

# Daylight compliance of multi-dwelling apartment blocks

Design considerations, evaluation criteria and occupant responses

Iason Bournas



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*Opponent*

Prof. Raphaël Compagnon  
Haute école d'ingénierie et d'architecture  
de Fribourg, Switzerland

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<b>Abstract</b> <p>This thesis examines the daylight compliance of residential spaces, in particular apartments in multi-dwelling building blocks, and provides knowledge that may prove useful for the development of future daylight criteria for dwellings. The implications of design choices on daylight compliance of spaces and the effect of daylight criteria on the level of compliance are at the core of this work. Daylight simulations were performed to evaluate a large sample of representative apartment buildings according to past and present daylight criteria. Self-administered questionnaires were also used to investigate occupant preferences and subjective impressions of daylight conditions in the dwellings. The simulations and questionnaires divide this work into two parts, which are connected on the basis of the same study object: multi-dwelling buildings.</p> <p>The first part includes a review of daylight regulations in Sweden from the time the term “daylight” first appeared in 1960. It proceeds with compliance testing results for a large sample of multi-dwelling blocks, evaluated according to the current Swedish daylight compliance criteria. Several criteria commonly used internationally are assessed for the same spaces, to evaluate compliance differences when using different criteria. The review concludes that there has been no significant progress in Swedish daylight regulations since 1975, when the basis for the current daylight factor criterion was first formulated. It also argues that the current geometric criterion has limitations due to spatial implications deriving from its formulation. The compliance testing results indicate that Swedish daylight criteria have not been successful in safeguarding daylight access for residential spaces historically, especially in denser urban areas, perhaps because they were expressed as “general recommendations” instead of “mandatory provisions”. To this end, several buildings built prior to the introduction of daylight criteria, and built only by architectural intuition, perform better than regulated buildings. A more detailed assessment of the investigated rooms using additional criteria indicated which building types perform better overall, which geometric attributes are more significant for compliance, and the effect of urban density on compliance.</p> <p>The second part includes results from a questionnaire survey carried out in the city of Malmö, the third largest city in Sweden. The questionnaires were distributed in buildings of the same block typologies as the buildings evaluated via simulations in the first part of this research. This second part concerns daylight perception, electric lighting use, and occupant preferences with respect to daylighting among room types. The questionnaire rating scales were validated for their suitability as a form of measurement for daylight surveys. The reported electric lighting use was compared between different room types, geometries, and facade orientations to evaluate whether there is less use of lighting in rooms with specific characteristics. The relation between reported daylight area and electric lighting use was analysed to assess whether daylight availability can yield reductions in electric light use, to what extent, and under which conditions. The survey also revealed clear occupant preferences, indicating the room types where daylight availability is prioritised.</p>			
<b>Key words:</b> Daylight, electric lighting, policy, regulation compliance, simulation, questionnaire, daylight metrics, perception, brightness, user preferences, urban density, block typology, room geometry, room function, room orientation			
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