What's in a (Model) Name?

Leo Jansen – Energy Efficient Homes Midwest, Inc.

Energy Efficient Homes Midwest

Leo Jansen

Owner / Primary Quality Assurance Designee

3rd Party Rating Provider Managing Over 13,000 Ratings Annually

RESNET Board Member Provider Representative

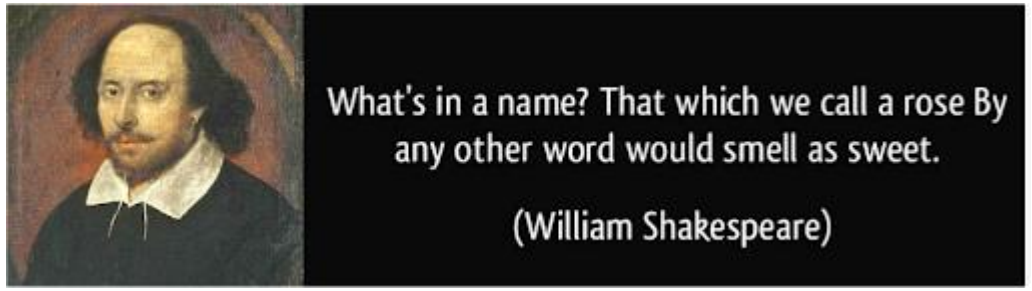
Voting member of SDC 900 and SDC 1600

Chair of the RESNET QA Checklist Staff Advisory Committee

Why this matters

- As Raters, increasing our knowledge of the HVAC industry and how it functions will enable us to become true partners with our local HVAC installers as we work to support our builder clients

- As we will see later, true compliance with programs like ENERGY STAR require that this information is 100% accurate and can be backed up with verified performance values in order to achieve certification.



National HVAC Manufacturers / Main Brands

TRANE TECHNOLOGIES

American Standard Heating & Air Conditioning · TRANE · MITSUBISHI ELECTRIC Heating & Air Conditioning

LENNOX INTERNATIONAL

LENNOX · CONCORD Quality heating and cooling products · ARMSTRONG AIR

Ducane AIR CONDITIONING AND HEATING · AIREASE

DAIKIN

Amana Heating & Air Conditioning · Goodman

Carrier

bryant · Payne · ICP International Comfort Products

Comfortmaker Air Conditioning & Heating · KeepRite Heating & Cooling Products · TEMPSTAR Heating and Cooling Products · Arcoaire Air Conditioning & Heating · HEIL Heating & Cooling Products

Rheem

RUUD

Johnson Controls

YORK · Coleman Heating & Air Conditioning · LUXAIRE Heating • Air Conditioning

Nomenclature 101

- Currently, there is not one approved standard or methodology for how manufacturers should develop their model number nomenclature

MODEL NUMBER NOMENCLATURE

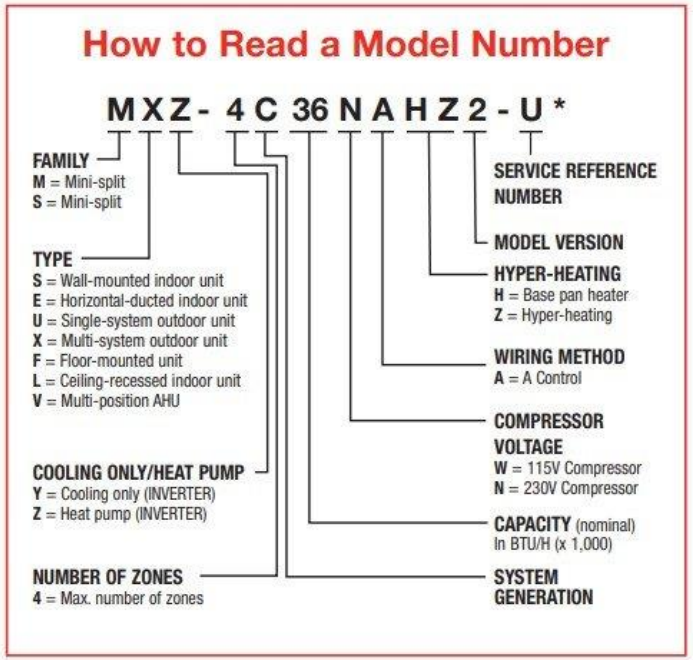
1	2	3	4	5	6	7	8	9	10	11	12	13
N	N	A	A	A/N	N	N	N	A/N	A/N	A/N	N	N
2	5	H	C	E	4	3	6	A	0	0	3	0
Product Series		Product Family	Tier	Major Series	SEER	Cooling Capacity		Grille Variations	Open	Open	Voltage	Minor Series
25 = HP		H = RES HP	C=Comfort	E = Puron	4=14 SEER			A=Dense Grille	0=Not Defined	0=Not Defined	3=208/230–1	0, 1, 2...

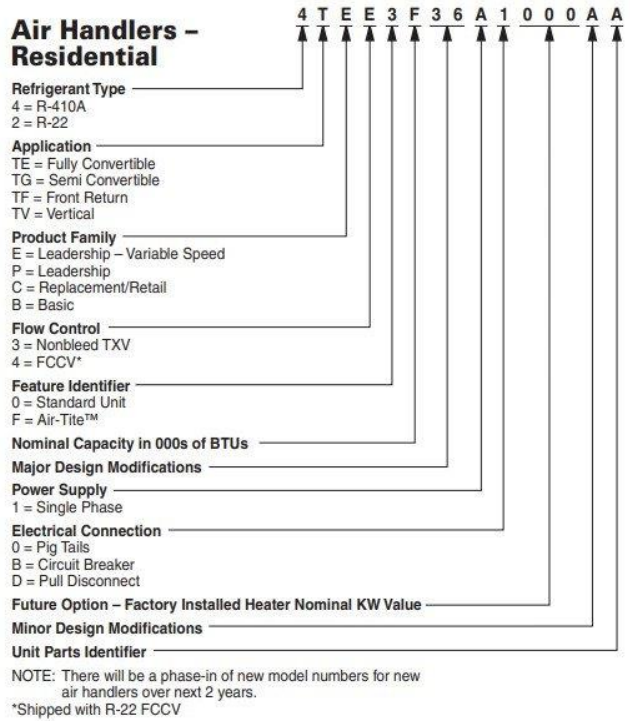
Use of the AHRI Certified TM Mark indicates a manufacturer's participation in the program For verification of certification for individual products, go to www.ahridirectory.org.

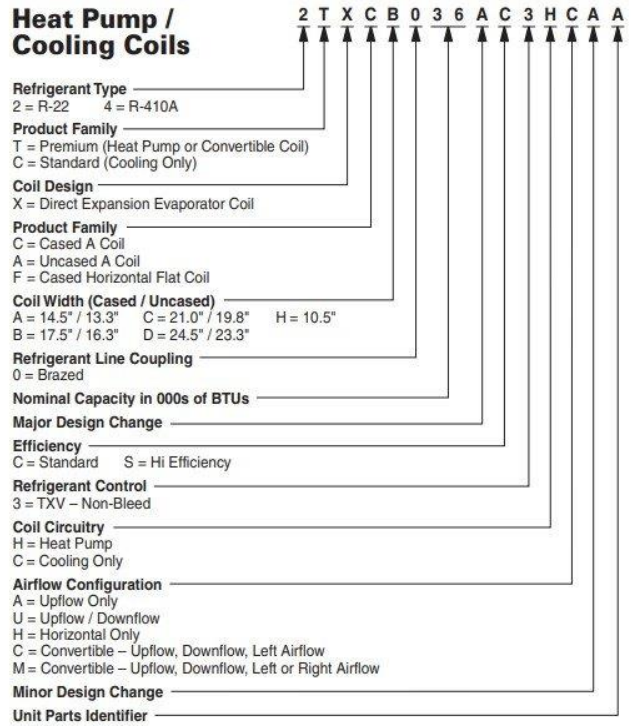
Photos secured from the below websites:
https://hvacrschool.com/nomenclature-and-how-to-use-it/

https://upload.wikimedia.org/wikipedia/commons/thumb/8/8f/Logo_of_the_Carrier_Corporation.svg/300px-Logo_of_the_Carrier_Corporation.svg.png

Nomenclature 101







MITSUBISHI ELECTRIC
HEATING & AIR CONDITIONING

TRANE®

Photos secured from the below websites:
https://www.hvacrschool.com/wp-content/uploads/2020/11/Screenshot-2020-11-12-111401.jpg
https://www.kearneyhvac.com/wp-content/uploads/2023/07/me-logo-primary-300-1024x508.jpg.webp

Nomenclature 101 – Common Themes

Data Point	Description	Common Indicators
Capacity	Indicates the cooling or heating capacity, typically in BTUs or tons.	- Numeric codes like "024" for 24,000 BTUs (2 tons). - Often found in the middle of the model number.
Efficiency	Reflects the unit's efficiency rating, such as SEER or AFUE.	- Codes like "16" indicating a 16 SEER rating. - May include letters denoting high-efficiency models.
System Type	Specifies the type of system, such as split system, packaged unit, heat pump, or air conditioner.	- Abbreviations like "HP" for heat pump or "AC" for air conditioner. - Prefixes or suffixes indicating system configuration.
Voltage	Denotes the operating voltage of the unit.	- Codes like "230" for 230 volts. - Often included towards the end of the model number.
Refrigerant Type	Indicates the type of refrigerant used in the system.	- Codes such as "R410A" or "R22". - May be represented by specific letters or numbers.
Configuration / Cabinet Size	Details about airflow direction or installation type (e.g., upflow, downflow, horizontal).	- Letters like "U" for upflow or "H" for horizontal. - Typically found towards the end of the model number.
Series/Model	Identifies the product series or model line.	- Specific letter combinations unique to each brand. - Usually at the beginning of the model number.
Special Features	Highlights additional features like variable speed, stage, or special coatings.	- Indicators such as "VS" for variable speed or "2S" for two-stage. - May appear as suffixes or within the model number.

Nomenclature 101 – Common Themes

Data Point	Why does this matter?
Capacity	Directly relates to meeting required load of HVAC Design
Efficiency	Directly relates to the ability to produce capacity
System Type	Specifies the type of system, such as split system, packaged unit, heat pump, or air conditioner.
Voltage	Directly relates to the power consumption and efficiency of the unit
Refrigerant Type	Directly impacts efficiency and also environmental impact
Configuration	Directly impacts static and flow dynamics
Series/Model	Identifies the product series or model line.
Special Features	Highlights additional features like variable speed, stage, or special coatings.

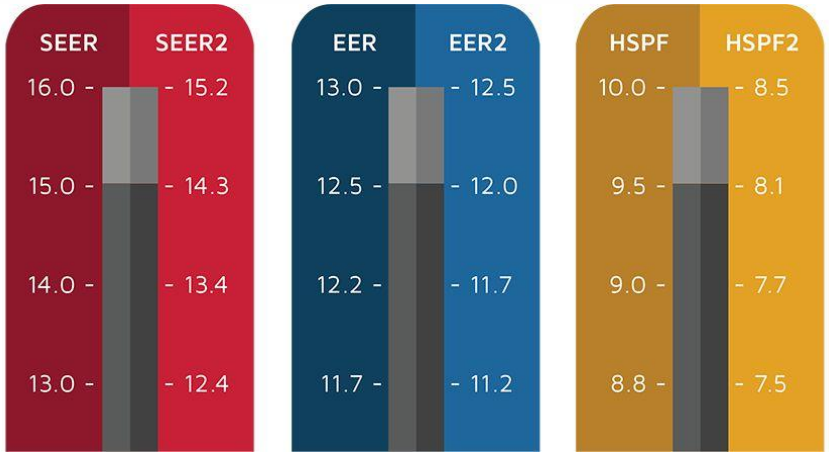
Challenges to Standardization

- Brand Identity:
  - Each brand uses unique nomenclature to differentiate itself in a competitive market. Custom naming conventions reinforce brand identity and create proprietary product recognition for consumers and contractors.

- Historical Development:
  - HVAC nomenclature evolved independently for each manufacturer based on their specific product lines, priorities, and timelines. Legacy systems and long-standing practices make standardization difficult to implement retroactively.

Regulatory Influences

- Efficiency Standards:
  - Updated efficiency metrics (e.g., SEER2, HSPF2, EER2) are mandated by DOE in the 2023 Energy Conservation Standards, but not the way they are encoded in model numbers.
  - This regulation introduces updated testing protocols outlined by DOE to better reflect real-world operating conditions.



  - Key Differences:
    - SEER used idealized testing with fixed external static pressures (ESP).
    - SEER2 accounts for higher ESPs to simulate field installations, especially for ductwork in real homes.

Photos secured from the below websites:
https://images.lennoxpros.com/is/image/LennoxIntl/Comparison-graphic1?scl=1

Ongoing Refrigerant Transitions

- Recent changes, such as the phase-out of R-22 and R-410-A (A1 Types) and the introduction of R-32 (A2L Type) and other low-GWP refrigerants, require manufacturers to adapt nomenclature to reflect refrigerant type. However, there's no standardized way to do so

FIGURE 3. Refrigerant safety classification from ASHRAE Standard 34.

	lower toxicity	higher toxicity	
higher flammability	A3	B3	LFL ≤ 0.10 kg/m³ or heat of combustion ≥19 000kj/kg
lower flammability	A2	B2	LFL ≤ 0.10 kg/m³ and heat of combustion ≥19 000kj/kg
	A2L*	B2L*	
no flame propagation	A1	B1	no LFL based on modified ASTM E681-85 test
	no identified toxicity at concentrations ≤400 ppm	evidence of toxicity below 400 ppm (based on data for TLV-TWA or consistent indices)	

*A2L and B2L are lower flammability refrigerants with a maximum burning velocity of < 10 cm/s.

FIGURE 2. Chemical elements of the Periodic Table commonly used in refrigerants

Photos secured from the below websites:
https://www.epa.gov/snap/refrigerant-safety

Technical Complexity

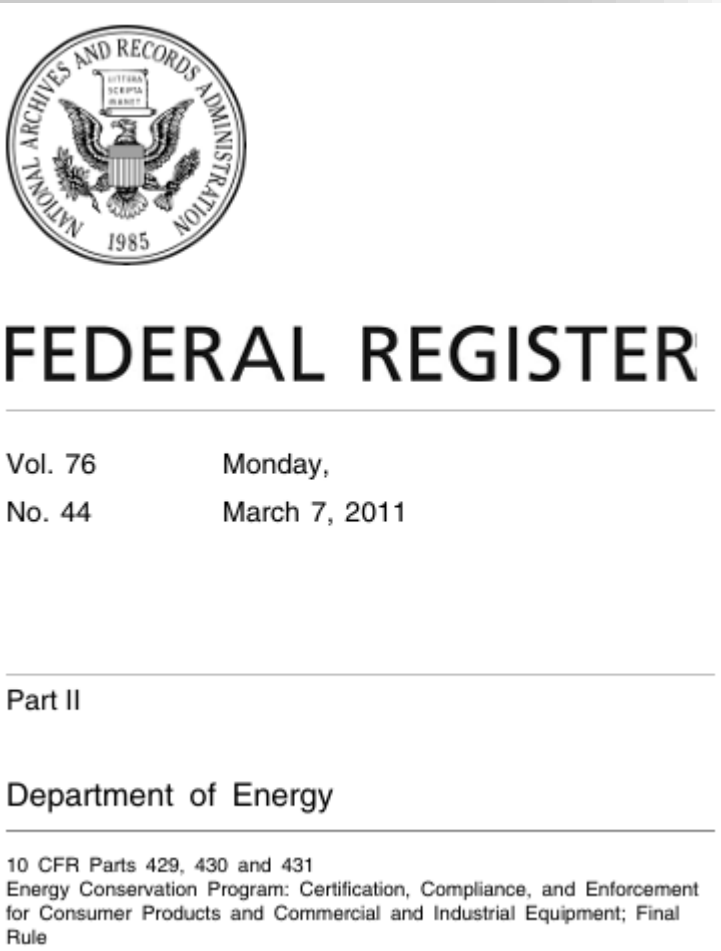
- Diverse Product Features:
  - Modern HVAC units include a growing range of features (e.g., smart technology, advanced compressors, eco-friendly refrigerants), requiring more complex naming conventions.
  - Each brand prioritizes different features in their nomenclature, making it hard to agree on a universal framework.
- Backward Compatibility:
  - Standardizing model numbers would likely break compatibility with historical systems, making it harder to identify and replace older units.

Lack of Collaboration

- Unlike industries like automotive or electronics, there's no central body driving universal HVAC nomenclature standards.
- Collaboration would require consensus among competing manufacturers, which may be challenging due to conflicting interests.

Where the requirements come from

- Title 10, Code of Federal Regulations, Part 429 (10 CFR Part 429) outlines the Certification, Compliance, and Enforcement procedures for consumer products and commercial and industrial equipment, including HVAC systems.
- This regulation is pivotal in ensuring that manufacturers adhere to energy conservation standards set forth by the U.S. Department of Energy (DOE).



FEDERAL REGISTER

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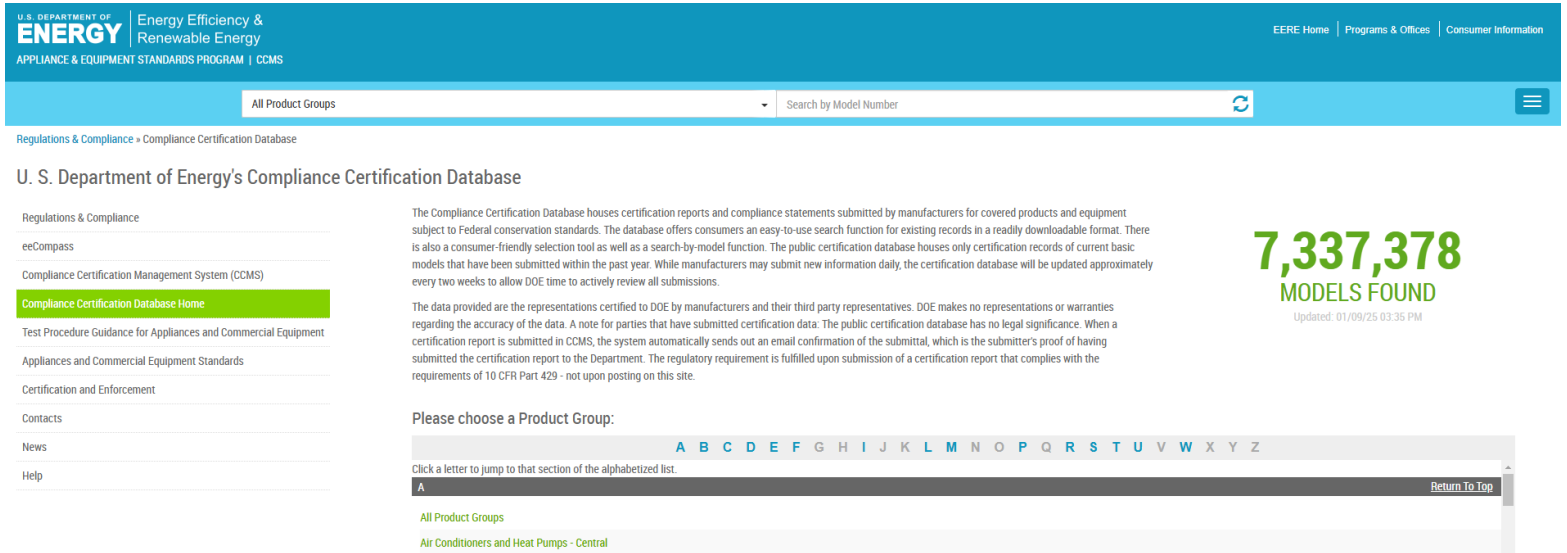
Part II

Department of Energy

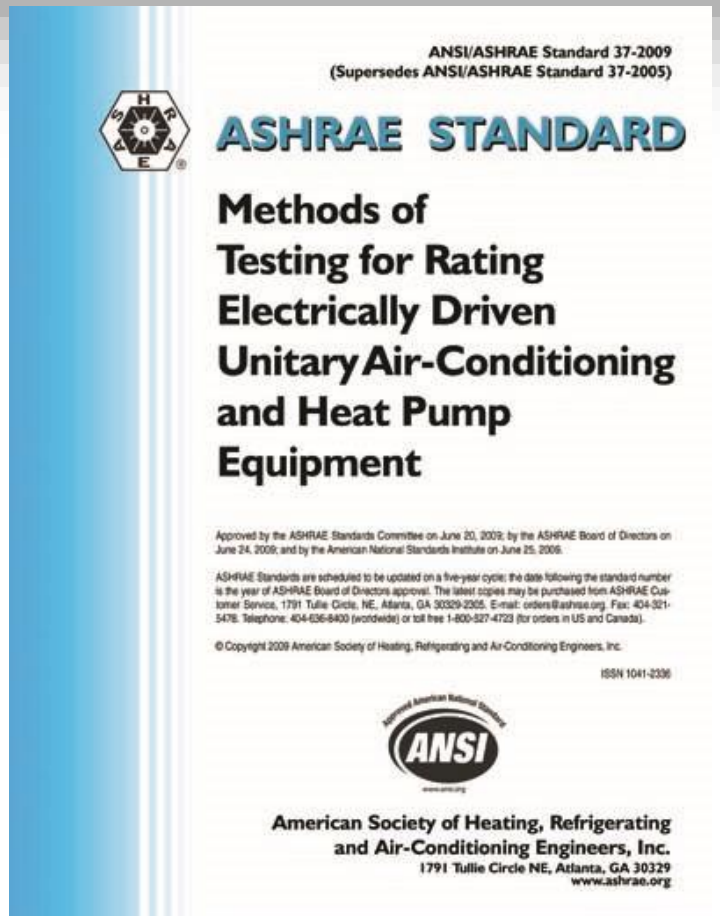
10 CFR Parts 429, 430 and 431
Energy Conservation Program: Certification, Compliance, and Enforcement for Consumer Products and Commercial and Industrial Equipment; Final Rule

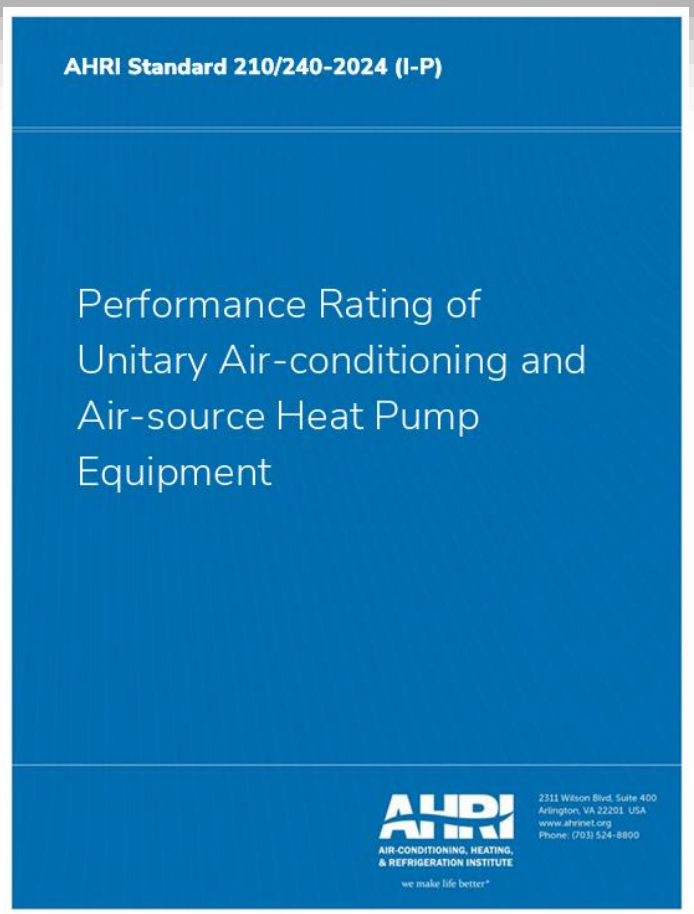
CCD - Compliance Certification Database

- While 10 CFR Part 429 does not prescribe specific nomenclature rules for model numbers, it indirectly influences them by requiring that model numbers be clearly defined and consistently used in certification reports.
- Managed by the FTC, these certification reports are sent in and compiled by DOE in the CCD, which is updated by manufacturers at regular intervals.



Testing and Certification Standards





Photos secured from the below websites:
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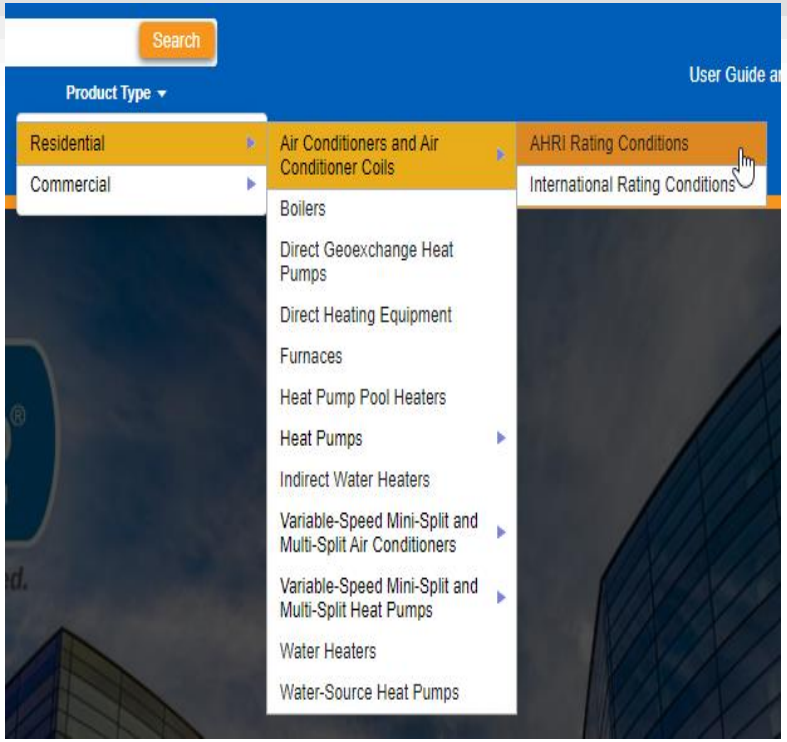
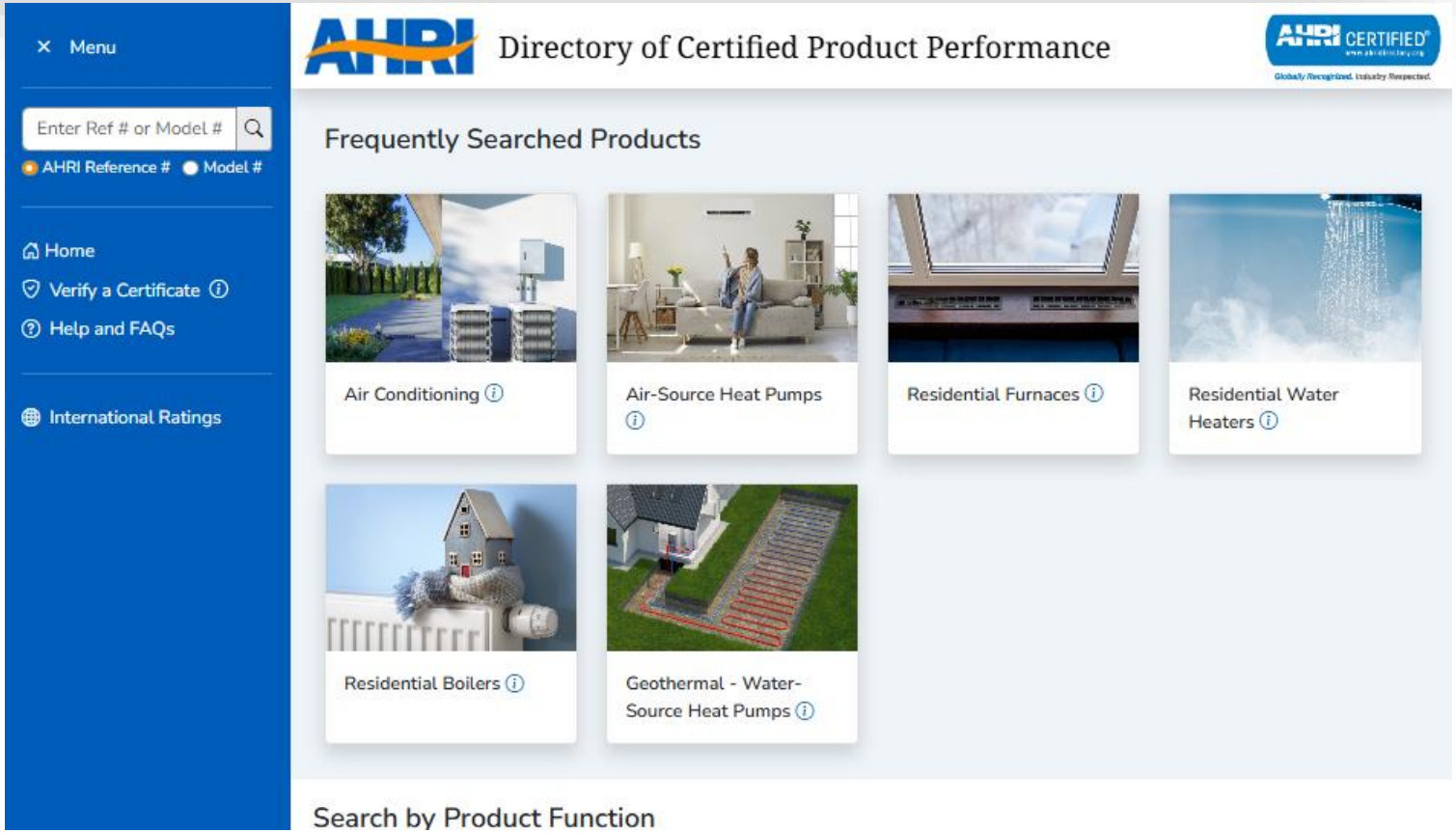
https://encrypted-tbn0.gstatic.com/images?q=tbn:ANd9GcQfGjEOjTl8rpEoljrhm-nQjWECMfg2KYVZCA&s

AHRI

- AHRI (Air-Conditioning, Heating, and Refrigeration Institute) is a global trade association representing manufacturers of HVAC, refrigeration, and water heating equipment.
- AHRI develops performance standards and certification programs to ensure that HVAC products meet specific efficiency and performance criteria.
- This is the main source of HVAC data in the CCD shown previously, but some information can still come directly from the manufacturer.

AHRI Facelift – Pros and Cons





ACs - Three Piece or Two Piece Match?

ENERGY STAR Single-Family New Homes
National HVAC Design Report, Version 3 / 3.1 / 3.2 (Rev. 12) [1]

27. If an AHRI Reference # is not available, OEM-provided documentation shall be attached with the rated efficiency of the specific combination of indoor & outdoor components of the air conditioner or heat pump, along with confirmation that the components are designed to be used together.

ENERGY STAR Single-Family New Homes
National HVAC Design Report, Version 3 / 3.1 / 3.2 (Rev. 13) [1]

28. If the equipment contains multiple components, the AHRI Reference # shall represent the rated efficiency of the specific combination of indoor and outdoor components. EPA recommends, but does not require, that the rating also encompass the furnace when such a rating is available. If an AHRI Reference # is not available, OEM-provided documentation shall be attached with the rated efficiency of the specific combination of indoor & outdoor components of the air conditioner or heat pump, along with confirmation that the components are designed to be used together.

ACs - Three Piece or Two Piece Match?

GA4SAN430-A / CVPVA3617XMC

AHRI Reference #: 208987814

MODEL DETAILS

AHRI Reference # :	208987814
Outdoor Unit Brand Name :	CARRIER
Outdoor Unit Series Name :	14 SEER2 AC
Outdoor Unit Model Number :	GA4SAN430**NA*
Indoor Unit Brand Name :	CARRIER
Indoor Unit Type :	
Indoor Unit Model Number :	CVPVA3617XMC*+TDR
Furnace Model Number :	

AHRI CERTIFIED RATINGS

Cooling Capacity (95F), btuh (Appendix M1) :	28200
EER2 (95F) (Appendix M1) :	11.5
SEER2 (Appendix M1) :	13.4

GA4SAN430-A / CVPVA3617XMC / 59SC6A060M17

AHRI Reference #: 212411185

MODEL DETAILS

AHRI Reference # :	212411185
Outdoor Unit Brand Name :	CARRIER
Outdoor Unit Series Name :	14 SEER2 AC
Outdoor Unit Model Number :	GA4SAN430**NA*
Indoor Unit Brand Name :	CARRIER
Indoor Unit Type :	
Indoor Unit Model Number :	CVPVA3617XMC*
Furnace Model Number :	59SC6A060M17**16

AHRI CERTIFIED RATINGS

Cooling Capacity (95F), btuh (Appendix M1) :	27600
EER2 (95F) (Appendix M1) :	12
SEER2 (Appendix M1) :	14.5

Cooling Capacity Δ of 600 bthu & SEER2 Δ of 1.1

Impact - Three Piece or Two Piece Match?

4b. Review of ENERGY STAR National HVAC Design Report [15, 16]
4b.2.6 Sensible, latent, & total heat gain are documented (3.10 - 3.12) for the orientation of the home to be certified. [22]
4b.2.7 The variation in total heat gain across orientations (3.13) is ≤ 6 kBtuh. [22]
4b.2.8 Cooling sizing % (4.13) is within the cooling sizing limit (4.15) selected by the HVAC designer.

4. Heating & Cooling Equipment Selection [16]						Designer Verified
4.1 Equipment selected per ACCA Manual S (see Footnote 26 & 27). [26, 27]						☐
Air Conditioner / Heat Pump (Complete if air conditioner or heat pump will be installed; otherwise check "N/A")						☐ N/A
4.2 Equipment type:	☐ Cooling-only air conditioner	or	☐ Cooling & heating heat pump			-
4.3 Condenser manufacturer & model:						-
4.4 Evaporator / fan coil manufacturer & model:						-
4.5 AHRI reference #: [28]						-
4.6 Rated cooling efficiency: [29]	/		Rated heating efficiency: [30]			-
4.7 Evaporator fan type:	☐ PSC	☐ ECM / ICM	☐ Other:			-
4.8 Compressor type:	☐ Single-speed	☐ Two-speed	☐ Variable-speed			-
4.9 Latent capacity at design conditions, from OEM expanded performance data: [31]					kBtuh	-
4.10 Sensible capacity at design conditions, from OEM expanded performance data: [31]					kBtuh	-
4.11 Total capacity at design conditions, from OEM expanded performance data: [31]					kBtuh	-
4.12 Air-source heat pump capacity:	At 17°F:	kBtuh	At 47°F:	kBtuh	☐ N/A	-
4.13 Cooling sizing % = Total capacity (Item 4.11) divided by maximum total heat gain (Item 3.12):	%					-
4.14 Complete this Item if Condition B Climate will be used to select sizing limit in Item 4.15. Otherwise, check "N/A": [32]					☐ 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 www.energystar.gov/hvacdesigntemps to determine this value for the design location)	=					
4.15 Check box of applicable cooling sizing limit from chart below: [26, 27]						-

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

4.16 Cooling sizing % (4.13) is within cooling sizing limit (4.15).	☐

Cooling Error Type	Error Type
Modeled SEER/SEER2/EER value off by 0.5 to 1.0 from AHRI certificate, supporting documentation, or conversion calculation	Minor
Modeled output capacity off by 2 kBtu/h to 5 kBtu/h from AHRI Certificate or supporting docs	Minor
Incorrect fan motor type modeled	Minor
% Cooling Load Served off by 2% to 5%	Minor
Incorrect location identified for Cooling System	Minor
Incorrect equipment type identified	Major
Incorrect fuel type identified	Major
Modeled SEER/SEER2/EER off by greater than 1.0 from AHRI certificate, supporting documentation, or conversion calculation	Major
SEER2 not properly converted to SEER or the improper SEER/SEER2 dropdown was selected in the building model	Major
% Cooling Load Served off by greater than 5%	Major
Modeled output capacity off by greater than 5 kBtu/h from AHRI Certificate or supporting docs	Major
SEER value from supporting documentation is modeled as SEER2 value	Major
No Photo Provided of Coil Model Number	No Photo
No Photo Provided of Condenser Model Number	No Photo
Incorrect number of units modeled	Incorrect number of units modeled

What is there is no AHRI?

- ENERGY STAR is looking for verified performance values - if you cannot get these, then you are working with a non-ENERGY STAR system and the home should not be certified under corrected.
- There is an exception to get the OEM-provided documentation (OEM Submittal) in place of the AHRI number.
  - This comes directly from the manufacturer, a simple letter from the HVAC Designer stating the a given combination will work for the National HVAC Design Report requirements is not sufficient.

What is there is no AHRI?

ENERGY STAR Single-Family New Homes
National Rater Field Checklist, Version 3 / 3.1 / 3.2 (Rev. 13)

35. If installed equipment does not match the National HVAC Design Report, then prior to certification the Rater shall obtain written approval from the designer (e.g., email, updated National HVAC Design Report) confirming that the installed equipment meets the requirements of the National HVAC Design Report. In addition, if "N/A" was selected for Item 1.2 of the National Rater Design Review Checklist, then the Rater shall verify that all installed equipment is an exempted type per Footnote 14 of that Checklist or, if not an exempted type, shall re-review the National Rater Design Review Checklist to ensure compliance with all requirements (e.g., contractor credential, full completion of HVAC Design Report, HVAC design tolerances).

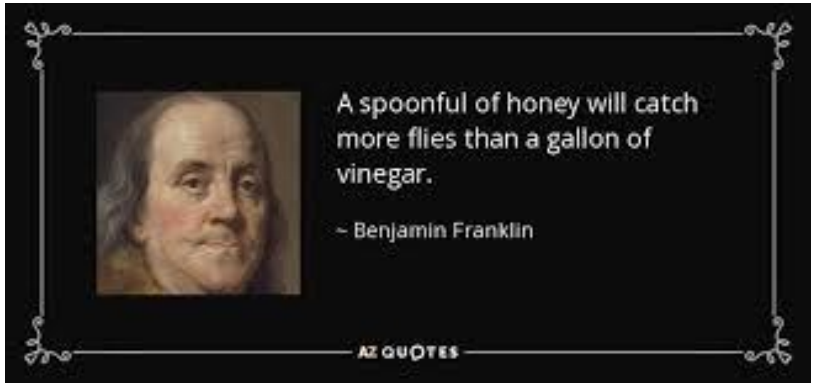
    In cases where the condenser unit is installed after the time of inspection by the Rater, the HVAC manufacturer and model numbers on installed equipment can be documented through the use of photographs provided by the HVAC Contractor after installation is complete.

ENERGY STAR Single-Family New Homes
National HVAC Design Report, Version 3 / 3.1 / 3.2 (Rev. 13) [1]

28. If the equipment contains multiple components, the AHRI Reference # shall represent the rated efficiency of the specific combination of indoor and outdoor components. EPA recommends, but does not require, that the rating also encompass the furnace when such a rating is available. If an AHRI Reference # is not available, OEM-provided documentation shall be attached with the rated efficiency of the specific combination of indoor & outdoor components of the air conditioner or heat pump, along with confirmation that the components are designed to be used together.

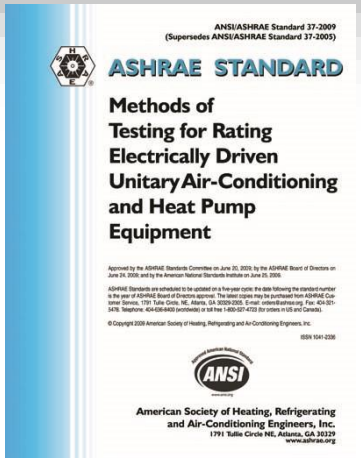
How do you get the OEM Submittal?

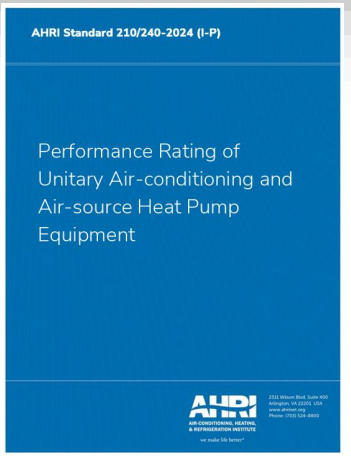
- This will come directly from the company that manufacturers parts or complete HVAC systems which may be sold under their own or another brand's name.
- It is important to remember that you as the Rater (unless you are also a HVAC Contractor) are not their client.
  - If you are going to try manage this ask directly, you need to identify and foster this relationship in your local market.
  - There is not one uniform / easy process to obtain this information.



Components of an OEM Submittal

- Product data sheets
- Performance curves
- Dimensional drawings
- Installation and operation manuals





- Importance in Projects: Used by engineers, contractors, and building owners to verify that the equipment meets the specified requirements and to aid in proper installation and maintenance

Process Flow for Success

- Receive Plans / Specs / HVAC Design Report (Before Construction!)
- Review HVAC Design Report, lookup AHRI and model in software
  - If errors found at this state, implement no TBI until correct policy
- During first site visit, confirm installed equipment (that is present)
  - If discrepancies are present, does need to be corrected – (see next slide)
  - If not installed, photos of the condenser provided by the HVAC contractor are allowed

	Outside Condenser	Inside Coil	Furnace
ES HVAC Design Model Number	24SCA430N00300	CVPVA3617XMC	
Photo of Installed Model Number	24SCA430N0030001	CVPVA3617XMC	59SC6A060M17116
AHRI Model Numbers used from Photos Provided			
Ekotrope Model Number	24SCA430N300	CVPVA3617XMC	59SC6A060M171116
	Match to 9 characters	Match to 12 characters	Match to 0 characters

This is where understanding your market's equipment's nomenclature rules will be critical!

THANK YOU