

No. B14 - 01  
July 23, 2014

## Determining ASHRAE 90.1-2010 Climate Zones

**ASHRAE 90.1-2010 Energy Standard for Buildings Except Low-Rise Residential Buildings** requirements are based on the environmental conditions of the proposed building location. ASHRAE 90.1-2010 requires four climatic values to define the environmental conditions of a proposed building location:

- Heating Degree-Days below 18°C
- Cooling Degree-Days above 10°C
- Monthly Mean Temperature
- Monthly Precipitation

Thresholds for each of these climatic values have been established in order to group environmental conditions into various zones. Table B-4 *International Climate Zone Definitions* in ASHRAE 90.1-2010 (see Appendix) provides the calculation formula for establishing Climate Zones based on these four climatic values. The assigned Climate Zone dictates energy efficiency requirements appropriate to the locations.

The BC Building Code states that the authority having jurisdiction (AHJ) can establish climatic values<sup>1</sup> for use in the calculation formula provided in Table B-4. A common approach is for AHJs to use Heating Degree-Days below 18°C from listed locations (or in the absence of a specific listing, neighbouring locations) within Table C-2 *Design Data for Selected Locations in Canada* of the BC Building Code, and apply them broadly to all construction within their jurisdiction<sup>2</sup>.

Values for cooling degree-days above 10°C, monthly mean temperature, and monthly precipitation however are not provided in Table C-2. These values can be modelled by Environment Canada based on latitude and longitude as a fee-based service. Alternatively, the AHJ can obtain raw climatic data from select weather stations (available on Environment Canada's website: [www.climate.weather.gc.ca](http://www.climate.weather.gc.ca)), and map appropriate values based on geographic proximity and local experience. It would be reasonable if an AHJ established a set of these three values and likewise apply them broadly within their jurisdiction.

If the AHJ chooses not to establish climatic values, the building designer must obtain the climatic values by selecting the appropriate values from Table C-2 of the BC Building Code and by contacting Atmospheric Environment Service, Environment Canada, 4905 Dufferin Street, Toronto, Ontario M3H 5T4, 416-739-4365.

<sup>1</sup> 2012 BC Building Code Sentence B.1.1.3.1.(1) The climate and seismic values required for the design of *buildings* under this Code shall be in conformance with the values established by the *authority having jurisdiction* or, in the absence of such data, with Sentence (2) and the climatic and seismic values in Appendix C.

<sup>2</sup> Some of the climatic values listed in Table C-2 have been interpolated or modelled from data collected at weather stations to better represent locations where construction is most predominant.

## Frequently Asked Questions

Question 1: Can I use the climate zones established in the 2011 National Energy Code for Buildings (NECB) as the climate zones for applying ASHRAE 90.1-2010?

Answer: No, ASHRAE climate zones are not the same as the zones defined in the 2011 NECB. The thresholds for defining these zones are derived from different values.

Question 2: The AHJ is suggesting a climate zone to use when designing my building. Do I have to use it?

Answer: Some AHJs complete the calculations in ASHRAE 90.1-2010 Table B-4 based on their established climatic values. This is appropriately done as a combination of a service to designers and as an exercise of their authority under Sentence B.1.1.3.1.(1).

Question 3: Section 5.1.4.2 of ASHRAE 90.1-2010 instructs you to use the climate zones for some Canadian locations shown in Table B-2 *Canadian Climate Zones* of Appendix B (of ASHRAE 90.1-2010). If my location is shown in Table B-2, can I use the climate zone given in the standard?

Answer: The climate zones listed in Table B-2 have been derived in collaboration with Environment Canada (from the values reported in Table D-2 *Canadian Climatic Data* of ASHRAE 90.1-2010) and can be viewed as a credible source. However, if the AHJ has established climatic values that differ from those given in the standard; it is the values from the AHJ that take precedence<sup>3</sup>. It should be noted that Table B-2 does not include the climate zone letter often required to identify the zone.

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<sup>3</sup> 2012 BC Building Code Sentence A.1.5.1.2.(1) In the case of conflict between the provisions of this Code and those of a referenced document, the provisions of this Code shall govern.

## Appendix

**ASHRAE 90.1-2010 Table B-4 International Climate Zone Definitions**

International Climate Zone Definitions Zone Number	Zone Name	Thermal Criteria (I-P Units)	Thermal Criteria (SI Units)
1A and 1B	Very Hot – Humid (1A) Dry (1B)	9000 < CDD50°F	5000 < CDD10°C
2A and 2B	Hot-Humid (2A) Dry (2B)	6300 < CDD50°F ≤ 9000	3500 < CDD10°C ≤ 5000
3A and 3B	Warm – Humid (3A) Dry (3B)	4500 < CDD50°F ≤ 6300	2500 < CDD10°C < 3500
3C	Warm – Marine (3C)	CDD50°F ≤ 4500 AND HDD65°F ≤ 3600	CDD10°C ≤ 2500 AND HDD18°C ≤ 2000
4A and 4B	Mixed-Humid (4A) Dry (4B)	CDD50°F ≤ 4500 AND 3600 < HDD65°F ≤ 5400	CDD10°C ≤ 2500 AND HDD18°C ≤ 3000
4C	Mixed – Marine (4C)	3600 < HDD65°F ≤ 5400	2000 < HDD18°C ≤ 3000
5A, 5B, and 5C	Cool-Humid (5A) Dry (5B) Marine (5C)	5400 < HDD65°F ≤ 7200	3000 < HDD18°C ≤ 4000
6A and 6B	Cold – Humid (6A) Dry (6B)	7200 < HDD65°F ≤ 9000	4000 < HDD18°C ≤ 5000
7	Very Cold	9000 < HDD65°F ≤ 12600	5000 < HDD18°C ≤ 7000
8	Subarctic	12600 < HDD65°F	7000 < HDD18°C

*Marine (C) definition* – Locations meeting all four of the following criteria:

1. Mean temperature of coldest month between 27°F (-3°C) and 65°F (18°C)
2. Warmest month mean < 72°F (22°C)
3. At least four months with mean temperatures over 50°F (10°C)
4. Dry season in summer. The month with the heaviest precipitation in the cold season has at least three times as much precipitation as the month with the least precipitation in the rest of the year. The cold season is October through March in the Northern Hemisphere and April through September in the Southern Hemisphere.

*Dry (B) definition* – Locations meeting the following criteria:

Not marine and

$$P < 0.44 \times (T - 19.5) \text{ [I-P units]}$$

$$P < 2.0 \times (T + 7) \text{ [SI units]}$$

Where:

$P$  = annual precipitation in inches (cm) and

$T$  = annual mean temperature in °F (°C).

*Moist (A) definition* – Locations that are not marine and not dry.