DAYLIGHTING RULE OF THUMB AND TYPOLOGY

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ABSTRACT

Rule of thumb in daylighting has been responsible for generating typologies of building forms and elements. However, not all of these typologies perform well in daylighting. This article briefly reviews the concept of typology in architecture and proposes its application in daylighting study. Based upon the literature and recent researches in daylighting typology, the authors argue for the use of typological approach as means for analyzing and generating rule of thumb in daylighting. Simulations are conducted using Lumen Micro 8 and AGi32 softwares. The findings are suggestive that the typological approach adapted in the simulations can contribute towards development of a new rule of thumb in daylighting.

Keywords: Daylighting, Typology, Daylighting Performance

1. INTRODUCTION

Rule of thumb exists in most disciplines particularly those that involve the application of knowledge related to complex phenomena such as daylight, and also where absolute precision may not be required. Rule of thumb provides "a broadly accurate guide or principle, based upon experience or practice rather than theory" (Procter, 1995) and derive its significance from having been repeatedly used and found to be working. In daylighting, rule of thumb is usually expressed in terms of limiting room parameters and parametric ratios influential in illuminance performance such as room depth to window head height ratio, room depth to ceiling height ratio, window area to floor area ratio and window area to wall area ratio (Nik Lukman and Hayman, 2002). This rule of thumb in daylighting actually influences building forms and typologies. For example, when limiting building depth rule of thumb in daylighting had been responsible for generating distinct building typologies as demonstrated by Steven Holl in *The Alphabetical City* (Holl, 1980).

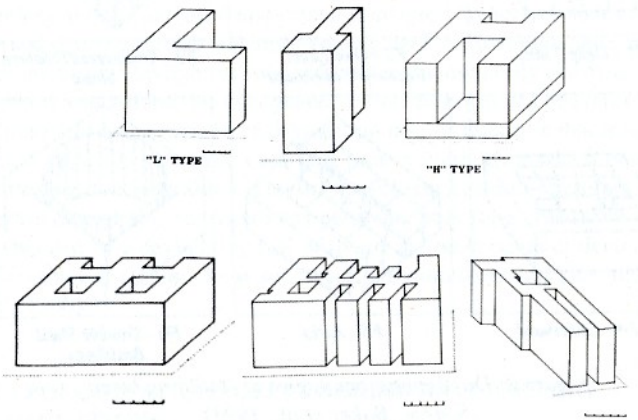

Figure 1: Several general building forms in alphabetical configurations generated by limiting floor depth rules of thumb for daylighting (Source: Holl, 1980).

In architecture, typology has been established as a fundamental aspect of the discipline.

The simulation studies carried out using Lumen Micro 8 and AGi-32 softwares to analyse daylighting rule of thumb has adapted the typological approach. A brief review of architectural typological concepts is provided prior to discussing the simulation methods and results. These fundamental concepts are used to inform the typological approach applied in the simulations.

2. DAYLIGHTING TYPOLOGY

The idea of daylit building typologies has been put forward numerous times in architectural discourses. The most recent and substantial by Baker et al. (1993) concerns itself with the complete range of possibilities from urban planning, building form, room configuration to window type (see Figure 2).

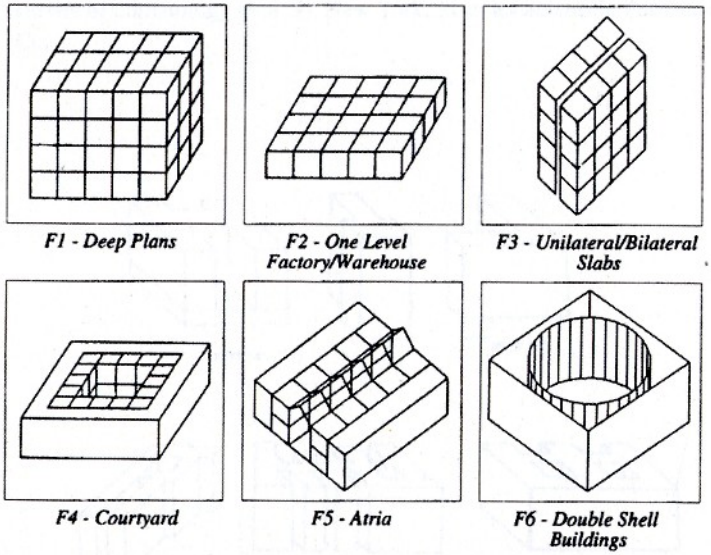

Figure 2: Daylighting typologies at 'building level' (Source: Baker et al., 1993).

Baker, Fanchiotti and Steemers (1993) propose a method of gathering a typological grammar from daylit buildings to aid designers composing these elements and forms. This design approach calls for the adaptive use of architectural precedents in daylighting practice and involves ideas expressed in visual terms such as drawings of building plans, elevations, sections, etc. The approach derives both from the typological culture of architectural composition found within the treatises of architectural theories, and from "shape grammar" developed by March and Stiny (1985) which involves two major aspects: i) the repertoire of types described by means of the "morphological box", and ii) the rules for selecting, placing and transforming these types. Daylit building types are organised in a hierarchical way by dividing the parameters into three levels: i) the room, ii) the building and iii) the site (surrounding built environment).

The proposed "morphological box" offers the possibility of decomposing the existing day-lit buildings into elements which become the "variations" within the defined "parameters". The "morphological box" serves as a means for generating new combinations of existing concepts by allowing combination of "parameters" and "variations" which can be derived from the day-lit building typology. Thus, a great number of design solutions can be generated (Baker et al., 1993). This typological approach in daylighting bridges the gap between building science researches and traditional design methods in architecture. However, this tool does not provide simple calculation methods or rule of thumb for daylighting.

3. DAYLIGHTING RULE OF THUMB AS 'ARCHETYPE'

Discussions in architectural typology often lead to the idea of 'archetype'. Archetype as put forward by De Quincy (1977), Vidler (1977), Moneo (1978), Johnson (1994), Argan (1996) and Scheekloth and Franck (1994) generally refers to the primal and universal guiding principle of types. This principle is not *a priori* or a set of fixed ideas. According to Argan (1996), archetype is the outcome of a process of reducing complex formal variants to a common root form. It is the interior structure of form or a principle which contains the possibility of infinite variations.

Daylighting rule of thumb in experienced practitioners' hands could be seen to operate on such level. An example of an archetypal rule of thumb was proposed by Vitruvius (See Figure 3) to determine the amount of potential light is a follow:

"On the side from which the light should be obtained, let a line be stretched from the top of the wall that seems to obstruct the light to the point at which it ought to be introduced, and if a considerable space of open sky can be seen when one looks up above the line, there will be no obstruction to the light in that situation." (Rowland, 1999: p. 262).