Providing insights for today's HVAC system designer

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TRANE

HVAC-Related Changes to ASHRAE® Standard 90.1-2022

Jurisdictions have begun to adopt ASHRAE 90.1-2019; some have even begun to adopt ASHRAE 90.1-2022. Practitioners often look to the 2022 version for ideas on ways to reduce energy over the 2019 version, whether due to participation in above-code programs, preparation for the future, or simply as a design preference for energy and utility cost saving. This *Engineers Newsletter* describes important changes in the 2022 edition that affect HVAC systems and related equipment.

Since 1975, ANSI/ASHRAE/IES Standard 90 and 90.1 have been the basis of many model energy codes and continues to be adopted directly or by reference via the International Energy Conservation Code (IECC). It is also the basis for determining compliance with the Energy Policy Act of 1992.

ASHRAE provides copies of the standard for a fee to help designers better understand the requirements as they apply to specific systems, climates, buildings, and design applications.

2022 Changes

Eighty-nine addenda were incorporated in the 2022 edition affecting scope, envelope, lighting, performance rating, and mechanical sections of the Standard. Of those, 39 resulted in energy savings which were captured in the energy models created by the U.S. Department of Energy to determine energy saving impacts. Addenda for which savings weren't captured typically involve equipment not included in the energy models, provide clarity to previous requirements, or are only part of the optional compliance paths.

Figure 1 shows the normalized energy use from the first version of the Standard released in 1975 through 90.1-2022. This value is the total energy consumed by the building, including equipment not regulated by 90.1. According to results of the 2022 model assessment, the 39 addenda save a weighted average of 14.4 percent compared to the 2019 version. Before diving into the HVAC-related changes, let's first briefly overview the non-mechanical changes.

Title, Purpose, and Scope expanded to include sites. The title, purpose and scope now include sites, defined as

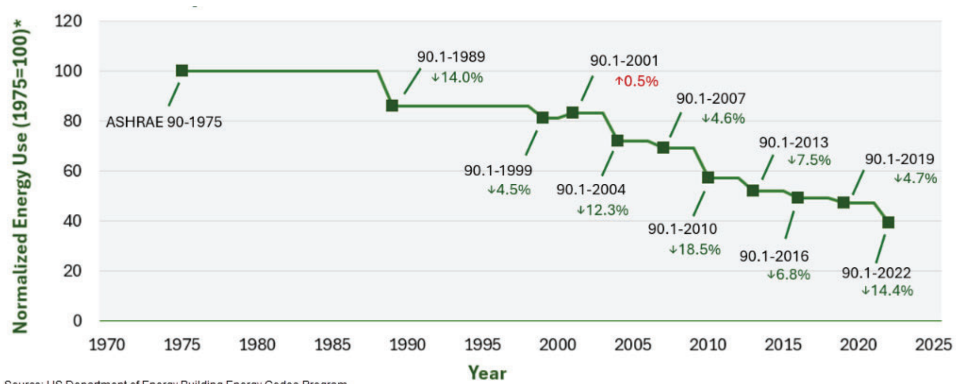
"an area of land that is under the control of a single owner or entity, which contains systems or equipment".

In Section 1.1 (Purpose), efficiency requirements are extended to "utilization of on-site renewable energy resources". This addition of sites clarifies that on-site renewables count as credits towards energy usage across the entire building project, even if they're not located within the building footprint. It also reduces ambiguity around exterior and parking lot lighting not provided through the main electrical panel of the building.

Building Envelope. There is now a requirement to perform whole-building air-leakage testing and measurement on buildings less than 25,000 ft². Multiple sections and new Appendix K now address impacts of thermal bridges in building envelopes. Also added are requirements for solar reflectance for walls in Climate 0 and provisions that differentiate roof replacements from other types of building modifications.

Power & Lighting. Interior lighting power allowances and minimum control requirements were updated. Lighting requirements were changed to align with the growing use of higher efficiency LED lighting and shifts in lighting practices. Additional interior lighting power allowance for video conferencing is now included, as well as new requirements for indoor horticulture lighting.

Figure 1. Improvement in ASHRAE Standard 90.1 from 1975-2022



Source: US Department of Energy Building Energy Codes Program

HVAC-related Changes

Below is a list of ASHRAE Standard 90.1-2022 updated section numbers and corresponding 90.1-2019 addendum letters:

Section 6: Heating, Ventilating, and Air Conditioning

- New optional Mechanical System Performance Path, allowing HVAC system efficiency trade-offs based on Total System Performance Ratio (TSPR) (Addendum AG: Sections 6.2.2 and 6.6.2, and Appendix L)
- Modified demand control ventilation requirements to be based on climate zone and Standard 62.1 ventilation rates (Addendum B: Section 6.4.3.8)
- Expanded air economizer requirement for fan-cooling units outside the building envelope with individual capacities above 33,000 btu/h. (Addendum CI: Section 6.5.1.1)
- Clarifications on relieving excess air when air economizing. (Addendum G: Section 6.5.1.1.5)
- Introduced exception to the DOAS supply air temperature requirements for Climate Zones 0A, 1A, 2A, 3A, and 4A. (Addendum X: Section 6.5.2.6)
- Added minimum Enthalpy Recovery Ratio requirements for exhaust-air energy recovery and clarified bypass requirements to enable airside economizing (Addendum CD: Section 6.5.6.1.2)
- Updated minimum efficiency requirements for Heat Pump and Heat Recovery Chillers, Variable Refrigerant Flow Air Conditioners, and Warm-Air Furnaces. (Addendum Y: Table 6.8.1-16; Addendum AY: Tables 6.8.1-8 and 6.8.1-9; Addendum BX: Table 6.8.1-5)
- Introduced a new metric (COPHR) for heat recovery equipment. (Addendum Y: Table 6.8.1-16)

On-Site Renewables, Additional Efficiency Requirements, and Performance Rating Method

- Minimum prescriptive requirement for on-site renewable energy. (Addendum BY: Sections 3.2, 10.2.1, and 10.5.1)
- New Section 11, Additional Efficiency Requirements, introduces energy credits requirements, which vary by building type and climate zone. (Addendum AP: Section 11)
- Introduced Informative Appendix I to establish how alternative performance metrics such as site energy, source energy, and carbon emissions could be used with the Performance Rating Method. (Addendum CH: Appendices I, G, Section 4.2.1.1)
- New normative Appendix J, Sets of Performance Curves, provides minimally compliant performance curves when specific equipment performance is not known. (Addendum BD: Appendices J, G)

The following sections provide detailed information for the 90.1-2022 updates.

New Mechanical System Performance Path. Section 6.6.2 introduced the Mechanical System Performance Rating Method (MSPR). This is an alternative, simplified performance-based compliance path for specific HVAC systems. This path does not require a whole-building energy model (such as Appendix G Performance Rating Method or Section 12 Energy Cost Budget) or compliance with all prescriptive requirements of Section 6.5.

MSPR is helpful for buildings that struggle to meet certain prescriptive requirements, such as fan power limits or economizer requirements, but could achieve better efficiency in other areas, including higher-efficiency cooling equipment or a reduction in pump power. This is because MSPR allows some HVAC system types to consider efficiency trade-offs against HVAC prescriptive requirements based on a new metric, Total System Performance Ratio (TSPR).

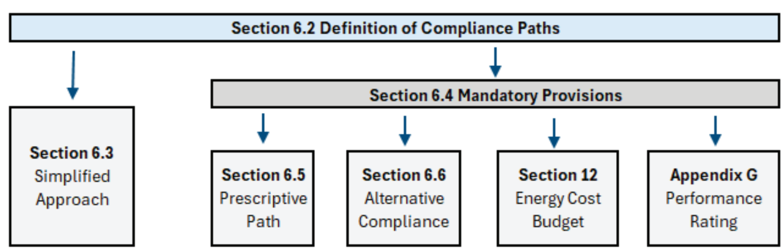
TSPR is the sum of the annual cooling and heating loads, divided by the sum of annual HVAC operating energy for the building. $TSPR_p$, which refers to the proposed building, is compared against $TSPR_r$, the reference building aligned with Appendix G.

$TSPR_p$ must be greater than or equal to $TSPR_r$ divided by the mechanical performance factor (MPF), which is based on climate zone and building type. The larger the TSPR, the more efficient the system, as it demonstrates less HVAC energy used to satisfy building loads.

New Appendix L, *Mechanical System Performance Rating Method*, provides details on the requirements and calculations for these values. Unlike Appendix G, MSPR is only for comparing the proposed and reference designs and does not allow building envelope or lighting system enhancements to tradeoff against HVAC system efficiency requirements.

Pacific Northwest National Labs created a free web-based tool to help with compliance calculations called the Mechanical System Performance Tool. This tool uses a block-based simplified model with ASHRAE 90.1 Appendix L loads and schedules to assess building energy efficiency (Figure 2). This is not the same as a whole-building performance-based approach, which would provide an in-depth analysis of the overall building performance; however, it is less time intensive and still produces valuable performance data.

Figure 2. Flow diagram based on Standard 90.1-2022 Section 6



Based on Standard 90.1-2022 Section 6 Flow Diagram

Revised Demand Control Ventilation Requirements. In previous versions of the standard, Section 6.4.3.8 stated demand control ventilation (DCV) was required for spaces larger than 500 ft² with a design occupancy for ventilation of ≥25 people per 1,000 ft² of floor area.

Now, in Standard 90.1-2022, Section 6.4.3.8 has been revised to base DCV requirements on climate zone, whether or not exhaust air energy recovery is also required, and Standard 62.1 ventilation requirements.

DCV's minimum floor area requirement is in Table 6.4.3.8 and is based on an occupant outdoor airflow component in CFM per 1000 ft² (Table 1) This is determined by multiplying the zone's cfm-per-person ventilation rate (Rp) from Standard 62.1 by the default occupant density (people per 1000 ft²).

Relief Air Clarifications. Section 6.5.1.1.5 requires systems to relieve excess outdoor air while economizing to prevent building over-pressurization.

Now, Standard 90.1-2022 clarifies these requirements. Return or relief fans are allowed as long as they meet the fan control requirements of Section 6.5.3.2.4. Barometric or motorized damper relief paths are also allowed, provided the total pressure drop at design relief airflow rate is under 0.10 in. H_2O.

New DOAS Reheat Exemption. Section 6.5.2.6, Ventilation Air Heating Control, prevents DOAS units from warming the supply air above 60°F whenever the majority of zones require cooling. This prevents wasted energy from re-cooling in the zone terminal units.

When a DOAS is used to dehumidify the entering outdoor air, it needs to be overcooled to reduce the moisture in the air. If the DOAS reheats this dehumidified air above 60°F when the cooling supply air temperature is 55°F and most zones require cooling, most equipment downstream will waste energy by re-cooling.

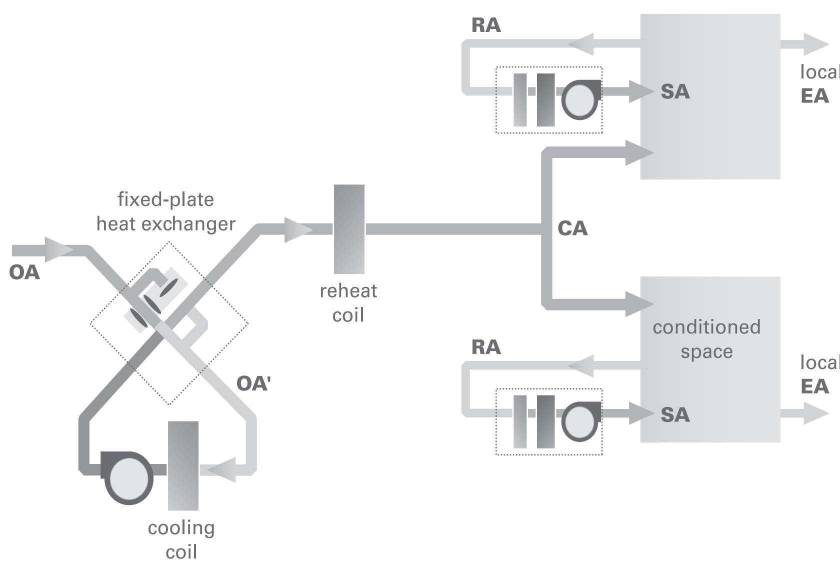
Now, Standard 90.1-2022 adds a new exception for units that use only series (or wraparound) energy recovery in Climate Zones 0A, 1A, 2A, 3A, and 4A.

In series energy recovery, a heat exchanger removes sensible heat (and possibly some latent heat) from the outdoor air upstream of the cooling coil, reducing the load on the cooling coil (Figure 3). The air then travels through the cooling coil, further removing sensible and latent heat. This air then travels through the downstream side of the heat exchanger, transferring the heat that was removed from the entering outdoor air to reheat the air downstream of the cooling coil. The latent heat of condensation that is generated as moisture condenses on the upstream side of the heat exchanger and adds to the overall heat transferred; however, only sensible heat moves to the other side of the heat exchanger, reheating the air downstream of the coil. The benefit of precooling the entering outdoor air offsets the impact of reheating the downstream dehumidified air, so warming the supply air above 60°F via series energy recovery is allowed in these climate zones.

Table 1. Based on "Table 6.4.3.8 Demand Control Ventilation (DCV) Floor Area Thresholds"

climate zone	occupant outdoor airflow component (CFM/100 ft²)					
	100 to 199	200 to 399	≥400	100 to 199	200 to 399	≥400
	Minimum Space Floor Area (ft²) Where DCV is Required					
	Areas Without Exhaust Air Energy Recovery			Areas With Exhaust Air Energy Recovery		
7, 8	400	200	150	800	400	250
5A, 6A, 6B	600	250	150	1400	900	400
0A, 0B, 1B, 3A, 4A, 5B, 5C	800	400	250	2000	1000	500
2A, 2B, 4C	1100	600	300	2300	1100	600
3B, 4B	1500	700	400	5200	2350	1250
1A	2400	1100	600	5800	2600	1400
3C	7000	3000	1700	12000	6000	3000

Figure 3. Series energy recovery in a dedicated outdoor air system



Revised Exhaust Air Energy Recovery. Section 6.5.6.1 includes requirements for exhaust air energy recovery with ventilation systems. This includes an enthalpy recovery ratio requirement, which caused some confusion when applied to systems that do not provide humidification.

Now, Standard 90.1-2022 Section 6.5.6.1.2.1 clarifies that if a system does not provide active humidification, the sensible energy recovery ratio must be at least 50% at the heating design condition, and the enthalpy recovery ratio only applies to the cooling design condition.

Section 6.5.6.1.2.2 clarifies bypass requirements for both outdoor air and exhaust air when air economizers are used. When bypassing, airflow through the device must be no greater than 10 percent of the full design airflow rate and pressure drop through the device must be no greater than 0.4 in. H_20.

Updates to Minimum Equipment Efficiency Tables

Heat Pumps and Heat Recovery Chillers (6.8.1-16). ASHRAE Standard 90.1-2019 introduced new requirements for heat pumps and heat recovery chillers in Table 6.8.1-16 (Table 2). Unchanged from the 2019 version, equipment that is not configured for cooling needs to meet only the Heat Pump Heating Full-Load Heating Efficiency (COP_H) at one of the heating standard rating conditions listed in Table 6.8.1-16. The equipment test procedures are AHRI 550/590 for all equipment in this table.

In Standard 90.1-2022, the table has been reformatted and updated to include expanded rating conditions. Heat Recovery Heating Full-Load Efficiency (COP_{HR}) now has its own column, instead of being combined with Simultaneous Cooling and Heating Full-Load Efficiency (COP_{SHC}).

COP_{HR} applies to units that use either all, or only a portion of, heat generated during chiller operation to serve a heating load, while the remaining, if any, is rejected to the outdoor ambient. This may be water-cooled equipment that has dual condensers or rejects heat via a heat exchanger to a cooling tower, or air-cooled equipment that rejects heat via an air-cooled condenser. Units that are only capable of partial heat recovery are not included in this table and instead should reference Table 6.8.1-3.

Consider a 100-ton screw chiller supplying chilled water at 44°F with entering/leaving hot water conditions of 120/140°F. In this example plant, the chiller's heating load is much lower than the chiller's cooling capacity, so excess heat is rejected via heat exchanger to a cooling tower. This equipment needs to meet the minimum COP_{HR} of 4.420 and the minimum cooling operation efficiency of either Path A or Path B.

COP_{SHC} applies to equipment that uses both the net heating and refrigerating capacities generated during operation to meet heating and cooling loads, respectively. These units do not reject any excess heat to outdoor ambient during operation.

Now consider a 100-ton screw chiller supplying chilled water at 44°F with entering/leaving hot water conditions of 120/140°F, this time in a plant where the chiller's heating and cooling loads are balanced. This equipment does not need to reject excess heat, so COP_{SHC} and minimum cooling operation efficiency apply. Notice that the minimum COP_{SHC} for this equipment is 4.420, the same as the COP_{HR} from the previous example. If this same chiller's leaving evaporator temperature is 65°F instead of 44°F, lowering the lift required, then this equipment needs to meet the minimum COP_{SHC} of 6.150 and the minimum cooling operation efficiency of either Path A or Path B.

Table 2. Example Cooling and Heating Operation Efficiency Requirements for Liquid-Source Electronically Operated Positive Displacement Equipment from Table 6.8.1-16

Size category refrig. capacity, ton_R	cooling operation efficiency (FL/IPLV)		heating source	heating operation efficiency											
				heat pump heating full-load heating efficiency (COP_H)				simultaneous cooling and heating full-load heating efficiency (COP_{SHC})				heat recovery heating full-load heating efficiency (COP_{HR})			
				entering/leaving heating liquid temperature				entering/leaving heating liquid temperature				entering/leaving heating liquid temperature			
				low	med	high	boost	low	med	high	boost	low	med	hot water	hot water
	Path A	Path B		95°/105°F	105°/120°F	120°/140°F	120°/140°F	95°/105°F	105°/120°F	120°/140°F	120°/140°F	95°/105°F	105°/120°F	90°/140°F	120°/140°F
≥11.25 and <150	≤0.7895 FL ≤0.6316 IPLV.IP	≤0.8211 FL ≤0.5263 IPLV.IP	44	≥4.640	≥3.680	≥2.680	NA	≥8.330	≥6.410	≥4.420	NA	≥8.330	≥6.410	≥4.862	≥4.420
			65	NA	NA	NA	≥3.550	NA	NA	NA	≥6.150	NA	NA	NA	NA
≥150 and <300	≤0.7579 FL ≤0.5895 IPLV.IP	≤0.7895 FL ≤0.5158 IPLV.IP	44	≥4.640	≥3.680	≥2.680	NA	≥8.330	≥6.410	≥4.420	NA	≥8.330	≥6.410	≥4.862	≥4.420
			65	NA	NA	NA	≥3.550	NA	NA	NA	≥6.150	NA	NA	NA	NA
≥300 and <400	≤0.6947 FL ≤0.5684 IPLV.IP	≤0.7158 FL ≤0.4632 IPLV.IP	44	≥4.640	≥3.680	≥2.680	NA	≥8.330	≥6.410	≥4.420	NA	≥8.330	≥6.410	≥4.862	≥4.420
			65	NA	NA	NA	≥3.550	NA	NA	NA	≥6.150	NA	NA	NA	NA
≥400 and <600	≤0.6421 FL ≤0.5474 IPLV.IP	≤0.657 FL ≤0.4316 IPLV.IP	44	≥4.930	≥3.960	≥2.970	NA	≥8.900	≥6.98	≥5.000	NA	≥8.900	≥6.980	≥5.500	≥5.00
			65	NA	NA	NA	≥3.900	NA	NA	NA	≥6.850	NA	NA	NA	NA
≥600	≤0.5895 FL ≤0.5263 IPLV.IP	≤0.6158 FL ≤0.4000 IPLV.IP	44	≥4.930	≥3.960	≥2.970	NA	≥8.900	≥6.98	≥5.000	NA	≥8.900	≥6.980	≥5.500	≥5.00
			65	NA	NA	NA	≥3.900	NA	NA	NA	≥6.850	NA	NA	NA	NA

Variable Refrigerant Flow (6.8.1-8, 6.8.1-9). Variable refrigerant flow (VRF) efficiency requirements decreased the EER by 4.2% to 6.7% in comparison to the 2019 Standard, while keeping the same IEER minimum efficiency requirements. This is due to revisions of AHRI Standard 1230 for rating and testing VRF equipment, where several test procedure changes were made. The purpose is to move towards part load and annualized metrics as opposed to full load metrics, as these are more aligned with actual building operation.

Warm-Air Furnaces, Duct Furnaces, and Unit Heaters (6.8.1-5). Table 6.8.1-5 was updated for warm-air furnace efficiency, now further differentiating products based on test procedures used per location, status as DOE or non-DOE covered products, electric power phase, and combo-unit cooling capacity.

For example, in 90.1-2019, the minimum efficiency for a three-phase electric warm-air furnace with a heating capacity less than 225,000 Btu/h in the United States is 78% AFUE, specified in Appendix F, Table F-4. The same unit for applications outside of the United States is listed in Table 6.8.1-5 and requires a minimum efficiency of 96% AFUE.

In 90.1-2022, three-phase electric warm-air furnaces with heating capacities less than 225,000 Btu/h in all locations are grouped together and included in Table 6.8.1-5 with a minimum efficiency of 96 pervcent AFUE. This means that, when applied in the United States, this specific equipment must have an 18 percent increased minimum efficiency compared to the 2019 version of the Standard.

New Minimum Requirement for Onsite Renewable Energy

Standard 90.1-2019 has requirements for renewables in the performance compliance paths as well as prescriptive path tradeoffs.

Standard 90.1-2022 removed the various prescriptive trade-offs and added a new Section 10.5.1.1, which introduces minimum prescriptive requirements for on-site renewable energy. It states the building site must have on-site renewable energy with a rated capacity of at least 0.5 W/ft² multiplied by the sum of the gross conditioned floor area for the three largest floors in the building site.

There are multiple exceptions, including buildings with low incident solar radiation or where more than 80 percent of the roof area is covered by equipment. Also excluded are alterations, and new construction or additions where the largest three floors' gross conditioned floor area is less than 10,000 ft².

New Section 11 Additional Efficiency Requirements

New energy credits laid out in Section 11, Additional Efficiency Requirements, apply to new buildings and additions exceeding 2,000 ft² gross conditioned floor area. Also included are alterations exceeding 5,000 ft² of gross conditioned floor area with at least two additional characteristics detailed in Section 11.1.4, Alterations to Existing Buildings.

These energy credits enable approximately 4 to 5 percent cost-effective energy savings beyond mandatory and prescriptive requirements through 33 different measures. The number of required and applicable credits varies by building type and climate zone, shown in Table 11.5.1-1 (Table 3).

Section 11.5.3 covers the Base Energy Credits Available, in Tables 11.5.3-1 through 11.5.3-9. These tables are organized by building use type, each with applicable energy credits listed per measure for every climate zone.

For example, in a Minneapolis health care facility, which is climate zone 6A, there are 50 credits required and 81 credits to choose from to meet this requirement. Shown in Table 4, the categories of available credits include equipment efficiency increases, heat recovery, control sequences, fault detection and diagnostics (FDD), ground-source heat pumps, energy storage, on-site renewable energy, light power reduction, energy monitoring, and others.

The highest energy credit measures for this building type and climate zone are ground source heat pumps, DOAS/fan controls, and electric energy storage in this example, but one would still need more than just these to meet the 50-credit requirement.

In projects with more than one building use type, the weighted-average project energy credit achieved is used based on the gross floor area of each building use type.

There are also a few caveats, such as energy credits achieved through on-site renewable energy and load management systems cannot exceed 60 percent of the total required energy credits.

Table 3. Based on Standard 90.1-2022 "Table 11.5.1-1 Energy Credit Requirements by Building Use Type"

Building Use Type	Climate Zone																		
	0A	0B	1A	1B	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6A	6B	7	8
Multifamily	50	50	50	50	50	50	46	50	50	48	50	46	50	50	49	50	50	50	50
Health Care	50	46	47	46	47	45	49	47	50	46	46	50	50	50	50	50	50	50	50
Hotel/Motel	50	45	47	46	49	48	46	47	50	48	50	50	47	46	47	49	46	50	50
Office	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
Restaurant	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
Retail	50	50	50	50	50	50	50	50	50	50	50	50	50	50	48	48	45	42	46
Education	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	46
Warehouse	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
Other	39	36	37	37	35	34	30	32	33	28	32	30	29	31	30	29	30	29	29

Table 4. Example Energy Credits for a Health Care Facility in Climate Zone 6A, Based on Table 11.5.3-2

Energy Credit, Abbreviated Title	Climate Zone 6A
Heating Efficiency	6
Cooling Efficiency	5
Ground-Source Heat Pump	14
DOAS/Fan Controls	9
Guideline 36 Sequences	3
SHW Preheat Recovery	2
Heat-Pump Water Heater	1
Efficient Gas Water Heater	1
SHW Pipe Insulation	1
Thermostatic Balancing Valves	1
Energy Monitoring	3
Lighting Dimming and Tuning	6
Increase Occupancy Sensor	1
Light Power Reduction	7
On-Site Renewable Energy	5
Efficient Elevator Equipment	2
Fault Detection and Diagnostics	3
Electric Energy Storage	10
HVAC Cooling Energy Storage	4
SHW Thermal Storage	1

In addition, many of the measures' base energy credits available are adjusted by specific factors or formulas, for instance, HVAC Cooling Performance Improvement. For a health care facility in climate zone 6A, there are 5 base energy credits available for this measure, ECH03_base, as long as the cooling efficiency improvement is at least 5 percent better than the minimum efficiency requirement. However, the adjusted base credit value, ECH03_adj, varies by how much the cooling equipment efficiency exceeds the minimum, limited to a maximum of 20%. If the space cooling equipment is 20% higher than the minimum efficiency requirement, the ECH03_adj would be 20 energy credits instead of 5.

Some building type and climate zone combinations have a much higher ratio of total available energy credits to energy credits required. For example, a multifamily building in Climate Zone 4C has 241 available and 46 required, compared to 81 available and 50 required for a health care building in 6A (Table 5).

Table 5. Example Energy Credits for a Health Care Facility in Climate Zone 6A, Based on Table 11.5.3-2

Building Type	Health Care	Health Care	Health Care	Hotel-Motel	Education	Education	Multifamily	Multifamily
Climate Zone	**6A**	**5B**	**4A**	**1A**	**3A**	**7**	**2B**	**4C**
Representative Location	**Minneapolis**	**Denver**	**St. Louis, Philadelphia**	**Miami, Puerto Vallarta**	**Atlanta**	**Calgary, Winnipeg**	**Phoenix**	**Vancouver, Portland, OR**
Required	50	50	46	47	50	50	50	46
Total Available	81	84	89	146	205	172	227	241
Available: HVAC, Service Hot-Water, Fault Detection and Diagnostics	32	32	35	43	48	41	89	110
Available: Ground-Source Heat Pump	14	11	11	7	6	12	4	6
Available: Storage	15	16	17	63	60	26	48	45

Informative Appendix I

While Informative Appendices are not a requirement in the Standard, Appendix I provides alternative metrics that “may be adopted by the rating authority for the Appendix G Performance Rating Method”, the computer modeling compliance path for Standard 90.1. It is possible that local codes may be modified to include one of the new metrics introduced in Appendix I.

These alternative metrics include site energy, source energy, and carbon emissions, and would be useful to assess building performance against carbon emission goals or similar types of comparison.

Summary

ANSI/ASHRAE/IES 90.1-2019 saves 14.4 percent of energy cost as compared to 90.1-2019 and 60 percent compared to the original ASHRAE 90-1975. These significant savings were developed using a rigorous and open process that includes multiple public reviews with the goal of reaching consensus with directly and materially affected parties.

Given the savings and consensus, this standard will become the basis for building codes in North America as well as other parts of the world.

The information in this *Engineers Newsletter* allows you to guide project teams in application of the standard either to meet new codes or to simply reduce the energy intensity of the world.

By Michelle Hull, applications engineer, Trane. You can find this and previous issues of the *Engineers Newsletter* at www.trane.com/EN. To comment, send e-mail to ENL@trane.com.

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Staying Informed on ASHRAE 90.1 Updates

To stay informed about addenda, such as when they are out for public review or are published, join the ASRAE 90.1 Project Committee List Server: https://www.ashrae.org/listserves.

The following link will take you directly to the post on the ASHRAE site.

Standard 90.1 Requirements Series | ashrae.org

The following are the current 7 published articles which relate to 2022 standard changes:

Part 1 Changes to Envelope Requirements

Part 2 Thermal Bridging Requirements

Part 3 What’s New in Standard 90.1-2022—Mechanical Updates

Part 4 Energy Credits

Part 5 Lighting Changes

Part 6 Mechanical System Performance Rating Method

Part 7 Performance Path Changes

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- HVAC Industry Update on Refrigerants
- Trane *Engineers Newsletter* "Introduction to Decarbonization"
- Trane *Engineers Newsletter* Live program "Building Decarbonization for Hydronic Systems"

Trane – by Trane Technologies (NYSE: TT), a global climate innovator – creates comfortable, energy efficient indoor environments through a broad portfolio of heating, ventilating and air conditioning systems and controls, services, parts and supply. For more information, please visit *trane.com or tranetechnologies.com.*

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