

BUILDING CODE TRAINING

Commercial Mechanical – ASHRAE 90.1 Simplified Approach

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ABOUT SOUTHFACE



*Building a Regenerative Economy, Responsible Resource Use
& Social Equity Through a Healthy Built Environment for All*

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ENERGY CODE RESOURCES

Online educational resources are available by visiting:

www.southfaceonlinetraining.org

Technical assistance or training requests can be submitted to Georgia Energy Code Hotline at: energycodes@southface.org or 404-604-3598

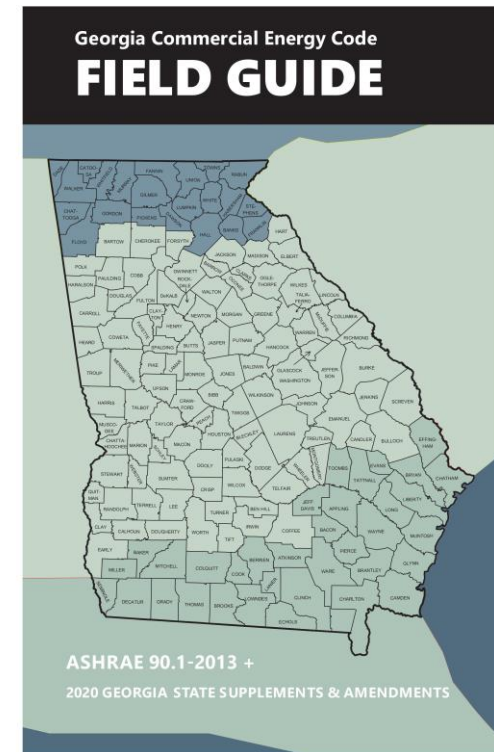
Additional Resources

Georgia Energy Code: If you would like additional information on Georgia's current energy code, please visit the Georgia Department of Community Affairs website at: www.dca.ga.gov/development/ConstructionCodes/programs/EnergyCodeTrainingWorkshops.asp

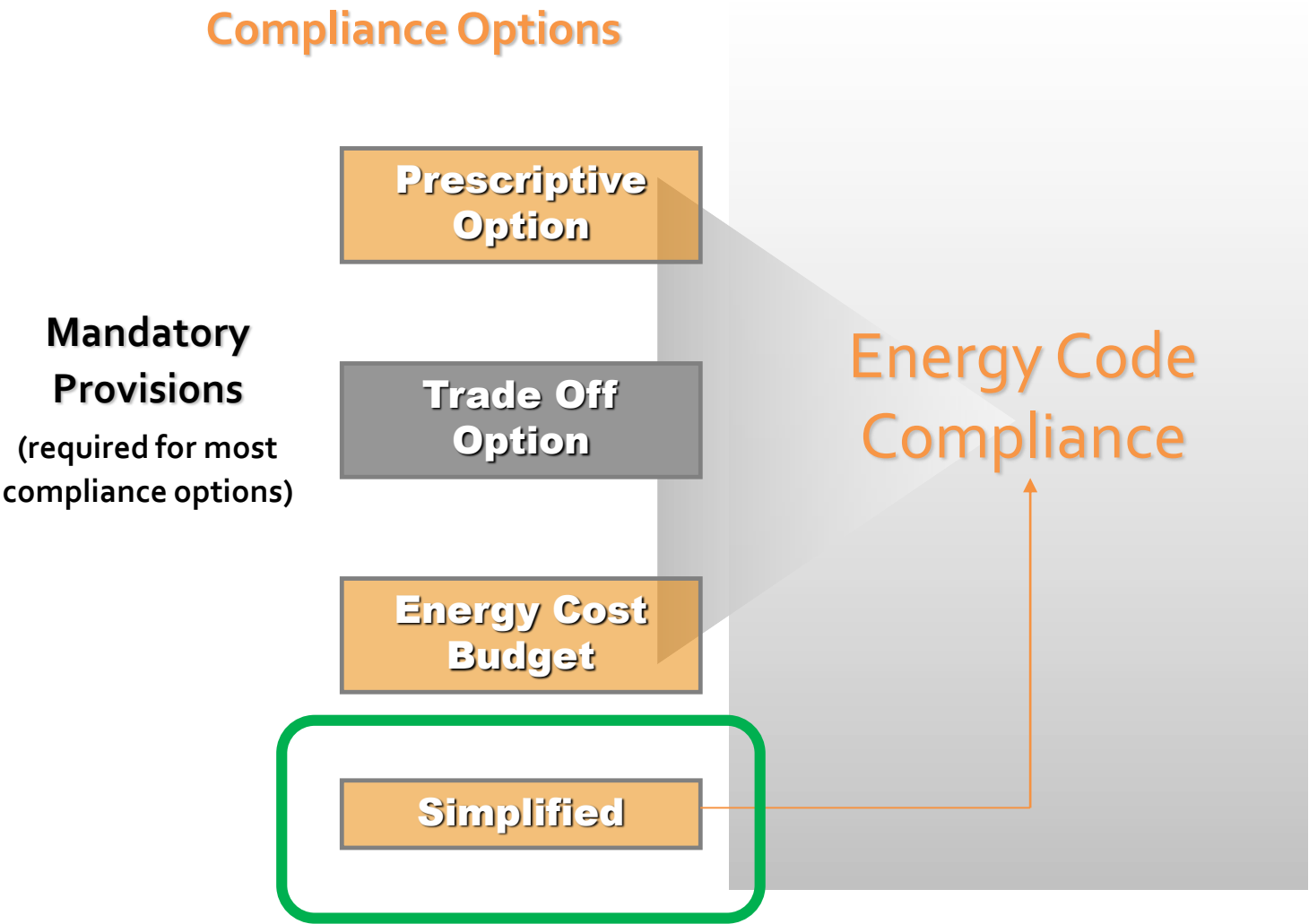
DOE Field Study: If you would like additional information on other DOE Field Studies and participating states, please visit the Building Energy Codes website here: <https://www.energycodes.gov/compliance/energy-code-field-studies>

Georgia Field Study: If you would like further information regarding the Georgia Energy Code Field Study, please visit our project webpage found at: www.seealliance.org

Tools Available: Commercial Field Guide, Pre-drywall Inspection video, webinars
<https://www.southface.org/resources/georgia-energy-code-resources/>



COMPLIANCE OPTIONS



ANSI/ASHRAE/IES Standard 90.1-2013
(Supersedes ANSI/ASHRAE/IES Standard 90.1-2010)
Includes ANSI/ASHRAE/IES Addenda listed in Appendix F

Energy Standard for Buildings Except Low-Rise Residential Buildings (I-P Edition)

See Appendix F for approval dates by the ASHRAE Standards Committee, the ASHRAE Board of Directors, the IES Board of Directors, and the American National Standards Institute.

This standard is under continuous maintenance by a Standing Standard Project Committee (SSPC) for which the Standards Committee has established a documented program for regular publication of addenda or revisions, including procedures for timely, documented, consensus action on requests for change to any part of the standard. The change submittal form, instructions, and deadlines may be obtained in electronic form from the ASHRAE website (www.ashrae.org) or in paper form from the Manager of Standards. The latest edition of an ASHRAE Standard may be purchased from the ASHRAE Web site (www.ashrae.org) or from ASHRAE Customer Service, 1791 Tullie Circle, NE, Atlanta, GA 30329-2305. E-mail: orders@ashrae.org. Fax: 678-539-2129. Telephone: 404-636-8400 (worldwide), or toll free 1-800-527-4723 (for orders in US and Canada). For reprint permission, go to www.ashrae.org/permissions.

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ISSN 1041-2336



SIMPLIFIED APPROACH OPTION FOR HVAC SYSTEMS

- The simplified approach is an optional path for buildings that meet these criteria:
 - Building is two stories or fewer in height.
 - Gross floor area is less than 25,000 sq. ft.
 - Each HVAC system in the building must comply with all 18 requirements.



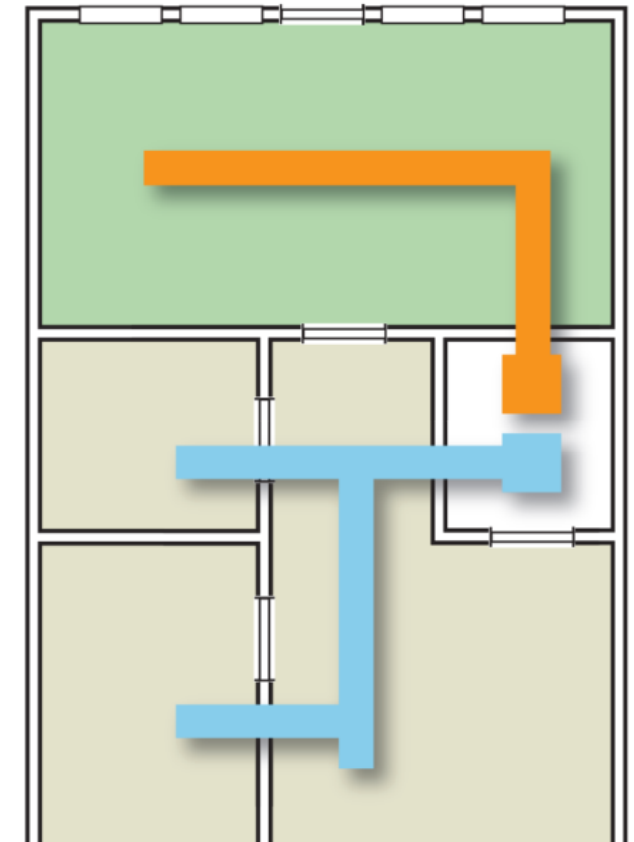
ZONES

1. The system must serve a single zone

An HVAC zone is a space or group spaces within a building with similar heating and cooling requirements that can be managed with a single control

- Multi-zone mechanical systems would not meet this requirement
- Separate mechanical systems serving individual zones would meet the requirement

Properly zoned spaces



VARIABLE FLOW EQUIPMENT

2. Variable fan speed equipment meets control requirements

DX and chilled-water cooling units that control the capacity of the mechanical cooling directly based on space temperature shall have a minimum of two stages of fan control. The following rules apply:

- Low or minimum speed shall not exceed 66% of full speed.
- At low or minimum speed, the fan system shall draw no more than 40% of the fan power at full fan speed.
- Low or minimum speed shall be used during periods of low cooling load and ventilation-only operation.

VARIABLE FLOW EQUIPMENT (CONT.)

All other units—including DX cooling units and chilled-water units that control the space temperature by modulating airflow—shall have modulating fan control. The following rules apply:

- Minimum speed shall not exceed 50% of full speed.
- At minimum speed, the fan system shall draw no more than 30% of the power at full fan speed.
- Low or minimum speed shall be used during periods of low cooling load and ventilation-only operation.

Units that include an air-side economizer to meet the requirements of Section 6.5.1 shall have a minimum of two speeds of fan control during economizer operation.

Some exceptions are made when mechanical ventilation requirements necessitate

larger volumes of outside air or for low-power fans.

COOLING EQUIPMENT EFFICIENCY

3. Air-cooled or evaporatively cooled equipment meet minimum efficiencies

Efficiencies are going up across the board for AHSR AE 90.1 2013

**TABLE 6.8.1-1 Electrically Operated Unitary Air Conditioners and Condensing Units—
Minimum Efficiency Requirements**

Equipment Type	Size Category	Heating Section Type	Subcategory or Rating Condition	Minimum Efficiency	Test Procedure ^a
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ECONOMIZERS

4. The system shall have an air economizer meeting the requirements of Section 6.5.1
 - ASHRAE 90.1-2013 now requires economizers for systems > 5 tons in climate zones 2-4.
 - The HVAC system shall have an air economizer with either barometric or powered relief sized to prevent over-pressurization of the building.
 - Outdoor air dampers for economizer use shall be provided with blade and jamb seals.



ECONOMIZER EXCEPTIONS

There are 10 exceptions, including for systems in certain types of computer rooms, healthcare facilities, and supermarkets. See Section 6.5.1 for details.

Computer room economizers are never required in CZs 2-4.

The use of an economizers may be traded off with more efficient equipment:

- CZ2 – equipment must be 17% more efficient

- CZ3 – equipment must be 27% more efficient

- CZ4 – equipment must be 42% more efficient

HEATING EQUIPMENT EFFICIENCY

5. Heating must be provided by one of the following:

- Unitary packaged or split-system heat pump that meets applicable efficiency requirements
- Fuel-fired furnace that meets applicable efficiency requirements
- Electric resistance heater
- Baseboard system connected to a boiler that meets applicable efficiency requirements

EXHAUST HEAT RECOVERY

6. The system shall meet the exhaust air energy recovery requirements of Section 6.5.6.1.
- Each fan system shall have an energy recovery system when the system's supply airflow rate exceeds the value listed based on the climate zone and percentage of outdoor airflow rate at design conditions.
 - There are two tables based on hours (8,000 hours/year)
 - Energy recovery systems must have at least 50% energy recovery effectiveness.
 - Provisions must be made to bypass or control the energy recovery system to permit air economizer operation as required

EXHAUST HEAT RECOVERY EXCEPTIONS

- There are ten exceptions for exhaust air recovery systems, including laboratories, systems that exhaust toxic fumes, commercial kitchens and others.
- There are distinctions made between heat recovery and cooling energy recovery based on climate zones



THERMOSTAT CONTROLS

7. The system must be equipped with a manual changeover or dual setpoint



HEAT PUMPS

8. Heat pumps with auxiliary electric resistance heat must have controls that prevent supplemental heater operation when the heating load can be met by the heat pump alone. The heat pump must be controlled by either:
- A digital or electronic thermostat designed for heat-pump use that energizes auxiliary heat only when the heat pump has insufficient capacity to maintain setpoint or to warm up the space at a sufficient rate
 - A multistage space thermostat and an outdoor air thermostat wired to energize auxiliary heat only on the last stage of the space thermostat and when outdoor air temperature is less than 40°F



REHEAT CONTROLS

9. The system may not cool then reheat air to control humidity.

In general, reheat is banned (with a few exceptions such as site-solar energy) as more efficient means of dehumidification are available. If reheat is desired for humidity control, the Prescriptive Path must be used to demonstrate compliance.

TIMECLOCK CONTROL

10. Systems with a cooling or heating capacity greater than 15,000 Btu/h and a supply fan motor power greater than 0.75hp must have a timeclock control that satisfies the following five requirements:

- Can start and stop the system under different schedules for seven different day types per week
- Is capable of retaining programming and time setting during a loss of power for a period of at least ten hours
- Includes an accessible manual override that allows temporary operation of the system for up to two hours
- Is capable of temperature setback down to 55°F during off-hours
- Is capable of temperature setup to 90°F during off-hours



REFRIGERANT PIPE INSULATION

11. Refrigerant piping requires insulation, and insulation must be protected from the elements

Insulation exposed to weather must be protected by aluminum, sheet metal, painted canvas, or plastic cover.

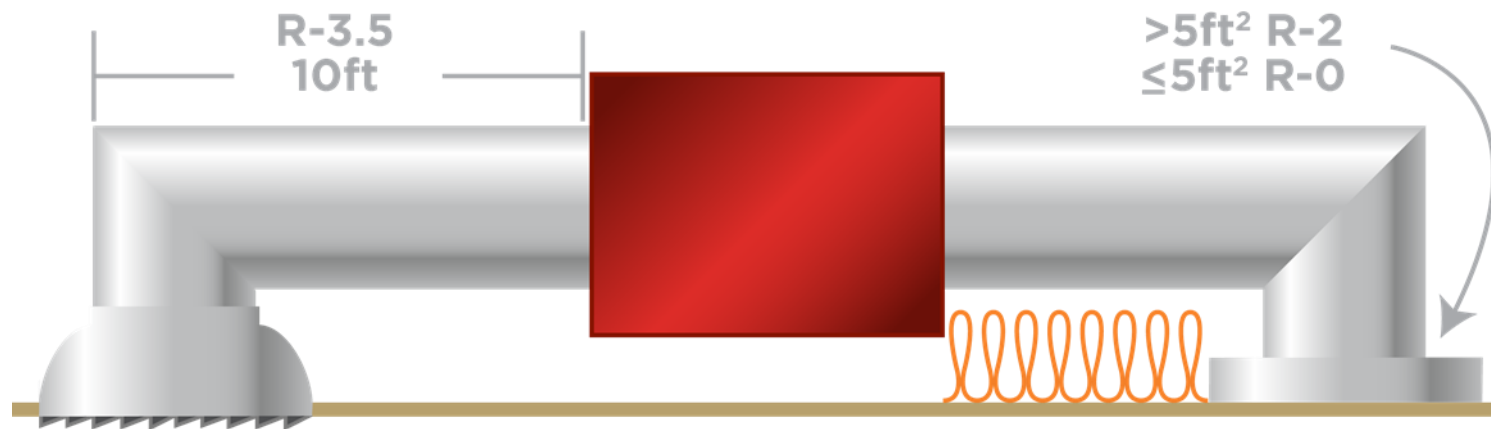
Cellular foam insulation must be protected as above or painted with a coating that is water resistant and provides shielding from solar radiation.



DUCTWORK

12. Ductwork and plenums must be sealed and insulated

Duct insulation requirements as a function of the duct application (e.g., cooling-only supply duct); climate; and duct or plenum location (e.g., ventilated attic).



DUCT BALANCING

13. Ducted systems must be air balanced to industry standards

Report must be included in construction documents



DUCT BALANCING REPORT

TECHNICIAN				DATE
PROJECT		STATION	☐ MCMURDO ☐ PALMER ☐ SOUTH POLE	
BLDG. NO.		BUILDING NAME		

	MAPCON NO. TAG NO.
EQUIPMENT LOCATION	
AREA SERVED	
EQUIPMENT MANUFACTURER	
MODEL	
SERIAL NUMBER	

MAPCON NO. TAG NO.

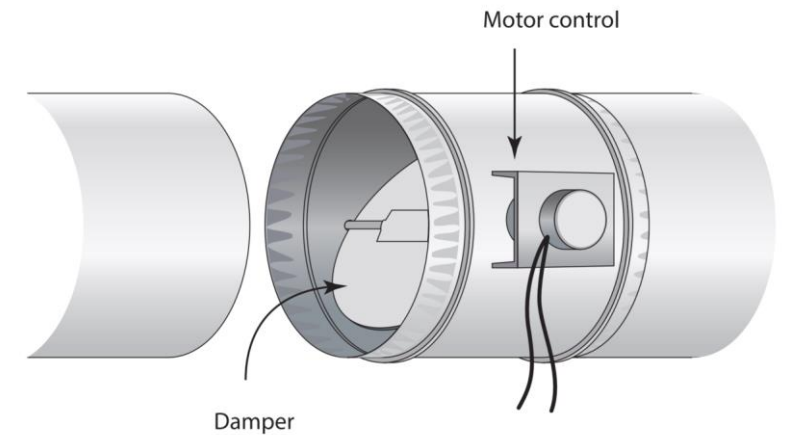
	SPECIFIED	ACTUAL
TOTAL CFM—FAN		
TOTAL CFM—OUTLET		
R/A CFM		
O/A CFM		
TOTAL STATIC		

SPECIFIED	ACTUAL

AUTOMATIC DAMPERS

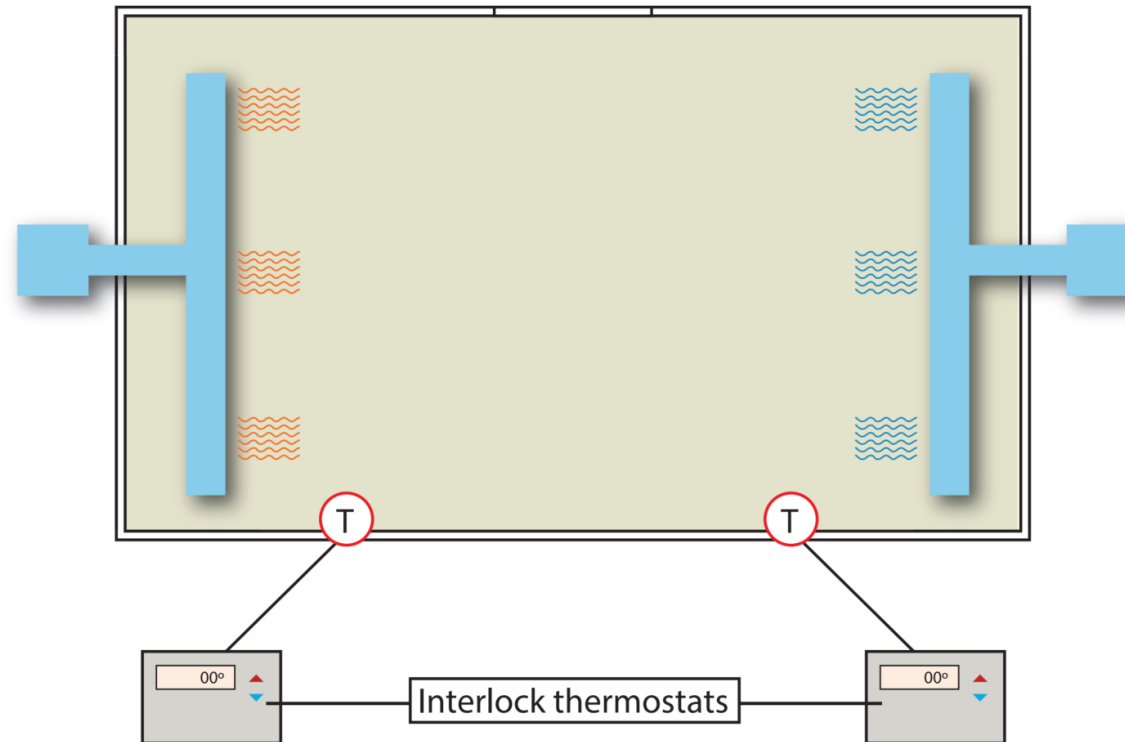
14. Ventilation and exhaust systems must have a gravity or motorized dampers

Motorized dampers should automatically shut when the systems or spaces served are not in use



INTERLOCKED THERMOSTATS

15. Thermostat systems in the same zone must have the ability to be interlocked to prevent simultaneous heating and cooling

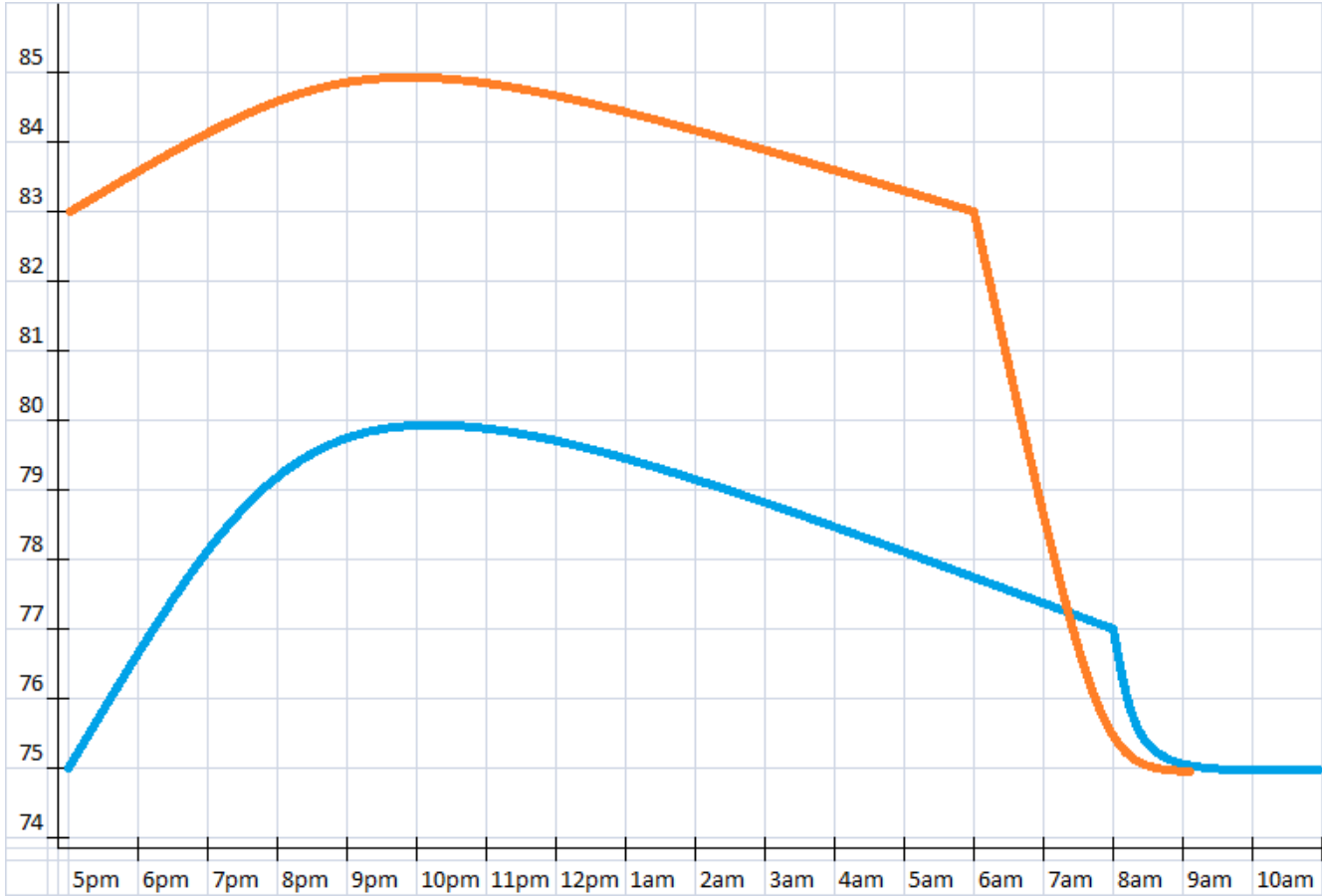


OPTIMUM START CONTROLS

16. Systems with a design supply air capacity greater than 10,000 cfm shall have optimum start controls.

These systems require a smart thermostat or control system to provide optimum start capability. Sometimes referred to as “adaptive learning,” these controls are designed to automatically adjust the start time of an HVAC system each day with the intention of bringing the space to the desired occupied temperature levels immediately before scheduled occupancy.

COOLING SEASON OPTIMUM START RECOVERY



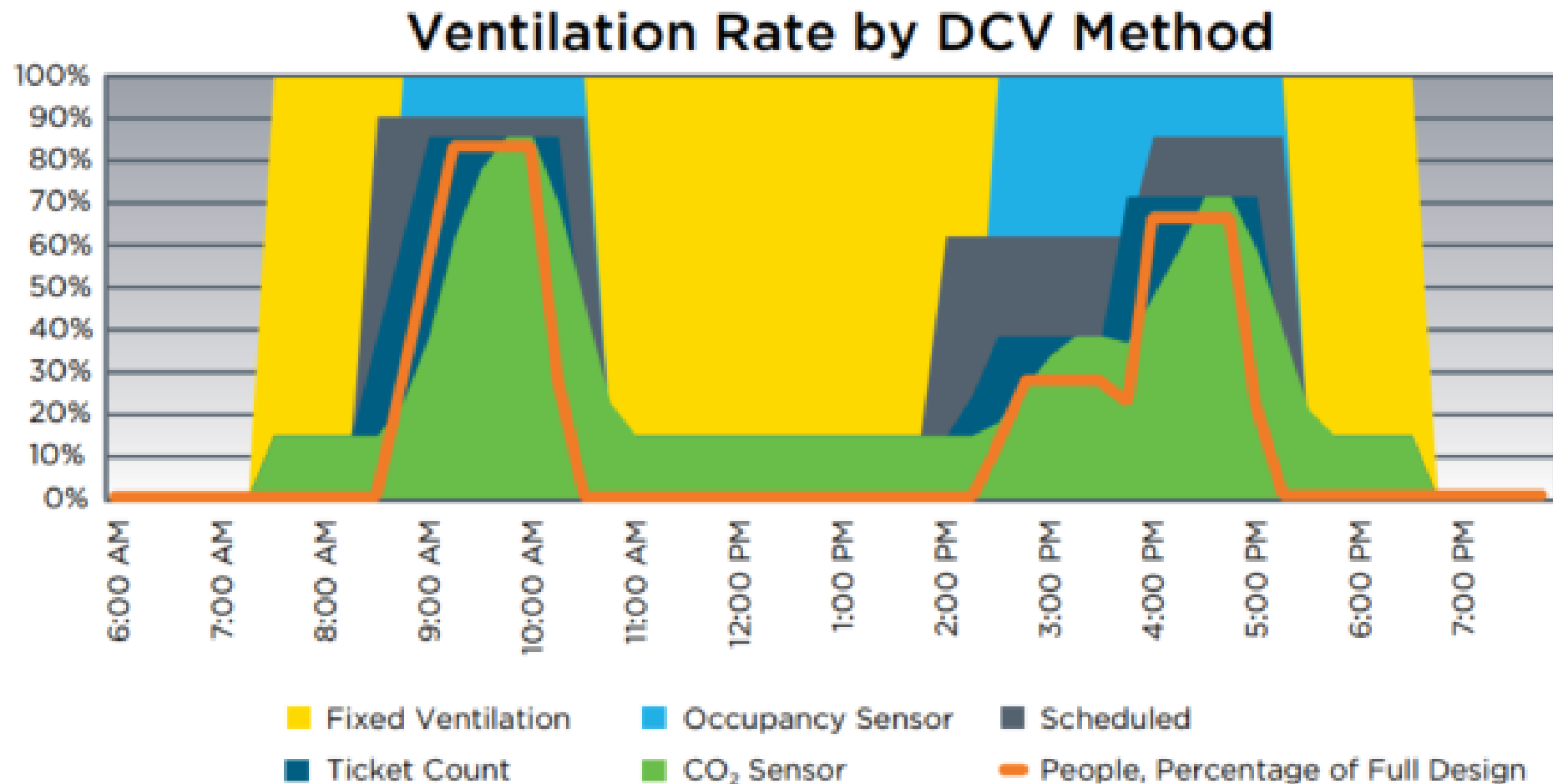
DEMAND CONTROLLED VENTILATION

17. DCV must be provided for each zone with a area > 500 ft² and the design occupancy > 25 people/1000 ft² where the HVAC system has:

- air-side economizer
- automatic modulating control of OSA dampers
- design outdoor airflow $> 3,000$ cfm



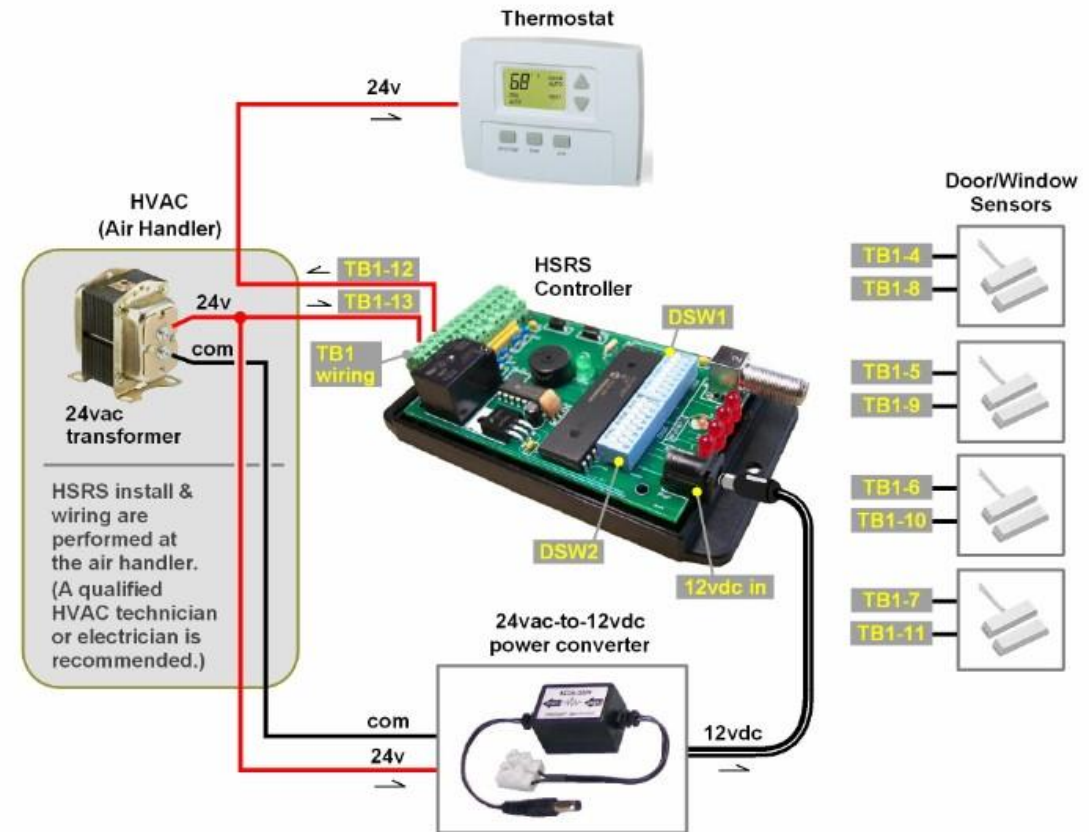
DEMAND CONTROLLED VENTILATION



DOOR SWITCHES

18. Any conditioned space with a door that opens to the outdoors must be provided with the following controls that when the door is open:

- Disables mechanical heating or resets the heating setpoint to 55°F or lower within five minutes of the door being left open
- Disables mechanical cooling or resets the cooling setpoint to 90°F or greater within five minutes of the door being left open



HVAC Smart Relay System - Kadtronix

CONCLUSION

Technical assistance or training requests can be submitted to
Georgia Energy Code Hotline at: energycodes@southface.org or 404-604-3598