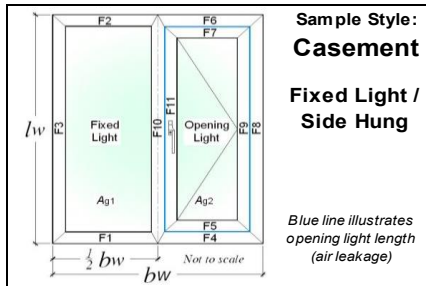


# BFRC Spreadsheet



Sample Style:  
**Casement**

Fixed Light /  
Side Hung

Blue line illustrates  
opening light length  
(air leakage)

Report Number: U19345-2      Issue No 22.3: 04/01/2016  
 Report Date: 12 September 2019  
 Project Details: Camden C70 Window - triple glazed

**THIS SPREADSHEET IS THE PROPERTY OF THE BFRC AND CAN ONLY BE USED IN CONJUNCTION WITH A BFRC LICENCE APPLICATION**

**Input Values:**  
 Yellow input, green intermediary, blue finals      X' DP is no. of decimal places to enter

Frame offset: **No**

|   |  |
|---|--|
| Nominal 4mm etc to <b>ODP</b> , others <b>IDP</b> |  |
| <b>Glazing dimensions and properties:</b>         |  |
| Thickness of pane 1                               | <b>4</b> mm                              |
| Pane 1/2 distance                                 | <b>14</b> mm                             |
| Gas fill (1/2)                                    | <b>Argon 90%</b>                         |
| Thickness of pane 2                               | <b>4</b> mm                              |
| Complete next 3 cells for TG IGU                  |  |
| Pane 2/3 distance                                 | <b>14</b> mm                             |
| Gas fill (2/3)                                    | <b>Argon 90%</b>                         |
| Thickness of pane 3                               | <b>4.0</b> mm                            |
| Glazing Trans. - <b>3DP</b>                       | $U_g$ <b>0.591</b> W/(m <sup>2</sup> ·K) |
| $g$ -value - <b>2DP</b>                           | $g_{\pm}$ <b>0.42</b>                    |

|  |                       |
|--|-----------------------|
| <b>Thermal transmittance of window from hot box test</b> |                       |
| $U_w$ - <b>2DP</b>                                       | W/(m <sup>2</sup> ·K) |

| Window Dimensions:                  |            | Area      |                             |                               |
|-------------------------------------|------------|-----------|-----------------------------|-------------------------------|
| Section                             | Length (m) | Width (m) | No gasket (m <sup>2</sup> ) | With gasket (m <sup>2</sup> ) |
| Fixed Light                         | 13800      | 0.5300    | 0.7314                      | 0.7314                        |
| Opening light                       | 12860      | 0.4360    | 0.5607                      | 0.5607                        |
| Total glazing, $A_g$                |            |           | 1.2921                      | 1.2921                        |
| Frame                               | (m)        | (m)       | (m <sup>2</sup> )           | (m <sup>2</sup> )             |
| F1                                  | 0.6150     | 0.0500    | 0.0286                      | 0.0286                        |
| F2                                  | 0.6150     | 0.0500    | 0.0286                      | 0.0286                        |
| F3                                  | 14800      | 0.0500    | 0.0715                      | 0.0715                        |
| F4                                  | 0.6150     | 0.0500    | 0.0286                      | 0.0286                        |
| F5                                  | 0.5300     | 0.0470    | 0.0227                      | 0.0227                        |
| F6                                  | 0.6150     | 0.0500    | 0.0286                      | 0.0286                        |
| F7                                  | 0.5300     | 0.0470    | 0.0227                      | 0.0227                        |
| F8                                  | 14800      | 0.0500    | 0.0715                      | 0.0715                        |
| F9                                  | 13800      | 0.0470    | 0.0627                      | 0.0627                        |
| F10                                 | 14800      | 0.0700    | 0.1001                      | 0.1001                        |
| F11                                 | 13800      | 0.0470    | 0.0627                      | 0.0627                        |
| Total Frame                         |            |           | 0.5283                      | 0.5283                        |
| Total Window, $A_w$                 |            |           | 1.8204                      | 1.8204                        |
| Percentage fixed light glass area   |            |           | 40.18%                      | 40.18%                        |
| Percentage opening light glass area |            |           | 30.80%                      | 30.80%                        |
| Percentage glass area (total)       |            |           | 70.98%                      | 70.98%                        |

|  |       |      |
|--|-------|------|
| <b>Solar Factor, <math>g</math>-value:</b> | $F_w$ | 0.9  |
|  | $g_w$ | 0.27 |

|              |                            |             |                       |
|--------------|----------------------------|-------------|-----------------------|
| $U_{window}$ | No bars: or attached bars  | <b>0.85</b> | W/(m <sup>2</sup> ·K) |
|              | Single cross bar in IGU    | <b>0.95</b> |                       |
|              | Multiple cross bar in IGU  | <b>1.1</b>  |                       |
|              | Glazing bar (Georgian bar) | <b>1.3</b>  |                       |

**Energy Window**  
Energy Index

**0**

Window Rating

**A**

**BFRC Rating**  
kWh/(m<sup>2</sup>·yr)

- ≥20 (A) ++
- >10 to <20 (A) +
- 0 to <10 (A)
- 10 to <0 (B)
- 20 to <-10 (C)
- 30 to <-20 (D)
- 50 to <-30 (E)

| Parameter                      | Symbol | Units   |
|--------------------------------|--------|---------|
| Total window height <b>ODP</b> | $l_w$  | 1480 mm |
| Total window width <b>ODP</b>  | $b_w$  | 1230 mm |

| Frame dimensions:  | Frame width, $b_f$ (mm) | Gasket protrusion, $b_{gf}$ (mm) | Frame & gasket widths (mm) |                |
|--|-------------------------|----------------------------------|----------------------------|----------------|
| All frame values round to nearest 1mm, gaskets to <b>IDP</b> | F1 fixed sill           | <b>50</b>                        | <b>0.0</b>                 | 50.0           |
|  | F2 fixed head           | <b>50</b>                        | <b>0.0</b>                 | 50.0           |
|  | F3 fixed jamb           | <b>50</b>                        | <b>0.0</b>                 | 50.0           |
| F4 + F5 sash sill  | F4 fixed sash sill      | <b>50</b>                        | n/a                        | 50.0           |
|  | F5 moving sash sill     | <b>47</b>                        | <b>0.0</b>                 | 47.0           |
| F6 + F7 sash head  | F6 fixed sash head      | <b>50</b>                        | n/a                        | 50.0           |
|  | F7 moving sash head     | <b>47</b>                        | <b>0.0</b>                 | 47.0           |
| F8 + F9 sash jamb  | F8 Fixed sash jamb      | <b>50</b>                        | n/a                        | 50.0           |
|  | F9 moving sash jamb     | <b>47</b>                        | <b>0.0</b>                 | 47.0           |
| F10 + F11 mullion  | F10 fixed mullion       | <b>70</b>                        | <b>0.0</b>                 | 70.0           |
|  | F11 moving mullion      | <b>47</b>                        | <b>0.0</b>                 | 47.0           |
| Total gasket area  |                         |                                  | 0                          | m <sup>2</sup> |

| Where a $U_w$ value from hot box testing is available, no $L_{r, 2D}$ or $L_{\psi, 2D}$ values need to be entered |   |            |               |            |
|---|---|------------|---------------|------------|
| Frame conductance:  | All $L$ values to <b>4DP</b> . All $b$ values to <b>ODP</b> |            |               |            |
|   | $W/(m^2K)$  | $b_g$ (mm) | $W/(m^2K)$    | $b_g$ (mm) |
| F1 fixed sill   | <b>0.1940</b>   | <b>190</b> | <b>0.1889</b> | <b>190</b> |
| F2 fixed head   | <b>0.1940</b>   | 190        | <b>0.1889</b> | 190        |
| F3 fixed jamb   | <b>0.1940</b>   | 190        | <b>0.1889</b> | 190        |
| F4 + F5 sash sill   | <b>0.2551</b>   | 190        | <b>0.2495</b> | 190        |
| F6 + F7 sash head   | <b>0.2551</b>   | 190        | <b>0.2495</b> | 190        |
| F8 + F9 sash jamb   | <b>0.2551</b>   | 190        | <b>0.2495</b> | 190        |
| F10 + F11 mullion   | <b>0.4320</b>   | 380        | <b>0.4218</b> | 380        |

| Frame:            | Frame width, $b_f$ (m) | Frame U-value, $U_f$ (W/(m <sup>2</sup> ·K)) | Frame areas, $A_f$ (m <sup>2</sup> ) | Frame heat flow, $H_f$ (W/K) | Linear trans., $\psi$ (W/(m·K)) | Linear length, $l_g$ (m) | Junction heat flow, $H_j$ (W/K) |
|-------------------|------------------------|--|--------------------------------------|------------------------------|---------------------------------|--------------------------|---------------------------------|
| F1 fixed sill     | 0.0500                 | 0.9855                                       | 0.0286                               | 0.0282                       | 0.0273                          | 0.5300                   | 0.0145                          |
| F2 fixed head     | 0.0500                 | 0.9855                                       | 0.0286                               | 0.0282                       | 0.0273                          | 0.5300                   | 0.0145                          |
| F3 fixed jamb     | 0.0500                 | 0.9855                                       | 0.0715                               | 0.0705                       | 0.0273                          | 1.3800                   | 0.0377                          |
| F4 + F5 sash sill | 0.0970                 | 1.1379                                       | 0.0513                               | 0.0584                       | 0.0268                          | 0.4360                   | 0.0117                          |
| F6 + F7 sash head | 0.0970                 | 1.1379                                       | 0.0513                               | 0.0584                       | 0.0268                          | 0.4360                   | 0.0117                          |
| F8 + F9 sash jamb | 0.0970                 | 1.1379                                       | 0.1342                               | 0.1527                       | 0.0268                          | 1.2860                   | 0.0345                          |
| F10 + F11 mullion | 0.1170                 | 1.2184                                       | 0.1628                               | 0.1983                       | 0.0547                          | 1.3330                   | 0.0729                          |
| Totals            |                        |  | 0.5283                               | 0.5946                       |                                 | Total                    | 0.1975                          |

|  |       |                     |             |               |                     |            |        |                       |
|--|-------|---------------------|-------------|---------------|---------------------|------------|--------|-----------------------|
| Other parameters needed for calculation, taken from simulations: |       |                     |             | $d_p = d_g =$ | 0.04                | m          |        |                       |
| $\lambda_p =$  | 0.035 | W/(m·K)             | $R_{se} =$  | 0.04          | m <sup>2</sup> ·K/W | $R_{se} =$ | 0.13   | m <sup>2</sup> ·K/W   |
| $R_p =$  | 1.129 | m <sup>2</sup> ·K/W | $R_{tot} =$ | 1.329         | m <sup>2</sup> ·K/W | $U_p =$    | 0.7617 | W/(m <sup>2</sup> ·K) |

|   |        |                                     |                       |
|---|--------|-------------------------------------|-----------------------|
| <b>Air Leakage loss:</b>  |        |                                     |                       |
| Air leakage at 50 Pa per hour & per unit length of opening light (BS 6375-1) - <b>2DP</b> |        |                                     |                       |
| Opening light length  | 3.8200 | m                                   | Total air leakage     |
| $L_{50}$  | 0.04   | m <sup>3</sup> /(m <sup>2</sup> ·h) | 0.076                 |
| Heat loss = 0.0165 $L_{50}$   |        | 0.00                                | W/(m <sup>2</sup> ·K) |

|                         |   |             |
|-------------------------|---|-------------|
| <b>BFRC Rating =</b>    | <b>218.6g<sub>window</sub> - 68.5 x (U<sub>window</sub> + Effective L<sub>50</sub>) =</b> | <b>0.38</b> |
| <b>Climate zone is:</b> |   | <b>UK</b>   |

|  |              |             |
|--|--------------|-------------|
| <b>Thermal transmittance, W/(m<sup>2</sup>·K)</b>        | $U_{window}$ | <b>0.85</b> |
| <b>Solar factor</b>                                      | $g_{window}$ | <b>0.27</b> |
| <b>Window air leakage heat loss, W/(m<sup>2</sup>·K)</b> | $L_{factor}$ | <b>0.00</b> |

Simulator Name: **Richard Bate**

**BFRC**

BFRC Certified Simulator No

**001**

The legal validity of this report can only be claimed on presentation of the complete report with supporting electronic information.