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Preface	Preface	6	General	2	I take issue with the contention, on the first page of this document, that the “ <i>basic aims</i> ” of road and public space lighting schemes includes “ <i>the discouragement of illegal acts,</i> ” and that “ <i>Category P lighting is acknowledge to be an effective counter to both the occurrence of crime and fear of crime.</i> ” <b>You have not established any of this with any sense of reliance on evidence.</b> Despite repeated mentions in this document implying that the use of outdoor lighting discourages the perpetration of night-time crime, the entire justification for this claim is based on three references: two trade publications and a UK Home Office report, none of which were subject to peer review. Just three references, all over 15 years old, that totally ignore the research literature in the intervening period. Worse, Appendix A abandons evidence altogether and merely appeals to “fear of crime,” which it admits “may not be justified,” as a criterion for the selection of lighting, noting that “dispelling fear of crime, as well, as actual crime, is a major objective.” The document doesn’t establish this with any objective evidence, rendering every single instance of crime as a driver of lighting design suspect, and undermining the authority the document purports to bring to this subject. Much of this document reads as if written by lighting manufacturing industry figures, severely damaging its credibility. (I’m happy to provide a	Absent much more rigorous evidence establishing a clear connection between the choice of lighting design/parameters and decreased perpetration of crime, the document should make no specific reference to light as a crime deterrent. Furthermore, it should not cite levels of crime – perceived or otherwise – as a criterion in categorizing the categories or subcategories for road reserves in local areas. The guidance should adhere strictly to the aspect of lighting that is backed by sound scientific evidence: public safety, which is ensured by design that enhances, not limits, night-time visibility.

<sup>1</sup> Options include: Clause, Title, Table of Contents, Preface, Foreword, Introduction, Appendix, Bibliography or Index.

<sup>2</sup> Options include: Editorial, General or Technical.

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					list of more modern light/crime literature upon request.)	
Preface	Preface	6	General	2	The insistence that “ <i>the performance criteria for road and public space lighting schemes</i> ” can or should include “ <i>contributing to the amenity of an area through increased aesthetic appeal,</i> ” is problematic for a variety of reasons, but most importantly due to the many known and suspected environmental hazards due to the widespread and careless application of artificial light at night (I could list literally <u>dozens</u> of scientific literature references on request). Along with the purported impact on crime, mentioned above, lighting for “increased aesthetic appeal” is nothing but a waste of a resources. Lighting of public spaces arguably should facilitate safe movement of people at night; the notion of ‘amenity’ lighting comes at an environmental cost that should be clearly stated. Virtually no limits are placed on the extent or brightness of lighting for “aesthetic appeal,” an irresponsible suggestion on the part of a standards organization like Standards Australia.	Clearly prescribe conditions for use of lighting to achieve aesthetic effects in the context of Category P roads and public spaces in order to limit, to the greatest extent possible, the environmental impact of this type of lighting. Given that it achieves no public safety goals, ‘amenity’ lighting should be severely limited in terms of its intensity, aiming, duration of use, and obtrusive effects.
Preface	Preface	10	General	3	The document states: “ <i>For each lighting subcategory described in this Standard the light technical parameters (LTPs) and their prescribed values are both necessary and sufficient for the particular application.</i> ” This, too, is asserted without evidence or reference. These are “necessary and sufficient” according to whom, other than Standards Australia?	Provide a justification for the LTPs specified throughout the document or drop the blanket assertion that the recommendations are “necessary and sufficient” by fiat.
Clause	1.1	2	General	5	The Standard is said specifically not to apply “ <i>to additional luminaires installed in lit roads for</i>	Justify the exemption of lighting installations characterized specifically as ‘security lighting’

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					<i>reasons of increased security,</i> ” or “ <i>lighting intended specifically as security lighting.</i> ” Why? It so confidently proclaims in previous pages that lighting deters crime, so why exempt installations whose stated purpose is providing “security lighting”?	from the provisions of this document.
Clause	2.3.1	4	General	9	“ <i>Road surface reflection properties are not taken into account in the design of Category P lighting for roads.</i> ” Given the diversity of ground covering materials in settings where Category P guidelines are in effect – as opposed to the uniformity of surface types typically Category V settings – it seems that road surface reflection properties <i>should</i> include wavelength-dependent albedo. This is especially true given illuminance standards provided in this document, which are specified as <i>minimum</i> values. Consideration of albedo allows for better control of apparent scene brightness. (Note that this should also take into account environment-dependent surfaces like those liable to alteration by rain and snow.)	Make some accommodation for the large variety of surface albedos encountered in Category P lighting situations in order to prevent over-lighting.
Clause	2.3.2	1	Technical	9	“ <i>Other considerations</i> ” in lighting design for Category P settings include “ <i>the use of white light</i> ”, with a reference to Clause 3.3. In turn, that clause calls for “ <i>the highest colour rendering index (CRI) possible</i> ” and “ <i>a nominal CCT no higher than 4000 K</i> ”. Again, these specifications are offered without any justification whatsoever. No reasoning is offered why such blue-rich white light should be contemplated, given the many known environmental hazards of its use at night. To the extent that high CRI values still largely imply blue-rich source spectral power distributions (SPDs), the same applies. Not every situation	Remove references in the document insisting on “ <i>the highest colour rendering index (CRI) possible</i> ” and similar; call for an absolute CCT upper limit of 3000K for all installations, regardless of (sub)category; and advise that installations should choose lamps emitting the least amount of blue light possible while achieving <u>sufficient</u> CRI to properly promote public safety.

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					deemed a “visual amenity” calls for the highest-possible CRI. To suggest otherwise, without justification, is purely arbitrary.	
Clause	3.1.1	3	Technical	15	LTPs in Tables 3.1 to 3.5 are “ <i>the minimum permissible, except for the parameter <math>U_{E2}</math> for which the values given are the maximum permissible.</i> ” Specifying minimum illuminances, rather than an acceptable range with clear maximum values, is irresponsible. Under such circumstances, lighting designers have no incentive to use the minimum amount of light required to support safe performance of tasks in outdoor spaces at night. These recommendations invite over-lighting, which potentially harms public safety by making transitions from lit to unlit spaces (or vice versa) difficult and creating nonuniformity that conveys an advantage to criminal perpetrators.	Specify, for every minimum illuminance value $\bar{E}_h$ and $E_{ph}$ given in tables 3.1 to 3.5, a corresponding maximum value that designers are not to exceed. State clearly that maximum values are <u>not</u> design goals, and that designers should rather design to the illuminances within the stated range that are most appropriate to specific task performance.
Clause	3.1.3.3	1	Technical	16	This paragraph introduces a new term, the “ <i>upward waste light ratio (UWLR)</i> ” that is completely unnecessary. It appears to be functionally identical to terms like Upward Light Ratio (ULR) and Upward Light Output Ratio (ULOR) that are already in wide circulation. The “Notes” section here refers to “Table 3.7”, which doesn’t exist; table numbering on page 23 jumps from 3.6 to 3.8.	Drop the introduction of a new and redundant term (UWLR) for existing ones (ULR or ULOR) that are already widely understood.
Clause	3.1.3.4	1	General	16	This clause asserts that “ <i>spill light can be advantageous in lighting the surrounds</i> ” and recommends “ <i>a minimum level of <math>0.5 E_{ph}</math> at a distance of 3 m inside abutting properties</i> ” to “ <i>prevent any undesirable sharp reduction in illumination immediately inside the property</i> ”	Drop suggestions of deliberate light trespass as a ‘beneficial’ side-effect of lighting design. Insist on full respect for property rights by calling for a strict adherence to practices that do not encourage or result in light trespass.

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					<i>boundaries,</i> ” noting that “ <i>this may be considered beneficial.</i> ” Whether or not a local jurisdiction maintains policies prohibiting light trespass, this kind of ‘enforced light trespass’ may constitute a legal nuisance under common law. Therefore, you may well be encouraging designers to create installations for clients that will leave them liable to civil suit.	
Clause	3.1.3.4	3	Editorial	16	The first sentence of this paragraph (“ <i>For pathways, cyclist paths and forecourts...</i> ”) is a fragment.	Write a complete sentence. Is it: “ <i>Pathways, cyclist paths and forecourts may be provided with lighting subcategories requiring vertical illuminance calculations of PW1, PW2 and PW3.</i> ”?
Clause	3.1.3.4	3	General	16	This clause also notes that the Standard specifies “ <i>no requirements ... for control of spill light.</i> ” Despite the provisions of AS/NZS 4282, I think it is a mistake to ignore the issue of spill light in this document. It says to lighting designers, in effect: “If it makes clients “feel safe,” use as much light wherever you like without regard for unwanted effects.” In any case, to this point in the document, there is still no evidence-based argument indicating that the use of outdoor light at night discourages crime, so the argument that “ <i>the relatively high illuminances associated with these subcategories are generally installed in response to a specific community need</i> ” undercuts the insistence that the Standard will not address spill light. Poor lighting design should not be excused on the supposition that incidentally spilled light is somehow beneficial to people who didn’t want or ask for it.	Devise some meaning of addressing spill light, perhaps in context to a discussion about light trespass (mentioned here, previously).

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Clause	3.2.1	1	Technical	16	<p>I'm confused as to why, e.g., HPS lamps "shall be derated to 0.75 of their quoted" lamp lumens because of their SPD and, presumably, a scene perceived under mesopic or scotopic conditions ("to compensate for the decreased sensitivity of the eye to 'yellow' light at low light levels"), but "no re-rating lumen multipliers of value greater than 1.0, such as those based on either the changing sensitivity of the eye at low light levels, or the enhanced receptiveness of the eye to 'white' light, shall be used in Category P lighting."</p> <p>These are completely contradictory statements. If the effective lumens associated with HPS lamps must be boosted in order to account for SPD and the sensitivity of the human eye to light, then blue-rich sources like white LED should be similarly treated. That would result in lumen multipliers &gt; 1, since scenes illuminated by blue-rich light are presumably perceived as <i>brighter</i> than they actually are. The mesopically adapted eye will perceive a blue-rich source, especially a white LED whose blue emission peaks near the peak of the CIE 1951 scotopic luminosity function, as brighter than the lamp lumens would indicate. To account for this, effective lumens should be rated <i>higher</i> than 1. (CIE 119:2010 is a "Recommended System for Mesopic Photometry Based on Visual Performance". And in the note, which mentions Reference 5 in Appendix H – that's a non-peer-reviewed white paper.)</p>	Add some means of compensating for higher apparent scene brightness when illumination sources consist of blue-rich white light.
Clause	3.4	1	General	17	<p>It seems like the document attempts to establish "a standard ... for defining, calculating and reporting the systemic energy impacts of road lighting," right as the note here suggests that this</p>	Clarify the applicability of the energy performance metrics.

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					doesn't exist (but it also says that the method "align[s] with the principles in EN 13201-5"). So, is this section informative, or normative?	
Clause	3.4	5	General	17	While Clause 3.3 states that " <i>The choice of light source should be based on an analysis of all the factors relevant to the particular application,</i> " this piece of Clause 3.4 calls for something that really only solid-state lighting (SSL) can provide: " <i>The methods in Appendix G accommodate lighting levels as dynamic and changing parameters rather than only as fixed values.</i> " The same goes for the discussion about constant light output (CLO; Clause 3.5.4) at various places in the document. Since non-SSL lighting essentially cannot be dimmed, or its output otherwise varied, it seems like the document explicitly endorses SSL (or other similarly controllable technologies).	Either be consistently agnostic about light sources throughout the document, in terms of lamp technology, or don't.
Clause	3.6.2	Table 3.1	General	19	No justification is given for recommending luminaire types for which UWLR > 0%. It's not clear why the document would recommend this, given that the same performance outcomes can be obtained by using fully shielded lighting products, while resulting in no emission of light directly into the night sky.	Recommend <u>only</u> Type 6 luminaires (UWLR = 0%) throughout the document.
Clause	3.6.2	Table 3.2	Editorial	20	This table, and Tables 3.3 and 3.5, recommend the use of Type 3 luminaires. However, Appendix E, note (d), page 44, states that " <i>Type 3 luminaires produce considerable glare and upward waste light and are not encouraged for use in the applications covered by this Standard.</i> "	Remove all references in the tables in which Type 3 luminaires are recommended. Recommend <u>only</u> Type 6 luminaires (UWLR = 0%) throughout the document.
Clause	3.6.2	Table 3.4	General	21	Illuminance values in the table for "connecting elements" are very high, by a factor of several,	More clearly state the need for proper transitions between areas of relatively high and low

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					relative to recommended illuminances for roads, pathways, outdoor car parks, etc. For example, someone could step out of a space lit at 35 lux (subcategory PE1) into another space lit only at, say, 7 lux (PR1). This creates a dangerous situation with respect to proper adaptation to vastly different light levels without any indication given as to the nature of the transition.	illuminance in order to allow the eye time to make the adjustment.
Clause	3.7.1.2	Table 3.7	Editorial	23	There is no Table 3.7. The numbering on this page runs from "Table 3.6" to "Table 3.8".	Correct the table numbering.
Clause	3.7.1.3	Table 3.8	Technical	23	It's totally unclear on what basis the values in this table were chosen. Because the metric ( $DGI_p$ ) is nonstandard, even specialists won't necessarily know how to interpret these numbers. Also, <b>H</b> is not defined anywhere (table columns 2 and 3), either here or in Appendix G.	Justify numerical values for $DGI_p$ defining the ranges of values for the stated discomfort glare classes. Define H.
Clause	3.7.2	Table 3.9	Technical	24	Between 1%-5% ULWR is allowed for all classes of luminaires in various applications contemplated in this table. There is no technical limitation why these classes can't all demand UWLR = 0%. My guess as to why you're allowing >1% is to validate sloppy design work that relies on tilting luminaires to achieve maximum horizontal throw. That's destructive to the night sky, and potentially causes both discomfort/disability glare and light trespass.	Recommend <u>only</u> Type 6 luminaires (UWLR = 0%) throughout the document.
Appendix	A2	2	General	38	The text in this section strips the Standard of virtually all credibility. After failing to establish objectively that the deployment of outdoor lighting mitigates the risk of crime – whether 'perceived' or actual – the Appendix drops the pretence of authority and appeals to " <i>quality of life</i> " for	Just drop the crime references and focus on what we know light <i>can</i> do: promote public safety through proper task illumination.

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					inhabitants of areas who fear “ <i>personal involvement</i> ” due to a “ <i>heightened perception of crime occurrence or risk (which may or may not be justified)</i> .” This is an incredibly weak argument that is not supported by evidence; rather, it comes across as the kind of talking points usually circulated by lighting manufacturing interests to literally scare people into demanding more of their products. The guidance in this document therefore appears to aim to convey a sense of safety, rather than actual, verifiable reductions in night-time crime. <u>The psychology of fear is not evidence for or against an influence of lighting on the perpetration of night-time crime.</u> It’s extremely disappointing that the document caters to a notion that has been largely discredited by scientific evidence in order to promote an unfounded justification for high outdoor lighting levels.	
Appendix	E1	Table 1	Editorial	43	Type 2, column 4: “See note (d)” refers to the wrong note.	Change this to “See note (c)”.
Appendix	E1	Table 1	Editorial	43	Type 3, column 4: a reference to “Note (d)” is missing.	Add “See Note (d)” to the final column of this entry.
Appendix	F1		Technical	46	The calculation of $A_L$ assumes that the underside of the luminaire (where the light engines are) is uniform, in the sense that the calculation does not take into account the spatial distribution of the light engines and reflective/refractive elements. Rather, the formula assumes that the luminaire emitting surface it literally of uniform brightness from edge to edge. Anyone who has looked up into an LED roadway luminaire at night knows this is not true!	This formula is just too simplistic, and vastly underestimates the variation in surface brightness of different parts of a luminaire. Add some supporting text to this effect, to note that there is a huge assumption in the formula about how luminaires are actually designed.

