Site-Specific 10-yr. Wind Pressure Report (V2.1 2016-01-04 Format)

Site Information:

Name: Yellowknife, YT
Latitude: 62° 30' 15.6" N
Longitude: 114° 16' 52.8" W
Tower Height (m): 91.4
Elevation MSL (m): 168

Results:

Note: **Following direction from the S37 Committee, Qe can no longer be provided.**

Q_{nbc} (Pa): 360 $\qquad$ $Q_{nbc} = 360(Z/10)^{0.2}$ $\qquad$ $V_{nbc} = 52.79$ mph

Icing: As per CAN/CSA S37-13

Q_{Min} (Pa) 250 $\qquad$ $Q_{Min} = 250(Z/10)^{0.2}$ $\qquad$ $V_{Min} = 43.99$ mph

Wind Pressure Formula (for z in metres and result in Pa):

$$Q_h = 0.12919 \{[0.0000\ e^{(-0.0000\ z)} + 1.0000\ ln(z/0.3000) / ln(z/0.3000)]\ 46.92\}^2\ (z/10)^{0.259}$$

Profile Formula General Form:

$$Q_h = 0.12919 \{[a_1\ e^{(-a2\ z)} + a_3\ ln(z/z_h) / ln(z/z_{01})]\ v_{01}\}^2\ (z/10)^{0.259}$$

Site Values of Coefficients:

$$a_1 = 0.0000,\ a_2 = 0.0000,\ a_3 = 1.0000,\ z_h = 0.3000,\ z_{01} = 0.3000,\ v_{01} = 46.92\ mph$$

Definitions

Tower Height: Height of the tower from ground level at the base of the tower to the top of the structure.

Q_{nbc}: Regionally representative reference wind pressure at 10 m in the format of the National Building Code of Canada and the Q_{nbc} value is profiled with the $^2/_{10}$ power law.

Q_{Min}: Minimum reference wind pressure (320 Pa, 300 Pa, and 250 Pa for the 50-year, 30-year, and 10-year return periods respectively) profiled with the $^2/_{10}$ power law as per Section 5.4.1 of S37-13.

Wind Pressure Formula: Formula for the design wind pressure as a function of height. (Ref.: S37-13, 5.3.1)
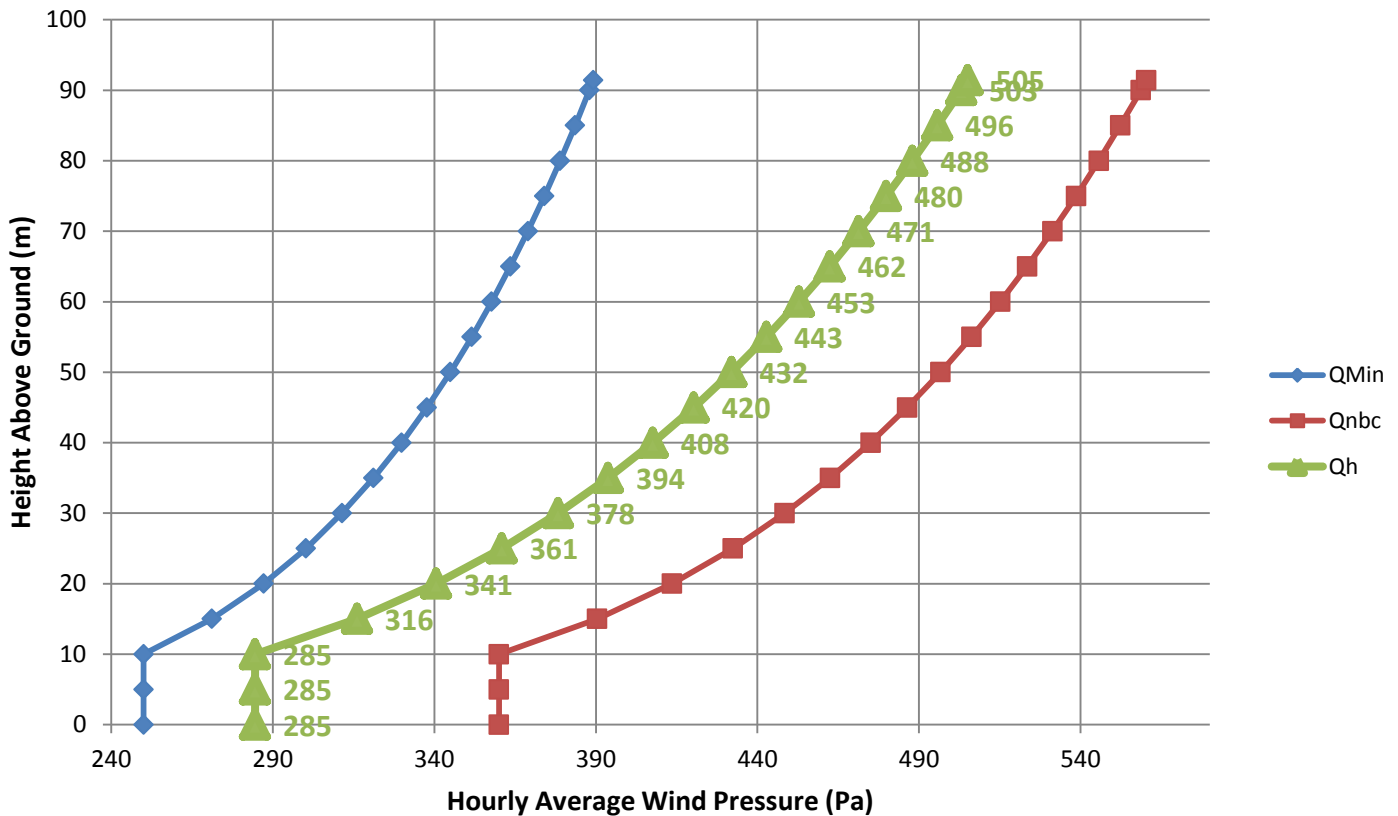**Height (Z):** the vertical distance (m) above ground level at the base of the tower.

Note: No wind pressure value less than 90% of the value at 10 m should be used for heights less than 10 m a.g.l.

These wind pressures were evaluated using a version of the methods described by Taylor and Lee (1984) "Simple Guidelines for Estimating Wind Speed Variations Due to Small Scale Topographic Features", Climatological Bulletin 18 2, using the Boyd (1969) analysis of thirty year return period wind speeds (which is also used for the National Building Code of Canada), modified by a technique described by Wieringa (1980) "Representativeness of Wind Observations at Airports" Bulletin of the American Meteorological Society, 61 9, as input data. The uncertainty in NBCC regionally representative reference wind pressures is about [+15%,-15%].

10-yr. Wind Pressure Profile Graph for Yellowknife, YT 91.4m Tower

Q_{nbc} Profile: Regionally representative reference wind profiled with the $^2/_{10}$ power law.

Q_{Min} Profile: Minimum site-specific wind pressure (320 Pa, 300 Pa, and 250 Pa for the 50-year, 30-year, and 10-year return periods respectively) profiled with the $^2/_{10}$ power law.

Q_h.Profile: The site-specific wind pressure profile directly from the Taylor and Lee (1984) simple guidelines.

Explanatory notes regarding the new report format and changes to calculation methods.
1. The most significant change from the previous versions of the reports is that the exponent used in the Q_h equation is no longer fixed at 0.2. The exponent now varies continuously from 0.2 for open terrain to 0.32 for closed terrain.
2. A new Q_{min} profile has been added to the graphs and it represents the minimum acceptable reference wind pressure profile. It starts with the minimum 10-metre reference wind pressure of 320 Pa for a 50-year return period as per section 5.4.1 of S37-13 and then uses the same $^2/_{10}$ power law formulation as the Q_{NBC} profile to generate the curve. The corresponding 10-metre reference wind pressures for the 10-year and 30-year return periods are 250 Pa and 300 Pa respectively.
3. Q_h will always be plotted even when they are less than Q_{Min}. This will allow designers to see how Q_h varies over the height of the tower. Also, in rough terrain and for taller towers, the Q_h profile might cross the Q_{Min} profile.
4. The coefficients for the Q_h equation will now always be given regardless of the Q_{NBC} or Q_{Min} values.
5. The wind speeds will be given for each of the 4 equations (Q_h, Q_{NBC}, or Q_{Min}) too.

Site-Specific 30-yr. Wind Pressure Report (V2.1 2016-01-04 Format)

Site Information:

Name: Yellowknife, YT
Latitude: 62° 30' 15.6" N
Longitude: 114° 16' 52.8" W
Tower Height (m): 91.4
Elevation MSL (m): 168

Results:

Note: **Following direction from the S37 Committee, Qe can no longer be provided.**

Q_{nbc} (Pa): 430	$Q_{nbc} = 430(Z/10)^{0.2}$	$V_{nbc} = 57.69$ mph
Icing: As per CAN/CSA S37-13		
Q_{Min} (Pa) 300	$Q_{Min} = 300(Z/10)^{0.2}$	$V_{Min} = 48.19$ mph

Wind Pressure Formula (for z in metres and result in Pa):

$$Q_h = 0.12919 \{[0.0000 \ e^{(-0.0000 \ z)} + 1.0000 \ ln(z/0.3000) / ln(z/0.3000)] \ 51.35\}^2 \ (z/10)^{0.259}$$

Profile Formula General Form:

$$Q_h = 0.12919 \{[a_1 \ e^{(-a2 \ z)} + a_3 \ ln(z/z_h) / ln(z/z_{01})] \ v_{01}\}^2 \ (z/10)^{0.259}$$

Site Values of Coefficients:

$$a_1 = 0.0000, \ a_2 = 0.0000, \ a_3 = 1.0000, \ z_h = 0.3000, \ z_{01} = 0.3000, \ v_{01} = 51.35 \ mph$$

Definitions

Tower Height: Height of the tower from ground level at the base of the tower to the top of the structure.

Q_{nbc}: Regionally representative reference wind pressure at 10 m in the format of the National Building Code of Canada and the Q_{nbc} value is profiled with the $^2/_{10}$ power law.

Q_{Min}: Minimum reference wind pressure (320 Pa, 300 Pa, and 250 Pa for the 50-year, 30-year, and 10-year return periods respectively) profiled with the $^2/_{10}$ power law as per Section 5.4.1 of S37-13.

Wind Pressure Formula: Formula for the design wind pressure as a function of height. (Ref.: S37-13, 5.3.1)
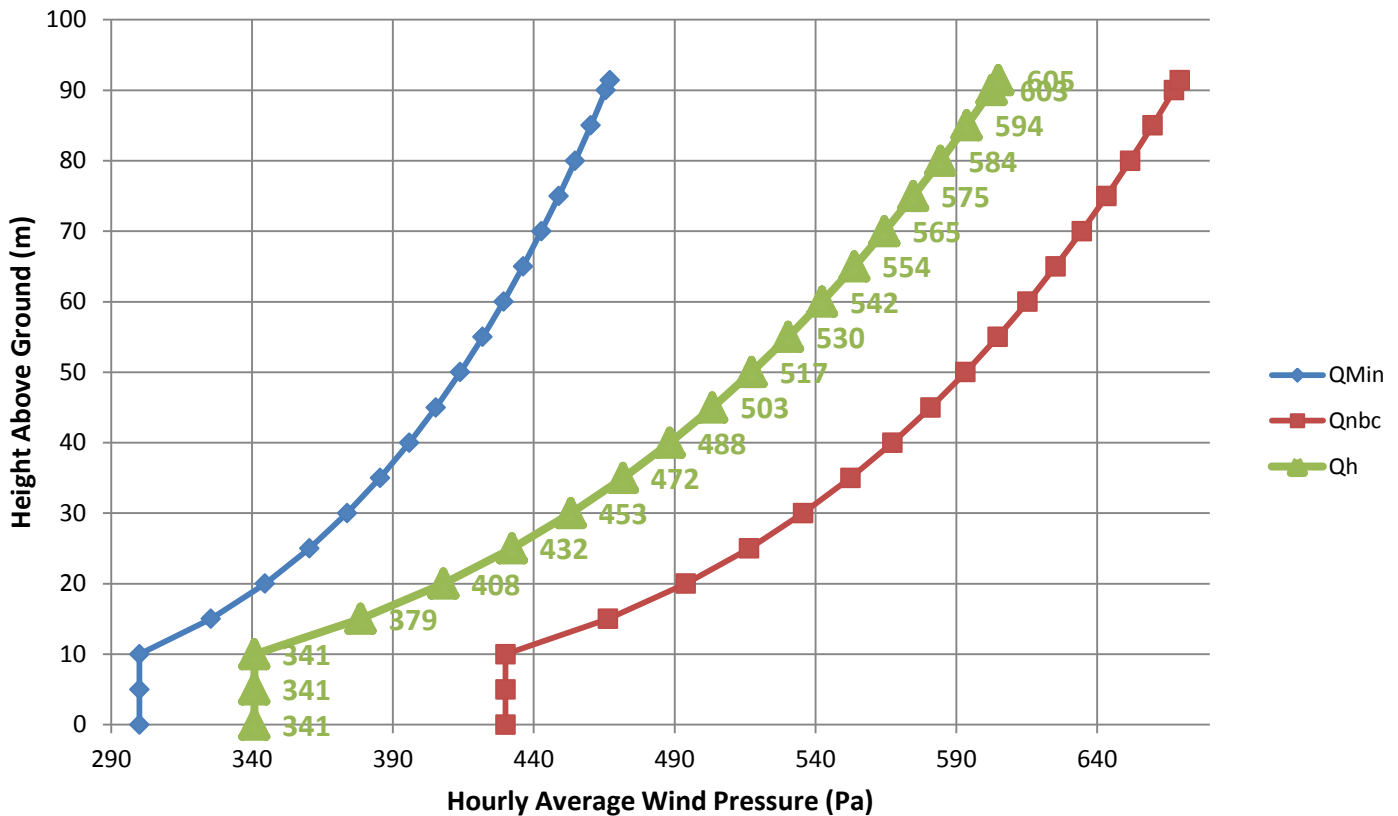
Height (Z): the vertical distance (m) above ground level at the base of the tower.

Note: No wind pressure value less than 90% of the value at 10 m should be used for heights less than 10 m a.g.l.

These wind pressures were evaluated using a version of the methods described by Taylor and Lee (1984) "Simple Guidelines for Estimating Wind Speed Variations Due to Small Scale Topographic Features", Climatological Bulletin 18 2, using the Boyd (1969) analysis of thirty year return period wind speeds (which is also used for the National Building Code of Canada), modified by a technique described by Wieringa (1980) "Representativeness of Wind Observations at Airports" Bulletin of the American Meteorological Society, 61 9, as input data. The uncertainty in NBCC regionally representative reference wind pressures is about [+15%,-15%].

30-yr. Wind Pressure Profile Graph for Yellowknife, YT 91.4m Tower

Q_{nbc} Profile: Regionally representative reference wind profiled with the $^2/_{10}$ power law.
Q_{Min} Profile: Minimum site-specific wind pressure (320 Pa, 300 Pa, and 250 Pa for the 50-year, 30-year, and 10-year return periods respectively) profiled with the $^2/_{10}$ power law.
Q_h.Profile: The site-specific wind pressure profile directly from the Taylor and Lee (1984) simple guidelines.

Explanatory notes regarding the new report format and changes to calculation methods.
1. The most significant change from the previous versions of the reports is that the exponent used in the Q_h equation is no longer fixed at 0.2. The exponent now varies continuously from 0.2 for open terrain to 0.32 for closed terrain.
2. A new Q_{min} profile has been added to the graphs and it represents the minimum acceptable reference wind pressure profile. It starts with the minimum 10-metre reference wind pressure of 320 Pa for a 50-year return period as per section 5.4.1 of S37-13 and then uses the same $^2/_{10}$ power law formulation as the Q_{NBC} profile to generate the curve. The corresponding 10-metre reference wind pressures for the 10-year and 30-year return periods are 250 Pa and 300 Pa respectively.
3. Q_h will always be plotted even when they are less than Q_{Min}. This will allow designers to see how Q_h varies over the height of the tower. Also, in rough terrain and for taller towers, the Q_h profile might cross the Q_{Min} profile.
4. The coefficients for the Q_h equation will now always be given regardless of the Q_{NBC} or Q_{Min} values.
5. The wind speeds will be given for each of the 4 equations (Q_h, Q_{NBC}, or Q_{Min}) too.

Site-Specific 50-yr. Wind Pressure Report (V2.1 2016-01-04 Format)

Site Information:

Name: Yellowknife, YT
Latitude: 62° 30' 15.6" N
Longitude: 114° 16' 52.8" W
Tower Height (m): 91.4
Elevation MSL (m): 168

Results:

Note: **Following direction from the S37 Committee, Qe can no longer be provided.**

Q_{nbc} (Pa): 470	$Q_{nbc} = 470(Z/10)^{0.2}$	$V_{nbc} = 60.32$ mph
Icing: As per CAN/CSA S37-13		
Q_{Min} (Pa) 320	$Q_{Min} = 320(Z/10)^{0.2}$	$V_{Min} = 49.77$ mph

Wind Pressure Formula (for z in metres and result in Pa):

$$Q_h = 0.12919 \{[0.0000\ e^{(-0.0000\ z)} + 1.0000\ ln(z/0.3000) / ln(z/0.3000)]\ 53.38\}^2\ (z/10)^{0.259}$$

Profile Formula General Form:

$$Q_h = 0.12919 \{[a_1\ e^{(-a2\ z)} + a_3\ ln(z/z_h) / ln(z/z_{01})]\ v_{01}\}^2\ (z/10)^{0.259}$$

Site Values of Coefficients:

$$a_1 = 0.0000,\ a_2 = 0.0000,\ a_3 = 1.0000,\ z_h = 0.3000,\ z_{01} = 0.3000,\ v_{01} = 53.38\ mph$$

Definitions

Tower Height: Height of the tower from ground level at the base of the tower to the top of the structure.

Q_{nbc}: Regionally representative reference wind pressure at 10 m in the format of the National Building Code of Canada and the Q_{nbc} value is profiled with the $^2/_{10}$ power law.

Q_{Min}: Minimum reference wind pressure (320 Pa, 300 Pa, and 250 Pa for the 50-year, 30-year, and 10-year return periods respectively) profiled with the $^2/_{10}$ power law as per Section 5.4.1 of S37-13.

Wind Pressure Formula: Formula for the design wind pressure as a function of height. (Ref.: S37-13, 5.3.1)
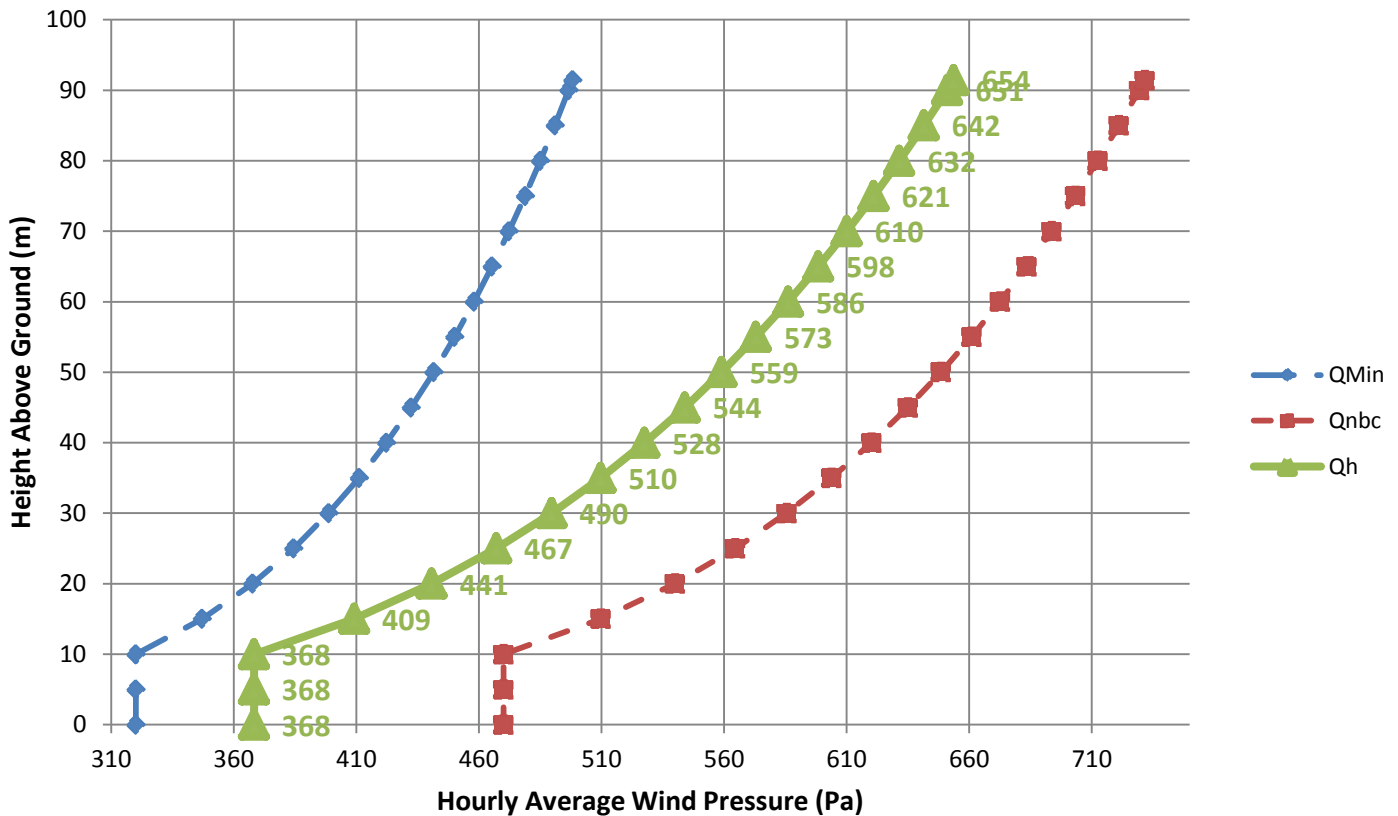
Height (Z): the vertical distance (m) above ground level at the base of the tower.

Note: No wind pressure value less than 90% of the value at 10 m should be used for heights less than 10 m a.g.l.

These wind pressures were evaluated using a version of the methods described by Taylor and Lee (1984) "Simple Guidelines for Estimating Wind Speed Variations Due to Small Scale Topographic Features", Climatological Bulletin 18 2, using the Boyd (1969) analysis of thirty year return period wind speeds (which is also used for the National Building Code of Canada), modified by a technique described by Wieringa (1980) "Representativeness of Wind Observations at Airports" Bulletin of the American Meteorological Society, 61 9, as input data. The uncertainty in NBCC regionally representative reference wind pressures is about [+15%,-15%].

50-yr. Wind Pressure Profile Graph for Yellowknife, YT 91.4m Tower

Q_{nbc} Profile: Regionally representative reference wind profiled with the $^2/_{10}$ power law.
Q_{Min} Profile: Minimum site-specific wind pressure (320 Pa, 300 Pa, and 250 Pa for the 50-year, 30-year, and 10-
   year return periods respectively) profiled with the $^2/_{10}$ power law.
Q_h.Profile: The site-specific wind pressure profile directly from the Taylor and Lee (1984) simple guidelines.

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    equation is no longer fixed at 0.2. The exponent now varies continuously from 0.2 for open terrain to 0.32 for
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    pressure profile. It starts with the minimum 10-metre reference wind pressure of 320 Pa for a 50-year return
    period as per section 5.4.1 of S37-13 and then uses the same $^2/_{10}$ power law formulation as the Q_{NBC} profile to
    generate the curve. The corresponding 10-metre reference wind pressures for the 10-year and 30-year return
    periods are 250 Pa and 300 Pa respectively.
3. Q_h will always be plotted even when they are less than Q_{Min}. This will allow designers to see how Q_h varies over
    the height of the tower. Also, in rough terrain and for taller towers, the Q_h profile might cross the Q_{Min} profile.
4. The coefficients for the Q_h equation will now always be given regardless of the Q_{NBC} or Q_{Min} values.
5. The wind speeds will be given for each of the 4 equations (Q_h, Q_{NBC}, or Q_{Min}) too.