

**(Effective until March 15, 2024)**

**WAC 51-11R-40215 Target/Proposed UA equations.**

**EQUATION 1 - GROUP R OCCUPANCY**

**TARGET UA**

$$UA_T = U_W A_W + U_{BGW} A_{BGW} + U_{VG} A_{VG} + U_{OG} A_{OG} + U_F A_F + U_{RC} A_{RC} + U_D A_D + F_S P_S + F_{BGS} P_{BGS}$$

**Where:**

- $UA_T$  = The target combined thermal transmittance of the gross exterior wall, floor and roof/ceiling area.
- $U_W$  = The thermal transmittance value of the opaque above grade wall found in Table R402.1.3.
- $A_W$  = Opaque above grade wall area.
- $U_{BGW}$  = The thermal transmittance value of the below grade opaque wall found in Table R402.1.3.
- $A_{BGW}$  = Opaque below grade wall area.
- $U_{VG}$  = The thermal transmittance value of the fenestration found in Table R402.1.3.
- $A_{VG}$  = (a) The proposed glazing area; where proposed fenestration glazing area is less than 15 percent of the conditioned floor area, minus  $A_{OG}$ .  
(b) 15 percent of the conditioned floor area; where the proposed fenestration glazing area is 15 percent or more of the conditioned floor area, minus  $A_{OG}$ .
- $U_{OG}$  = The thermal transmittance value of the skylight glazing found in Table R402.1.3.
- $A_{OG}$  = Skylight glazing area (if the proposed  $A_{OG}$  exceeds 15 percent, the target  $A_{OG}$  shall be 15 percent of the total floor area of the conditioned space).
- $U_F$  = The thermal transmittance value of the floor found in Table R402.1.3.
- $A_F$  = Floor area over unconditioned space.
- $U_{RC}$  = The thermal transmittance value of the ceiling found in Table R402.1.3.
- $A_{RC}$  = Roof/ceiling area.
- $U_D$  = The thermal transmittance value of the fenestration found in Table R402.1.3.
- $A_D$  = Opaque door area.
- $F_S$  = Concrete slab on grade component  $F$ -factor found in Table R402.1.3.
- $P_S$  = Lineal ft. of concrete slab on grade perimeter.
- $F_{BGS}$  = Concrete below grade slab component  $F$ -factor found in Table R402.1.3.
- $P_{BGS}$  = Lineal ft. of concrete below grade slab perimeter.

**EQUATION 2 - GROUP R OCCUPANCY**

**PROPOSED UA**

$$UA = U_W A_W + U_{BGW} A_{BGW} + U_{VG} A_{VG} + U_{OG} A_{OG} + U_F A_F + U_{RC} A_{RC} + U_D A_D + F_S P_S + F_{BGS} P_{BGS}$$

**Where:**

- $UA$  = The combined thermal transmittance of the gross exterior wall, floor and roof/ceiling assembly area.
- $U_W$  = The thermal transmittance of the opaque above grade wall area.
- $A_W$  = Opaque above grade wall area.
- $U_{BGW}$  = The thermal transmittance value of the below grade opaque wall.
- $A_{BGW}$  = Opaque below grade wall area.
- $U_{VG}$  = The thermal transmittance value of the fenestration glazing.
- $A_{VG}$  = Fenestration glazing area, including windows in exterior doors.
- $U_{OG}$  = The thermal transmittance value of the skylight glazing.
- $A_{OG}$  = Skylight glazing area.
- $U_F$  = The thermal transmittance of the floor.
- $A_F$  = Floor area over unconditioned space.

- $U_{RC}$  = The thermal transmittance of the ceiling.
- $A_{RC}$  = Ceiling area.
- $U_D$  = The thermal transmittance value of the opaque door area.
- $A_D$  = Opaque door area.
- $F_S$  = Concrete slab on grade component  $F$ -factor.
- $P_S$  = Lineal ft. of concrete slab on grade perimeter.
- $F_{BGS}$  = Concrete below grade slab component  $F$ -factor.
- $P_{BGS}$  = Lineal ft. of concrete below grade slab perimeter.

NOTE: Where more than one type of wall, window, roof/ceiling, door and skylight is used, the  $U$  and  $A$  terms for those items shall be expanded into subelements as:

$$U_{W1}A_{W1} + U_{W2}A_{W2} + U_{W3}A_{W3} + \dots\text{etc.}$$

NOTE: Below grade walls: The wall is assumed to extend from the slab upward to the top of the mud sill for the distance specified in Table A104.1, with 6 inches of concrete wall extending above grade. This will be calculated separately from above grade walls using the wall height that best describes the system.

[Statutory Authority: RCW 19.27A.020, 19.27A.045, 19.27A.160 and chapter 19.27 RCW. WSR 20-01-047, § 51-11R-40215, filed 12/9/19, effective 7/1/20.]

**(Effective March 15, 2024)**

**WAC 51-11R-40215 Target/Proposed UA equations.**

**EQUATION 1 - GROUP R OCCUPANCY  
TARGET UA**

$$U_{AT} = U_W A_W + U_{BGW} A_{BGW} + U_{VG} A_{VG} + U_{OG} A_{OG} + U_F A_F + U_{RC} A_{RC} + U_D A_D + F_S P_S + F_{BGS} P_{BGS}$$

**Where:**

- $U_{AT}$  = The target combined thermal transmittance of the gross exterior wall, floor and roof/ceiling area.
- $U_W$  = The thermal transmittance value of the opaque above grade wall found in Table R402.1.2.
- $A_W$  = Opaque above grade wall area.
- $U_{BGW}$  = The thermal transmittance value of the below grade opaque wall found in Table R402.1.2.
- $A_{BGW}$  = Opaque below grade wall area.
- $U_{VG}$  = The thermal transmittance value of the fenestration found in Table R402.1.2.
- $A_{VG}$  = (a) The proposed glazing area; where proposed fenestration glazing area is less than 15 percent of the conditioned floor area, minus  $A_{OG}$ .  
(b) 15 percent of the conditioned floor area; where the proposed fenestration glazing area is 15 percent or more of the conditioned floor area, minus  $A_{OG}$ .
- $U_{OG}$  = The thermal transmittance value of the skylight glazing found in Table R402.1.2.
- $A_{OG}$  = Skylight glazing area (if the proposed  $A_{OG}$  exceeds 15 percent, the target  $A_{OG}$  shall be 15 percent of the total floor area of the conditioned space).
- $U_F$  = The thermal transmittance value of the floor found in Table R402.1.2.
- $A_F$  = Floor area over unconditioned space.
- $U_{RC}$  = The thermal transmittance value of the ceiling found in Table R402.1.2.
- $A_{RC}$  = Roof/ceiling area.
- $U_D$  = The thermal transmittance value of the fenestration found in Table R402.1.2.
- $A_D$  = Opaque door area.
- $F_S$  = Concrete slab on grade component  $F$ -factor found in Table R402.1.2.
- $P_S$  = Lineal ft. of concrete slab on grade perimeter.

- $F_{BGS}$  = Concrete below grade slab component  $F$ -factor found in Table R402.1.2.
- $P_{BGS}$  = Lineal ft. of concrete below grade slab perimeter.

**EQUATION 2 - GROUP R OCCUPANCY  
PROPOSED UA**

$$UA = U_W A_W + U_{BGW} A_{BGW} + U_{VG} A_{VG} + U_{OG} A_{OG} + U_F A_F + U_{RC} A_{RC} + U_D A_D + F_S P_S + F_{BGS} P_{BGS}$$

**Where:**

- $UA$  = The combined thermal transmittance of the gross exterior wall, floor and roof/ceiling assembly area.
- $U_W$  = The thermal transmittance of the opaque above grade wall area.
- $A_W$  = Opaque above grade wall area.
- $U_{BGW}$  = The thermal transmittance value of the below grade opaque wall.
- $A_{BGW}$  = Opaque below grade wall area.
- $U_{VG}$  = The thermal transmittance value of the fenestration glazing.
- $A_{VG}$  = Fenestration glazing area, including windows in exterior doors.
- $U_{OG}$  = The thermal transmittance value of the skylight glazing.
- $A_{OG}$  = Skylight glazing area.
- $U_F$  = The thermal transmittance of the floor.
- $A_F$  = Floor area over unconditioned space.
- $U_{RC}$  = The thermal transmittance of the ceiling.
- $A_{RC}$  = Ceiling area.
- $U_D$  = The thermal transmittance value of the opaque door area.
- $A_D$  = Opaque door area.
- $F_S$  = Concrete slab on grade component  $F$ -factor.
- $P_S$  = Lineal ft. of concrete slab on grade perimeter.
- $F_{BGS}$  = Concrete below grade slab component  $F$ -factor.
- $P_{BGS}$  = Lineal ft. of concrete below grade slab perimeter.

NOTE: Where more than one type of wall, window, roof/ceiling, door and skylight is used, the  $U$  and  $A$  terms for those items shall be expanded into subelements as:

$$U_{W1} A_{W1} + U_{W2} A_{W2} + U_{W3} A_{W3} + \dots \text{etc.}$$

NOTE: Below grade walls: The wall is assumed to extend from the slab upward to the top of the mud sill for the distance specified in Table A104.1, with 6 inches of concrete wall extending above grade. This will be calculated separately from above grade walls using the wall height that best describes the system.

[Statutory Authority: RCW 19.27A.020, 19.27A.045, 19.27A.160, and chapter 19.27A RCW. WSR 23-02-060, 23-12-102, and 23-20-022, § 51-11R-40215, filed 1/3/23, 6/7/23, and 9/25/23, effective 3/15/24. Statutory Authority: RCW 19.27A.020, 19.27A.045, 19.27A.160 and chapter 19.27 RCW. WSR 20-01-047, § 51-11R-40215, filed 12/9/19, effective 7/1/20.]