|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Criteria label | Criteria name | Short description of criteria and its assessment technique | Preference function | Min/Max |
| C 1 | The construction cost | Overall construction costs. Expressed in EUR/m2  | V-shape | Min |
| C 2 | The facade maintenance cost | Overall facade maintenance costs per one year in a period of 20 years calculated from the moment of completion of the building. Expressed in EUR/20 years | V-shape | Min |
| C3 | The energy budget | Overall energy budget per one year. Expressed in EUR/1 year | V-shape | Min |
| C 4 | The complexity of the construction | Expert’s assessment of the complexity of the construction design, grading: 1-simple construction, 2-medium complex construction, 3- complex construction | V-shape | Min |
| C 5 | The facade aesthetics | Expert’s assessment, grading: 1(worst)-10(best) | V-shape | Max |
| C 6 | Functionality of using | Expert’s assessment, grading: 1(worst)-10(best) | V-shape | Max |
| C 7 | Safety | Expert’s assessment of the glass safety level in terms of its dissipation in the case of breaking, grading: 1-toughened glass, 2-laminated glass, 5-toughened laminated glass with correction performed by multiplying with 1,5 in the case of triple glazing, reducing the possibility of spreading of the glass during breakage | V-shape | Max |
| C 8 | Heat transfer coefficient | Expressed with the size of thermal transmittance for double and triple glazing (W/m2K) | V-shape | Min |
| C 9 |  Energy savings | Expressed in (kWh/year) | V-shape | Max |

Table 1.Criteria and preference function

|  |  |  |
| --- | --- | --- |
| Criteria label | Criteria name | Weight |
| Scenario 1 | Scenario 2 | Scenario 3 | Average |
| C1 | The construction cost | 0,30 | 0,12 | 0,12 | 0,18 |
| C2 | The facade maintenance cost | 0,14 | 0,08 | 0,08 | 0,10 |
| C3 | The energy budget | 0,10 | 0,07 | 0,04 | 0,07 |
| C4 | The complexity of the construction | 0,03 | 0,08 | 0,40 | 0,17 |
| C5 | The facade aesthetics | 0,15 | 0,35 | 0,13 | 0,21 |
| C6 | Functionality of using | 0,05 | 0,10 | 0,08 | 0,077 |
| C7 | Safety | 0,09 | 0,05 | 0,05 | 0,063 |
| C8 | Heat transfer coefficient | 0,06 | 0,07 | 0,05 | 0,06 |
| C9 | Energy savings | 0,08 | 0,08 | 0,05 | 0,07 |

Table 2. Criteria weights for 3 scenarios

|  |  |
| --- | --- |
| Alternative label | Name/description of alternative |
| CF 1 | Continuum facade + toughened glass + thermal profile and triple glass  |
| CF 2 | Continuum facade + toughened glass + cold profile and double glass  |
| CF 3 | Continuum facade + laminated glass + thermal profile and triple glass  |
| CF 4 | Continuum facade + laminated glass + cold profile and double glass  |
| CF 5 | Continuum facade + toughened laminated glass + thermal profile and triple glass |
| CF 6 | Continuum facade + toughened laminated glass + cold profile and double glass  |
| SF 1 | Structural facade + toughened glass + thermal profile and triple glass  |
| SF 2 | Structural facade + toughened glass + cold profile and double glass  |
| SF 3 | Structural facade + laminated glass + thermal profile and triple glass  |
| SF 4 | Structural facade + laminated glass + cold profile and double glass  |
| SF 5 | Structural facade + toughened laminated glass + thermal profile and triple glass  |
| SF 6 | Structural facade + toughened laminated glass + cold profile and double glass  |
| SSF 1 | Semi-structural facade + toughened glass + thermal profile and triple glass  |
| SSF 2 | Semi-structural facade + toughened glass + cold profile and double glass  |
| SSF 3 | Semi-structural facade + laminated glass + thermal profile and triple glass  |
| SSF 4 | Semi-structural facade + laminated glass + cold profile and double glass  |
| SSF 5 | Semi-structural facade + toughened laminated glass + thermal profile and triple glass  |
| SSF 6 | Semi-structural facade + toughened laminated glass + cold profile and double glass  |

Table 3. Alternatives/solutions of the glass facade

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Alternatives/Criteria | C1 | C2 | C3 | C4 | C5 | C6 | C7 | C8 | C9 |
| CF 1 | 196000 | 56000 | 43041,453 | 1 | 1 | 1 | 1,5 | 0,89 | 5922 |
| CF 2 | 189000 | 56000 | 43775,571 | 1 | 1 | 1 | 1 | 1,4 | 928 |
| CF 3 | 231000 | 56000 | 43041,453 | 1 | 1 | 1 | 1,5 | 0,89 | 5922 |
| CF 4 | 224000 | 56000 | 43775,571 | 1 | 1 | 1 | 1 | 1,4 | 928 |
| CF 5 | 266000 | 56000 | 43041,453 | 1 | 1 | 1 | 1,5 | 0,89 | 5922 |
| CF 6 | 259000 | 56000 | 43775,571 | 1 | 1 | 1 | 1 | 1,4 | 928 |
| SF 1 | 266000 | 84000 | 43201,83 | 3 | 10 | 10 | 4,5 | 0,9 | 4831 |
| SF 2 | 259000 | 84000 | 43911,987 | 3 | 10 | 10 | 3 | 1,5 | 0 |
| SF 3 | 301000 | 84000 | 43201,83 | 3 | 10 | 10 | 4,5 | 0,9 | 4831 |
| SF 4 | 294000 | 84000 | 43911,987 | 3 | 10 | 10 | 3 | 1,5 | 0 |
| SF 5 | 336000 | 84000 | 43201,83 | 3 | 10 | 10 | 4,5 | 0,9 | 4831 |
| SF 6 | 329000 | 84000 | 43911,987 | 3 | 10 | 10 | 3 | 1,5 | 0 |
| SSF 1 | 217000 | 70000 | 43201,83 | 2 | 7 | 8 | 3 | 0,9 | 4831 |
| SSF 2 | 210000 | 70000 | 43911,987 | 2 | 7 | 8 | 2 | 1,5 | 0 |
| SSF 3 | 252000 | 70000 | 43201,83 | 2 | 7 | 8 | 3 | 0,9 | 4831 |
| SSF 4 | 245000 | 70000 | 43911,987 | 2 | 7 | 8 | 2 | 1,5 | 0 |
| SSF 5 | 287000 | 70000 | 43201,83 | 2 | 7 | 8 | 3 | 0,9 | 4831 |
| SSF 6 | 280000 | 70000 | 43911,987 | 2 | 7 | 8 | 2 | 1,5 | 0 |

Table 4. Decision matrix

|  |  |  |
| --- | --- | --- |
| Rank | The glass facade type (alternative) | Net flow (ɸ) |
| 1 | SSF1 | 0,1799 |
| 2 | CF1 | 0,1438 |
| 3 | SSF3 | 0,1345 |
| 4 | CF3 | 0,0984 |
| 5 | SF1 | 0,0943 |
| 6 | SSF5 | 0,0891 |
| 7 | CF5 | 0,0531 |
| 8 | SF3 | 0,0489 |
| 9 | SF5 | 0,0035 |
| 10 | SSF2 | -0,0079 |
| 11 | CF2 | -0,0348 |
| 12 | SSF4 | -0,0533 |
| 13 | CF4 | -0,0801 |
| 14 | SSF6 | -0,0986 |
| 15 | SF2 | -0,1031 |
| 16 | CF6 | -0,1255 |
| 17 | SF4 | -0,1484 |
| 18 | SF6 | -0,1938 |

Table 5. Net flow results and complete

ranking for compromise (average) scenario