ENERGY STAR Certified Homes

Fewer Shades of Gray: HVAC Design in Rev. 08

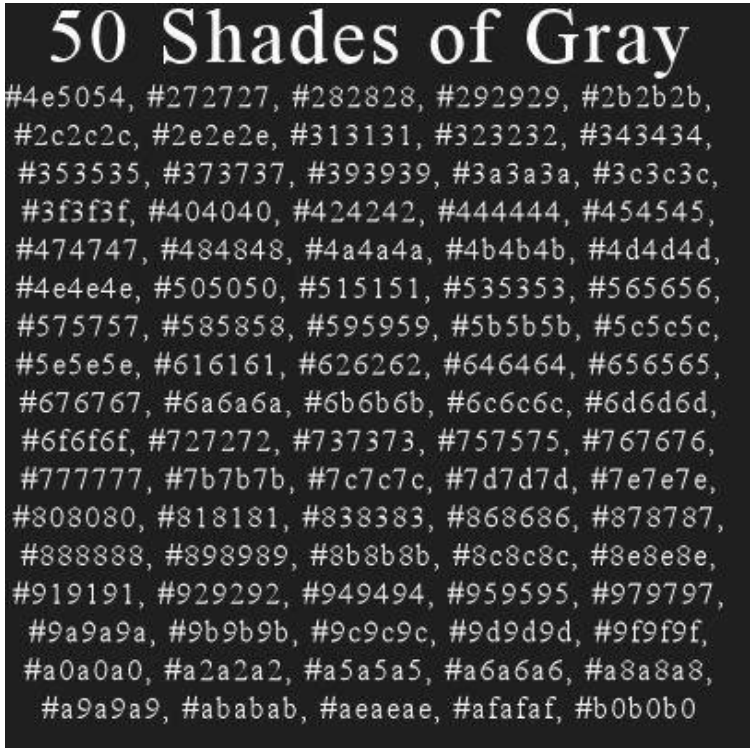
March 1, 2016

Too many shades of gray are not helpful

SW 6255
Morning Fog

SW 7663
Monorail Silver

SW 7004
Snowbound



SW 7743
Mountain Road

SW 7655
Stamped Concrete

SW 7657
Tinsmith

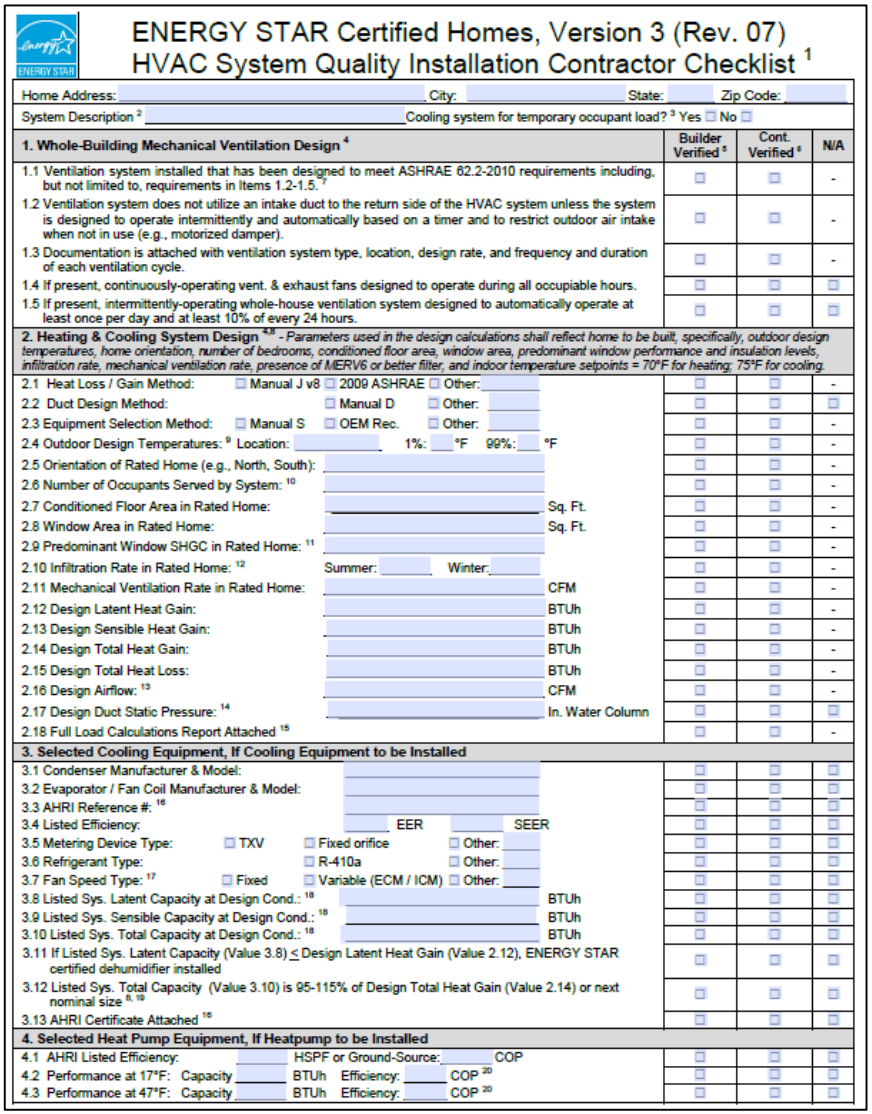
Too many shades of gray are not helpful

"Geographically Closest Location"

"Next Nominal Size"

"Group Design Policy"

"Design Duct Static Pressure"



ENERGY STAR Certified Homes, Version 3 (Rev. 07)
HVAC System Quality Installation Contractor Checklist [1]

Home Address: _____ City: _____ State: _____ Zip Code: _____

System Description [2] _____ Cooling system for temporary occupant load? [3] ☐ Yes ☐ No

1. Whole-Building Mechanical Ventilation Design [4]	Builder Verified [5]	Cont. Verified [6]	N/A
1.1 Ventilation system installed that has been designed to meet ASHRAE 62.2-2010 requirements including, but not limited to, requirements in Items 1.2-1.5. [7]	☐	☐	-
1.2 Ventilation system does not utilize an intake duct to the return side of the HVAC system unless the system is designed to operate intermittently and automatically based on a timer and to restrict outdoor air intake when not in use (e.g., motorized damper).	☐	☐	-
1.3 Documentation is attached with ventilation system type, location, design rate, and frequency and duration of each ventilation cycle.	☐	☐	-
1.4 If present, continuously-operating vent. & exhaust fans designed to operate during all occupiable hours.	☐	☐	☐
1.5 If present, intermittently-operating whole-house ventilation system designed to automatically operate at least once per day and at least 10% of every 24 hours.	☐	☐	☐
2. Heating & Cooling System Design [8] - *Parameters used in the design calculations shall reflect home to be built, specifically, outdoor design temperatures, home orientation, number of bedrooms, conditioned floor area, window area, predominant window performance and insulation levels, infiltration rate, mechanical ventilation rate, presence of MERV6 or better filter, and indoor temperature setpoints = 70°F for heating; 75°F for cooling.*			
2.1 Heat Loss / Gain Method: ☐ Manual J v8 ☐ 2009 ASHRAE ☐ Other:	☐	☐	-
2.2 Duct Design Method: ☐ Manual D ☐ Other:	☐	☐	☐
2.3 Equipment Selection Method: ☐ Manual S ☐ OEM Rec. ☐ Other:	☐	☐	-
2.4 Outdoor Design Temperatures: [9] Location: 1%: °F 99%: °F	☐	☐	-
2.5 Orientation of Rated Home (e.g., North, South):	☐	☐	-
2.6 Number of Occupants Served by System: [10]	☐	☐	-
2.7 Conditioned Floor Area in Rated Home: Sq. Ft.	☐	☐	-
2.8 Window Area in Rated Home: Sq. Ft.	☐	☐	-
2.9 Predominant Window SHGC in Rated Home: [11]	☐	☐	-
2.10 Infiltration Rate in Rated Home: [12] Summer: Winter:	☐	☐	-
2.11 Mechanical Ventilation Rate in Rated Home: CFM	☐	☐	-
2.12 Design Latent Heat Gain: BTUh	☐	☐	-
2.13 Design Sensible Heat Gain: BTUh	☐	☐	-
2.14 Design Total Heat Gain: BTUh	☐	☐	-
2.15 Design Total Heat Loss: BTUh	☐	☐	-
2.16 Design Airflow: [13] CFM	☐	☐	-
2.17 Design Duct Static Pressure: [14] In. Water Column	☐	☐	☐
2.18 Full Load Calculations Report Attached [15]	☐	☐	-
3. Selected Cooling Equipment, If Cooling Equipment to be Installed			
3.1 Condenser Manufacturer & Model:	☐	☐	☐
3.2 Evaporator / Fan Coil Manufacturer & Model:	☐	☐	☐
3.3 AHRI Reference #: [16]	☐	☐	☐
3.4 Listed Efficiency: EER SEER	☐	☐	☐
3.5 Metering Device Type: ☐ TXV ☐ Fixed orifice ☐ Other:	☐	☐	☐
3.6 Refrigerant Type: ☐ R-410a ☐ Other:	☐	☐	☐
3.7 Fan Speed Type: [17] ☐ Fixed ☐ Variable (ECM / ICM) ☐ Other:	☐	☐	☐
3.8 Listed Sys. Latent Capacity at Design Cond.: [18] BTUh	☐	☐	☐
3.9 Listed Sys. Sensible Capacity at Design Cond.: [18] BTUh	☐	☐	☐
3.10 Listed Sys. Total Capacity at Design Cond.: [18] BTUh	☐	☐	☐
3.11 If Listed Sys. Latent Capacity (Value 3.8) ≤ Design Latent Heat Gain (Value 2.12), ENERGY STAR certified dehumidifier installed	☐	☐	☐
3.12 Listed Sys. Total Capacity (Value 3.10) is 95-115% of Design Total Heat Gain (Value 2.14) or next nominal size [8, 19]	☐	☐	☐
3.13 AHRI Certificate Attached [15]	☐	☐	☐
4. Selected Heat Pump Equipment, If Heatpump to be Installed			
4.1 AHRI Listed Efficiency: HSPF or Ground-Source: COP	☐	☐	☐
4.2 Performance at 17°F: Capacity BTUh Efficiency: COP [20]	☐	☐	☐
4.3 Performance at 47°F: Capacity BTUh Efficiency: COP [20]	☐	☐	☐

Rev. 08 Brings Fewer Shades of Gray

- Moved all design requirements on to HVAC Design Report.
- Eliminated the need for supplemental documentation.
- Clarified key policies.

Agenda

- Key design policies clarified in Rev. 08:
  - Design temperature selection
  - Sizing limits
  - Group design process
  - Whole-house ventilation system
  - Duct design
- Looking forward.
- Question & Answers

Design Temperature Selection

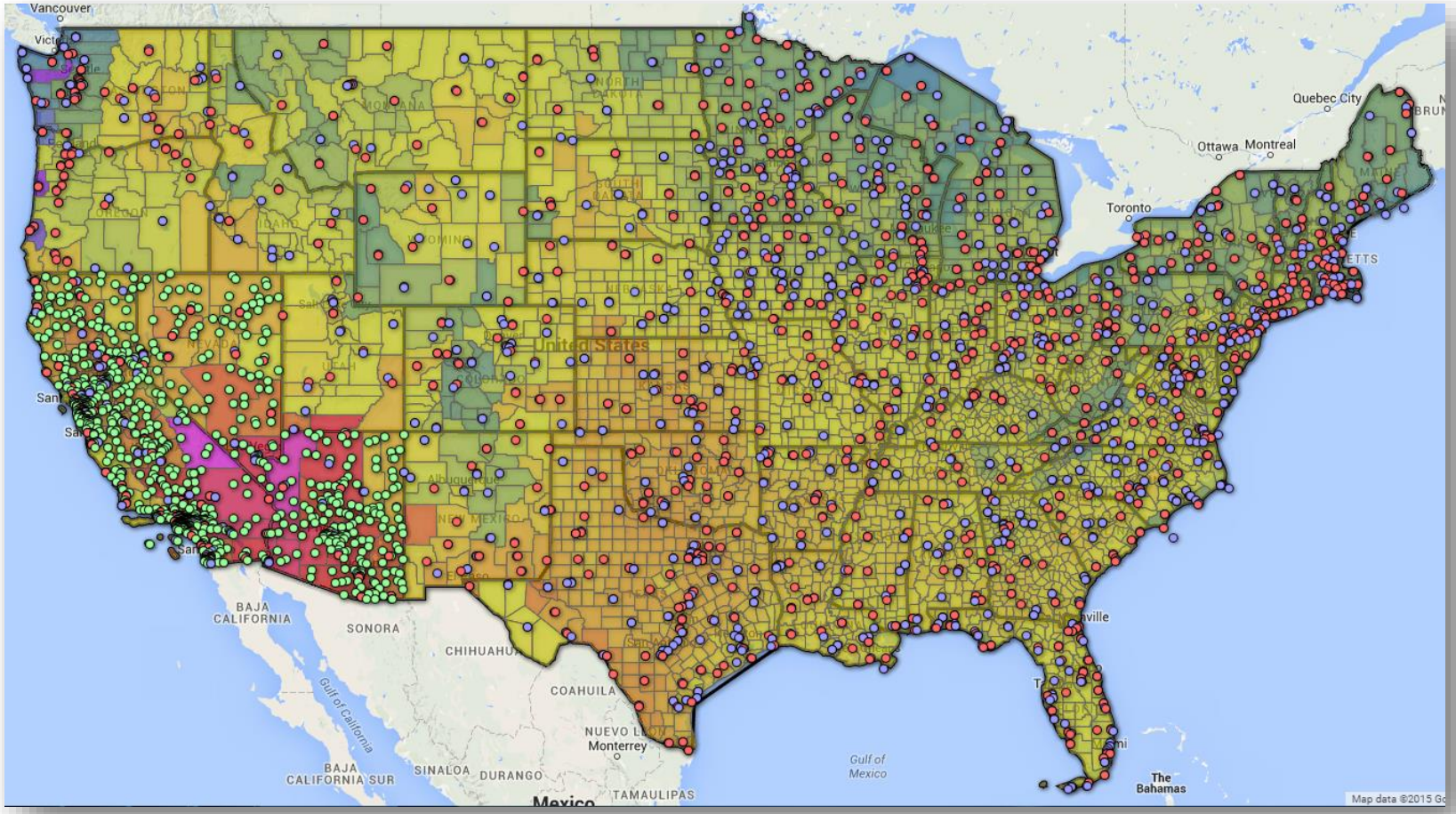
Design Temperature Selection: Context

- Shades of gray (Before Rev. 08):
  - Several sources for design temperatures are available.
  - Finding closest geographic weather station can be subjective.
  - Single set of design temps often used in metropolitan areas.

- Black & white (Rev. 08)
  - A single source of county-level design temperature limits.

Design Temperature Selection: Context

County-Level Design Temperature Map



Design Temperature Selection: Resource

County-Level Design Temperature Table

ENERGY STAR Certified Homes
County-Level Design Temperature Reference Guide

State	County	1% Cooling Temperature (°F)	99% Heating Temperature (°F)	HDD/CDD Ratio	Weather Station Selected for Cooling Temperature	Reference	Weather Station Selected for Heating Temperature	Reference
Texas	Bell	99	28	0.3	ROBERT GRAY AAF TX	ASHRAE	Fort Hood Gray AAF Texas	Manual J
Texas	Bexar	99	31	0.2	Kelly Air Force Base Texas	Manual J	San Antonio Randolph Air Force Base Texas	Manual J

Download this table as follows:

- Visit www.energystar.gov/HVACDesignTemps
- Click on County-Level Design Temperature Reference Guide.

Design Temperature Selection: Example

- Certifying a home in Dallas, TX - in Dallas County

1. Using Temp. Reference Guide, look up Dallas County, TX.

State	County	1% Cooling Temperature (°F)	99% Heating Temperature (°F)
Texas	Crosby	96	13
Texas	Culberson	91	19
Texas	Dallam	95	13
Texas	Dallas	99	26

Cooling limit ≤ 99 F

Heating limit ≥ 26 F

2. Complete loads using outdoor design temperatures that don't exceed 99 F for the cooling load or 26 F for the heating load.

Design Temperature Selection: Example (cont.)

3. Designer enters county, state, and design temperatures on Item 3.3. of the HVAC Design Report.

3.3 Outdoor design temperatures used in loads: (See Footnote 12 and energystar.gov/hvacdesigntemps) [12]

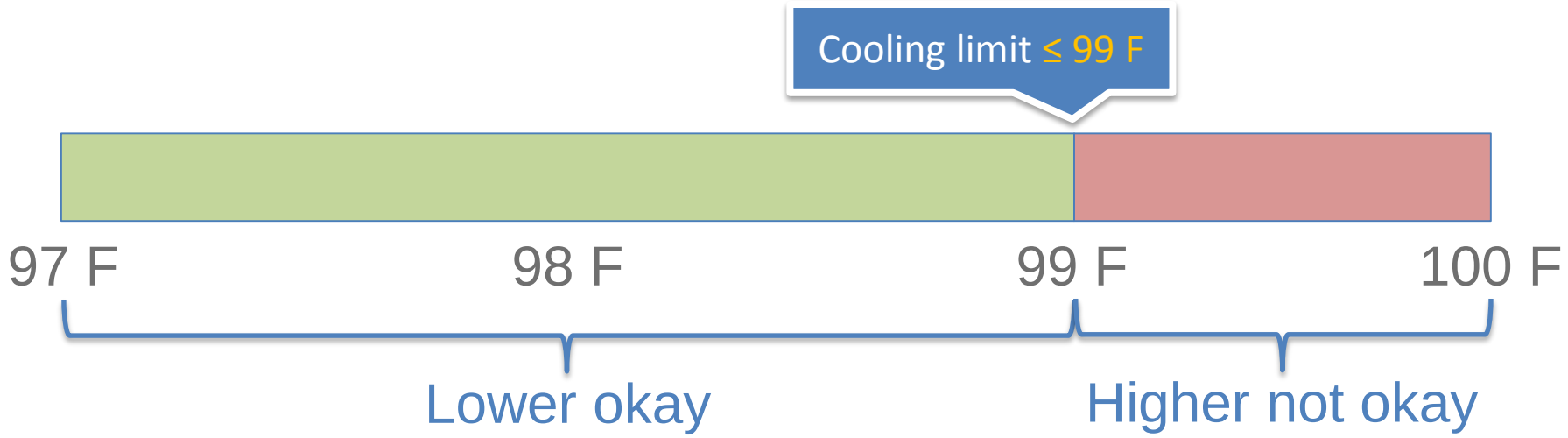
County & State selected: Dallas County, TX Cooling season: 99 °F Heating season: 26 °F

4. Rater verifies that temperature limits are not exceeded on Item 4.2.1 of the Rater Design Review Checklist.

4.2.1 Cooling season and heating season outdoor design temperatures used in loads (3.3) are within the limits defined at energystar.gov/hvacdesigntemps for the State and County where the home will be built, or the designer has provided an allowance from EPA to use alternative values [8]

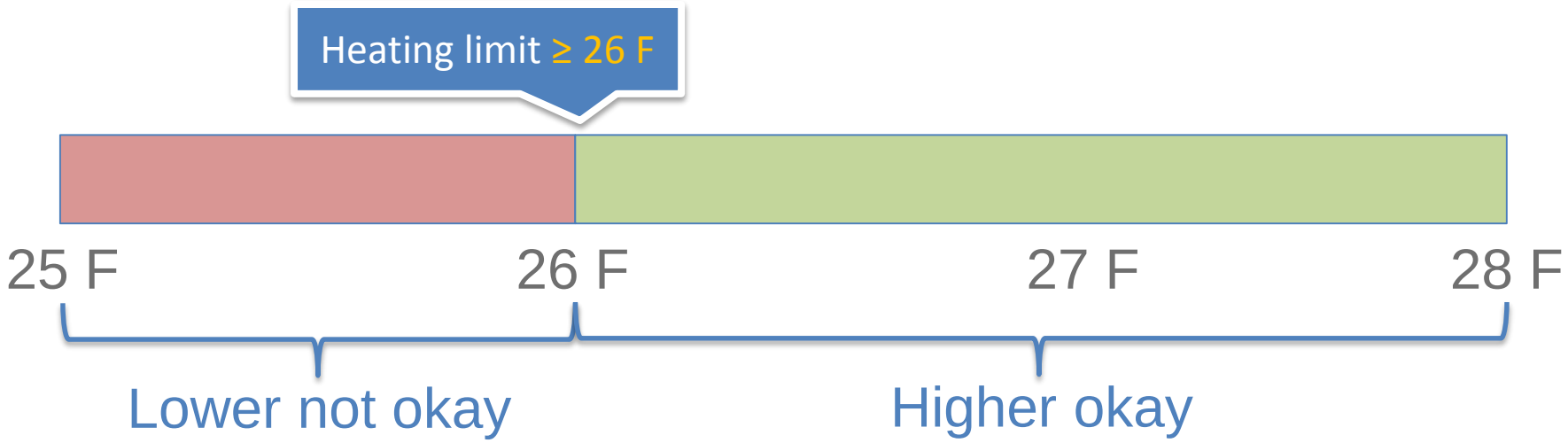
Design Temperature Selection: Key points

- The cooling limit is the maximum temp. that can be used



Design Temperature Selection: Key points

- The heating limit is the minimum temp. that can be used



Design Temperature Selection: Key points

- The same HVAC Design Report can be used in a different county, if the limits are not exceeded for that county.

Design Temperature Selection: Example

- HVAC Design Report was completed for Dallas County, TX, with limits of 99 F and 26 F.
- Builder is certifying a home using the same plan and HVAC design in neighboring Tarrant County (Fort Worth).
- Can the same HVAC Design Report be used?

State	County	1% Cooling Temperature (°F)	99% Heating Temperature (°F)
Texas	Tarrant	100	22

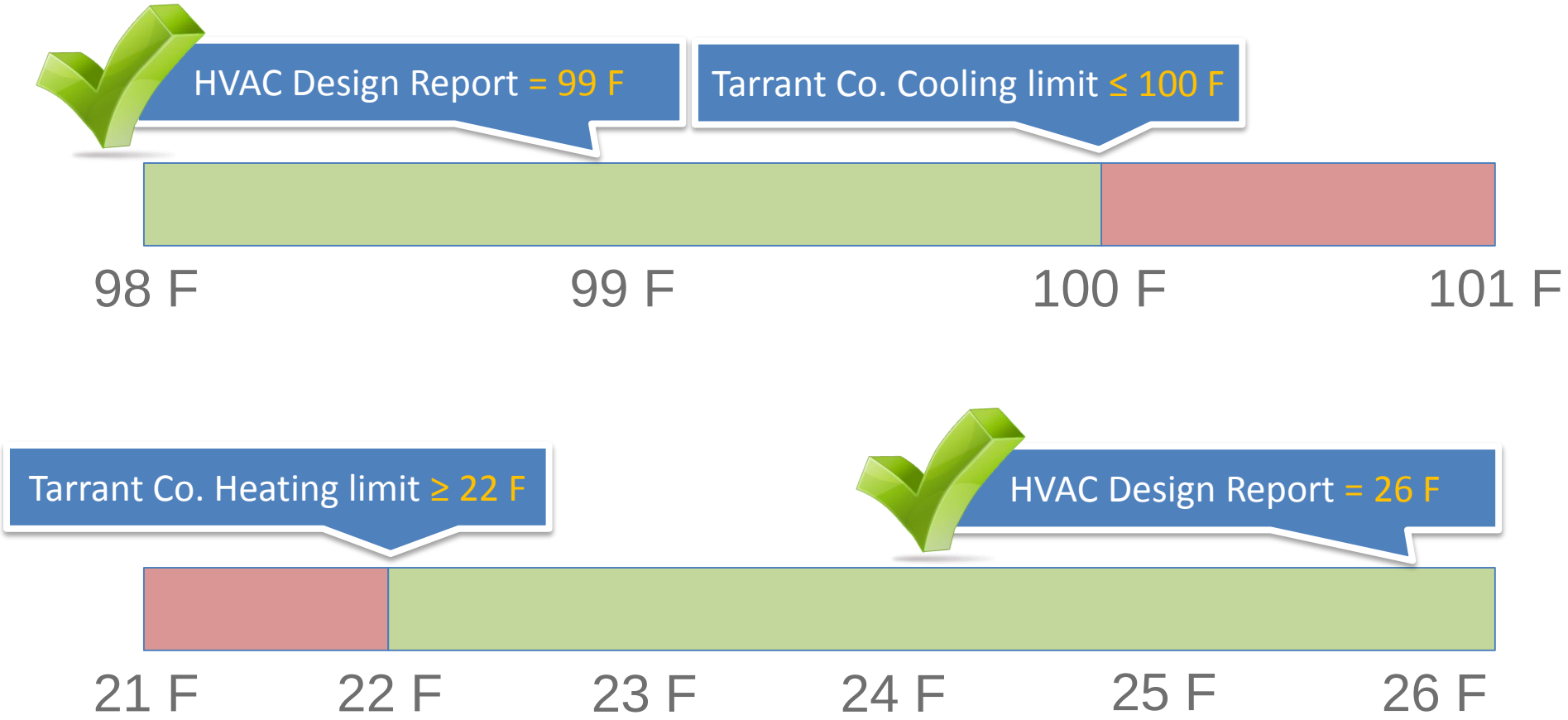
Cooling limit ≤ 100 F

Heating limit ≥ 22 F

- Tarrant County, TX, limits are 100 F and 22 F

Design Temperature Selection: Example (cont.)

- HVAC Design Report for Dallas Co. can be used in Tarrrant Co.



Design Temperature Selection: Key points

- Only two exceptions to design temperature limits:
  1. Jurisdiction-specified temperature:
     - If design temps are specified then (of course) use those.
  2. Exception request:
     - In rare cases, the designer may believe an exception is warranted.
     - If so, the designer submits an exception request to EPA before certification of the home.
     - If EPA grants the exception, they'll provide an allowance, which the designer can give to the Rater.

Design Temperature Selection: Key points

ENERGY STAR Certified Homes
Design Temperature Limit Allowance

In response to a Design Temperature Exception Request, EPA has granted the following design temperature limit allowance. This allowance is only valid for the timeframe, designer, states, and counties specified below.

For the purposes of meeting the requirements of the ENERGY STAR Certified Homes program, the designer is permitted to use the "allowed" design temperatures in their load calculations. A copy of this allowance must also be provided to the Home Energy Rater so that they can complete their verification tasks.

Design Temperature Allowance					
EPA Tracking #	xxx				
Applicable to Homes Permitted On the Following Dates	08/31/2015 through 08/31/2016				
Designer Name (Requestor)	ABC Designer				
State	County	Cooling Design Temp. Limit		Heating Design Temp. Limit	
		Standard	Allowed	Standard	Allowed
TX	Waller	98 °F	**100 °F**	36 °F	36 °F

Sample Design Temperature Limit Allowance

Sizing Limits

Sizing Limits: Context

- Shades of gray (Before Rev. 08):
  - "Next nominal size": Easy to explain, but difficult to enforce.

- Black & white (Rev. 08)
  - ~~"Next nominal size"~~ replaced with numeric limits.
  - Higher limits provided for certain equipment types.

Sizing Limit: Key Concept

- Limits are located directly on HVAC Design Report.
- Two ranges provided:
  - Recommended = Strict compliance with ACCA Manual S.
  - Allowed = Slightly higher tolerance in lieu of “next nominal size”.

Cooling Sizing Limits

4.15 Check box of applicable cooling sizing limit from chart below: [19, 20]

Equipment Type (Per Item 4.2) & Climate Condition (Per Item 4.14)	Compressor Type (Per Item 4.8)		
	Single-Speed	Two-Speed	Variable-Speed
For Cooling-Only Equipment or For Cooling Mode of Heat Pump in Condition A Climate	☐ Recommended: 90 – 115% Allowed: 90 – 130%	☐ Recommended: 90 – 120% Allowed: 90 – 140%	☐ Recommended: 90 – 130% Allowed: 90 – 160%
For Cooling Mode of Heat Pump in Condition B Climate	☐ 90% - 100%, plus 15 kBtuh	☐ 90% - 100%, plus 15 kBtuh	☐ 90% - 100%, plus 15 kBtuh

Sizing Limit: Key Concept

- Higher cooling limits provided for:
  - Two-speed & variable-speed compressors.

Cooling Sizing Limits

4.15 Check box of applicable cooling sizing limit from chart below: [19, 20]				
Equipment Type (Per Item 4.2) & Climate Condition (Per Item 4.14)		Compressor Type (Per Item 4.8)		
	Single-Speed	Two-Speed	Variable-Speed	
For Cooling-Only Equipment or For Cooling Mode of Heat Pump in Condition A Climate	☐ Recommended: 90 – 115% Allowed: 90 – 130%	☐ Recommended: 90 – 120% Allowed: 90 – 140%	☐ Recommended: 90 – 130% Allowed: 90 – 160%	
For Cooling Mode of Heat Pump in Condition B Climate	☐ 90% - 100%, plus 15 kBtuh	☐ 90% - 100%, plus 15 kBtuh	☐ 90% - 100%, plus 15 kBtuh	

  - Designer indicates type in Item 4.8 of the HVAC Design Report.

4.8 Compressor type:	☐ Single-speed	☐ Two-speed	☐ Variable-speed

Sizing Limit: Key Concept

- Higher cooling limits provided for:
  - Very cold dry climates (called Condition B climates).

Cooling Sizing Limits

4.15 Check box of applicable cooling sizing limit from chart below: [19, 20]						-
Equipment Type (Per Item 4.2) & Climate Condition (Per Item 4.14)	Compressor Type (Per Item 4.8)					
	Single-Speed		Two-Speed		Variable-Speed	
For Cooling-Only Equipment or For Cooling Mode of Heat Pump in Condition A Climate	☐	Recommended: 90 – 115% Allowed: 90 – 130%	☐	Recommended: 90 – 120% Allowed: 90 – 140%	☐	Recommended: 90 – 130% Allowed: 90 – 160%
For Cooling Mode of Heat Pump in Condition B Climate	☐	90% - 100%, plus 15 kBtuh	☐	90% - 100%, plus 15 kBtuh	☐	90% - 100%, plus 15 kBtuh

  - Designer assesses if climate meets Condition B in Item 4.14 of HVAC Design Report.

4.14 Complete this Item if Condition B Climate will be used to select sizing limit in Item 4.15. Otherwise, check "N/A": [22]	☐ N/A
4.14.1 Load sensible heat ratio = Max. sensible heat gain (Item 3.10) / Max. total heat gain (Item 3.12)	= _____ %
4.14.2 HDD / CDD ratio (Visit energystar.gov/hvacdesigntemps to determine this value for the design location)	= _____

Sizing Limit: Cooling Example

- Designer is selecting an AC w/ a single-speed compressor.

1. Designer documents load in Item 3.12 of HVAC Design Report.

Loads At Design Conditions (kBtuh)		N	NE	E	SE	S	SW	W	NW
Cooling	3.10 Sensible heat gain (By orientation [16])					32.8			
	3.11 Latent heat gain (Not by orientation)					3.2			
	3.12 Total heat gain (By orientation [16])					36.0			
	3.13 Maximum – minimum total heat gain (Item 3.12) across orientations = 0.0 kBtuh						Variation is ≤ 6 kBtuh [16, 17]		

2. Designer documents compressor type, design capacity, and cooling sizing % in Items 4.8 - 4.13 of HVAC Design Report.

4.8 Compressor type:	[X] Single-speed	[ ] Two-speed	[ ] Variable-speed	
4.9 Latent capacity at design conditions, from OEM expanded performance data:	2.9	kBtuh		
4.10 Sensible capacity at design conditions, from OEM expanded performance data:	38.1	kBtuh		
4.11 Total capacity at design conditions, from OEM expanded performance data:	41.0	kBtuh		
4.12 Air-source heat pump capacity:	At 17°F: ____ kBtuh	At 47°F: ____ kBtuh	[X] N/A	
4.13 Cooling sizing % = Total capacity (Item 4.11) divided by maximum total heat gain (Item 3.12): 114 %				

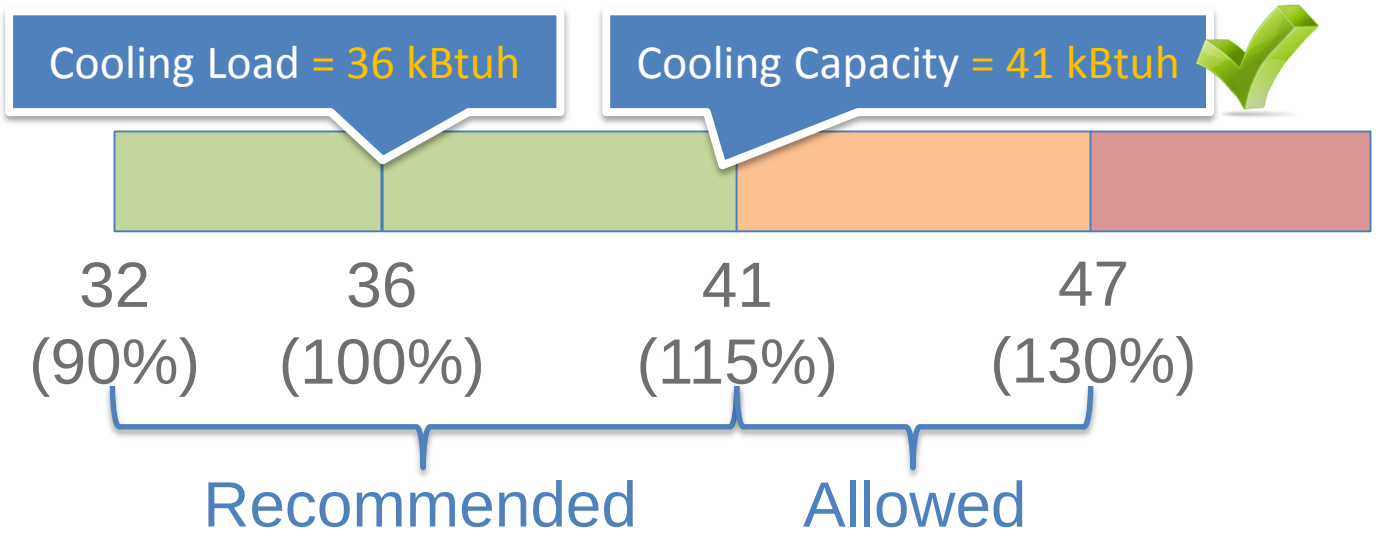
Sizing Limit: Cooling Example

3. Designer checks applicable cooling limit in Item 4.15 of HVAC Design Report.

4.15 Check box of applicable cooling sizing limit from chart below: [19, 20]				-
Equipment Type (Per Item 4.2) & Climate Condition (Per Item 4.14)	Compressor Type (Per Item 4.8)			
	Single-Speed	Two-Speed	Variable-Speed	
For Cooling-Only Equipment or For Cooling Mode of Heat Pump in Condition A Climate	☒ Recommended: 90 – 115% Allowed: 90 – 130%	☐ Recommended: 90 – 120% Allowed: 90 – 140%	☐ Recommended: 90 – 130% Allowed: 90 – 160%	
For Cooling Mode of Heat Pump in Condition B Climate	☐ 90% - 100%, plus 15 kBtuh	☐ 90% - 100%, plus 15 kBtuh	☐ 90% - 100%, plus 15 kBtuh	

Sizing Limit: Cooling Example

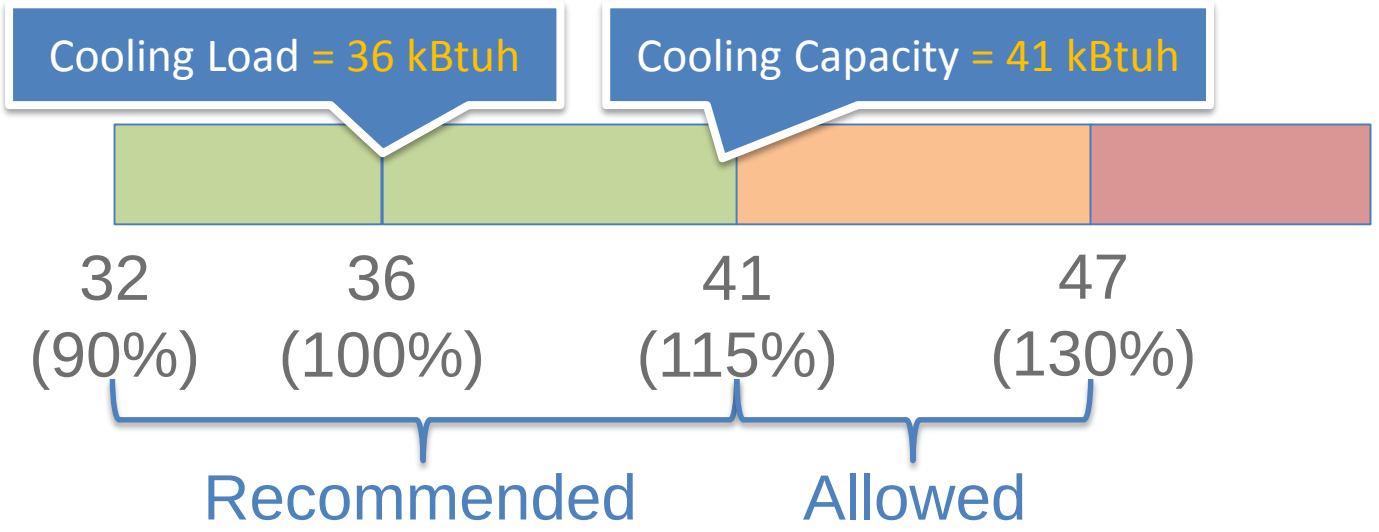
4. Designer verifies that cooling sizing % meets cooling limit in Item 4.16 of HVAC Design Report.



4.16 Cooling sizing % (4.13) is within cooling sizing limit (4.15)	[X]

Sizing Limit: Cooling Example

5. Rater verifies that cooling sizing % meets cooling limit in Item 4.2.8 of Rater Design Review Checklist.



4.2.8 Cooling sizing % (4.13) is within the cooling sizing limit (4.15) selected by the HVAC designer	☐	☒

Sizing Limit: Key Concept

- Limits are located directly on HVAC Design Report.

Furnace Sizing Limits

4.21 Check box of applicable heating sizing limit from chart below:		-
When Used for Heating Only	When Paired With Cooling	
☐ 100 – 140%	☐ Recommended: 100 – 140% Allowed: 100 – 200%	

Sizing Limit: Furnace Example

- Designer is selecting a furnace paired with AC.

1. Designer documents load in Item 3.14 of HVAC Design Report.

Heating	3.14 Total heat loss (Not by orientation)	31.6

2. Designer documents design capacity and heating sizing % in Items 4.19 & 4.20 of HVAC Design Report.

4.19 Total capacity:	44.9	kBtuh
4.20 Heating sizing % = Total capacity (Item 4.19) divided by total heat loss (Item 3.14):	142	%

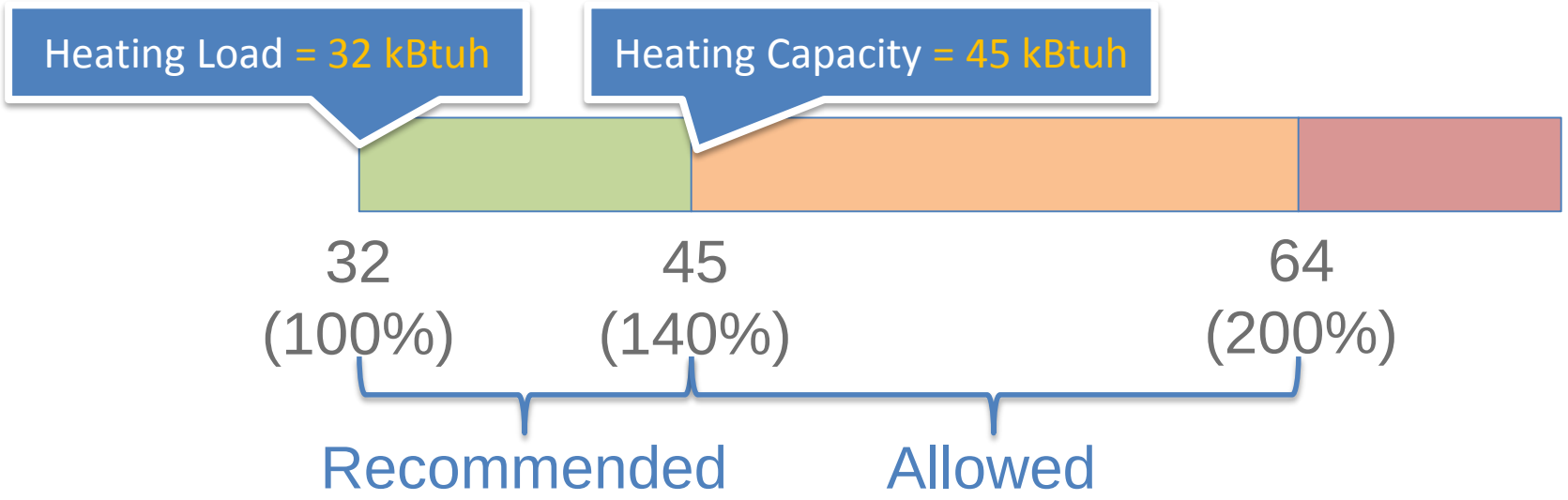
Sizing Limit: Furnace Example

3. Designer checks applicable heating limit in Item 4.21 of HVAC Design Report.

4.21 Check box of applicable heating sizing limit from chart below:			-
When Used for Heating Only		When Paired With Cooling	
☐ 100 – 140%	☒	Recommended: 100 – 140%	Allowed: 100 – 200%

Sizing Limit: Furnace Example

4. Designer verifies that furnace sizing % meets limit in Item 4.22 of HVAC Design Report.



4.22 Heating sizing % (4.20) is within heating sizing limit (4.21)	X

Group Design Policy

Group Design Policy: Poll

- When I say “Group Design Policy” what do you think of?
  A. Rules for an interior decorating team challenge on HGTV.
  B. How to group multiple plan configurations so the designer only needs to create a single HVAC design.
  C. I wonder if I’ll have the chicken or beef option for lunch.

Group Design Policy: Context

- Shades of gray (Before Rev. 08):
  - The rules for grouping plan configurations were too confusing.

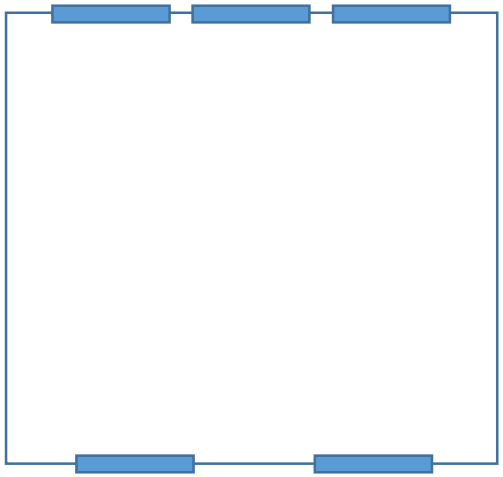
- Black & White (Rev. 08)
  - The rules have been greatly simplified.

Group Design Policy: Context

- In an ideal world, designers would create an HVAC design that's perfectly tailored to each home built (site-specific):
  - Calculate heating and cooling loads for that specific home.
  - Size heating and cooling equipment for that specific home.
  - Design a duct system for that specific home.
- Site-specific design is often achieved for custom homes.
- But it's rarely achieved for production homes.

Group Design Policy: Context

Plan 'Hallmark'

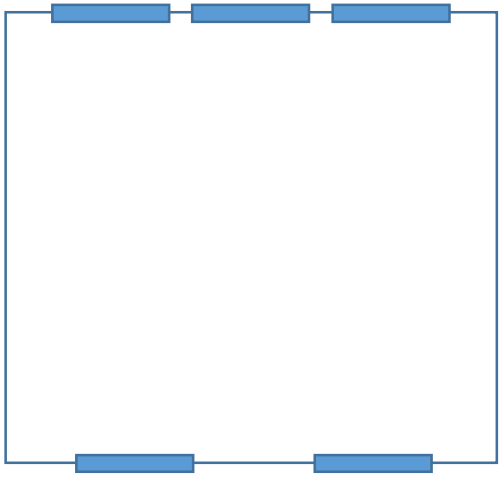


Group Design Policy: Context

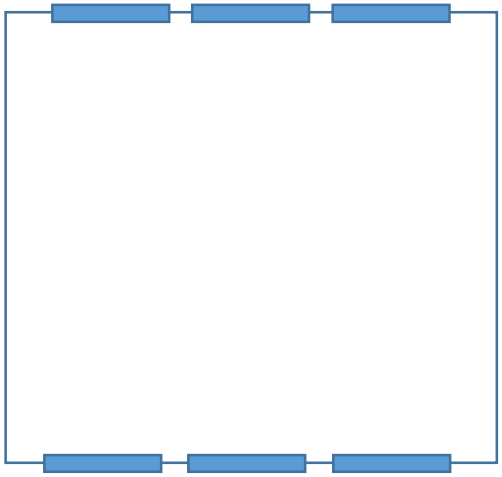
Plan 'Hallmark'

Different Elevations

E1



E2

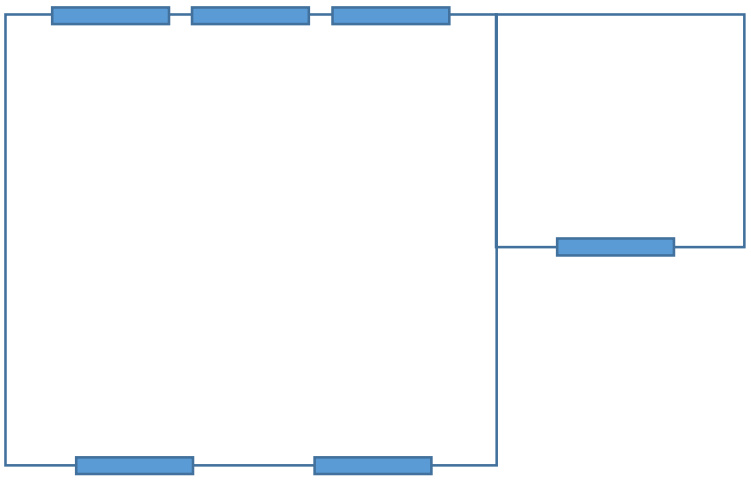


Group Design Policy: Context

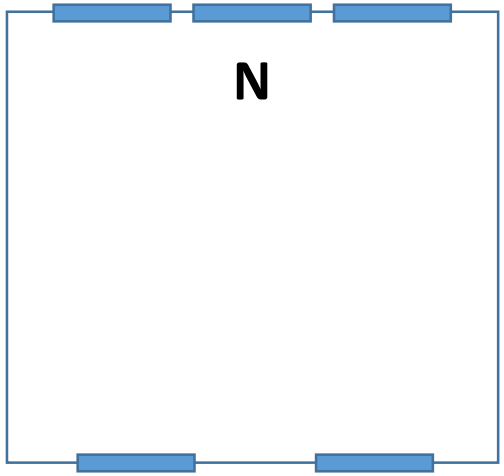
Plan 'Hallmark'

Different Options

Option A – Bonus Room

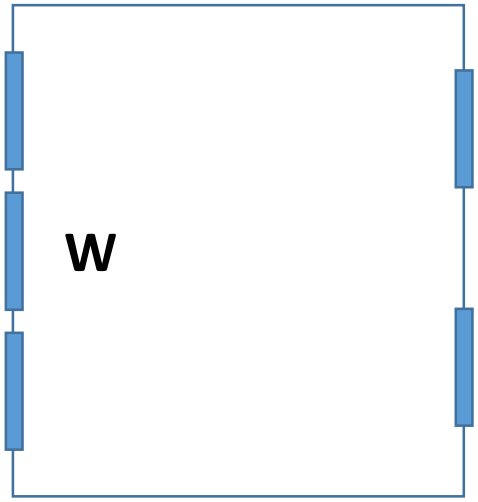


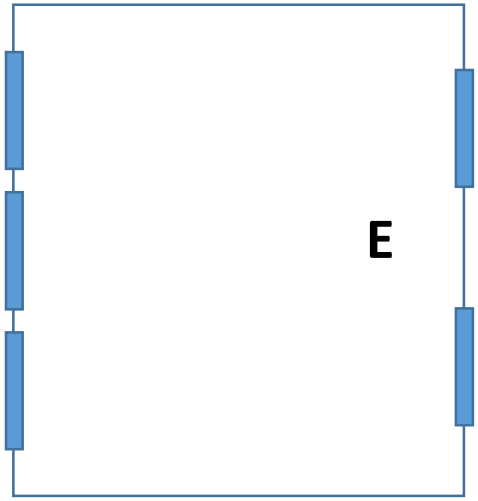
Group Design Policy: Context

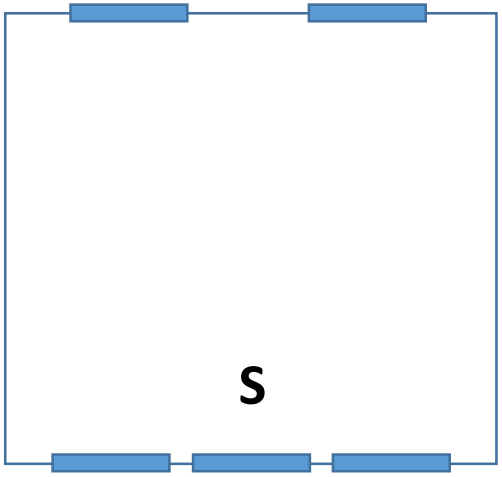


Plan 'Hallmark'

Different Orientations







Group Design Policy: Context

Plan 'Hallmark'

Configurations

Parameter	Count
Elevations	2
Options	2
Orientations	4
Total Configurations	**16**

Group Design Policy: Context

- Completing a site-specific design for every possible house configuration can be very time intensive.
- Sometimes, a change in configuration is no big deal.
- Other times, a change in configuration is a big deal.
- ENERGY STAR's goal is to make sure every HVAC design is at least pretty good.

Group Design Policy: Definition

1. Occupants used in loads is within ± 2 of the home to be certified.

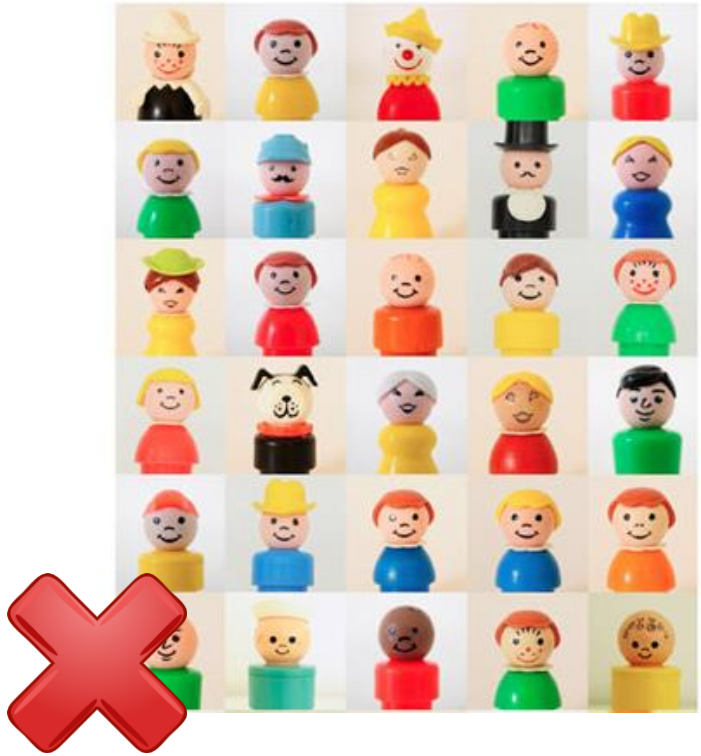
Certified Home

HVAC Design Home

Group Design Policy: Definition

1. Occupants used in loads is within ± 2 of the home to be certified.

Certified Home



HVAC Design Home

Group Design Policy: Definition

2. Conditioned floor area used in loads is between 0 and 300 sq. ft. larger than the home to be certified.

Certified Home

2,000 ft²

2,200 ft²

2,500 ft²

2,600 ft²

HVAC Design Home

Group Design Policy: Definition

3. Window area used in loads is between 0 and 60 sq. ft. larger than the home to be certified.

Certified Home

170 ft² ✗

180 ft² ✓

240 ft² ✓

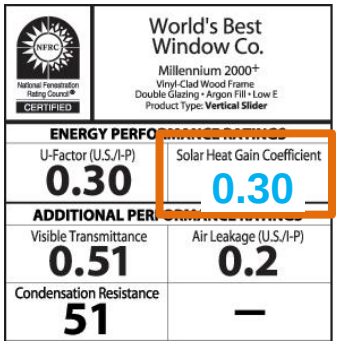
241 ft² ✗

HVAC Design Home

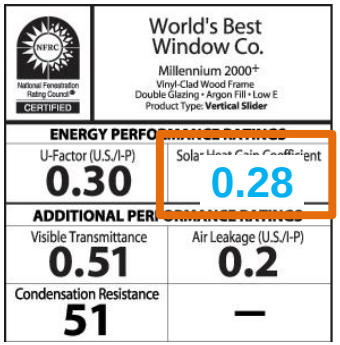
Group Design Policy: Definition

4. The predominant window SHGC is within 0.1 of the predominant value in the home to be certified.

160 ft²



20 ft²



Certified Home

0.19 ft²

0.20 ft²

0.40 ft²

0.41 ft²

HVAC Design Home

Group Design Policy: Definition

5. The variation in total heat gain across orientations is ≤ 6 kBtuh.

Loads At Design Conditions (kBtuh)		N	NE	E	SE	S	SW	W	NW
Cooling	3.10 Sensible heat gain (By orientation [16])	36.0	38.5	41.0	40.0	39.0	40.0	40.9	38.0
	3.11 Latent heat gain (Not by orientation)	3.0							
	3.12 Total heat gain (By orientation [16])	39.0	41.5	44.0	43.0	42.0	43.0	43.9	41.0
	3.13 Maximum – minimum total heat gain (Item 3.12) across orientations =	5.0	kBtuh	Variation is ≤ 6 kBtuh [16, 17]					
Heating	3.14 Total heat loss (Not by orientation)								

Group Design Policy: Definition

- For all designs, meet or beat these tolerances:

1. Occupants used in loads is within ± 2 of the home to be certified.
2. Conditioned floor area used in loads is between 0 and 300 sq. ft. larger than the home to be certified.
3. Window area used in loads is between 0 and 60 sq. ft. larger than the home to be certified.
4. The predominant window SHGC is within 0.1 of the predominant value in the home to be certified.
5. The variation in total heat gain across orientations is ≤ 6 kBtuh.
6. Outdoor design temperature used in loads are within the limits defined at energystar.gov/hvacdesigntemps.

Group Design Policy: Example

Plan 'Hallmark'

Parameter	Min	Max	Delta	Limit
Occupants	4	5	1	±2
Conditioned Floor Area	2,200	2,350	150	+300
Window Area	180	210	30	+60
Predominant SHGC	0.30	0.30	0	±0.1
Load Variation Across Orientations	N	E	5.0	≤6 kbtuh

Use these max values in your load and to fill out the HVAC Design Report

Group Design Policy: Example

- Complete basic information about the system design

1. Design Overview

1.1 Designer name: Joe Designer III Designer company: 123 Design Date: 3/1/2016

1.2 Select which party you are providing these design services to: [X] Builder or [ ] Credentialed HVAC contractor

1.3 Name of company you are providing these design services to (if different than Item 1.1): N/A

1.4 Area that system serves: [X] Whole-house [ ] Upper-level [ ] Lower-level [ ] Other

1.5 Is cooling system for a temporary occupant load? [3] [ ] Yes [X] No

1.6 House plan: Hallmark Check box to indicate whether the system design is site-specific or part of a group: [2]

[X] Site-specific design. Option(s) & elevation(s) modeled: Standard/None

[ ] Group design. Group #: _____ out of _____ total groups for this house plan. Configuration modeled: _____

Group Design Policy: Example

- Load inputs go into Section 3.

3.4 Number of occupants used in loads: [13]	5	
3.5 Conditioned floor area used in loads:	2,350	Sq. Ft.
3.6 Window area used in loads:	210	Sq. Ft.
3.7 Predominant window SHGC used in loads: [14]	0.30	

Whole-House Ventilation System

Whole-House Ventilation System: Context

- Shades of gray (Before Rev. 08):
  - Only some of the design requirements for whole-house vent systems were included on the HVAC checklists.

- Black & White (Rev. 08)
  - All the design requirements for whole-house vent systems are included on the HVAC Design Report.

Whole-House Ventilation System: Example

- Design parameters for the mechanical ventilation system

2. Whole-House Mechanical Ventilation Design [4, 5]	Designer Verified
Airflow:	
2.1 Ventilation airflow design rate & run-time meet the requirements of ASHRAE 62.2-2010 or 2013 [6]	☒
2.2 Ventilation airflow rate required by 62.2 for a continuous system 60 CFM	-
2.3 Design for this system: Vent. airflow rate: 120 CFM Run-time per cycle: 30 minutes Cycle time: 60 minutes	-

Whole-House Ventilation System: Example

- Design parameters for the mechanical ventilation system

System Type & Controls:		
	2.4 Specified system type: ☐ Supply ☒ Exhaust ☐ Balanced	-
	2.5 Specified control location: Upstairs bathroom (e.g., Master bath, utility room)	-
	2.6 Specified controls allow the system to operate automatically, without occupant intervention	☒
	2.7 Specified controls include a readily-accessible ventilation override and a label has also been specified if its function is not obvious (e.g., a label is required for a standalone wall switch, but not for a switch that's on the ventilation equipment)	☒
	2.8 No outdoor air intakes designed to connect to the return side of the HVAC system, unless specified controls operate intermittently and automatically based on a timer and restrict intake when not in use (e.g., motorized damper) [7]	☒
Sound:	2.9 The fan of the specified system is rated ≤ 3 sones if intermittent and ≤ 1 sone if continuous, or exempted [8]	☒

Whole-House Ventilation System: Example

- Design parameters for the mechanical ventilation system

Efficiency:	
2.10 If system utilizes the HVAC fan, then the specified fan type in Item 4.7 is ECM / ICM, or the specified controls will reduce the standalone ventilation run-time by accounting for hours when the HVAC system is heating or cooling	☒
2.11 If bathroom fans are specified as part of the system, then they are ENERGY STAR certified [9]	☒
Air Inlet Location: (Complete this section if system has a specified air inlet location; otherwise check "N/A") [10]	☒ N/A
2.12 Inlet pulls ventilation air directly from outdoors and not from attic, crawlspace, garage, or adjacent dwelling unit	☐
2.13 Inlet is ≥ 2 ft. above grade or roof deck; ≥ 10 ft. of stretched-string distance from known contamination sources (e.g., stack, vent, exhaust, vehicles) not exiting the roof, and ≥ 3 ft. from known sources exiting the roof	☐

Whole-House Ventilation System: Key Concept

- Join us tomorrow at 8:30 AM for more on these requirements from the Rater perspective in *Clearing the Air: Ventilation*.

Duct Design

Duct Design: Context

- Shades of gray (Before Rev. 08):
  - Duct design info was scattered throughout the HVAC checklist.

- Black & White (Rev. 08)
  - All duct design info is consolidated into a single section.

Duct Design: Key Concept

- Fill in the design system air flow, fan-speed setting, and static pressure.
- List out the design room-by-room air flows.
- (Join us for our *Under Pressure* presentation right after this to learn more!)

Duct Design: Example

5. Duct Design (Complete if heating or cooling equipment will be installed with ducts; otherwise check "N/A") ☐ N/A

5.1 Duct system designed for the equipment selected in Section 4, per ACCA Manual D	☒
5.2 Design HVAC fan airflow: [23] Cooling mode 900 CFM Heating mode 1100 CFM	-
5.3 Design HVAC fan speed setting (e.g., low, medium, high): [24] Cooling mode Medium Heating mode High	-
5.4 Design total external static pressure (corresponding to the mode with the higher airflow in Item 5.2): [25] 0.70 IWC	-
5.5 Room-by-room design airflows documented below (which must sum to the mode with the higher airflow in Item 5.2) [26, 27]	-

	Room Name	Design Airflow (CFM)		Room Name	Design Airflow (CFM)
1	Master bedroom	250	13		
2	Upstairs bedroom	150	14		
3	Living room	200	15		
4	Kitchen	150	16		
5	Bonus room	200	17		
6	Downstairs bedroom	150	18		
7			19		
8			20		
9			21		
10			22		
11			23		
12				Total for all rooms	1100

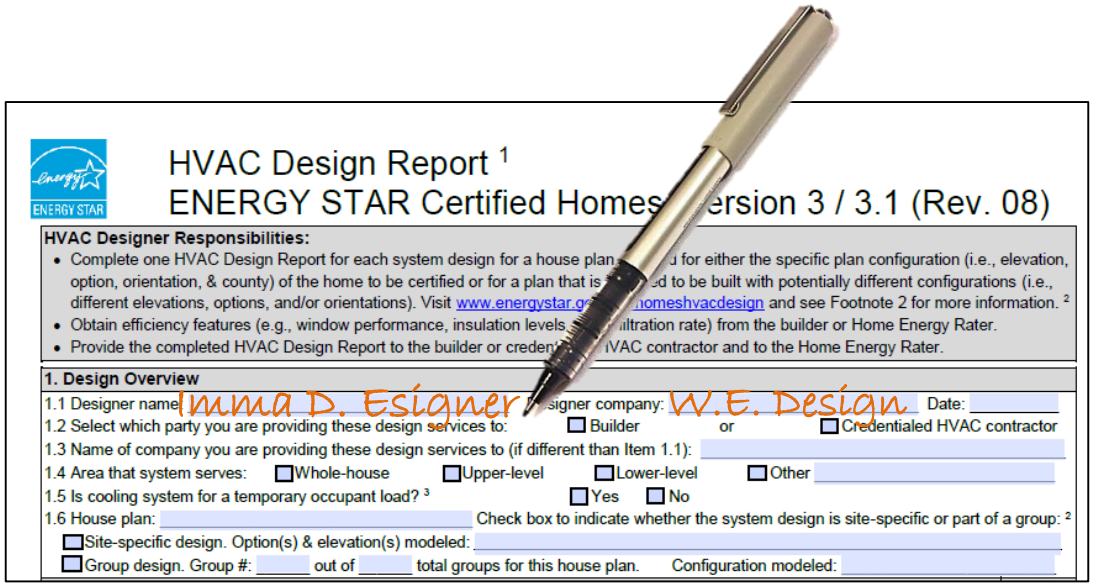
Looking Forward

HVAC Design Report Automation

Completing the HVAC Design Report Today

Step 1:

Designer creates design

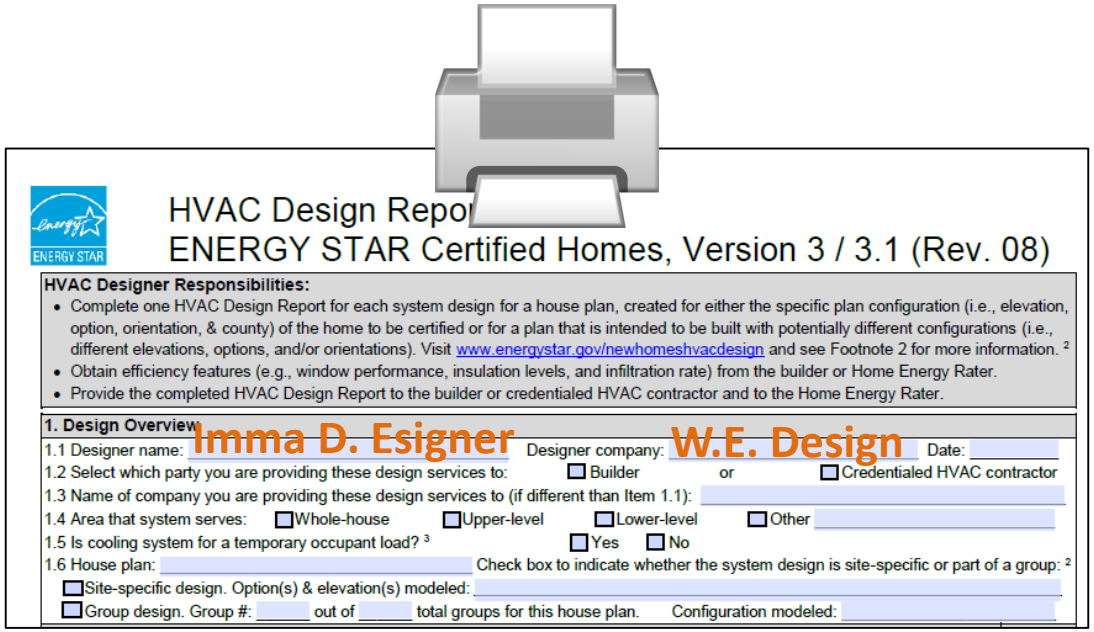


Step 2:

Designer laboriously copies design info onto HVAC Design Report

Completing the HVAC Design Report In the Future

Step 1:
Designer creates design



Step 2:
Designer hits Print

Completing the HVAC Design Report In the Future

- The future starts next week.
- The next major release of Wrightsoft is coming March 8th and will allow designers to print the completed Rev. 08 HVAC Design Report.
- Working with Elite to add the same functionality to RHVAC.
- The HVAC Design Report helps standardize and ease the exchange of information between the HVAC and HERS rating industry.

ENERGY STAR Certified Homes

Web:

Main: www.energystar.gov/newhomespartners
Technical: www.energystar.gov/newhomesguidelines
Training: www.energystar.gov/newhomestraining
HVAC: www.energystar.gov/newhomesHVAC

Email:

energystarhomes@energystar.gov

Social Media:

@energystarhomes

facebook.com/energystar

Contacts:

Dean Gamble
US EPA
Technical Manager
ENERGY STAR Certified Homes
gamble.dean@epa.gov

Charlie Haack
ICF International
Technical Support
ENERGY STAR Certified Homes
Charlie.haack@icfi.com