



Summary of Research
Declaration of Equivalence

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Van Mourik Broekmanweg 6
P.O. Box 49
2600 AA Delft
The Netherlands

www.tno.nl

F +31 15 276 30 00
T +31 15 276 30 10

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Determination of LT, g-value and U-value of Solatube daylighting systems

Versie: Solatube 750 DS

Client:

Grontmij | Technical management
P.O. Box 68
3800 AB Amersfoort
The Netherlands



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Solatube is a brand name for a daylighting system using a tubular entrance method. Using this daylighting system it is possible to bring daylight into areas where this is not feasible with windows or rooflights. TNO determined the thermal energy transmittance (U-value), the light transmittance (LT) and the total solar energy transmittance or g-value for Techcomlight B.V. These parameters are necessary in building design to optimize the façade on insulation as well as light transmittance and solar energy transmittance. A Solatube system is characterized by 4 main parts. The tube is fixed with a roof flashing, the flashing is a hollow steel cylindrical up-stand with flat base that is screwed to the roof. Bituminous roof felt can be welded to the flashing. Between roof and tube we find a rubber seal for airtight sealing. The light tube itself is made out of flat sheet of highly reflecting aluminium. The roof dome is made of acrylic material that has high transmittance. The entire daylighting system fits together using click mechanisms and has additional screws for secure fixing. The Solatube systems are tested using a tube length of 40 cm below the flashing.

The Solatube range has several diameters and different sorts of domes. This research summary concerns the type 750 DS with a diameter of 53 cm. Type 750DS is available with 2 different interior appliances. Type 750 DS-O is a plain version and has a single acrylic pane with Vusion lenses. The type 750 DS-C concerns the office version which has a ceiling box that is insulated and deeper. This part tapers from circular to square, the light-tube is closed by a single acrylic window and the interior diffuser is square with Vusion lenses.



Measurements

The U-value measurements are carried out with a dedicated hotbox specifically built for the test. This enabled to carry out the measurements with the daylight systems mounted in vertical position. The measurements were carried out in accordance with EN-ISO 12567 for windows and doors. The optical measurements were carried out spectrally in accordance with EN 410 using the spectral range of 250-2500 nm. A 2.5 kW HMI light source was used. The measurements were carried out for an angle of incidence of 45 degrees to determine the g-value.

Table 1: Results of measurements and calculations on daylightingsystems.

| type | Diameter cm | LTA | Direct solar transmittance | g-value | U-value W/m ² K | Comparison with IGU |
|--------------------------|----------------|------|-------------------------------|---------|-------------------------------|--------------------------------------|
| Solatube 750 DS-O | 53 | 0.37 | 0.32 | 0.46 | 2.8 | Double-glazing airfilled |
| Solatube 750 DS-C office | 53 | 0.25 | 0.22 | 0.27 | 2.1 | Double-glazing with Low-e coating |

The results of the measurement and calculations are shown in table 1. The U-value of the 750 DS-O is determined on 2.8 W/m²K, this is equivalent to standard airfilled insulating glazing. The 750 DS-C shows a lower U-value of 2.1 W/m²K, this is equivalent to coated insulated glazing.