Cooling:	19,500 BTU/hr
Latent:	0 BTU/hr



Total Effective Length (TEL)

TEL is the sum of all the ELs along the most restrictive path



EXAMPLE System

TEL of the long path = 5 + 10 + 20 + 12 = 47 ft

TEL of the short path = 5 + 60 + 40 + 20 = 125 ft

RESULT – the TEL of this duct system is 125 ft

Two Ducting Approaches

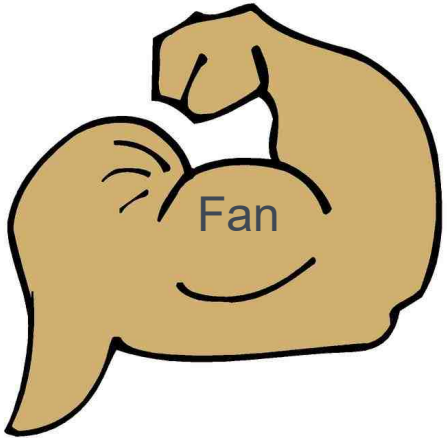
Both will deliver adequate heating and cooling to the spaces

Good Design
or
Big Ducts

Energy Savings
Low Duct Leakage
Quiet System

Target Friction Rate = 0.07 to 0.12

(inches of air pressure per 100 ft of EL)



Restrictive Duct
Design

Customer
Complaint
Risk

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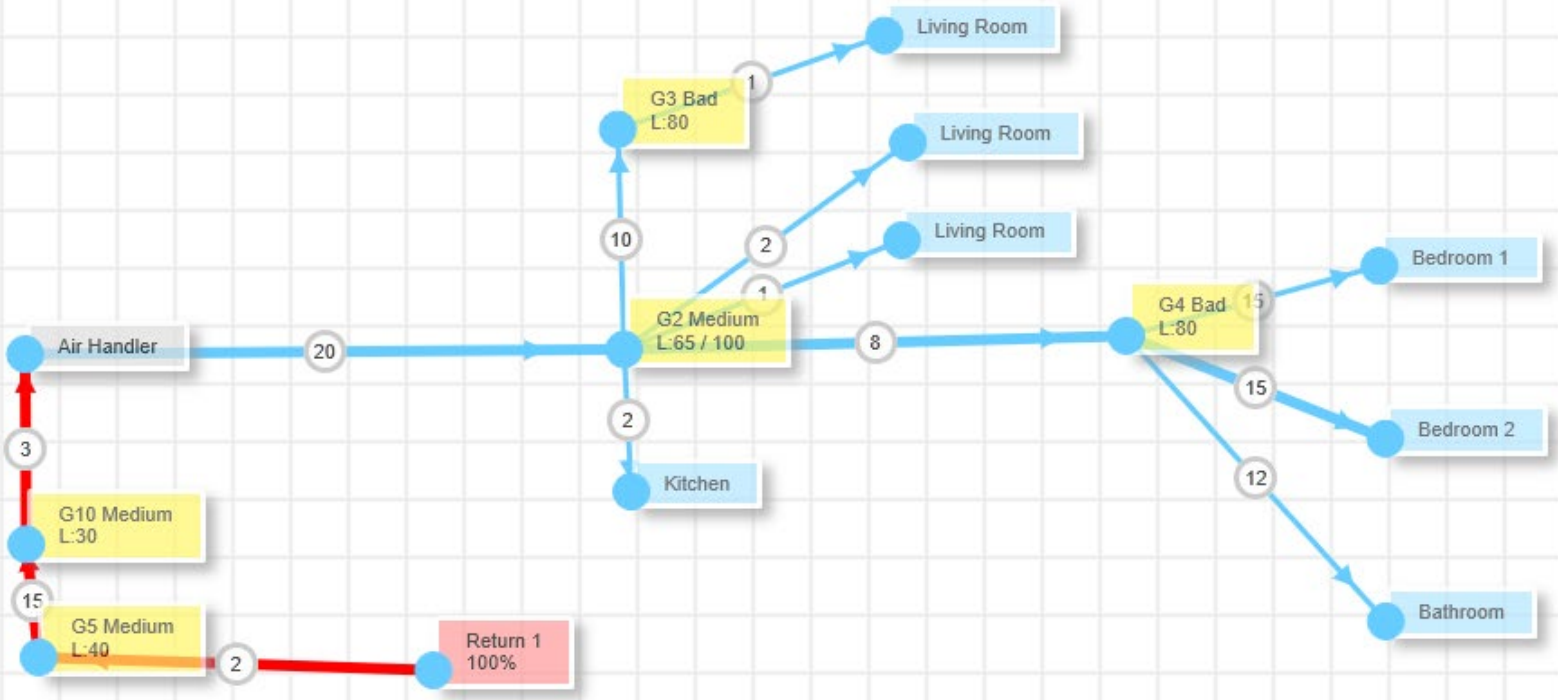
Duct Design

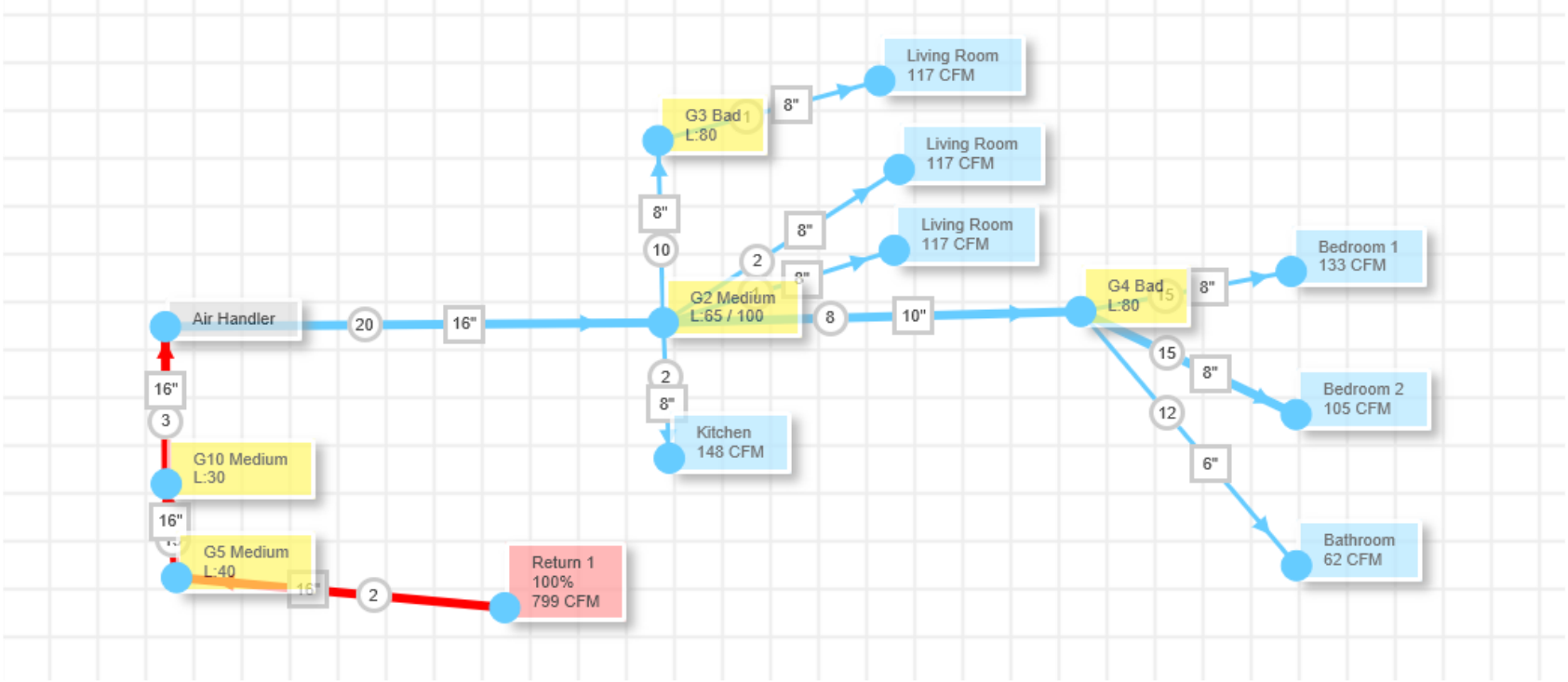
Save

Parts

Total Equivalent Length (TEL): 313

Long path: Return 1 > G5 Medium > G10 Medium > Air Handler > G2 Medium > G4 Bad > Bedroom 2





Parts Summary

Length in ducts: 106' 6" (12'), 8" (46'), 10" (8'), 16" (40')
Length in fittings: 330'
Duct Type: Wire Helix (flex)
Friction Rate: 0.083

Avaliable Duct Sizes

3", 4", 5", 6", 8", 9", 10", 12", 14", 16", 18", 20", 22", 24", 26", 28", 30" (Configure)

Room Loads

Room Name	Suggested # Ducts	# Ducts	Duct Size	CFM/Duct	Room CFM	Heating Load	Cooling Load
Bathroom	1	1	6	62	62	1,950	1,643
Bedroom 1	1	1	8	133	133	5,118	3,117
Bedroom 2	1	1	8	105	105	4,010	2,295
hall				0	0	49	124
Kitchen	1	1	8	148	148	5,623	3,355
Living Room	3	3	8	117	351	11,529	8,949
Total	7	7			799	28,279	19,483

5 Things To Remember

1. hvac.betterbuiltnw.com
2. Watch the You-Tube Webinars
3. November 1st is the deadline for SpecPro users
4. HIT THE SAVE BUTTON
5. Disclaimers
    1. Limited support
    2. Garbage in = garbage out

BetterBuiltNW is a resource center designed to support and promote energy-efficient home building