

International Association of Plumbing and Mechanical Officials

4755 East Philadelphia Street Ontario, California – USA 91761-2816

Ph: 909.472.4100 | Fax: 909.472.4150 http://www.iapmo.org

November 21, 2017

April Trafton Donald Dickerson Associates 18425 Burbank Blvd. Tarzana, CA 91356

> Re: IAPMO Standards Council Decision TIA UMC-003-18 Decision date: November 21, 2017** Uniform Mechanical Code – Sections E 503.1.3, E 503.4.6 – E 503.5.11.3,

Dear Ms. Trafton:

I am transmitting to you herewith the following decision of the Standards Council. At its meeting on November 15, 2017, the Standards Council considered your written request for the issuance of proposed TIA UMC-003-18 in the 2018 edition of the *Uniform Mechanical Code*. The proposed Tentative Interim Amendment requested revisions to sections E 503.1.3 and E503.4.6 through E 503.5.11.3 as follows:

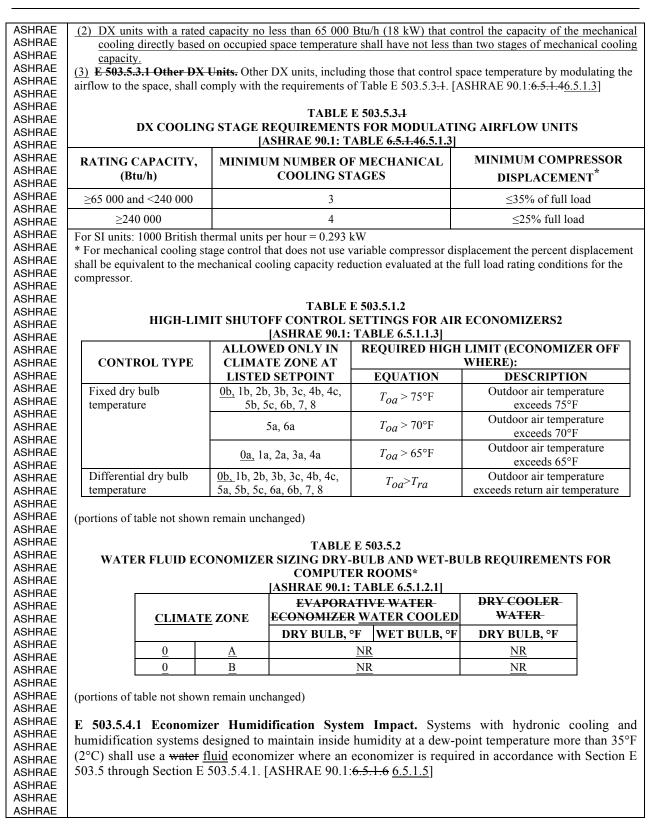
ASHRAE	E 503.1.3 Alterations to Heating, Ventilating, Air-Conditioning, and Refrigeration in Existing Buildings. New
ASHRAE	HVACR equipment as a direct replacement of existing HVACR equipment shall be in accordance with the minimum
ASHRAE	requirements following sections as applicable to for the equipment being replaced.
ASHRAE	(1) Section E 503.3
ASHRAE	(2) Section E 503.4
ASHRAE	(3) Section E 503.4.6
ASHRAE	(4) Section E 503.4.6.2
ASHRAE	(5) Section E 503.4.6.3
ASHRAE	$\frac{(5)^{-1} \text{ Section E 503.1.6.5}}{(6) \text{ Section E 503.4.6.4}}$
ASHRAE	$\frac{(0)}{(7)} = \frac{505.4.6.8}{503.4.6.8}$
ASHRAE	
ASHRAE	$\frac{(8) \text{Section E 503.4.6.9}}{(8) \text{Section E 503.4.6.1}}$
ASHRAE	$\frac{(9) \text{ Section E 503.4.6.11}}{(10) \text{ Section E 503.5.1}}$
ASHRAE	(10) Section E 503.5.1 (11) $S_{\text{exc}} = E 502.5.2$
ASHRAE	$\underbrace{(11) \text{ Section E } 503.5.3}_{(12)}$
ASHRAE ASHRAE	(12) Section E 503.5.3.1
	(13) Section E 503.5.6.1.2
ASHRAE ASHRAE	(14) Section E 503.5.6.2
ASHRAE	(15) Section E 503.5.6.5
ASHRAE	(16) Section E 503.5.7
ASHRAE	(17) Section E 503.5.7.2
ASHRAE	(18) Section E 503.5.8.1. [ASHRAE 90.1:6.1.1.3.1]
ASHRAE	
ASHRAE	E 503.4.6 Zone Thermostatic Controls. The supply of heating and cooling energy to each zone shall be
ASHRAE	individually controlled by thermostatic controls responding to temperature within the zone. For the purposes of
ASHRAE	Section E 503.4.6, a dwelling unit shall be permitted to be considered a single zone.
ASHRAE	Exceptions: Independent perimeter systems that are designed to offset only building envelope loads shall be
ASHRAE	permitted to serve one or more zones also served by an interior system provided:
ASHRAE	(1) The perimeter system includes not less than one thermostatic control zone for each building exposure having
ASHRAE	exterior walls facing only one orientation for 50 contiguous feet (15 240 mm) or more- and
ASHRAE	(2) The perimeter system heating and cooling supply is controlled by a thermostatic control(s) located within the
ASHRAE	(2) <u>Fine permeter system nearing and cooling supply is controlled by a memostatic control(s) located within the zones(s) served by the system.</u>
ASHRAE	
ASHRAE	Exterior walls and semiexterior walls are considered to have different orientations where the directions
ASHRAE	exposures they face differ by more than 45 degrees (0.79 rad). [ASHRAE 90.1:6.4.3.1.1]
ASHRAE	

ASHRAE	E 503.4.6.1 Dead Band. Where used to control both heating and cooling, zone thermostatic controls shall be capable
ASHRAE	of providing and configured to provide a temperature range or dead band of not less than 5°F (3°C) within which the
ASHRAE	supply of heating and cooling energy to the zone is shut off or reduced to a minimum.
ASHRAE	Exceptions:
ASHRAE	(1) Thermostats that require manual changeover between heating and cooling modes.
ASHRAE	(2) Special occupancy or special applications where wide temperature ranges are not acceptable (such as retirement
ASHRAE	homes, process applications, museums, some areas of hospitals) and are approved by the Authority Having
ASHRAE	
ASHRAE	Jurisdiction. [ASHRAE 90.1:6.4.3.1.2]
ASHRAE	E 503.4.6.2 Setpoint Overlap Restriction. Where the heating and cooling to a zone are controlled by separate zone
ASHRAE	thermostatic controls located within the zone, means (such as limit switches, mechanical stops, or, for DDC systems,
ASHRAE	software programming) shall be provided to prevent the heating setpoint from exceeding the cooling setpoint minus
ASHRAE	an applicable proportional band. [ASHRAE 90.1:6.4.3.2]
ASHRAE	
ASHRAE	E 503.4.6.3.2 Setback Controls. Heating systems shall be equipped with controls capable of and configured to
ASHRAE	automatically restart and temporarily operate the system as required to maintain zone temperatures above an
ASHRAE	adjustable heating setpoint of not less than 10° F (6°) below the occupied heating setpoint. Cooling systems shall be
ASHRAE	equipped with controls capable of and configured to automatically restart and temporarily operate the mechanical
ASHRAE	
ASHRAE	cooling system as required to maintain zone temperatures below an adjustable cooling setpoint of not less than 5°F
ASHRAE	(3°C) above the occupied cooling setpoint or to prevent high space humidity levels.
ASHRAE	Exception: Radiant heating systems capable of and configured with a setback heating setpoint at not less than 4°F
ASHRAE	(2°C) below the occupied heating setpoint. [ASHRAE 90.1:6.4.3.3.2]
ASHRAE	
ASHRAE	E 503.4.6.3.4 Zone Isolation. HVAC systems serving zones that are intended to operate or be occupied
ASHRAE	nonsimultaneously shall be divided into isolation areas. Zones shall be permitted to be grouped into a single isolation
ASHRAE	area provided it does not exceed 25 000 square feet (2322.6 m ²) of conditioned floor area and does not include more
ASHRAE	than one floor. Each isolation area shall be equipped with isolation devices capable of and configured to
ASHRAE	
ASHRAE	automatically shutting shut off the supply of conditioned air and outdoor air to and exhaust air from the area. Each
ASHRAE	isolation area shall be controlled independently by a device meeting the requirements of Section E 503.4.6.3.1. For
	central systems and plants, controls and devices shall be provided to allow stable system and equipment operation
ASHRAE	for any length of time while serving only the smallest isolation area served by the system or plant.
ASHRAE	Exceptions: Isolation devices and controls are not required for the following:
ASHRAE	(1) Exhaust air and outdoor air connections to isolation zones where the fan system to which they connect is not
ASHRAE	more than 5000 ft ³ /min (2.3597 m ³ /s).
ASHRAE	
ASHRAE	(2) Exhaust airflow from a single isolation zone of less than 10 percent of the design airflow of the exhaust system
ASHRAE	to which it connects.
ASHRAE ASHRAE	(3) Zones intended to operate continuously or intended to be inoperative <u>only where when all</u> other zones are
ASHRAE	inoperative. [ASHRAE 90.1:6.4.3.3.4]
ASHRAE	
ASHRAE	E 503.4.6.4 Ventilation System Controls. Stair and elevator shaft vents shall be equipped with motorized dampers
ASHRAE	that are capable of and configured to being automatically closed during normal building operation and are
ASHRAE	interlocked to open in accordance with as required by fire and smoke detection systems. [ASHRAE 90.1:6.4.3.4.1]
ASHRAE	
ASHRAE	E 503.4.6.4.1 Shutoff Damper Controls. Outdoor air intake and exhaust systems shall be equipped with motorized
ASHRAE	dampers that will automatically shut where when the systems or spaces served are not in use. Ventilation outdoor air
ASHRAE	
ASHRAE	and exhaust or relief dampers shall be capable of <u>and configured to</u> automatically shut ting off during preoccupancy
ASHRAE	building warm-up, cooldown, and setback, except where when ventilation reduces energy costs or where when
ASHRAE	ventilation shall be supplied to be in accordance with the requirements of this code comply with the code
ASHRAE	requirements.
ASHRAE	Exceptions:
ASHRAE	(1) Backdraft gravity (nonmotorized) dampers shall be permitted for exhaust and relief in buildings less than three
ASHRAE	stories in height, and for ventilation air intakes and exhaust and relief dampers in buildings of any height
ASHRAE	located in e <u>C</u> limate $\frac{zZ}{z}$ ones 1 through zone 0, 1, 2 and 3. Back-draft dampers for ventilation air intakes shall be
ASHRAE ASHRAE	protected from direct exposure to wind.
ASHRAE	(2) Back-draft gravity (nonmotorized) dampers shall be permitted in systems with a design outdoor air intake or
ASHRAE	exhaust capacity of 300 ft^3/min (0.142 m ³ /s) or less.
ASHRAE	(3) Dampers shall not be required in ventilation or exhaust systems serving unconditioned spaces.
ASHRAE	(4) Dampers shall not be required in exhaust systems serving Type 1 kitchen exhaust hoods. [ASHRAE]
ASHRAE	90.1:6.4.3.4.2]
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ASHRAE ASHRAE ASHRAE ASHRAE	TABLE E 503.4.6.4.2 MAXIMUM DAMPER LEAKAGE (cubic foot per minute per square foot) at 1.0 in. w.g LASUDAE 00 1: TABLE 6.4.3.4.31							
ASHRAE ASHRAE ASHRAE		CLIMATE	[ASHRAE 90.1: TABLE 6.4.3.4.3] VENTILATION AIR INTAKE EXHAUST/RELIEF					
ASHRAE		ZONE						
ASHRAE			NONMOTORIZED*	MOTORIZED	NONMOTORIZED*	MOTORIZED		
ASHRAE ASHRAE		<u>0,</u> 1, 2 any height	20	_ 4	20	4		
ASHRAE		uny noight	20	·	20	·		
ASHRAE ASHRAE		(portion of table not sho	own remain uncha	nged)			
ASHRAE								
ASHRAE					ore than 0.75 hp (0.50 or of and configured to s			
ASHRAE ASHRAE	not require		IIII Section E 505.4.0.3	5.1 that are capable	e of <u>and configured to</u> s	silut ting off fails w	mere <u>when</u>	
ASHRAE			ms intended to operate	continuously. [As	SHRAE 90.1:6.4.3.4.4]			
ASHRAE								
ASHRAE ASHRAE					ms. Freeze protection s			
ASHRAE					ing heat tracing, shall outdoor air temperatur			
ASHRAE					ent freezing. Snow- an			
ASHRAE ASHRAE					tting off the systems			
ASHRAE					lling, and an automatic			
ASHRAE			en [ASHRAE 90.1:6.4		n 40°F (4°C) so that t	ne potential for si	now or ice	
ASHRAE ASHRAE					Demand control ventila	tion (DCV) shall l	be required	
ASHRAE	for spaces	that are more	than 500 square feet (4	16.45 m^2) and with	a design occupancy for	or ventilation of no	ot less than	
ASHRAE				or area and served	by systems with one or	more of the follo	wing:	
ASHRAE ASHRAE		ir-side econor	mizer. Iulating control of the o	outdoor air damne	r			
ASHRAE			airflow more than 300					
ASHRAE	Exception				,			
ASHRAE ASHRAE			st air energy recovery					
ASHRAE			gn outdoor airflow less		nmunicating with a centric $(0.3540 \text{ m}^3/\text{s})$	itral control panel.		
ASHRAE					outdoor airflow is requ	uired for makeup	air that is	
ASHRAE ASHRAE	exhau	sted from the	space or transfer air that	at is required for n	nakeup air that is exhau	sted from other sp	oace (s) .	
ASHRAE					in accordance with Ch			
ASHRAE ASHRAE		g. [ASHRAE]		science labs; bar	bers; beauty and nail	salons; and boy	viing alley	
ASHRAE	Seatin	5. [¹ 101110112	JULI 10. 1.5.0]					
ASHRAE					nat have fans shall inc		r or water	
ASHRAE ASHRAE					3.5.1 through Section E	503.5.4.1.		
ASHRAE			s shall not be required		systems: than the minimum list	ed in Table E 5(3.5(1) for	
ASHRAE					uter room applications.		55.5(1) 101	
ASHRAE ASHRAE	(2) Chille	d-water cooli	ng systems without a	fan or that use i	nduced airflow, where	the total capacit		
ASHRAE					Zones 0, 1B, and 2 thr	ough 4; less than	1 400 000	
ASHRAE			<u>Climate Zones 5 throug</u>		ice with ASHRAE 62.1			
ASHRAE ASHRAE					an 75 percent of the ai		upplied by	
ASHRAE					l more than 35°F (2°C			
ASHRAE					on standards . In; in all stem is to spaces that a			
ASHRAE ASHRAE					process needs. This e			
ASHRAE		uter rooms.	-, Forme tempe		r			
ASHRAE ASHRAE								
ASHRAE								

ASHRAE (45) Systems that include a condenser heat recovery system with a minimum capacity in accordance with ASHRAE Section E 503.5.10.1.2. ASHRAE (56) Systems that serve residential spaces where the system capacity is less than five times the ASHRAE requirement listed in Table E 503.5(1). ASHRAE (67) Systems that serve spaces whose sensible cooling load at design conditions, excluding transmission ASHRAE ASHRAE and infiltration loads, is less than or equal to transmission and infiltration losses at an outdoor ASHRAE temperature of 60°F (16°C). ASHRAE (78) Systems expected to operate less than 20 hours per week. ASHRAE (89) Where the use of outdoor air for cooling will affect supermarket open refrigerated casework ASHRAE systems. ASHRAE ASHRAE (910) For comfort cooling where the cooling efficiency is not less than the efficiency improvement ASHRAE requirements in accordance with Table E = 503.5(3) E 503.5(2). ASHRAE (1011) Systems primarily serving computer rooms where in accordance with one of the following: ASHRAE (a) The total design cooling load of all computer rooms in the building is less than 3 000 000 Btu/h ASHRAE ASHRAE (879 kW) and the building in which they are located is not served by a centralized chilled water ASHRAE plant. ASHRAE (b) The room total design cooling load is less than 600 000 Btu/h (176 kW) and the building in ASHRAE which they are located is served by a centralized chilled water plant. ASHRAE (c) The local water authority does not permit cooling towers. ASHRAE (d) Less than 600 000 Btu/h (176 kW) of computer room cooling equipment capacity is being ASHRAE ASHRAE added to an existing building. ASHRAE (4412) Dedicated systems for computer rooms where a minimum of 75 percent of the design load ASHRAE serves one of the following: ASHRAE (a) Spaces classified as an essential facility. ASHRAE (b) Spaces having a mechanical cooling design of Tier IV in accordance with TIA 942. ASHRAE ASHRAE (c) Spaces classified as eCritical oOperations pPower sSystems (COPS) in accordance with NFPA ASHRAE 70 ASHRAE (d) Spaces where core clearing and settlement services are performed such that their failure to settle ASHRAE pending financial transactions is capable of systemic risk in accordance with "The Interagency ASHRAE Paper on Sound Practices to Strengthen the Resilience of the US Financial System", (April 7, ASHRAE ASHRAE 2003).⁻⁻ [ASHRAE 90.1:6.5.1] ASHRAF ASHRAE TABLE E 503.5(1) ASHRAE MINIMUM FAN-COOLING UNIT SIZE WHERE AN ASHRAE ECONOMIZER IS REQUIRED FOR COMFORT COOLING ASHRAE [ASHRAE 90.1: TABLE 6.5.1-1] ASHRAE COOLING CAPACITY WHERE AN ASHRAE CLIMATE ZONES ASHRAE ECONOMIZER IS REQUIRED ASHRAE <u>0a, 0b,</u> 1a, 1b No economizer requirement ASHRAE 2a, 2b, 3a, 4a, 5a, 6a, 3b, 3c, ≥54 000 Btu/h ASHRAE 4b, 4c, 5b, 5c, 6b, 7, 8 ASHRAE For SI units: 1000 British thermal units per hour = 0.293 kW ASHRAE ASHRAE TABLE E 503.5(2) ASHRAE **MINIMUM FAN-COOLING UNIT SIZE WHERE AN** ASHRAE ECONOMIZER IS REQUIRED FOR COMPUTER ROOMS ASHRAE ASHRAE [ASHRAE 90.1: TABLE 6.5.1-2] ASHRAE **CLIMATE ZONES** COOLING CAPACITY WHERE AN ASHRAE **ECONOMIZER IS REQUIRED** ASHRAE 1a, 1b, 2a, 3a, 4a No economizer requirement ASHRAE 2b, 5a, 6a, 7, 8 >135 000 Btu/h ASHRAF ASHRAE 3b, 3c, 4b, 4c, 5b, 5c, 6b >65 000 Btu/h ASHRAE For SI units: 1000 British thermal units per hour = 0.293 kW ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE

ASHRAE	TABLE E 503.5(3) <u>503.5(2)</u>
ASHRAE	ELIMINATE REQUIRED ECONOMIZER FOR COMFORT
ASHRAE	COOLING BY INCREASING COOLING EFFICIENCY
ASHRAE	[ASHRAE 90.1: TABLE 6.5.1-3 6.5.1-2]
ASHRAE	
ASHRAE	* Where a unit is noted with an IDLV IEED or SEED to aliminate the
ASHRAE	* Where a unit is rated with an IPLV, IEER or SEER, to eliminate the
ASHRAE	required air or water economizer, the minimum cooling efficiency of the
ASHRAE	HVAC unit shall be increased by the percentage shown. Where the HVAC
ASHRAE	unit is rated with a full load metric like EER or COP cooling, these shall
ASHRAE	be increased by the percentage shown.
ASHRAE	
ASHRAE	(portions of table not shown remain unchanged)
ASHRAE	
ASHRAE	E 503.5.1 Air Economizers, Design Capacity. Air economizer systems shall be capable of and configured to
ASHRAE	modulating modulate outdoor air and return air dampers to provide up to 100 percent of the design supply air
ASHRAE	quantity as outdoor air for cooling. [ASHRAE 90.1:6.5.1.1.1]
ASHRAE	
ASHRAE	E 503.5.1.1 Control Signal. Economizer dampers controls shall be capable of and configured to being sequenced
ASHRAE	the dampers with the mechanical cooling equipment and shall not be controlled by only mixed air temperature.
ASHRAE	Exception: The use of mixed air temperature limit control shall be permitted for systems controlled from space
ASHRAE	temperature (such as single-zone systems). [ASHRAE 90.1:6.5.1.1.2]
ASHRAE	E 503.5.1.2 High-Limit Shutoff. Air economizers shall be capable of and configured to automatically reducing
ASHRAE	reduce outdoor air intake to the design minimum outdoor air quantity where outdoor air intake will no longer reduce
ASHRAE	cooling energy usage use. High-limit shutoff control types and associated setpoints for specific climate zones shall
ASHRAE	be chosen from Table E 503.5.1.2. [ASHRAE 90.1:6.5.1.1.3]
ASHRAE	
ASHRAE	E 503.5.2 Water Fluid Economizers, Design Capacity. Water Fluid economizer systems shall be capable of
ASHRAE	cooling supply air by indirect evaporation and providing up to 100 percent of the expected system cooling load at
ASHRAE	
ASHRAE	outdoor air temperatures of not more than 50°F (10°C) dry bulb or 45°F (7°C) wet bulb.
ASHRAE	Exceptions:
ASHRAE	(1) Systems primarily serving computer rooms in which 100 percent of the expected system cooling load at the dry
ASHRAE	bulb and wet bulb temperatures in accordance with Table E 503.5.2 is achieved met with evaporative water-
ASHRAE	<u>cooled fluid</u> economizers.
ASHRAE	(2) Systems primarily serving computer rooms in which 100 percent of the expected system cooling load at the dry
ASHRAE	bulb temperatures in accordance with listed in Table E 503.5.2 is achieved met with dry cooler water air-cooled
ASHRAE	<u>fluid</u> economizers.
ASHRAE	(3) Systems where dehumidification requirements are not capable of being met using outdoor air temperatures of
ASHRAE	50° F (10°C) dry bulb or 45°F (7°C) wet bulb ₅ and where 100 percent of the expected system cooling load at
ASHRAE	45°F (7°C) dry bulb or 40°F (4°C) wet bulb is achieved met with evaporative water-cooled fluid economizers.
ASHRAE	[ASHRAE 90.1:6.5.1.2.1]
ASHRAE	E 503.5.2.1 Maximum Hydronic Pressure Drop. Precooling coils and waterfluid-to-water heat exchangers used as
ASHRAE	part of a water fluid economizer system shall either have a water_side pressure drop of less than 15 feet of water (45
ASHRAE	kPa), or a secondary loop shall be created so that the coil or heat exchanger pressure drop is not seen by the
ASHRAE	circulating pumps where the system is in the normal cooling (non-economizer) mode. [ASHRAE 90.1:6.5.1.2.2]
ASHRAE	
ASHRAE	E 503.5.3 Integrated Economizer Control. Economizer systems shall be integrated with the mechanical cooling
ASHRAE	system and be capable of and configured to providing provide partial cooling even where additional mechanical
ASHRAE	cooling is required to be in accordance with the remainder of the cooling load. Controls shall not false load the
ASHRAE	mechanical cooling systems by limiting or disabling the economizer or by other means, such as hot gas bypass,
ASHRAE	except at the lowest stage of mechanical cooling.
ASHRAE	Units that include an air economizer shall comply with the following:
ASHRAE	(1) Unit controls shall have the mechanical cooling capacity control interlocked with the air economizer controls such that
ASHRAE	the outdoor air damper is at the 100 percent open position when mechanical cooling is on, and the outdoor air damper
ASHRAE	
ASHRAE	does not begin to close to prevent coil freezing due to minimum compressor run time until the leaving air temperature
ASHRAE	is less than 45°F (7°C).
ASHRAE	(2) DX units that control the capacity of the mechanical cooling directly based on occupied space temperature shall
ASHRAE	have a minimum of two stages of mechanical cooling capacity per the following effective dates:
ASHRAE	(a) Not less than 75 000 Btu/h (22kW) Rated Capacity—Effective 1/1/2014
ASHRAE	
ASHRAE	(b) Not less than 65 000 Btu/h (18kW) Rated Capacity—Effective 1/1/2016 [ASHRAE 90.1:6.5.1.3]
ASHRAE	
ASHRAE	
ASHRAE	



ASHRAE	E 503.5.5 Simultaneous Heating and Cooling Limitation, Zone Controls. Zone thermostatic controls shall
ASHRAE	prevent the following:
ASHRAE	(1) Reheating.
ASHRAE	(1) Recooling.
ASHRAE	
ASHRAE	(3) Mixing or simultaneously supplying air that has been previously mechanically heated and air that has been
ASHRAE	previously cooled, either by mechanical cooling or by economizer systems.
ASHRAE	(4) Other simultaneous operation of heating and cooling systems to the same zone.
ASHRAE	Exceptions:
ASHRAE	(1) Zones without DDC for which the volume of air that is reheated, recooled, or mixed is less than the larger
ASHRAE	of the following:
ASHRAE	(a) Thirty Twenty percent of the zone design peak supply rate for systems with DDC and 30 percent for
ASHRAE	other systems.
ASHRAE	(b) The outdoor airflow rate required to be in accordance with the ventilation requirements of Chapter 4
ASHRAE	or ASHRAE 62.1 for the zone.
ASHRAE	(c) A higher rate that is capable of demonstrating, to the satisfaction of the Authority Having
ASHRAE	Jurisdiction, to reduce overall system annual energy usage by offsetting reheat or recool energy losses
ASHRAE	through a reduction in outdoor air intake for the system.
ASHRAE	(d) The airflow rate required to be in accordance with applicable codes or accreditation standards, such as
ASHRAE	pressure relationships or minimum air change rates.
ASHRAE	(2) (remaining text unchanged)
ASHRAE	(2) (remaining text unchanged)(3) (remaining text unchanged)
ASHRAE	(4) (remaining text unchanged) [ASHRAE 90.1:6.5.2.1]
ASHRAE	(+) (remaining text unenanged) [ASTIVAL 70.1.0.3.2.1]
ASHRAE	E 503.5.5.2.3 Hydronic (Water Loop) Heat Pump Systems. Hydronic heat pumps connected to a common heat
ASHRAE	pump water loop with central devices for heat rejection (e.g., cooling tower) and heat addition (e.g., boiler) shall
ASHRAE	have the following:
ASHRAE ASHRAE	
ASHRAE	(1) Controls that are capable of and configured to providing provide a heat pump water supply temperature dead hard of not less than 20% (11%C) between initiation of heat rejection and heat addition by the control devices
ASHRAE	band of not less than 20°F (11°C) between initiation of heat rejection and heat addition by the central devices
ASHRAE	(e.g., tower and boiler).
ASHRAE	(2) (remaining text unchanged) [ASHRAE 90.1:6.5.2.2.3]
ASHRAE	
ASHRAE	E 503.5.5.3 Dehumidification. Where humidity controls are provided, such controls shall prevent reheating, mixing
ASHRAE	of hot and cold airstreams, or other means of simultaneous heating and cooling of the same airstream.
ASHRAE	Exceptions:
ASHRAE	(1) The system is <u>capable of and configured</u> to reduce supply air volume to 50 percent or less of the design airflow
ASHRAE	rate or the minimum outdoor air ventilation rate in accordance with ASHRAE 62.1 or other applicable federal,
ASHRAE	state, or local code or recognized standard, whichever is larger before simultaneous heating and cooling takes
ASHRAE	place.
ASHRAE	(2) The individual fan cooling unit has a design cooling capacity of not more than 65 000 Btu/h (19 kW) and is
ASHRAE	capable of and configured to unloading unload to 50 percent capacity before simultaneous heating and cooling
ASHRAE	takes place.
ASHRAE	(3) The individual mechanical cooling unit has a design cooling capacity of not more than 40 000 Btu/h (11.7 kW).
ASHRAE	An individual mechanical cooling unit is a single system composed of a fan or fans and a cooling coil capable
ASHRAE	of providing mechanical cooling.
ASHRAE ASHRAE	(4) Systems serving spaces where specific humidity levels are required to satisfy process needs, such as vivariums,
ASHRAE	museums, surgical suites, pharmacies, and buildings with refrigerating systems, such as supermarkets,
ASHRAE	refrigerated warehouses, and ice arenas, and where the building includes site-recovered energy or site solar
ASHRAE	energy source that provide energy equal to 75 percent or more of the annual energy for reheating or for
ASHRAE	providing warm air in mixing systems. This exception shall not apply to computer rooms.
ASHRAE	(5) Not less than 90 percent of the annual energy for reheating or for providing warm air in mixing systems is
ASHRAE	provided from a site-recovered energy (including condenser heat) or site-solar energy source.
ASHRAE	(6) Systems where the heat added to the airstream is the result of the use of a desiccant system and 75 percent of
ASHRAE	the heat added by the desiccant system is removed by a heat exchanger, either before or after the desiccant
ASHRAE	system with energy recovery. [ASHRAE 90.1:6.5.2.3]
ASHRAE	E 503.5.6 Air System Design and Control. HVAC air system design and control systems having a total
ASHRAE	fan system motor nameplate horsepower (hp) exceeding 5 hp (3.7 kW) shall be in accordance with the
ASHRAE	
ASHRAE	provisions of Section E 503.5.6.1 through Section E 503.5.6.5 <u>E 503.5.6.6</u> . [ASHRAE 90.1:6.5.3]
ASHRAE	
ASHRAE	
ASHRAE	
i	

ASHRAE	F 503 5 6 1 Fan System Power and Efficiency Fo	ach HVAC systems at fan system design conditions				
ASHRAE	E 503.5.6.1 Fan System Power and Efficiency. <u>Each</u> HVAC systems at fan system design conditions shall not exceed the allowable <u>having a total</u> fan system motor nameplate horsepower (kW) <u>exceeding 5 hp</u>					
ASHRAE						
ASHRAE	(3.7 kW) at fan system design conditions shall not exceed the allowable fan system motor nameplate					
ASHRAE	horsepower (kW) (Option 1) or fan system brake horsepower (kW) (Option 2) as shown in Table E					
ASHRAE	503.5.6.1(1). This shall include supply fans, return or relief fans, exhaust fans, and fan-powered terminal					
ASHRAE	units associated with systems providing heating or	cooling capability that operate at fan system design				
ASHRAE	conditions. Single-zone variable air volume VAV s	vstems shall comply with the constant-volume fan				
ASHRAE	power limitation.	5 1 5				
ASHRAE	Exceptions:					
ASHRAE	-	tiliza flow control devices on exhaust return or both				
ASHRAE	(1) Hospital, vivarium, and laboratory systems that u					
ASHRAE		ry for occupant health and safety, or environmental				
ASHRAE ASHRAE	control shall be permitted to use variable-volume					
ASHRAE	(2) Individual exhaust fans with motor nameplate	horsepower of 1 hp (0.7 kW) or less. [ASHRAE]				
ASHRAE	90.1:6.5.3.1.1]					
ASHRAE						
ASHRAE						
ASHRAE	TABLE E 5	03.5.6.1(2)				
ASHRAE	FAN POWER LIMITATION PRE	ESSURE DROP ADJUSTMENT				
ASHRAE	[ASHRAE 90.1:]					
ASHRAE	DEVICE	ADJUSTMENT				
ASHRAE	CREDITS					
ASHRAE	CREDITS					
ASHRAE						
ASHRAE	Fully ducted return, exhaust, or both air systems Return or	0.5 in. w.c. (2.15 in w.c. for laboratory and vivarium				
ASHRAE	exhaust systems required by code or accreditation	systems)				
ASHRAE	standards to be fully ducted, or systems required to	5,555,555				
ASHRAE	maintain air pressure differentials between adjacent rooms					
ASHRAE	maintain an pressure arrefentials between adjacent rooms					
ASHRAE	Energy recovery device, other than coil runaround loop	For each airstream [(2.2 x energy recovery effectiveness				
ASHRAE		enthalpy recovery ratio) - 0.5] in w.c. for each airstream				
ASHRAE						
ASHRAE ASHRAE						
ASHRAE	(portions of table not shown remain unchanged)					
ASHRAE	(portions of tuble not shown remain unenanged)					
ASHRAE	E 503.5.6.1.1 Motor Nameplate Horsepower. For a	a analy fan, the calcoted fan motor shall be not larger				
ASHRAE						
ASHRAE	than the first available motor size more than the brak					
ASHRAE	shall be indicated on the design documents to allow	for compliance verification by the Authority Having				
ASHRAE	Jurisdiction.					
ASHRAE	Exceptions:					
ASHRAE	(1) For fans less than 6 bhp (4.5 kW), where the f	irst available motor larger than the bhp (kW) has a				
ASHRAE		(kW), the next larger nameplate motor size shall be				
ASHRAE	selected.					
ASHRAE		first available motor larger than the her (1-W) has				
ASHRAE	(2) For fans 6 bhp (4.5 kW) and larger, where the					
ASHRAE		(kW), the next larger nameplate motor size shall be				
ASHRAE	selected.					
ASHRAE	(3) Systems that are in accordance with Section E 50	3.5.6.1, Option 1.				
ASHRAE ASHRAE	(4) Fans with motor nameplate horsepower of less th					
ASHRAE	E 503.5.6.1.2 Fan Efficiency. Fans shall have a fa					
ASHRAE	-					
ASHRAE	manufacturers' certified data in accordance with AMC					
ASHRAE	point of operation shall be within 15 percentage points	s of the maximum total efficiency of the fan.				
ASHRAE	Exceptions:					
ASHRAE	(1) Single Individual fans with a motor nameplate hor	sepower of 5 hp (3.7 kW) or less that are not part of				
ASHRAE	a group operated as the functional equivalent of a sing					
ASHRAE	(2) through (7) remain unchanged	<u>,</u> -				
ASHRAE	[ASHDAE 00 1.6 5 2 1 2]					
ASHRAE ASHRAE	[ASHRAE 90.1:6.5.3.1.3]					
	[ASHRAE 90.1:6.5.3.1.3]					

ASHRAE E 503.5.6.2.2 VAV Setpoint Reset. For multiple-zone VAV systems having a total fan system motor nameplate ASHRAE horsepower exceeding 5 hp (3.7 kW) with DDC of individual zones reporting to the central control panel, static ASHRAE pressure setpoint shall be reset based on the zone requiring the most pressure, such as the setpoint is reset lower until ASHRAE one zone damper is nearly wide open. Controls shall provide the following: ASHRAE (1) Monitor zone damper positions or other indicator of need for static pressure. ASHRAE Automatically detect those zones that are capable of excessively driving the reset logic and generate an alarm to (2) ASHRAE the system operator. ASHRAE (3) Readily allow operator removal of zone(s) from the reset algorithm. [ASHRAE 90.1:6.5.3.2.3] ASHRAE ASHRAE **TABLE E 503.5.6.2** ASHRAE **EFFECTIVE DATES FOR** FAN AIRFLOW CONTROL ASHRAE [ASHRAE 90.1: TABLE 6.5.3.2.1] ASHRAE ASHRAE FAN MOTOR SIZE, MECHANICAL COOLING COOLING SYSTEM TYPE EFFECTIVE DATE CAPACITY, (Btu/h) ASHRAE (hp) ASHRAE DX cooling $\geq 110.000 \geq 65.000$ ASHRAE ≥75 000 1/1/2014 Any ASHRAE <u>≥65 000</u> 1/1/2016 ASHRAE Chilled-water and ≥5 Any ASHRAE evaporative cooling ASHRAE $\geq 1/4$ 1/1/2014 Any ASHRAE For SI units: 1000 British thermal units per hour = 0.293 kW, 1 horsepower = 0.746 kW, 1 cubic foot per minute = $0.00047 \text{ m}^3/\text{s}$ ASHRAE ASHRAE ASHRAE E 503.5.7.1 Hydronic Variable Flow Systems. HVAC pumping Chilled- and hot-water distribution systems that ASHRAE include three or more control valves designed to modulate or step open and close as a function of load shall be ASHRAE designed for variable fluid flow and shall be capable of and configured to reduce pump flow rates to not more than the ASHRAE larger of 25 50 percent or less of the design flow rate or the minimum flow required by the heating/ cooling equipment ASHRAE manufacturer for the proper operation of equipment. Individual or parallel pumps serving variable-flow heating-water ASHRAE or chilled-water systems, where the nameplate horsepower of the motor or combined parallel motors is not less than ASHRAE the power shown in Table E503.5.7.1, 5 hp (3.7 kW) shall have controls, or devices, or both that will result in pump ASHRAE motor demand of not more than 30 percent of design wattage at 50 percent of design water flow. The controls or ASHRAE ASHRAE devices shall be controlled as a function of desired flow or to maintain a minimum required differential pressure. ASHRAE Differential pressure shall be measured at or near the most remote heat exchanger or the heat exchanger requiring the ASHRAE greatest differential pressure. The differential pressure setpoint shall not exceed 110 percent of that required to achieve ASHRAE design flow through the heat exchanger. Where differential pressure control is used to be in accordance comply with ASHRAE this section, and DDC systems are used, the setpoint shall be reset downward based on valve positions until one valve ASHRAE is nearly wide open. ASHRAE **Exceptions:** ASHRAE (1) Differential pressure set-point reset is not required where valve position is used to comply with Section E ASHRAE 503 5 7 3 ASHRAE (2) Variable-pump flow control is not required on heating-water pumps where more than 50 percent of annual heat is ASHRAE generated by an electric boiler. ASHRAE (3) Variable flow is not required for primary pumps in a primary/secondary system. ASHRAE (4) Variable flow is not required for a coil pump provided for freeze protection. ASHRAE ASHRAE (5) Variable flow is not required for heat recovery coil runaround loops. [ASHRAE 90.1:6.5.4.2] ASHRAE ASHRAE

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ASHRAE	<u>0A, 0B, 1A, 1</u>
ASHRAE	<u>2A, 3B</u>
ASHRAE	<u>3A, 3C, 4A, 4</u>
ASHRAE ASHRAE	4C, 5A, 5B, 5
ASHRAE	
ASHRAE	-
ASHRAE	<u>7, 8</u>
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ASHRAE	For SI units:
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TABLE E 503.5.7.1 PUMP FLOW CONTROL REQUIREMENTS [ASHRAE 90.1: Table 6.5.4.2]

CHILLED WATER PUMPS IN THESE CLIMATE ZONES	HEATING WATER PUMPS IN THESE CLIMATE ZONES	MOTOR NAMEPLATE HORSEPOWER
<u>0A, 0B, 1A, 1B, 2B</u>	NR	<u>≥2 hp</u>
<u>2A, 3B</u>	NR	<u>≥3 hp</u>
<u>3A, 3C, 4A, 4B</u>	<u>7,8</u>	<u>≥5 hp</u>
<u>4C, 5A, 5B, 5C, 6A, 6B</u>	<u>3C, 5A, 5C, 6A, 6B</u>	<u>≥7.5 hp</u>
-	<u>4A, 4C, 5B</u>	<u>≥10 hp</u>
<u>7,8</u>	<u>4B</u>	<u>≥15 hp</u>
-	<u>2A, 2B, 3A, 3B</u>	<u>≥25 hp</u>
-	<u>1B</u>	<u>≥100 hp</u>
-	<u>0A, 0B, 1A</u>	<u>≥200 hp</u>

For SI units: 1 horsepower = 0.746 kW

TABLE E 503.7.2 MINIMUM DUCT INSULATION R-VALUE¹ [ASHRAE 90.1: TABLE 6.8.2]

	DUCT LOCATION							
CLIMATE ZONE	EXTERIOR ² UNCONDITIONED SPACE AND BURIED DUCTS		INDIRECTLY CONDITIONED SPACE ^{3, 4}					
SU	PPLY AND RETURN DUCTS F	FOR HEATING AND COOLING	G					
0 to 4	R-8	R-6	R-1.9					
5 to 8	R-12	R-6	R-1.9					
	SUPPLY AND RETURN DUC	CTS FOR HEATING ONLY						
0 to 1	none	none	none					
2 to 4	R-6	R-6	R-1.9					
5 to 8	R-12	R-6	R-1.9					
	SUPPLY AND RETURN DUCTS FOR COOLING ONLY							
0 to 6	R- <u>68</u>	R-6	R-1.9					
7 to 8	R-1.9	R-1.9	R-1.9					

- Insulation R-values, measured in [°F•h•ft²/(Btu•in)] [(m•K)/W], are for the insulation as installed and do not include film resistance. The required minimum thicknesses do not consider water vapor transmission and possible surface condensation. Where exterior walls portions of the building envelope are used as a plenum walls enclosure, wall building envelope insulation shall be in accordance with as required by the most restrictive condition of Section E 503.4.7-E 503.4.7.1 or ASHRAE 90.1, depending on whether the plenum is located in the roof, wall, or floor. Insulation resistance measured on a horizontal plane in accordance with ASTM C518 at a mean temperature of 75°F (24°C) at the installed thickness.
- 2. Includes attics above insulated ceilings, parking garages and crawl spaces.
- 3. Includes return air plenums, with or without exposed roofs above.
- 4. Return ducts in this duct location do not require insulation.

E 503.5.10 Exhaust Air Energy Recovery. A Each fan system shall have an energy recovery system where the design supply fan airflow rate exceeds the value listed in Table E 503.5.10(1) and Table E 503.5.10(2), based on the climate zone and percentage of outdoor airflow rate air at design airflow conditions. Table E 503.5.10(1) shall be used for all ventilation systems that operate less than 8000 hours per year and Table E 503.5.10(2) shall be used for all ventilation systems that operate 8000 or more hours per year.

	-								
ASHRAE	Energy recovery sy								
ASHRAE	enthalpy recovery ratio of not less than 50 percent. A fFifty percent energy enthalpy recovery effectiveness ratio shall be-								
ASHRAE	the mean a change in the enthalpy of the outdoor air supply equal to 50 percent of the difference between the outdoor air								
ASHRAE	and return entering exhaust air enthalpies at design conditions. Provision shall be provided to bypass or control the								
ASHRAE									or the
ASHRAE	energy recovery sy	stem to permi	it air econom	izer operation	i in accordan	ice with Sect	$100 \pm 503.5.1$		
ASHRAE	Exceptions:								
-	(1) Laboratory sy	stems that are	in accordance	ce with Sectio	on E 503.5.11	1.3.			
ASHRAE	(2) Systems servi						$F(16^{\circ}C)$		
ASHRAE	(3) Where more th								
ASHRAE		an 60 percen	t of the outd	loor air neatir	ig energy is	provided in	om site-recov	ered energy	or site-solar
ASHRAE	energy.								
ASHRAE	(4) Heating energy	recovery in C	Climate Zone	s 0, 1, and 2.					
ASHRAE	(3 5) Cooling energy				5bB 5eC 6b	B 7 and 8			
	(4 6) Where the su						006 mm) of	aab athar is	loss than 75
ASHRAE							096 mm) of 6	each other is	less than 75
ASHRAE	percent of the				exhaust air th	nat is			
ASHRAE	(a) used for								
ASHRAE	(b) not allow	ed by ASHR	AE 170 for u	se in energy r	ecoverv syst	ems with lea	kage potenti	al. or	
ASHRAE	(c) of Class						inage potenti	, 01	
ASHRAE						,	La P	.1	
ASHRAE	(5 <u>7</u>) Systems requ								
ASHRAE	(6 8) Systems expe	ected to opera	te less than 2	20 hours per v	week at the o	outdoor air p	ercentage in	accordance	with Table E
	503.5.10(1). [ASHRAE 90.	1:6.5.6.1]						
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ASHRAE	EXHAUST AIR ENERGY RECOVERY REQUIREMENTS FOR VENTILATION SYSTEMS OPERATING LESS THAN 8000 HOURS PERYEAR*								
	[ASHRAE 90.1: TABLE 6.5.6.1-1]								
		(EAR*		
ASHRAE			[A	SHRAE 90.1	: TABLE 6.	.5.6.1-1]			
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ASHRAE ASHRAE ASHRAE			[A PE	SHRAE 90.1	: TABLE 6. DOR AIR AT F	5.6.1-1] ULL DESIGN	AIRFLOW RA		
ASHRAE ASHRAE ASHRAE ASHRAE	CLIMATE ZONE	≥10% and	[A PE ≥20% and	SHRAE 90.1 RCENT OUTDO ≥30% and	: TABLE 6. DOR AIR AT F ≥40% and	5.6.1-1] OLL DESIGN ≥50% and	AIRFLOW RA ≥60% and	≥70% and	>80%
ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE	CLIMATE ZONE		[A PE	SHRAE 90.1	: TABLE 6. DOR AIR AT F	5.6.1-1] ULL DESIGN	AIRFLOW RA		≥80%
ASHRAE ASHRAE ASHRAE ASHRAE	CLIMATE ZONE	≥10% and	[A PE ≥20% and <30%	SHRAE 90.1 RCENT OUTDO ≥30% and <40%	: TABLE 6. DOR AIR AT F ≥40% and <50%	5.6.1-1] ULL DESIGN ≥50% and <60%	AIRFLOW RA ≥60% and <70%	≥70% and <80%	≥80%
ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE		≥10% and	[A PE ≥20% and <30%	SHRAE 90.1 RCENT OUTDO ≥30% and	: TABLE 6. DOR AIR AT F ≥40% and <50%	5.6.1-1] ULL DESIGN ≥50% and <60%	AIRFLOW RA ≥60% and <70%	≥70% and <80%	≥80%
ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE	<u>0A,</u> 1A, 2A, 3A,	≥10% and <20%	[A PE ≥20% and <30% DE	SHRAE 90.1 RCENT OUTDO ≥30% and <40% SIGN SUPPLY	: TABLE 6. DOR AIR AT F ≥40% and <50% FAN AIRFLOV	5.6.1-1] ••••••••••••••••••••••••••••••••••••	AIRFLOW RA ≥60% and <70% c feet per minu	≥70% and <80% ite)	
ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE		≥10% and	[A PE ≥20% and <30%	SHRAE 90.1 RCENT OUTDO ≥30% and <40%	: TABLE 6. DOR AIR AT F ≥40% and <50%	5.6.1-1] ULL DESIGN ≥50% and <60%	AIRFLOW RA ≥60% and <70%	≥70% and <80%	≥80% > <u>0 ≥120</u>
ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE	<u>0A,</u> 1A, 2A, 3A,	≥10% and <20%	[A PE ≥20% and <30% DE	SHRAE 90.1 RCENT OUTDO ≥30% and <40% SIGN SUPPLY	: TABLE 6. DOR AIR AT F ≥40% and <50% FAN AIRFLOV	5.6.1-1] ••••••••••••••••••••••••••••••••••••	AIRFLOW RA ≥60% and <70% c feet per minu	≥70% and <80% ite)	
ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE	<u>0A,</u> 1A, 2A, 3A, 4A, 5A, 6A	≥10% and <20% ≥26 000	[A PE ≥20% and <30% DEs ≥16 000	SHRAE 90.1 RCENT OUTDO ≥30% and <40% SIGN SUPPLY ≥5500	: TABLE 6. OOR AIR AT F ≥40% and <50% FAN AIRFLOV ≥4500	5.6.1-1] ULL DESIGN ≥50% and <60% V RATE (cubic ≥3500	AIRFLOW RA ≥60% and <70% c feet per minu ≥2000	≥70% and <80% tte) ≥1000	> <u>0≥120</u>
ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE	<u>0A,</u> 1A, 2A, 3A, 4A, 5A, 6A 7, 8	≥10% and <20% ≥26 000 ≥4500	[A PE ≥20% and <30% DE ≥16 000 ≥4000	SHRAE 90.1 RCENT OUTDO ≥30% and <40% SIGN SUPPLY	: TABLE 6. DOR AIR AT F ≥40% and <50% FAN AIRFLOV	5.6.1-1] ••••••••••••••••••••••••••••••••••••	AIRFLOW RA ≥60% and <70% c feet per minu	≥70% and <80% ite)	
ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE	<u>0A,</u> 1A, 2A, 3A, 4A, 5A, 6A	≥10% and <20% ≥26 000 ≥4500	[A PE ≥20% and <30% DE ≥16 000 ≥4000	SHRAE 90.1 RCENT OUTDO ≥30% and <40% SIGN SUPPLY ≥5500	: TABLE 6. OOR AIR AT F ≥40% and <50% FAN AIRFLOV ≥4500	5.6.1-1] ULL DESIGN ≥50% and <60% V RATE (cubic ≥3500	AIRFLOW RA ≥60% and <70% c feet per minu ≥2000	≥70% and <80% tte) ≥1000	> <u>0≥120</u>
ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE	<u>0A,</u> 1A, 2A, 3A, 4A, 5A, 6A 7, 8	≥10% and <20% ≥26 000 ≥4500	[A PE ≥20% and <30% DE ≥16 000 ≥4000	SHRAE 90.1 RCENT OUTDO ≥30% and <40% SIGN SUPPLY ≥5500	: TABLE 6. OOR AIR AT F ≥40% and <50% FAN AIRFLOV ≥4500	5.6.1-1] ULL DESIGN ≥50% and <60% V RATE (cubic ≥3500	AIRFLOW RA ≥60% and <70% c feet per minu ≥2000	≥70% and <80% tte) ≥1000	> <u>0≥120</u>
ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE	<u>0A,</u> 1A, 2A, 3A, 4A, 5A, 6A 7, 8	≥10% and <20% ≥26 000 ≥4500	[A PE ≥20% and <30% DE ≥16 000 ≥4000	SHRAE 90.1 RCENT OUTDO ≥30% and <40% SIGN SUPPLY ≥5500	: TABLE 6. OOR AIR AT F ≥40% and <50% FAN AIRFLOV ≥4500	5.6.1-1] ULL DESIGN ≥50% and <60% V RATE (cubic ≥3500	AIRFLOW RA ≥60% and <70% c feet per minu ≥2000	≥70% and <80% tte) ≥1000	> <u>0≥120</u>
ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE	<u>0A,</u> 1A, 2A, 3A, 4A, 5A, 6A 7, 8	≥10% and <20% ≥26 000 ≥4500	[A PE ≥20% and <30% DE ≥16 000 ≥4000	SHRAE 90.1 RCENT OUTDO ≥30% and <40% SIGN SUPPLY ≥5500 ≥2500	: TABLE 6. DOR AIR AT F ≥40% and <50% FAN AIRFLOW ≥4500 ≥1000	5.6.1-1] ULL DESIGN ≥50% and <60% V RATE (cubic ≥3500	AIRFLOW RA ≥60% and <70% c feet per minu ≥2000	≥70% and <80% tte) ≥1000	> <u>0≥120</u>
ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE	0A, 1A, 2A, 3A, 4A, 5A, 6A 7, 8 (portion of table not s	 ≥10% and <20% ≥26 000 ≥4500 ≥4500 	[A PE ≥20% and <30% DE: ≥16 000 ≥4000 unchanged)	SHRAE 90.1 RCENT OUTDO ≥30% and <40% SIGN SUPPLY ≥5500 ≥2500 TABLE 1	: TABLE 6. DOR AIR AT F ≥40% and <50% FAN AIRFLOW ≥4500 ≥1000 E 503.5.10(2)	5.6.1-1] ULL DESIGN ≥50% and <60% V RATE (cubic ≥3500 >0 ≥140	AIRFLOW RATE	≥70% and <80% ite) ≥1000 >0 ≥100	>0 <u>≥120</u> >0 <u>≥80</u>
ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE	<u>0A,</u> 1A, 2A, 3A, 4A, 5A, 6A 7, 8	 ≥10% and <20% ≥26 000 ≥4500 ≥4500 	[A PE ≥20% and <30% DE: ≥16 000 ≥4000 unchanged)	SHRAE 90.1 RCENT OUTDO ≥30% and <40% SIGN SUPPLY ≥5500 ≥2500 TABLE I QUIREMENT	: TABLE 6. COR AIR AT F ≥40% and <50% FAN AIRFLOW ≥4500 ≥1000 E 503.5.10(2) S FOR VEN	5.6.1-1] ULL DESIGN \geq 50% and <60% V RATE (cubic \geq 3500 \Rightarrow 0 \geq 140 FILATION S	AIRFLOW RATE	≥70% and <80% ite) ≥1000 >0 ≥100	>0 <u>≥120</u> >0 <u>≥80</u>
ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE	0A, 1A, 2A, 3A, 4A, 5A, 6A 7, 8 (portion of table not s	 ≥10% and <20% ≥26 000 ≥4500 ≥4500 	[A PE ≥20% and <30% DE: ≥16 000 ≥4000 unchanged) COVERY REA T	SHRAE 90.1 RCENT OUTDO \$30% and <40% SIGN SUPPLY \$25500 \$2500 TABLE I QUIREMENT HAN 8000 HC	: TABLE 6. COR AIR AT F ≥40% and <50% FAN AIRFLOW ≥4500 ≥1000 E 503.5.10(2) S FOR VEN DURS PER Y	5.6.1-1] ULL DESIGN ≥50% and <60% V RATE (cubic ≥3500 >0 ≥140 FILATION S EAR*	AIRFLOW RATE	≥70% and <80% ite) ≥1000 >0 ≥100	>0 <u>≥120</u> >0 <u>≥80</u>
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Ξ	CLIMATE ZONE	≥10% and <20%	≥20% and <30%	≥30% and <40%	≥40% and <50%	≥50% and <60%	≥60% and <70%	≥70% and <80%	≥80%
Ξ			DESI	GN SUPPLY F	AN AIRFLOW	RATE (cubic	feet per minut	te)	
	0B, 1B, 2B, 3B, 4C, 5C	NR	≥19 500	≥9000	≥5000	≥4000	≥3000	≥1500	>0 <u>≥ 120</u>
	0A, 1A, 2A, 3A, 4B, 5B	≥2500	≥2000	≥1000	≥500	>0 <u>≥ 140</u>	>0 <u>≥ 120</u>	>0 <u>≥ 100</u>	>0 <u>≥ 80</u>
	4A, 5A, 6A, 6B, 7, 8	>0 ≥ 200	>0 ≥ 130	>0 ≥ 100	$\geq 0 \geq 80$	>0 <u>≥70</u>	$\geq 0 \geq 60$	$\geq 0 \geq 50$	$>0 \ge 40$
			2						

1 cubic foot per minute = $0.00047 \text{ m}^3/\text{s}$

* NR-Not required

E 503.5.11.2.1 Kitchen or Dining Facility. Where a kitchen or dining facility has a total kitchen hood exhaust airflow rate more than 5000 ft3/min (2.3597 m³/s), then one of the following shall be provided: (1) Fifty percent or more of <u>all</u> replacement air is transfer air that would otherwise be exhausted.

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ASHRAE ASHRA	ASHRAE	(2) Demand ventilation system(s) provide on 75 percent or more of the exhaust air. Such systems shall
ASHRAE ASHRA		be capable of and configured to provide 50 percent or more reduction in exhaust and replacement
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ASHRAE A	ASHRAE	(3) Listed energy recovery devices that result in a sensible heat energy recovery effectiveness ratio of
ASHRAE ASHRA	ASHRAE	
ASHRAE ASHRAE ASHRAEpercent of the difference between the outdoor air and entering exhaust air dry-bulb temperatures at design conditions. [ASHRAE 90.1:6.5.7.2.3]BE 503.5.11.3 Laboratory Exhaust Systems. Buildings with laboratory exhaust systems having a total exhaust rate of more than 5000 ft ³ /min (2.3597 m ³ /s) shall include not less than one of the following features: (1) VAV laboratory exhaust and room supply systems capable of and configured to reduce exhaust ariffow rates, and makeup airflow rates, or both incorporate a heat recovery system to precondition makeup air from laboratory exhaust, or both, and shall be in accordance with the following: ASHRAE ASHR	ASHRAE	
ASHRAE ASHRAE ASHRAEdesign conditions. [ASHRAE 90.1:6.5.7.2.3]ASHRAE ASHRAE ASHRAE ASHRAE ASHRAEE 503.5.11.3 Laboratory Exhaust Systems. Buildings with laboratory exhaust systems having a total exhaust rate of more than 5000 ft³/min (2.3597 m³/s) shall include not less than one of the following features: (1) VAV laboratory exhaust and room supply systems capable of and configured to reduce exhaust airflow rates, and makeup airflow rates, or both, incorporate a heat recovery system to precondition makeup air from laboratory exhaust. or both, and shall be in accordance with the following: ASHRAE ASHRA	ASHRAE	
ASHRAE A	ASHRAE	
ASHRAE A	ASHRAE	design conditions. [ASHRAE 90.1:6.5.7.2.3]
ASHRAE A	ASHRAE	
ASHRAE A	ASHRAE	E 503.5.11.3 Laboratory Exhaust Systems, Buildings with laboratory exhaust systems having a
ASHRAE A	ASHRAE	
ASHRAE ASHRAEfollowing features: (1)VAV laboratory exhaust and room supply systems capable of and configured to reduce exhaust airflow rates, and makeup airflow rates, or both-incorporate a heat recovery system to precondition makeup air from laboratory exhaust, or both, and shall be in accordance with the following:ASHRAE ASHRAE ASHRAE $A+B \cdot (E/M) \ge 50\%$ (Equation E 503.5.11.3) $A+B \cdot (E/M) \ge 50\%$ (Equation E 503.5.11.3)ASHRAE ASHRA		
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ASHRAE ASHRAE ASHRAE $A+B \cdot (E/M) \ge 50\%$ (Equation E 503.5.11.3)ASHRAE <br< td=""><td></td><td>makeup an from laboratory exhaust, of boun, and shan be in accordance with the following.</td></br<>		makeup an from laboratory exhaust, of boun, and shan be in accordance with the following.
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ASHRAE ASHRA		$A+B\bullet(E/M) \ge 50\%$ (Equation E 503.5.11.3)
ASHRAE ASHRAE ASHRAEWhere: A = Percentage that the exhaust and makeup airflow rates are capable of being reduced from design conditions.ASHRAE AS		
ASHRAE ASHRAEA = Percentage that the exhaust and makeup airflow rates are capable of being reduced from design conditions.ASHRAE ASHRAE $A = \text{Percentage that the exhaust and makeup airflow rates are capable of being reduced from designconditions.ASHRAEASHRAEB = \text{Sensible energy recovery effectiveness ratio.}A = \text{Percentage that through the heat recovery device at design conditions.}ASHRAEASHRAEASHRAEH = \text{Makeup airflow rate through the heat recovery device at design conditions.}ASHRAE$		Where
 ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE B = Sensible <u>energy</u> recovery <u>effectiveness</u> ratio. <i>E</i> = Exhaust airflow rate through the heat recovery device at design conditions. ASHRAE ASHRAE		
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 ASHRAE ASHRAE		B = Sensible energy recovery effectiveness ratio.
 ASHRAE ASHRAE		E = Exhaust airflow rate through the heat recovery device at design conditions.
 ASHRAE ASHRAE (2) VAV laboratory exhaust and room supply systems <u>that are</u> required to have minimum circulation rates to be in accordance with the codes or <u>accreditation</u> standards shall be capable of <u>reducing and</u> <u>configured to reduce</u> zone exhaust and makeup airflow rates to the regulated minimum circulation ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE (3) Direct makeup (auxiliary) air supply of 75 percent or more of the exhaust airflow rate, heated not more than 2°F (1°C) below room setpoint, cooled to not less than 3°F (2°C) above room setpoint, no humidification added, and no simultaneous heating and cooling are used for dehumidification control. [ASHRAE ASHRAE 		
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 ASHRAE ASHRAE	-	rates to be in accordance with the codes or <u>accreditation</u> standards shall be capable of reducing and
 ASHRAE ASHRAE		<u>configured to reduce</u> zone exhaust and makeup airflow rates to the regulated minimum circulation
 ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE ASHRAE Construction of the state of the		
 ASHRAE Direct makeup (auxiliary) air supply of 75 percent or more of the exhaust airflow rate, heated not more than 2°F (1°C) below room setpoint, cooled to not less than 3°F (2°C) above room setpoint, no humidification added, and no simultaneous heating and cooling are used for dehumidification control. [ASHRAE ASHRAE 		
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ASHRAE		Collicol. [ASHIKAE 90.1.0.3.7.3]

Prior to the November 15 meeting, the proposed TIA was balloted through the Mechanical Technical Committee in accordance with the Regulations Governing Committee Projects to determine if there existed the necessary three-fourths majority support on technical merit and emergency nature to establish the recommendation for issuance. The ballot failed on both accounts. The recommendation of the Mechanical Technical Committee is to not issue the TIA.

When considering an application for a TIA, the Standards Council accords great respect and deference to the IAPMO codes and standards development process. In conducting its review, the Council will overturn the result recommended through that process only where a clear and substantial basis for doing so is demonstrated.

IAPMO Standards Council Decision TIA UMC-003-18 Decision date: November 21, 2017** *Uniform Mechanical Code – Sections E 503.1.3, 503.4.6 – 503.5.11.3*

Upon a full review and consideration of all of the information available to it, the Council concludes that a clear and substantial basis exists to amend sections E 503.1.3 and E503.4.6 through E 503.5.11.3 of the 2018 edition of the *Uniform Mechanical Code* – as noted above – to read consistently with *ASHRAE 90.1* – 2016, the source of the extracted text. Of equal importance, the TIA resolves conflicting language between the *Uniform Mechanical Code* and *ASHRAE 90.1*.

Thus, the Council hereby issues the proposed TIA.

Sincerely,

Gabriella Davis Secretary, Standards Council

CC: Monte Bogatz, Executive VP & General Counsel Hugo Aguilar, VP, Codes & Standards Development IAPMO Standards Council Members of the Mechanical TC

****NOTE**: Participants in IAPMO's codes and standards making process are advised that limited review of this decision may be sought from the IAPMO Board of Directors. For the rules describing the available review and the method for petitioning the Board of Directors for review, please consult Section 1-7 of the *IAPMO Regulations Governing Committee Projects* and the *IAPMO Regulations Governing Petitions to the Board of Directors from Decisions of the Standards Council.* Notice of the intent to file such a petition must be submitted to the Petitions Clerk of the Board of Directors within 15 calendar days of the Date of Decision noted in the subject line of this letter. As this document is an American National Standard (ANS), any persons who have directly and materially affected interests by this decision have the right to appeal to ANSI in accordance with ANSI procedures.

IAPMO Regulations Governing Committee Projects

Section 1-7

1-7 Petitions to the Board of Directors.

1-7.1 General. The Standards Council has been delegated the responsibility for the administration of the codes and standards development process and the issuance of Documents. However, where extraordinary circumstances requiring the intervention of the Board of Directors exist, the Board of Directors may take any action necessary to fulfill its obligations to preserve the integrity of the standards development process. Anyone seeking such intervention of the Board of Directors may petition the Board of Directors concerning Standards Council action on any matters. Such petitions shall be filed and processed in accordance with the Regulations Governing Petitions to the Board of Directors from Decisions of the Standards Council.

1-7.2 Notice of Intent to File the Petition. Anyone wishing to petition the Board of Directors concerning an Standards Council action related to the issuance of a document, shall file a Notice of Intent to File a Petition within 15 days following the Standards Council action. A Standards Council action related to the issuance of a document includes any action of the Council that issues or returns a Document or that affects the text of a Document. Petitions concerning other Standards Council actions shall be filed within a reasonable period of time.

1-7.3 Effect of Filing. The filing of a Petition will not serve to stay the effective date of a Document or a Tentative Interim Amendment unless the Chief Executive Officer of the Association or the Board of Directors acts, pursuant to 4-7.2 or 5-6, to delay the effective date. Any Petition pending at the time a Document or Tentative Interim Amendment becomes effective will be treated as a Petition to withdraw the Document or Tentative Interim Amendment.

1-8 Use of Visual Aids and Demonstrations Before the Standards Council or Board of Directors. The policy for the use of visual aids and physical demonstrations to the Standards Council and Board of Directors shall be the same as that required for TCCs, TCs, and Task Groups, in accordance with 3-3.3.3(e) and 3-3.3.3(f).

IAPMO Regulations Governing Petitions to the Board of Directors from Decisions of the Standards Council

ADOPTED BY THE IAPMO BOARD OF DIRECTORS SEPTEMBER 4, 2000. Amended in January 2007.

Section 1 Scope of and Authority for these Regulations.

(a) These regulations have been issued by the Board of Directors pursuant to its authority under Article 5, 6 and 8 of the IAPMO Bylaws.

(b) These regulations set forth the procedures to be used for the filing and processing of all petitions to the Board of Directors filed pursuant to 1-7 of the Regulations Governing Committee Projects.

(c) The Board of Directors can amend these regulations from time to time and waive or supplement, in whole or in part, at any time or times at its discretion.

(d) For the purposes of these regulations, the Standards Council Secretary, or such other person as the Chair of the Board of Directors may appoint, shall act as a petitions clerk.

Section 2 Subcommittees of the Board of Directors. Unless the Board of Directors otherwise orders, the authority to consider and make recommendations on the disposition of a petition by the Board of Directors shall be delegated to a subcommittee of the Board of Directors, which shall be appointed, in accordance with 2.1 of these regulations. Subcommittees shall be appointed by the Chair of the Board of Directors.

2-1 Composition of Subcommittees. Subcommittees shall consist of three or more members of the Board of Directors. The criteria for selection and appointment of subcommittee members shall be as follows:

(a) A subcommittee member shall be a person who can decide the petition on the merits in an impartial manner.

(b) A subcommittee member shall not have any conflict of interest. (A conflict of interest is defined as any situation in which a decision on a petition could substantially and materially affect the member's financial or business interest.)

(c) Each subcommittee member shall, to the extent practicable, represent diverse interests within the association.

In making a decision of whether or not to serve on a subcommittee, the member may consult with the IAPMO general counsel.

Section 3 The Scope of Review. The petitioner shall generally confine the argument in the petition to matters that were presented below and shall not raise any new matters that could have but were not presented within the standards development process. A petition to the Board of Directors shall not be regarded as simply another opportunity to reargue a position that was rejected by the Standards Council. In considering a petition, the subcommittee shall give due deference to the judgment of the Standards Council and shall not intervene unless it can be demonstrated that extraordinary circumstances exist requiring the Board of Director's intervention to protect the integrity of the standards development process.

Section 4 The Record. In its consideration of the petition, the subcommittee shall have before it the entire record that was before the Standards Council, as well as all proceedings and decisions of the Standards Council on the issue. In addition, the subcommittee may consult any other records of the association that it deems pertinent to the issue, and the subcommittee may seek technical assistance from staff, the technical committee, or any other source or persons that it deems appropriate.

Section 5 Notice of Intent to File the Petition. Anyone wishing to petition the Board of Directors concerning a Standards Council action related to the issuance of a document, shall file a Notice of Intent to File a Petition within 15 days following the Standards Council action. A Standards Council action related to the issuance of a document includes any action of the

Council that issues or returns a document or that affects the text of a document. Petitions concerning other Standards Council actions shall be filed within a reasonable period of time.

Section 6 Filing and Contents of the Petition.

(a) Within 15 days following the receipt of the notice of intent to file, or within such other time as the petitions clerk may allow, the petitioner shall file the petition together with 20 copies. The petition shall be no more than 10 pages in length and shall contain, in separately denominated sections, the following:

(1) Name, affiliation, and address of the petitioner;

(2) Statement identifying the particular Standards Council action to which the petition relates;

(3) Argument setting forth the grounds for the petition and, in particular, addressing why there exist extraordinary circumstances requiring the intervention of the Board of Directors (see the preceding Section 3 and 1-7 of the Regulations Governing Committee Projects); and

(4) Statement of the precise relief requested.

(b) Any part of the record related to the standards development process that is referenced or discussed in the petition should be clearly cited in the petition using available markings such as the title, author, date, and page of the record. Since the full record will be available to the subcommittee during its review, attachments and appendices shall not accompany the petition, unless express permission has been obtained from the petitions clerk.

Section 7 Consideration of the Petition.

7-1 Initial Review. The petitions clerk may, at his or her discretion, arrange for initial review of the petition by meeting, correspondence, or telephone conference. If upon such initial review of the petition and any relevant portions of the record, the subcommittee determines that the petition has no merit, it may dismiss the petition.

7-2 Full Review. If initial review is not conducted, or, if upon such review, the subcommittee determines that further review is warranted, it shall afford the opportunity for responses to be filed by interested parties. Responses, together with 20 copies, shall be filed within 15 days or within such other time as the petitions clerk may allow.

(a) Responses shall be no more than 10 pages in length and shall contain, in separately denominated sections, the following:

(1) Name, affiliation, and address of the respondent;

(2) Statement identifying the petition to which the response relates and stating whether the respondent supports or opposes the petition; and

(3) Argument setting forth the grounds for opposing or supporting the petition and, in particular, addressing why there does or does not exist extraordinary circumstances requiring the intervention of the Board of Directors (see the preceding Section 3

and 1-7 of the Regulations Governing Committee Projects).

(b) Any part of the record related to the standards development process that is referenced or discussed in a response should be clearly cited in the response using available markings such as the title, author, date, and page of the record. Since the full record will be available to the subcommittee during its review, attachments and appendices shall not accompany the response, unless express permission has been obtained from the petitions clerk.

(c) So as to avoid unnecessary repetition and duplication of effort, parties are encouraged to file joint responses where possible and appropriate.

(d) Unless a hearing has been requested and granted by the subcommittee (see Section 8), the subcommittee shall, either by meeting or telephone conference, review and render a decision on the petition based on the written submissions of the parties and the record before it.

Section 8 Requests for Hearings. If the petitioner requests a hearing on the petition and that hearing is granted, the petitioner shall be assessed a filing fee of \$2,500 to be posted following the granting of the request. This fee may be reduced or waived by the Chief Executive Officer upon application of the petitioner if good cause for reducing or waiving the fee is presented. If a hearing is granted, the Procedures for Hearings shall be followed.

Section 9 Waiver of Regulations. Any of the deadlines or requirements set forth in these regulations may be waived by the subcommittee upon application of the petitioner or any other party for good cause shown, or in the discretion of the subcommittee.

Section 10 Subcommittee Report to the Board of Directors. The subcommittee shall file with the Board of Directors a written report concerning each petition that it has determined.