LIGHTING AND DAYLIGHTING QUALITY: CRITICAL REVIEW OF CRITERIA AND RECOMMENDATIONS AND ITS INSERTION IN BRAZILIAN CONTEXT

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Abstract
The discussions about lighting quality suggest solutions that incorporate ideas of visual comfort, health, energy efficiency and the relation between architectural design and human needs. Before evaluating lighting quality, it is important to determine which criteria are important to quantify light. Recent research (BOYCE, 2003; AMORIM, 2011) points that values from international standards are changing illuminance levels based especially in political and economical context. In Brazil, it is important a more complete discussion of lighting standards in national context. Besides, in studies about lighting quality daylighting has an important role, especially regarding windows characteristics, related with discomfort due to glare and external view. This article makes a literature review about recent research, focusing the most used evaluation methods and indexes, and also tendencies for future research, especially for Brazilian context.

Keywords: Lighting Quality; Daylighting; criteria; Brazilian context

1 Introduction

The study of lighting quality must initiate by quantitative aspects, and it is fundamental to understand the indexes stablished by international Standards. The rates currently found cause divergences, since the values for the same task are very different between countries, and there are doubts about the users' preferences for the aspects of light.

Thus, the concept of quality of light appears as the beginning of an important discussion to establish new criteria and evaluation methods more consistent with contemporary reality, especially in the integration of artificial light and daylight. Several issues become important, related to economic, sustainable, human needs and the architecture itself.

In this article, was performed a literature review, first on the quantitative aspects of light and its insertion in the rules, to seek posteriorly conceptualization of light quality, its variables, in order to focus on a specific aspect of daylight: glare caused by window.

This discussion is essential for Brazil, at a time when standards are being reviewed and research groups, linked to the CIE, are conducting joint research with a focus on national reality. Economics and climate aspects, especially in relation to the type of variability of light and sky, should be considered in adapting to Brazil index lighting.

2 Quantitative aspects of lighting

Inicially were examined researches focused in quantitative aspects of lighting and its approach in international Standards and specifically in Brazilian context.
2.1 International context

Established values of international standards have altered illuminance values depending on economic and political development and not on human needs, like visibility, task performance, visual comfort, social communication, health, well being, safety and so on (BOYCE, 1996 and 2003).

Also in different countries illuminance recommendations can vary even considering the same visual tasks. Mills & Borg (1999) showed this situation of illuminance recommendation for different visual tasks in different countries. The conclusions are “that illuminance recommendations have potentially large implications for energy use and may explain differences in lighting use between countries. Although it has been a convenient measure of lighting energy services, the “lux” is only an approximate indicator. What is needed are sophisticated quantitative methods (and visualization tools) that can identify least-energy/maximum quality lighting design solutions.” (MILLS & BORG, 1999)

Osterhaus (1997) investigated the development of standards for office lighting in the last 80 years. It discusses the recommended lighting practice, the nature of the quantitative recommendations, and trends in recommended values on a comparative basis. Recommended illuminance values, after being on the rise for almost a century, have reached their peak and have descended to a more appropriate level. The emphasis in lighting design has gradually shifted from illuminance to luminance and qualitative lighting aspects. Research guided towards worker comfort, satisfaction and productivity, as well as energy efficiency of integrated office building systems as an essential part of the development.

Dehoff (2011) gives an overview of the requirements for the lighting in interior workplaces as described in the European Standards: EN 12464-1_2002 “Lighting of interior workplaces” and CIE S 008 - ISO standard 8995-1. The differences in requirements are fairly small, and a significant improvement could be reached. The major issues were: the daylight approach; uniformity assigned to the tasks and activities; new definition of a background area; grid; glare; vertical and cylindrical illuminances and modelling; the definition of areas for lighting and calculation; the luminance limits for luminaires used with computer screens; clearer descriptions and energy, daylight and its variability.

2.2 Brazilian context

Actually Brazil has lighting Standards, in special NBR 5413 - Illuminance in Interior Environments (1992) and NBR 15215 – Daylighting (2005). Many research (AMORIM, 2011) point that these Standards, specially the first one, should be reviewed to propose new parameters, because they focus only the illuminance limits for lighting. Regarding daylighting, the standard only focuses some methods to measurement and daylighting calculation.

The NBR 5413 – Illuminance in Interior Environments - is being reviewed and the new Lighting Standard will be based on the adoption of ISO/CIE 8995 - Lighting of Indoor Spaces. Amorim (2011) affirms that the adoption of ISO/CIE 8995 lighting standard in the Brazilian context brings advantages in terms of evaluation of lighting quality, but it could be interesting to quantify the impact of this Standard in energy efficiency of buildings. When comparing this European standard with the Brazilian, some recommended illuminance values were elevated without any critical evaluation. It’s necessary to observe that the ISO/CIE establishes also values of other parameters, as Glare Limitation (UGR) and Colour Quality (Ra) of light. It can be considered a more complete evaluation of lighting quality than the present Standard in Brazil (NBR 5413).

As already exist critical and indications for revision of ISO/CIE 8995, would be more appropriate that Brazil intensify their research in finding proper lighting parameters, especially in relation to the use of daylighting. In this sense, there is a joint research project of some Brazilian universities (UNB, UFMG, UFSC, and UFAL USP), members of CIE- Brazil Division 3, with support from Eletrobras, for structuring and development studies in the area of daylight for contribute to the standards of lighting and energy efficiency.

Feijó (2009) investigated a collection of international Standards, regulations and recommendations (USA, Canada, United Kingdom, Germany, France, Portugal and Brazil, so as CIE, IESNA, LEED, BREEAM, ISO) aiming to contribute to the discussion about Brazilian standard of daylighting in offices. After grouping different aspects (Implantation, Room/Windows geometry, solar protection, illuminances, uniformity, glare and daylight/artificial light integration) the research concluded that some aspects are important for daylighting performance and should be present in a specific law. These aspects are facades
orientation, relation between window area and floor area, room deep, illuminance level, lighting power density and energy consumption. Other aspects should be present in certifications and recommendations: external solar protection, internal solar protection, glazing area for view and lighting, circuit division, controls and maintenance.

Feijó (2009) and Fernandes (2009) mention that in Brazil it is important to review existing urban laws, building codes, norms and regulations, aiming to include these aspects and to contribute to better daylighting performance in internal environments.

The conclusions of the evaluated researches indicate a new focus: the search of qualitative criteria to lighting and specially daylighting.

3 Qualitative aspects of lighting

The complexity of defining lighting quality is exactly on the dependence of many aspects and cannot be based on simple measurement or measurement technic. (BOYCE, 2003). We light spaces to respond to human necessities and there is no unitary measure of adaptability between these objectives and obtained results. (MARTAU, 2008) Many authors investigate concepts or models that can contribute to demonstrate the factors that should be present in good lighting.

3.1 General concept of lighting quality

3.1.1 International context

In the last two decades researches about lighting quality has grown and the theme is being discussed internationally.

Marans and Brown (1987) affirms that is important to distinguish between Ratings of Lighting Quality – RLQ – that includes satisfaction with lighting depending on the task and type of lighting and Ratings of Visual Quality – RVQ – that will include the grade in which lighting is considered attractive, pleasant, interesting and comfortable to user. The relation between RLQ-RVQ must be considered in the evaluation of lighting quality of rooms.

Veitch and Newsham (1996) affirms that the quality depends on lighting conditions that cause desirable impact on task performance, health and user behaviour of a specific space. Quality is defined as the grade in which an specific luminous environment supports the following aspects regarding people: visual performance, post visual performance, interaction and social communication, health and safety, aesthetical judgements.

Boyce and Cuttle (1998) includes visual comfort and users expectations as main components of good lighting. According to these authors, lighting quality makes easy to distinguish details, colours, forms, textures and surface finishings, with no visual discomfort. They mention the fact of many studies measure quality only based on performance or users opinion. Architecture Must be included between indicators of lighting quality, and the big problem is to find a way to describe what people are seeing in terms of photometrical values.

Veitch (2006) affirms that is necessary to define indicators about how lighting influences what we see and after that, to define metrics related with these indicators.

Pop, Pop and Chindris (2002) relates four main variables to define lighting quality: visual satisfaction (photometry and visual comfort), visibility, human productivity and energy consumption.

Kramer model (2002) establishes eight guidelines related to lighting quality: 1. Light must orientate time and space for users; 2. To be a composition element of design; 3. To give support to intentions (form, colours, materials); 4. To create character and atmosphere of the place, according to the expectations; 5. To allow and promote communication; 6. Light must contain a message and meaning (bright, colour and movement); 7. To be original and cause effects. 8. Light must allow that people see and recognize the environment.. The author is based on the three basic needs of users established by Lam (1977): the creation of na ambience; verbal communication and time orientation and to receive informations about the environment in which lives. Kramer introduces a fourth need that is the desire of variations and exploration of surprises in the environment.

For Veitch (2006) there are many contributions to this new approach on lighting quality and mentions some advantages: lighting makes more than to reveal critical details (visibility) and control glare (visual comfort). It responds to a large range of people needs in spaces; good lighting conditions are determinated in the specific context; the research must must be directed to this large range of behavioral and psicological performance related to light and
lighting; individual and cultural differences are context factors that deserves more attention; there is a big problem created by manuals, that had only quantitative indicators (recommended illuminances), which are contributing to and stimulating low quality projects.

Some research have showed quality questions of lighting and energy efficiency in offices, like Bhushal, Tetri and Halonen (2006). For these authors, “efficient lighting and quality lighting are not contradictory to each other and the better understanding of these two terms would be helpful to promote the improvement of the energy efficiency.”

IESNA (Illuminating Engineering Society of North America) in 2008, pointed that lighting quality is, first of all, related to visibility, that is defined from human needs that depend on lighting: mood and atmosphere, task performance, visual comfort, aesthetical judgement, safety and well being and finally, social communication. Understanding these relations is basic to provide data about lighting quality. The concept defined by IESNA, widely referred in academic studies, is based on the interaction of three general aspects: architecture, economics and human needs.

Osterhaus (2009) affirms a strong focus on lighting quality and productivity as well as a renewed interest in energy efficiency in recent years has highlighted the lack of appropriate design guidance for architects, interior and lighting designers for creating glare-free daylit work environments, especially for offices. Well-developed design guidelines based on visual experience and careful monitoring of the design process from the start would likely go a long way in ensuring that daylit work environments are essentially glare-free. Extensive research on human vision and perception and innovation in architectural lighting design practice and technology have produced considerable opportunities for compiling a document aimed at providing useful design assistance for creating healthy and enjoyable work spaces.

Tralau, Dehoff and Schierz (2011) developed a research based on a script for the LiTG (Deutsche Lichttechnische Gesellschaft), to find a general definition of lighting quality and to define a unified terminology. The awareness that next to the photometric criteria which can be measured and are laid down in the European standard EN 12464, further objective and subjective factors are needed, is raised. The lighting quality of a room or an environment is the description or the experience of the lighting effect and lighting distribution of a room independent of the light source itself. That means that also the daylight influence of a room is part of the lighting quality. The combination of several factors is essential for the description. The appraisal of lighting quality is subjective and linked to the user requirements. Lighting quality is effecting in different aspects: visual- to fulfill the visual task; emotional- to create atmospheres; biological- to support and stimulate people; orientation- to feel secure. They point as basic aspects to lighting quality evaluation:

- **Design aspects of lighting quality**: illuminance and uniformity; psychological glare; Physiological glare; colour rendering; colour temperature; contrast; shadowing; modelling; daylight;

- **Individual aspects of lighting quality**: acceptance; well-being; activation; circadian rhythm; hierarchy of perception; light centre; flexibility/individuality; mental concepts (expectations); smart light

- **Creative aspects of lighting quality**: architectural elements; zoning/positioning; character/branding; visual quality of luminaire; contrasts.

This research discusses the necessity to establish parameters of lighting quality according to the specificities of each typology (offices, schools, hospitals) and how should be the best method to evaluate these criteria.

On Division 3 of CIE (Interior environment and lighting design) there is a proposal to a new TC (Lighting quality). For Peter Thorns e Martine Knoop (2012) “frequently when we talk about lighting and energy reduction we state that a reduction in energy usage should not be at the expense of lighting quality. However this is a vaguely defined term which then becomes difficult to defend. In lighting standards we talk about task and performance requirements but less so about human needs. If we are to defend the importance of lighting quality we need to define in simple terms understandable by a politician or building owner: What is lighting quality? What determines comfort? What are the benefits? And these need defining in concrete ways, not wrapped up and hidden in lighting or ergonomics terminology. We need to link what we as lighting practitioners know to the real world experience of non-practitioners. And we need to make a link between the ‘what is’ and ‘how do we’”. To the authors most of this information already exists but is diffused in many sources, frequently in terminology too technical for everyday lighting practitioners.”
3.1.2 Brazilian context

In Brazil, some recent research focused on lighting quality and its relation with health and users well being and the relations with windows characteristics. Martau’s doctoral thesis (2008) addresses the issue of non-visual impacts of human exposure to light, in an attempt to relate the quality of lighting to health, comfort, and well-being of employees. A large literature review about lighting quality was done and to the evaluation it has been considered: store dimensions and systems characteristics including the occurrence of glare, color appearance of light, flexibility, and possibility of lighting control by employees.

Barbosa (2010) has focussed on the relation between lighting and architecture and human preferences. The research approaches perception of daylighting and suplementary artificial lighting in an office environment investigated in a “mock up”, reproducing the room in real scale. Users should choose between two situations, with the following variables: position and windows dimensions for daylighting; insertion of suplementary artificial lighting. The results confirm the hypothesis that preferences for lighting in offices are connected to fulfilling the need for luminous comfort. Preferences are also linked to task lighting, including the distribution of light sources. In those situations where natural light meets the quantitative demands of the lighting task luminous comfort is achieved and this is preferred to artificial light.

To conclude, inside the general context of lighting quality, it is necessary to identify evaluation methods and more adequate criteria in their specific context.

3.2 Evaluation of Lighting Quality

In the last years, Dehof (2010; 2011) investigates an approach and method for general evaluation, confirming that it is necessary to find the right balance between energy efficiency and lighting quality; the author proposes two specific indicators LENI (Lighting Energy Numeric Indicator) and ELI (Ergonomic Lighting Indicator).

ELI specifies lighting quality aspects, related to standards or simply subjective or creative, using questionaries and measurements. Five criteria are evaluated: 1. Visual Performance (illuminance and uniformity, chromatic reprodution, reflexion limitation, shadows limitation, contrast definition); 2. View (architectural conception, users expectation, orientation, perception hierarchy, exterior perception, material, environment); 3. Visual Comfort (glare control, luminance distribution, modelling, daylighting, sense of protection, cintilation limitation); 4. Vitality (wellness, activation, circadian rithm, daylighting, risks limitation); 5. Empowerment (individual control of lighting scene, presence detector, daylighting dinamic control; dinamic control, flexibility, privacy).

It is interesting to think in using data from Brazil and other countries in ELI to enlarge the method aplicability, allowing comparisons between results, that can generate directives to lighting quality.

Most research about lighting quality has focused on particular aspects, specially: daylighting and artificial lighting integration; glare discomfort; luminances distribution; daylighting indexes; controls and automation; users preferences; methods and indexes for evaluation In this article we will approach aspects of daylighting related to the glare discomfort and its relation with windows characteristics.

3.2.1 Daylighting quality

Between lighting research, a special focus is on daylighting use, advantages, benefits, and difficulties to measure, due to its dynamic nature.

Reinhart, Mardaljevic and Rogers (2006) propose the use of dynamic metrics and the revision of traditional metrics as Daylight Factor.

In this direction, other research (NABIL; MARDALJEVIC, 2006) proposed the Useful Daylight Illuminance (UDI), to help the interpretation of climate-based analyses of daylight Illuminance levels founded on hourly meteorological data for a period of a full year. Unlike the conventional daylight factor approach, a climate-based analysis employs realistic, time-varying sky and sun conditions and predicts hourly levels of absolute daylight Illuminance. (NABIL; MARDALJEVIC, 2006).

Catin and Dubois (2011) proposed a method for assessing daylighting quality based on metrics related to illuminance, distribution, glare and direcionality. The calculations are done using the softwares RADIANCE and DAYSIM, and the results indicate that the following
set of metrics is the most useful for assessing the daylighting quality of architectural spaces: Useful Daylight Illuminance (UDI), Daylight Glare Probability and Vector/Scalar illuminance ratio. The results also suggest that the daylight factor should be replaced by the UDI and that more empirical research is needed to establish appropriate criteria for acceptable luminance ratios in the case of well daylit buildings.

NG (2011) proposes the use of Daylighting Performance Index (DPI). This research affirms that daylighting performance in a cellular office depends on a series of criteria and decision factors, and every occupant has a similar tendency towards each influential factor. The DPI considers human factors and energy issues, and offers a more comprehensive performance-based assessment method for interior daylighting.

This discussion is fundamental in the Brazilian context, because most of the territory has sunny sky, with high daylight availability, which makes not feasible the use of Daylight Factor as a reference criteria (VIANNA & GONÇALVEZ, 2007). Many studies (RAMOS and GHISI, 2007; CINTRA and AMORIM, 2012) are using dynamic simulation and searching new criteria for daylighting, and also developing new computational platforms (APOLUX – PEREIRA, PEREÍRA AND CLARO, 2011; TROPLUX- CABUS, 2005).

Recently, one of the most discussed themes related to the quality of daylighting is discomfort glare, in special the windows characteristics influence, the need of external views , users preferences and the difficult to measure and establish indexes for daylighting.

### 3.2.2 Windows: discomfort glare

In the last decade, many research focused on discomfort glare caused by daylighting from windows. (IWATA, 2011). Besides, there is a search for better indexes and evaluation methods to measure glare from windows. Reinhart (2010) shows the most used indexes and their limits:

<table>
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<tr>
<th>Metric</th>
<th>Limits(REINHART,2010)</th>
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<tr>
<td><strong>Daylight Glare Index (DGI):</strong> developed by R.G. Hopkinson at Cornell in 1972, DGI is the first metric to consider large glare sources (like the sky viewed through a window). Direct sunlight and reflections are typically not taken into consideration.</td>
<td>DGI should only be applied under conditions where direct sunlight will not enter the space; however, CGI provides relatively similar data while predicting a worse-case discomfort scenario.</td>
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<tr>
<td><strong>CIE Glare Index (CGI):</strong> Published by Einhorn in 1969 and adopted by the Commission Internationale de l'Eclairage (CIE). Calculations require both direct and diffuse illuminances. This index is for luminaire sources of glare.</td>
<td>CGI predicts the highest likelihood of discomfort glare for diffuse daylight conditions as a worst case scenario for comparison between designs.</td>
</tr>
<tr>
<td><strong>Visual Comfort Probability (VCP):</strong> Comprised of a massive system of equations adopted by the Illuminating Engineering Society of North America (IESNA). This index is only valid for typically-sized luminaire sources of light (i.e., no halogens or visible skies).</td>
<td>Under sunlit conditions, VCP produces the values least in line with other metrics. As it was developed only for very specific, artificially-ill circumstances, it is not recommended for use with daylit scenes.</td>
</tr>
<tr>
<td><strong>CIE Unified Glare Rating (UGR):</strong> Established by CIE in 1995, this index represents a simplification of the CGI and the separation of direct and diffuse illuminances are no longer needed.</td>
<td>Much as DGI, UGR is only useful under conditions where direct sunlight will not enter the space.</td>
</tr>
<tr>
<td><strong>Daylight Glare Probability (DGP):</strong> Developed by Christoph Reinhart and Jan Wienold at Harvard University, the DGP is quickly emerging as the most reputable glare index. According to Reinhart, DGP detects glare sources based on contrast ratios. As a result, direct daylight and specular reflections are considered while a dim visible sky might not be. The DGP relies on careful measurement and user polling conditions from two independent experiments.</td>
<td>We have found DGP to be the most robust metric that generates the most plausible results under the investigated scenes and daylighting conditions. DGP responds predictably to most daylight situations including those with many or large solid angle direct or specular luminance sources. For this reason, the automation of many iterative time-step simulations can be achieved and their results compared with less chance of erroneous results.</td>
</tr>
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</table>

Jakubiec and Reinhart (2012) in a new comparison, defend the use of DGP (Daylight Glare Probability). In an attempt to deal with multiple positions and view directions simultaneously, the concept of an ‘adaptive zone’ is introduced within which building occupants may freely adjust their position and view in order to minimize the effect of glare.
The spatial and directional extents of the adaptive zone depend on furniture layout and the freedom of occupants’ tasks. It is found that applying the adaptive zone concept to a sidelit office with manually operated venetian blinds reduces the predicted hours of intolerable discomfort glare from 735 to 18 occupied hours per year and increases the annual mean daylight availability from 40% to 72%.

Kim & Kim (2012) suggest the methodology to identify the glare source, which is necessary in order to control glare coming from windows. Experiments with subjects were conducted in order to evaluate discomfort glare from windows and the features that made the subjects recognize the glare sources in the windows with non uniform luminance distributions were explored. There is a linear relationship between the average luminance of the visual field and the average luminance of the glare patches. Such linear relationship has been translated into a formula, whose high accuracy is proven in the study. Using the formula makes it possible to easily identify the window patches that would generate glare.


Currently, CIE has a Technical Committees (TC 3-39: Discomfort Glare from Daylight in Buildings), coordinate by Osterhaus, to review existing discomfort glare assessment methods with respect to their suitability to daylight glare. To identify strengths/weaknesses and threats/opportunities in these existing methods. To make a recommendation on a provisional method for daylight glare assessment. To identify additional parameters that might influence the perception and assessment of discomfort and glare from daylight. To develop proposals for possible research directions and projects suitable to advance the understanding of these parameters.

### 3.2.3 Windows: external view, users preference and energy efficiency

In daylighting studies, it’s important to consider adequate dimension of windows, in order to satisfy user’s need to external view and comfort, but also energy efficiency.

Ghisi, Tinker and Ibrahim (2005) mention that there is a discrepancy between what is suggested for ideal window dimension for external view and what is necessary to energy efficiency. This fact shows the importance of the discussion about what should be adequate and how to evaluate this, considering users preference and visual comfort. Besides, it is necessary to study influence of solar protection that will also influence the perception (BOGO et al, 2009), and its control (automatic of manual).

Galasu & Veitch (2006) made a literature review about occupant preferences and satisfaction with the luminous environment and control systems in daylit offices. They conclude that the degree of discomfort reported depends in part on the quality of the view outside the window, as well as on the distance from the window and on the task; The preferred window size probably varies for different settings, but in general larger windows are preferred. Optimal window size for offices appears to be in the range 1.8–2.4 m in height and somewhat wider than taller, to provide a wide lateral view.

AIRES et al (2010) studied about windows, view, and office characteristics prediction of physical and psychological discomfort. The results show that window views, which that are rated as being more attractive, are beneficial to building occupants by reducing discomfort. However, being close to a window and rating the lighting as being of lower quality can result in thermal and glare problems (environmental utility). Reduced discomfort at work can improve sleep quality, indicating that physical conditions at work influence home life.

There is still need of knowledge about Windows dimensioning and its influence in comfort and users preferences. Besides, there is a large discussion about the better method to evaluate daylighting quality.

In this sense the CIE (Divisions 3 and 6) proposed a new TC intitled “Visual, Health, and Environmental Benefits of Windows in Buildings”. The aim is to review the scientific literature in all relevant fields and to produce a concise document that identifies the values of windows in buildings. Examples of such values could the provision of light for visibility,
ventilation, means of egress; aesthetic benefits, access to a view, and light for physiological functioning, including circadian rhythm regulation. If possible, based on this literature, the committee will propose preliminary criteria for daylighting metrics (the metrics being already under development by TC 3-47) to support these functions.

According to Veitch (2012), “surprisingly there is no document that has the status of a consensus-based international document that pulls together these various aspects of windows. The absence of such a document is causing some friction between lighting professionals and building scientists focused on building energy efficiency. In some parts of the world there is pressure to reduce window sizes (or to permit buildings not to have windows) in order to maximize the insulation value of walls.”

The LACAM1 (UnB/Brazil) is part of this discussion and is developing research focusing on the quality of daylight and its relation to the window’s characteristics. The integration between architecture and psychology is fundamental to the development of this study, where the user perception will be confronted with the normative indexes and dynamic metrics simulation.

4 Conclusions and suggestions for future research

It is clear after reviewing research related to the lighting Standards some important questions: How quantitative illuminance criteria have been altered during the past years? Which are the adequate illuminance levels for daylight and artificial light? What is the minimum daylight quantity and how should it be perceived? Which are the main qualitative aspects of light that should be incorporated in the Standards? How to do research with users to generate normative indexes?

Regarding the discussion about quantitative and qualitative aspects of lighting, it’s clear that there are several important gaps for future research, especially for the Brazilian reality. Large scale studies, focusing the comparison between the normative index, dynamic simulations and users’ perception stand out as important ways. New indexes and methods for evaluating glare caused by windows, for example, need to be evaluated to Brazil, to discourage and prevent the use of information and criteria without a critical evaluation.

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