



OVERALL ENVELOPE TDV ENERGY APPROACH

ENV-3C
 (Page 1 of 8)

| | | |
|---------------|-------|---------------|
| Project Name: | Date: | Climate Zone: |
|---------------|-------|---------------|

WINDOW RATIO CALCULATION §143(b)

| | | | | |
|-----------------------------------|--|--------------------------|-----------------|---------------------------------|
| A. TOTAL LINEAR DISPLAY PERIMETER | | FT × 6 FT = | ft ² | DISPLAY AREA |
| B. TOTAL GROSS EXTERIOR WALL AREA | | ft ² × 0.40 = | ft ² | 40% of GROSS EXTERIOR WALL AREA |
| C. ENTER LARGER OF (A or B) | | | ft ² | MAXIMUM STANDARD AREA |
| D. ENTER PROPOSED WINDOW AREA | | | ft ² | PROPOSED AREA |

If the Proposed Window Area is greater than the Maximum Standard Area, then go to Window Adjustment step below.

E. WINDOW WALL RATIO = (Row D) Divided by (Row B) = Must meet RSHG in Table 143-A, 143-B, or 143-C

WEST WINDOW RATIO CALCULATION

| | | | | |
|------------------------------------|--|--------------------------|-----------------|--------------------------------|
| F. WEST LINEAR DISPLAY PERIMETER | | FT × 6 FT = | ft ² | WEST DISPLAY AREA |
| G. WEST EXTERIOR WALL AREA | | ft ² × 0.40 = | ft ² | 40% of WEST EXTERIOR WALL AREA |
| H. ENTER LARGER OF (F or G) | | | ft ² | MAXIMUM STANDARD WEST AREA |
| I. ENTER PROPOSED WEST WINDOW AREA | | | ft ² | PROPOSED WEST WINDOW AREA |

If the Proposed West Window Area is greater than the Maximum Standard West Area, then Go to Window Adjustment step below.

J. WINDOW WALL RATIO = (Row I) Divided by (Row G) = Must meet RSHG in Table 143-A, 143-B, or 143-C

Combined Area for North, East and South Walls

| | | | | |
|--|--|--------------------------|-----------------|----------------------------------|
| K. N/E/S DISPLAY PERIMETER (A Minus F) | | FT × 6 FT = | ft ² | N/E/S of WEST EXTERIOR WALL AREA |
| L. N/E/S EXTERIOR WALL AREA (B Minus G) | | ft ² × 0.40 = | ft ² | 40% N/E/S AREA |
| M. ENTER LARGER OF K or L | | | ft ² | MAXIMUM STANDARD N/E/S/ AREA |
| N. PROPOSED N/E/S/ WINDOW AREA (D Minus I) | | | ft ² | PROPOSED N/E/S/ AREA |

Window Adjustment

O. IF D>C and/or if I>H, Proceed to the calculation Step 1 for all walls or Step 2 for West wall. If not, go to the Skylight Area Test on ENV-3C Page 6, **CALCULATE ADJUSTED AREAS.**

1. IF D>C: Use the calculated Window Adjustment Factor (WAF) for all walls.

| | | | | |
|------------------------------------|---|--------------------------------------|---|---------------------------------|
| MAX. STANDARD AREA (from C) | | PROPOSED WINDOW AREA (from D) | | WINDOW ADJUSTMENT FACTOR |
| | ÷ | | = | |

2. IF I>H: Calculate one Window Adjustment Factor (WAF) for the West wall.

| | | | | |
|------------------------------------|---|---|---|--------------------------------------|
| MAX. STANDARD AREA (from M) | | PROPOSED WEST WINDOW AREA (from I) | | WEST WINDOW ADJUSTMENT FACTOR |
| | ÷ | | = | |
| <u>MAX STANDARD</u> | | <u>PROPOSED AREA (from D)</u> | | <u>WEST WINDOW ADJUSTMENT FACTOR</u> |



OVERALL ENVELOPE TDV ENERGY APPROACH

ENV-3C
 (Page 2 of 8)

| | | |
|---------------|-------|---------------|
| Project Name: | Date: | Climate Zone: |
|---------------|-------|---------------|

| | | | | |
|--|---|--|---|--|
| | ÷ | | = | |
|--|---|--|---|--|

SKYLIGHT RATIO CALCULATION §143(b)

| | ACTUAL GROSS ROOF AREA | | MAXIMUM ALLOWED STANDARD SKYLIGHT AREA |
|---|---------------------------|--------------------------|---|
| A. IF Atrium/Skylight Height is ≤ 55 ft; or | | ft ² × 0.05 = | ft ² |
| B. IF Atrium/Skylight Height is > 55 ft | | ft ² × 0.10 = | ft ² |
| C. Proposed Skylight Area | | ft ² | |
| D. Skylight Ratio = Proposed Skylight Area (Row C) <u>Divided</u> by Actual Gross Roof Area = | | | % SRR _{Prop} |
| E. Maximum Allowed Skylight Roof Ratio = Maximum Allowed Standard Skylight Area (Row A or B) <u>Divided</u> by Total Gross Exterior Roof Area = | | | % SRR _{STD} |

IF THE PROPOSED SKYLIGHT AREA IS GREATER THAN THE STANDARD SKYLIGHT AREA PROCEED TO THE NEXT CALCULATION FOR THE SKYLIGHT AREA ADJUSTMENT. IF NOT GO TO PAGE 3 OF 6.

SKYLIGHT AREA ADJUSTMENT

IF F>D, Proceed To Calculation Step 1

Step 1. Calculated the Skylight Adjustment Factor (SAF).

| STANDARD SKYLIGHT AREA | | PROPOSED SKYLIGHT AREA (IF E = 0 ENTER 1) | | SKYLIGHT ADJUSTMENT FACTOR (SAF) |
|------------------------------|---|--|---|--|
| [] | ÷ | [] | = | [] |

CARRY THE WINDOW ADJUSTMENT FACTOR (SAF) TO PAGE 6 OF 6 TO CALCULATE THE ADJUSTED AREA



OVERALL ENVELOPE TDV ENERGY APPROACH

ENV-3C
(Page 5 of 8)

Project Name:

Date:

Climate Zone:

9. Calculate the Cool Roof, M_{CR} , first by using the next page (Page 5 of 6). Enter the value in the Proposed Column L.
10. Calculate the Overhang M_{OH} on the next page (Page 5 of 6). Enter the value in the Proposed Column M.
11. The Proposed TDV energy use for all assemblies other than roofs must be equal to or less than Standard TDV in Page 3 of 6. Therefore; $TDV_p = \text{Column D} \times [(U \text{ factor} \times CSu) + (CR_{ui} \times UR_i \times MCR_i) + (SHGCP \times CS_{si} \times MOH) + (VTP \times CSt)]$ Enter the calculated value in Column N.
12. Sum up all the Proposed TDV Energy in Column N and enter value in the cell. Similarly enter the sum of all Standard TDV Energy and compare. Proposed must be \leq to the Standard.



| | | |
|---|-------|--------------------------------|
| OVERALL ENVELOPE TDV ENERGY APPROACH | | ENV-3C (Page 6 of 8) |
| Project Name: | Date: | Climate Zone: |

| Occupancy Type and Coefficients Tables | | <input type="checkbox"/> Nonresidential, See Table NA5-3 | <input type="checkbox"/> 24-Hour Use, See Table NA5-4 | <input type="checkbox"/> Retail, See Table NA5-5 | Climate Zone: | | |
|---|-------------------|--|---|--|--|---|---------------------------------------|
| Coefficients of | | | | | | Calculation | |
| A | B | C | D | E | F | G | |
| Reflectance | Emittance | Proposed Aged Solar Reflectance | Standard Aged Solar Reflectance ¹ | Proposed Thermal Emittance | Standard Thermal Emittance | Cool Roof Multiplier ² | |
| C _{Ref} | C _{Emit} | ρ _{aged prop} | ρ _{aged std} | ε _{prop} | ε _{std} | M _{CR,I} | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| Excerpt from Table NA5-2. Where: Standard design values for Solar Reflectance and Thermal Emittance. | | | | | | Enter multiplier in Page 4 of 6 Column L. | |
| Low-Rise, Low-Sloped, CZ2 through CZ15 | | | 0.55 | 0.75 | Standard Aged Solar Reflectance (Column D) | | Standard Thermal Emittance (Column F) |
| Low-Rise, Low-Sloped, CZ1 and CZ16 | | | 0.10 | 0.75 | | | |
| High-Rise, Low-Sloped, CZ10 through CZ15 | | | 0.55 | 0.75 | | | |
| High-Rise, Low-Sloped, CZ1-9 and CZ16 | | | 0.10 | 0.75 | | | |
| Steep-Sloped, CZ2 through CZ15 | | | 0.25 | 0.75 | | | |
| Steep-Sloped, all other | | | 0.10 | 0.75 | | | |
| <p>1. Proposed Aged Design Solar Reflectance; ρ_{aged prop} = (0.7 x ρ_{init prop}) + 0.06, Where (ρ_{init prop}) reflectance value is found in the CRRC Directory. Enter results of the Cool Roof Multiplier equation in footnote 2.</p> <p>2. Cool Roof Multiplier M_{CR,I} = 1 + C_{Ref} x (ρ_{aged prop} - ρ_{aged std}) + C_{Emit} x (ε_{prop} - ε_{std}) or 1 + Col A x (Col C - Col D) + Col B x (Col E - Col F)</p> | | | | | | | |

| Occupancy Type and Coefficients Tables | | <input type="checkbox"/> Nonresidential, See Table NA5-3 | <input type="checkbox"/> 24-Hour Use, See Table NA5-4 | <input type="checkbox"/> Retail, See Table NA5-5 | Climate Zone: | |
|--|------------------------------------|--|---|--|--------------------------------|----------------------------------|
| Coefficients of | | Fenestration Overhang | | | Calculation | |
| A | B | C | D | E | F | G |
| Overhang Orientation | 1st Projection Factor ¹ | 2nd Projection Factor ¹ | Horizontal Projection (ft ²) | Vertical Distance (ft ²) | Projection Factor ² | Overhang Multiplier ³ |
| | a _i | b _i | H | V | PF | M _{OH,I} |
| | | | | | | |
| | | | | | | |
| | | | | | | |



OVERALL ENVELOPE TDV ENERGY APPROACH

ENV-3C
 (Page 8 of 8)

| | | |
|---------------|-------|---------------|
| Project Name: | Date: | Climate Zone: |
|---------------|-------|---------------|

| (e.g. Roof-1, Roof-2) | AREA | AREA | T FACTOR (From Page 2 of 6) | AREA (C×D) | (B - E) |
|-----------------------|------|------|--------------------------------|---------------|---------|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| TOTALS: | | | | | |