

SSE Control Board Heat Pump Operation

Operation

The following sections describe the operation details.

Cooling

Cooling calls are handled the same way as non-heat pump cooling units with one exception.

Note: An exception to this is during cooling, the control energizes the H1 output to turn on the reversing valve.

The H1 output to the reversing valve remains energized between calls for cooling. If a heating call arises, the H1 output turns off.

Heating

All available compressor outputs are energized.

If there is a first stage call for heating, thermostat or zone sensor/network, all available compressors stage on with a 30-second delay between compressors.

The cooling fan on delay and cooling fan off delay are used for the first stage of heat pump heating.

During a first stage of heating, the H1 output turns off and remain off between heat calls.

If there is a second stage call for heating, the H2 or AUX output energizes the emergency/aux heating.

If a thermostat calls for W2 only, only the H2 output energizes. The heating fan on delay and heating fan off delay are used.

Defrost

The heat pump defrost cycle only applies during compressor heating operation.

- The H1 output is de-energized.
- The C1 and/or C2 outputs are (and possibly H2) energized.
- The CN-FAN output is energized.

Defrost cycle initiation

Number of refrigeration systems (**#RefrigSys**) is set to 1

When the intersection of the operational outdoor air temperature (**OprOAT**) and the condenser coil temperature 1 (**CC1**) remain in the demand defrost region for 4½ minutes, the defrost cycle is initiated in the following cases:

- Defrost curve selection 1, 2, 3 or 4 - 40 minutes have elapsed since the previous defrost cycle or

UCB boot-up

- Defrost curve selection 5 - 60 minutes have elapsed since the previous defrost cycle or UCB bootup
- Defrost curve selection 6 - 30 minutes have elapsed since the previous defrost cycle or UCB bootup

Number of refrigeration systems (**#RefrigSys**) is set to 2 or more

When the intersection of the operational outdoor air temperature (**OprOAT**) and either the condenser coil temperature 1 (**CC1**) or the condenser coil temperature 2 (**CC2**) remain in the demand defrost region for 4½ minutes, the defrost cycle initiates based on the same conditions as if the number of refrigeration systems is set to 1.

Number of refrigeration systems (**#RefrigSys**) is set to 1

When the intersection of the operational outdoor air temperature (**OprOAT**) and the condenser coil temperature 1 (**CC1**) remain in the forced defrost region for 4½ minutes, the defrost cycle is initiated in the following case:

- Defrost curve selection 1, 2, 3, 4, 5 or 6 - 6 hours have elapsed since the previous defrost cycle or UCB boot-up

Number of refrigeration systems (**#RefrigSys**) is set to 2 or more

When the intersection of the operational outdoor air temperature (**OprOAT**) and either the condenser coil temperature 1 (**CC1**) or the condenser coil temperature 2 (**CC2**) remain in the forced defrost region for 4½ minutes, the defrost cycle is initiated in the following case:

- Defrost curve selection 1, 2, 3, 4, 5 or 6 - 6 hours have elapsed since the previous defrost cycle or UCB boot-up

At the initiation of the defrost cycle the following outputs occur:

- The H1 output energizes
- The H2 output energizes or remains energized
- The C1 and/or C2 output remain energized
- The CN-FAN output is de-energized

Defrost cycle termination

If the number of refrigeration systems (**#RefrigSys**) is set to 1, the defrost cycle continues until one of the following cases occur:

- Defrost curve selection 1, 2, 3, 4 or 5: the condenser coil temperature 1 (**CC1**) reaches the 40°F defrost termination temperature or 8 minutes have elapsed since the initiation of the defrost cycle.
- Defrost Curve selection 6: the condenser coil temperature 1 (**CC1**) reaches the 50°F defrost termination temperature or 10 minutes have elapsed since the initiation of the defrost cycle - pinked due to possible production variation.

If the number of refrigeration systems (**#RefrigSys**) is set to 2, the defrost cycle continues until one of the following cases occur:

- Defrost curve selection 1, 2, 3, 4 or 5: both the condenser coil temperature 1 (**CC1**) and the condenser coil temperature 2 (**CC2**) reach the 40°F defrost termination temperature or 8 minutes have elapsed since the initiation of the defrost cycle. Within the 8-minute period; if either CC1 or CC2 is above the 40°F defrost termination temperature and the remaining CC input has not reached 40°F, the CC input above 40°F holds the corresponding C output on until that CC input reaches the 50°F defrost cutout temperature. If the remaining CC input has not reached 40°F and the other CC input reaches 50°F, the CC input above the 50°F defrost cutout temperature turns off the corresponding C output for the remainder of the defrost cycle. The C output that was turned off due to defrost cutout temperature can resume compressor heating operation once the defrost cycle terminates and that C output ASCD expires.
- Defrost Curve selection 6 - both Condenser Coil Temperature 1 (**CC1**) and Condenser Coil Temperature 2 (**CC2**) reach the 50°F defrost termination temperature or 10 minutes have elapsed since the initiation of the defrost cycle. Within the 10-minute period; if either CC1 or CC2 are above the 50°F defrost termination temperature and the remaining CC input has not reached 50°F, the CC input above 50°F holds the corresponding C output on until that CC input reaches the 60°F defrost cutout temperature. If the remaining CC input has not reached 50°F and the other CC input reaches the 60°F defrost cutout temperature, the CC input above 60°F turns off the corresponding C output for the remainder of the defrost cycle. The C output that was turned off due to defrost cutout temperature can resume compressor heating operation once the defrost cycle terminates and that C output ASCD expires.

The heat pump heating operation according to the demand resumes when the defrost cycle terminates.

Initiation of the defrost cycle is prevented by temperature sensor input in the following cases:

- If the operational outdoor air temperature (**OprOAT**) is less than -25°F ±1°F or greater than 50°F ±1°F.
- If the CC1 and CC2 condenser coil temperatures are both greater than 40°F ±1°F.

Within the boundaries of the operational outdoor air temperature (**OprOAT**) greater than -25°F ±1°F or less than 50°F ±1°F and the condenser coil temperature (CC1 and CC2) less than 40°F ±1°F, demand defrost and forced defrost regions for defrost cycle initiation are determined by the defrost curve selection, see the following figures.

Figure 13: Smart Equipment defrost curve selection 1

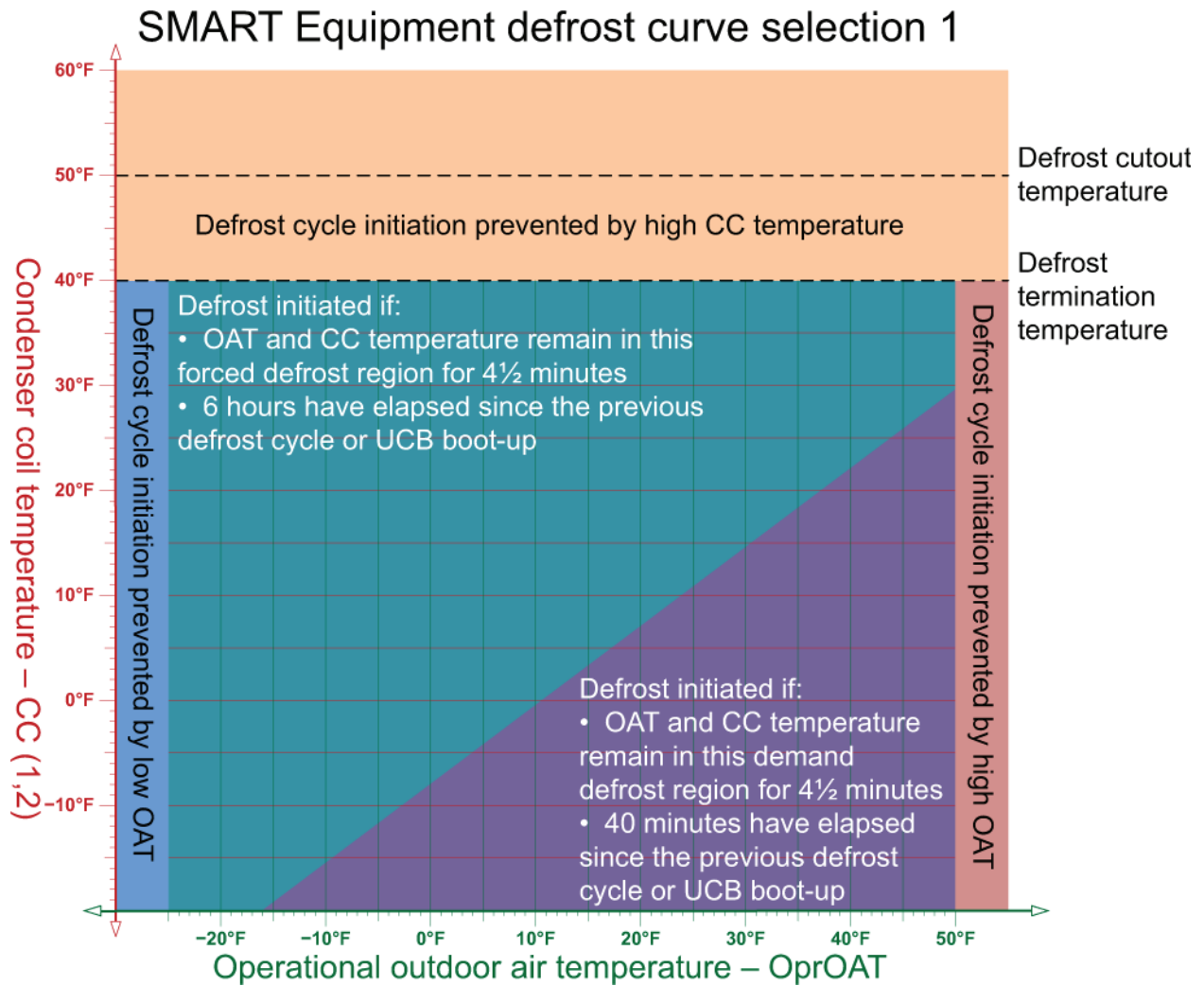


Figure 14: Smart Equipment defrost curve selection 2

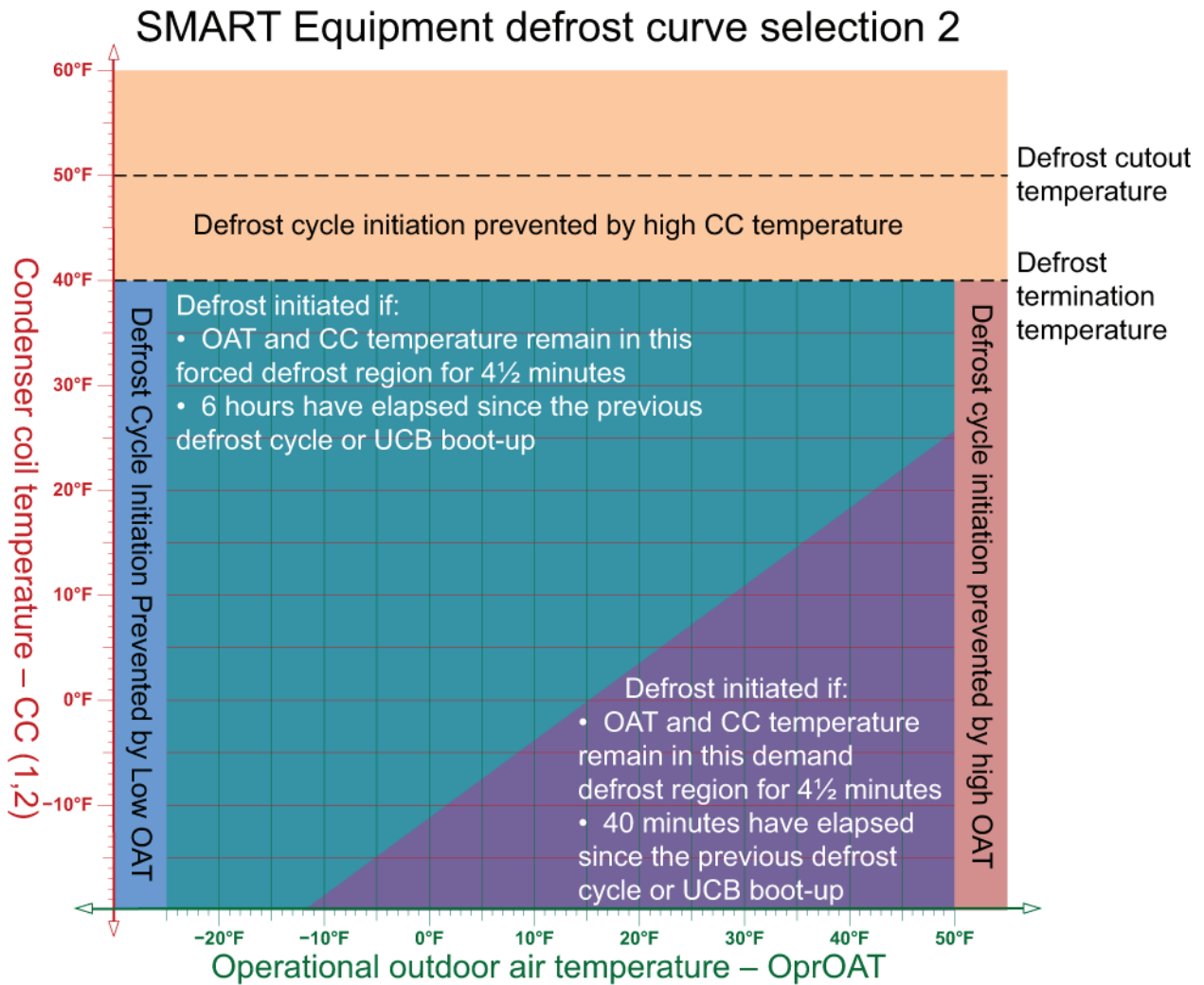


Figure 15: Smart Equipment defrost curve selection 3

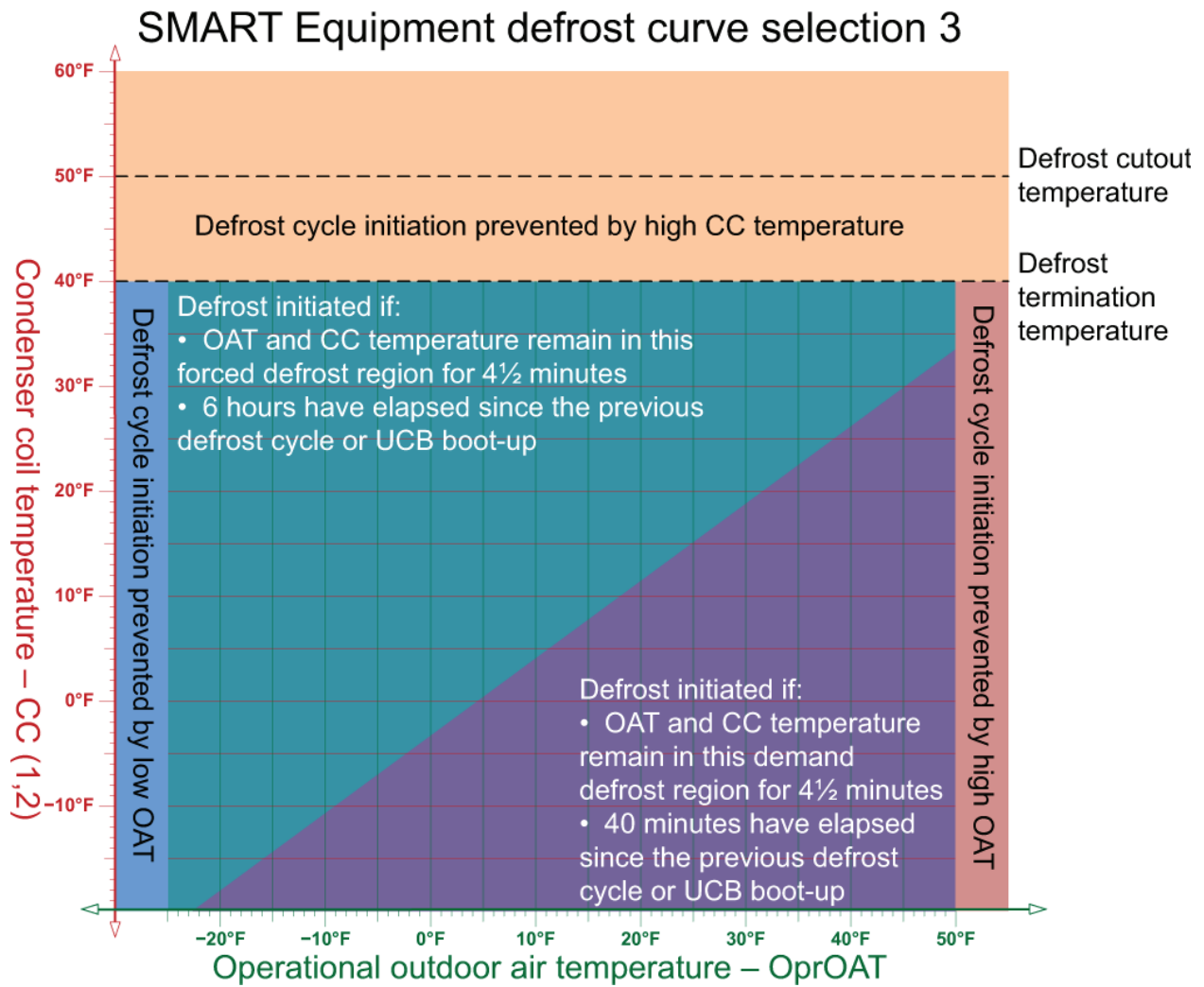


Figure 16: Smart Equipment defrost curve selection 4

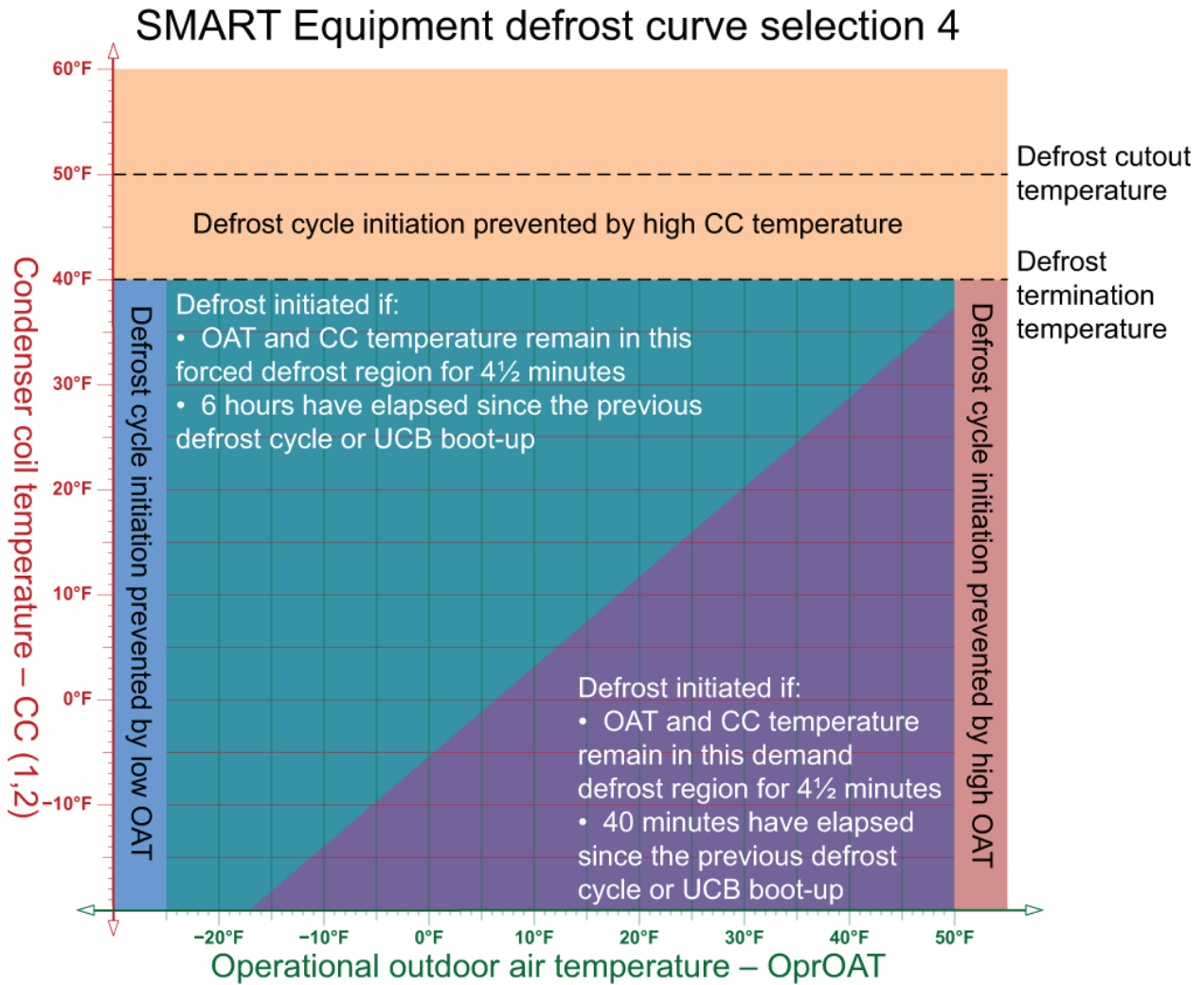


Figure 17: Smart Equipment defrost curve selection 5

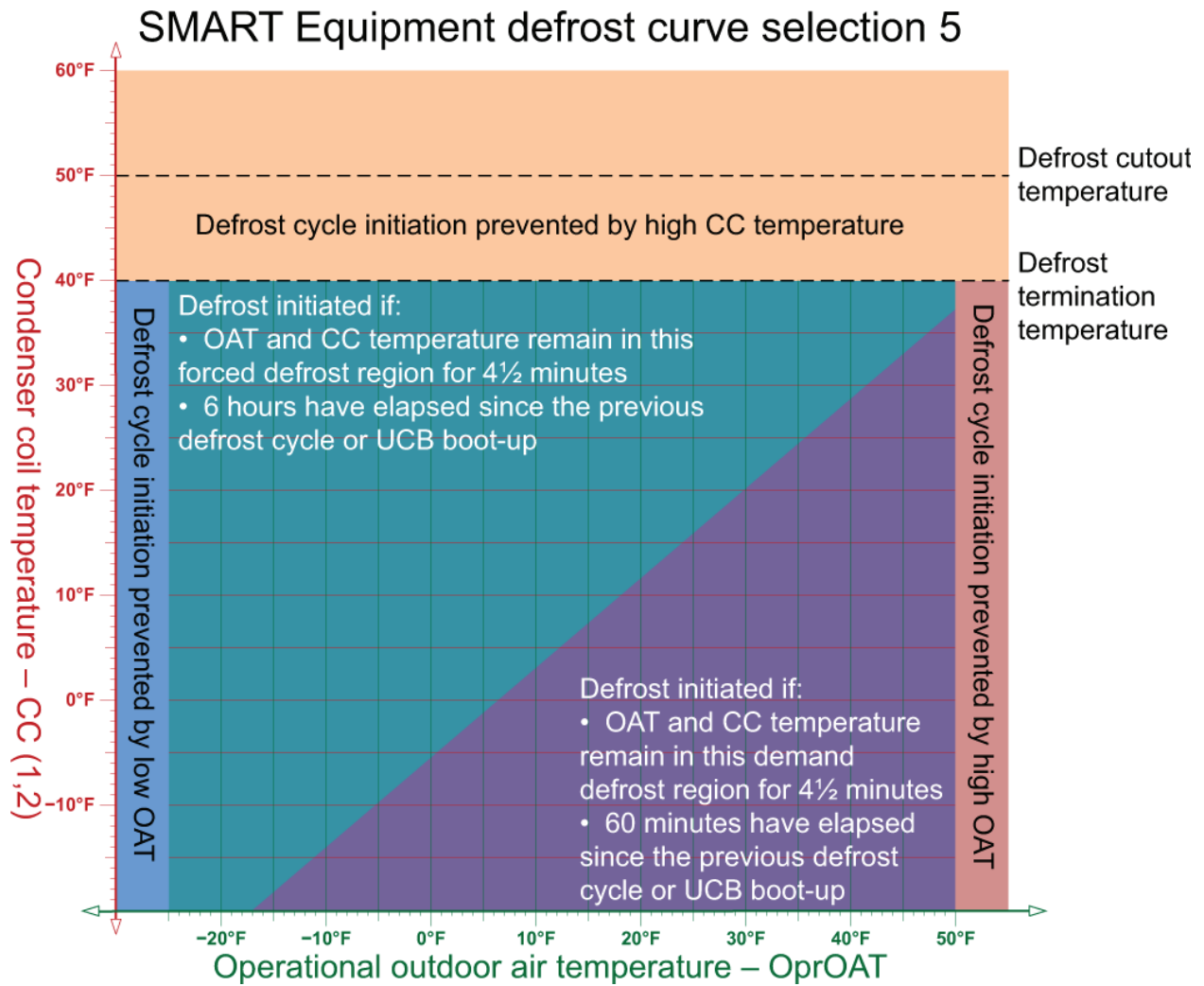


Figure 18: Smart Equipment defrost curve selection 6 - standard or replacement board

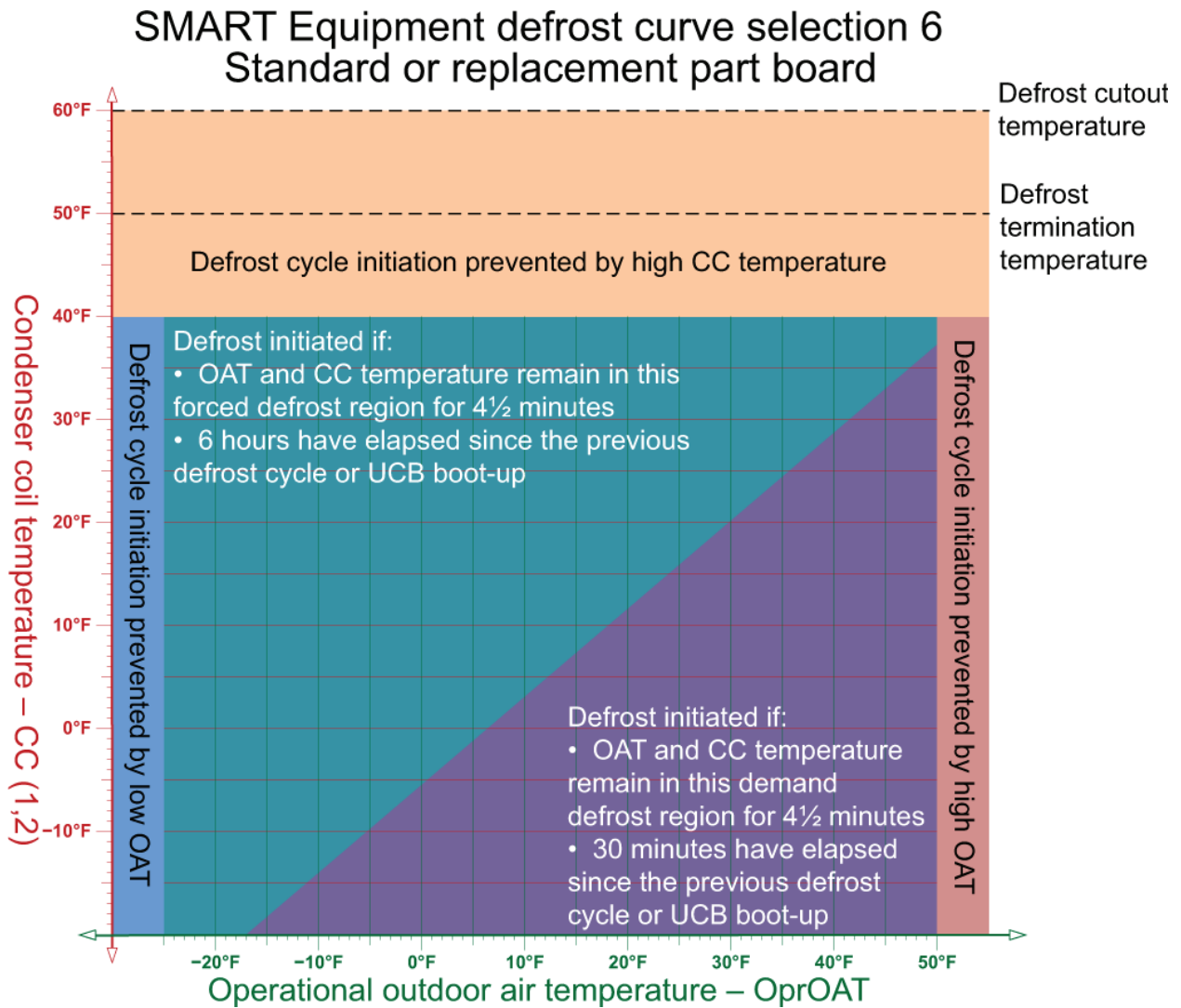


Figure 19: Smart Equipment defrost curve selection 6 - 3 ton Core heat pump

SMART Equipment defrost curve selection 6 3 ton Core heat pump

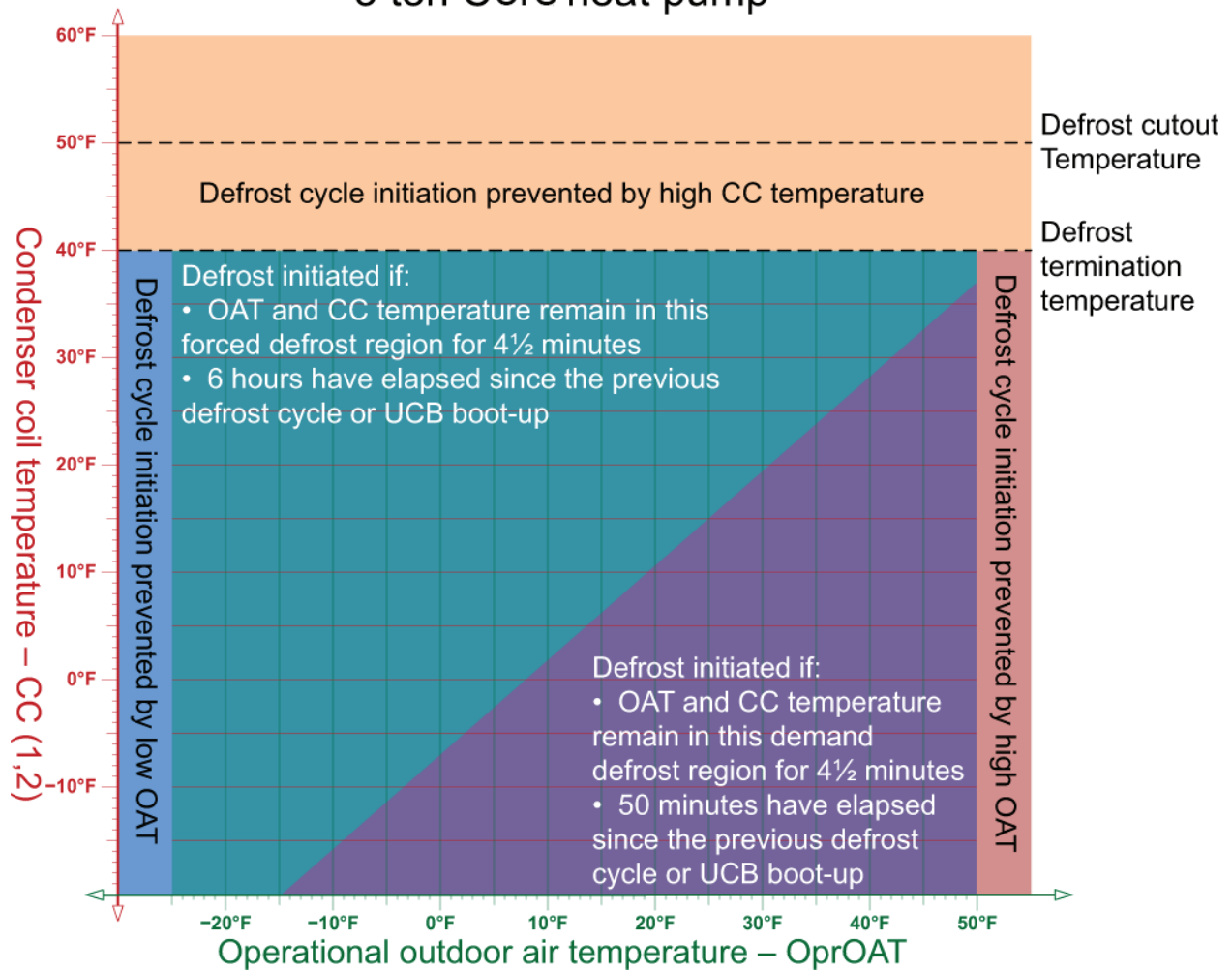


Figure 20: Smart Equipment defrost curve selection 6 - 4 ton Core heat pump

SMART Equipment defrost curve selection 6 4 ton Core heat pump

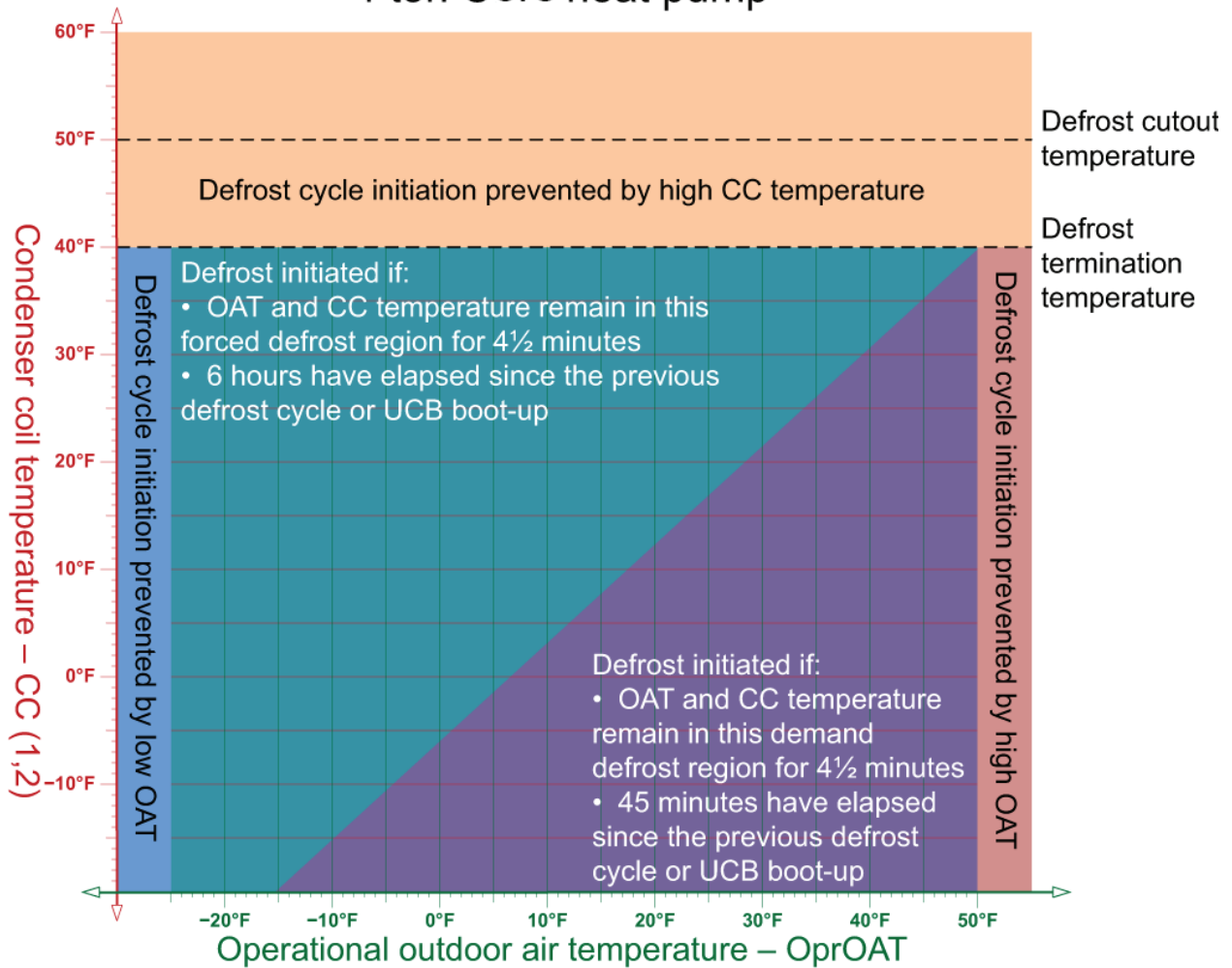
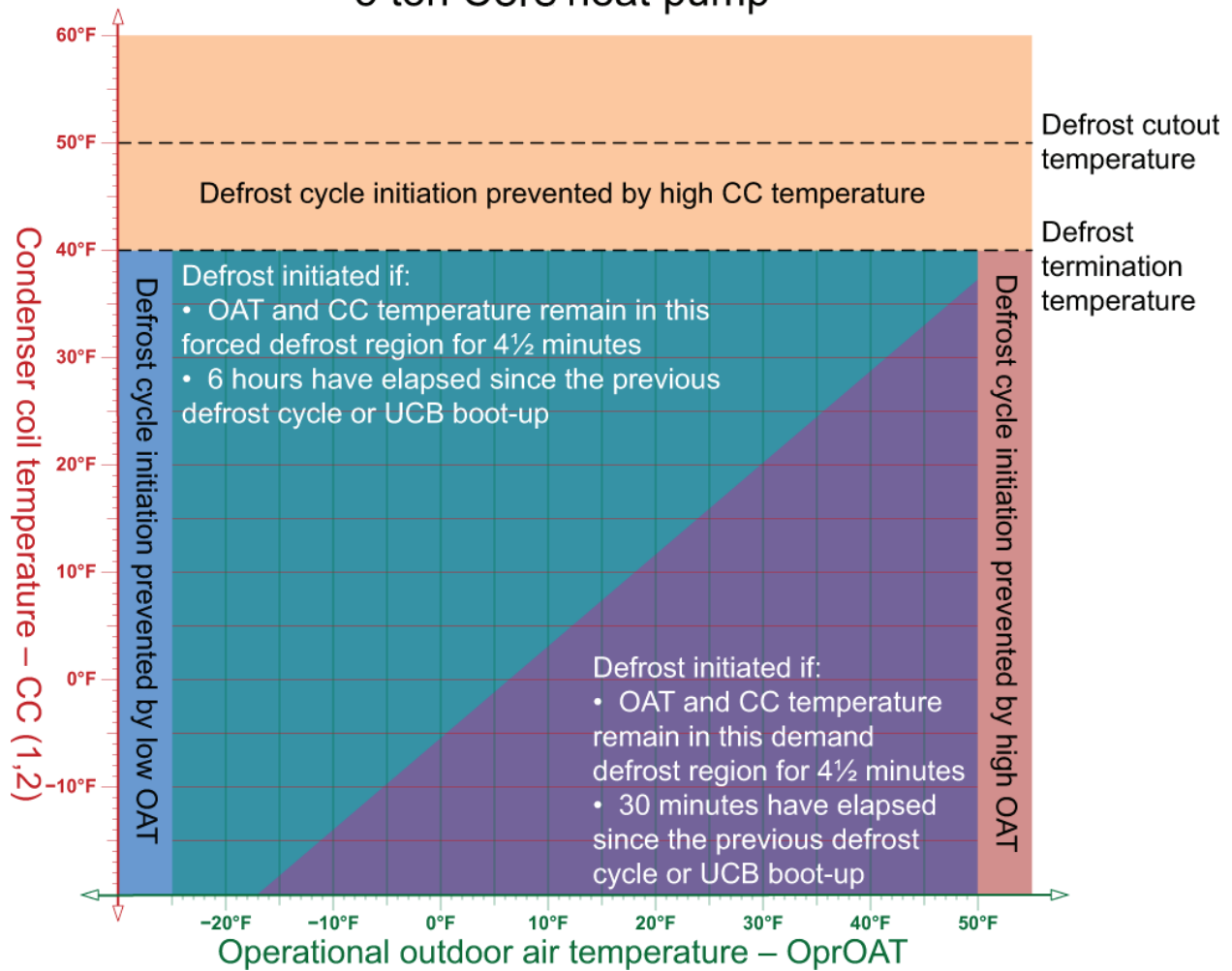


Figure 21: Smart Equipment defrost curve selection 6 - 5 ton Core heat pump

SMART Equipment defrost curve selection 6 5 ton Core heat pump



- ① **Note:** There is a $\pm 1^\circ\text{F}$ tolerance between demand defrost and forced defrost regions for defrost cycle initiation, the diagonal line in the figures.