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BRE Client Report

Assessment of obtrusive light impact of tennis court floodlighting on adjacent highway

Prepared for: Chipperfield Tennis Club

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Executive summary

Floodlighting is being proposed to the front court at Chipperfield Tennis Club in Kings Langley, WD4 9BS. This consists of six LED flood lights mounted on 6m high columns, three on each side of the tennis court, all fitted with one or several deflectors. 3m high, 2% transmittance net screening is also proposed for the front fence.

BRE have been commissioned to undertake a study to assess the impact of obtrusive light from the proposed tennis court floodlighting on the adjacent highway. Specifically, this study assesses the potential of the proposed floodlighting to cause glare to drivers on the adjacent highway.

This report presents the results of the glare assessment, which is based on calculation of veiling luminance (L_v) and threshold increment (TI) at multiple points placed at various distances along the centre line of each lane, and at 1.5m above road level. The calculated values are compared against maximum guideline benchmarks recommended by the Institution of Lighting Professionals (ILP) for unlit roads.

The calculation results indicate that there is no risk of glare to drivers on either lane of the adjacent highway. Using a 3m high, 2% transmittance net screening on the front fence, in addition to the luminaire deflectors, will allow the proposed scheme to achieve veiling luminance (L_v) and threshold increment (TI) values below the maximum ILP guideline benchmarks.

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1 Introduction

Floodlighting is being proposed to the front court at Chipperfield Tennis Club in Kings Langley, WD4 9BS. This consists of six LED flood lights mounted on 6m high columns, three on each side of the tennis court, all fitted with one or several deflectors. Figure 1 shows the location of the front court (left) and the locations of the proposed flood lights (right). Net screening is also proposed for the front fence (3m high, 2% transmittance).

Figure 1 Site layout showing front court location (left, adapted from Google Maps) and plan drawing showing the locations of the proposed LED flood lights (right, adapted from Outdoor Tennis LED Lighting Design report, ref. 5226d, dated September 2021, by Luminance Pro Lighting Systems Ltd). Key legend for image to the right: ▫ – full deflector; A – extended rear deflector; B – extended side deflector; ▬ – green net screening (front fence only).

The Outdoor Tennis LED Lighting Design report, ref. 5226d, dated September 2021, by Luminance Pro Lighting Systems Ltd, specifies six HiLux Match Slim LED luminaires, each rated 413 Watts and 55020 lumens. The proposal includes the use of a full deflector for all six luminaires, and extended rear and side deflectors for the two luminaires nearest to the adjacent highway. The dimensions of the proposed deflectors are shown in Figure 2.

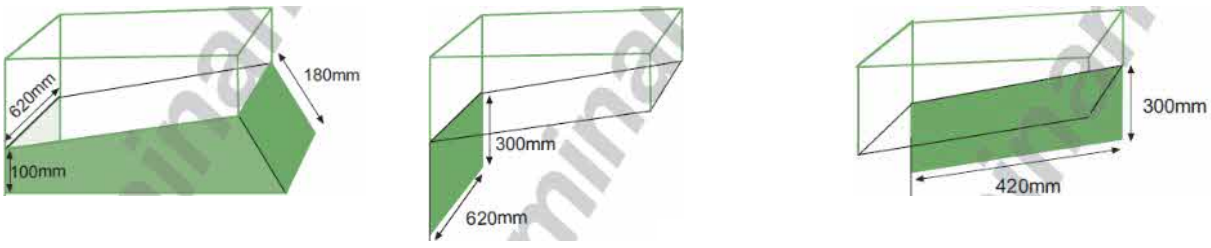

Figure 2 Dimensions of proposed luminaire deflectors. Adapted from Outdoor Tennis LED Lighting Design report, ref. 5226d, dated September 2021, by Luminance Pro Lighting Systems Ltd.

BRE have been commissioned by Chipperfield Tennis Club (the Client) to undertake a study to assess the impact of obtrusive light from the proposed tennis court floodlighting on the adjacent highway. Specifically, this study assesses the potential of the proposed floodlighting to cause glare to drivers on the adjacent highway. This report presents the results of the glare assessment.

2 Description of the project

Hertfordshire Highways and their external lighting consultant, Ringway, commented on the tennis court floodlighting proposed by the Client. The following excerpt was provided by the Client via email:

> *"The Highway includes the carriageway and the footpath and the results from the calculations show the light spill is going to be between 5 Lux and 100 Lux on the Highway. The calculated results need to show down to 1 Lux as there is no other lighting in the vicinity but the results provided only show down to 5 Lux. Whilst the side baffles do make a significant difference, baffles and a solid fence that no light can pass through on the side adjacent the Highway would most likely be the best solution from a Highway safety perspective in my opinion, but I am not the designer and they may have a better solution and appreciate other aspects of the design/brief that I have not been made familiar with."*

The 'Roads in Hertfordshire: Highway Design Guide 3rd Edition' [ref 1] includes a reference to the publication 'Lighting in the Countryside - Towards Good Practice' [ref 2]. This publication cites an example from Suffolk County Council in Box 6 on pages 43-44 (Standard Conditions for Floodlighting of Tennis Court) that "Any spill level of illumination must not exceed one lux at the boundary with the highway." Whilst Hertfordshire Highways may be still referring to this publication, it is dated 1997 and was replaced (or 'cancelled') by the Planning Practice Guidance Suite [ref 3] and the corresponding National Planning Policy Framework published in 2012 and revised in 2018. The Planning Practice Guidance no longer gives any benchmark for illuminance produced by schemes like tennis court floodlighting at highway boundaries. Instead, it refers to the Institution of Lighting Professionals (ILP) guidance for reducing obtrusive light [ref 4].

Limiting the illuminance on the roadway is a very poor way to improve road safety. Street lighting design generally aims to do the exact opposite, improving visibility by increasing illuminance on the roadway.

An assessment of the potential of glare from the proposed floodlighting to drivers, rather than illuminances on the road surface, would be the most relevant aspect of obtrusive light for road safety on the adjacent highway. This is also supported by the Institution of Lighting Professionals (ILP) guidance for reducing obtrusive light, given that in terms of limitation of the effects on users of road networks the ILP guidance gives maximum benchmarks for veiling luminance (L_v) and threshold increment (TI), both of which are measures of glare.

The potential of glare was assessed through calculations of veiling luminance (L_v) and threshold increment (TI) values at a series of viewing positions in the path of travel. The calculations were undertaken using DIALux lighting software and the results are compared against the maximum values recommended for unlit roads by the Institution of Lighting Professionals (ILP) guidance on obtrusive light. These are shown in Table 1.

Table 1 Maximum ILP guideline benchmarks for veiling luminance (L_v) and threshold increment (TI) for unlit roads. Based on the Institution of Lighting Professionals 'Guidance Note 01/21: The Reduction of Obtrusive Light'.

Lighting parameter	Maximum value recommended
Veiling luminance L_v	0.037 cd/m^2
Threshold increment TI	15%

Calculations were performed in line with the recommendations given in BS EN 12464-2 [ref 5] and BS EN 13201-3 [ref 6]. A computer model was built to include the proposed flood lights, deflectors, and net screening (2m high, 30% transmittance). The model also included the nearest buildings to the tennis court. In line with standard recommendations, reflected light from all external surfaces was disregarded, except for the road surface which was assumed to have 20% reflectance. No site visit was undertaken, and all dimensions of the buildings included in the model were estimated using the site layout provided by the Client as well as Google Earth.

Multiple calculation points were placed at various distances along the centre line of each lane, and at 1.5m above road level. The line of sight was taken to be 1º below the horizontal and in a vertical plane in the longitudinal direction along the centre line of each lane. Figure 3 shows the locations of the calculation points used for the glare assessment.

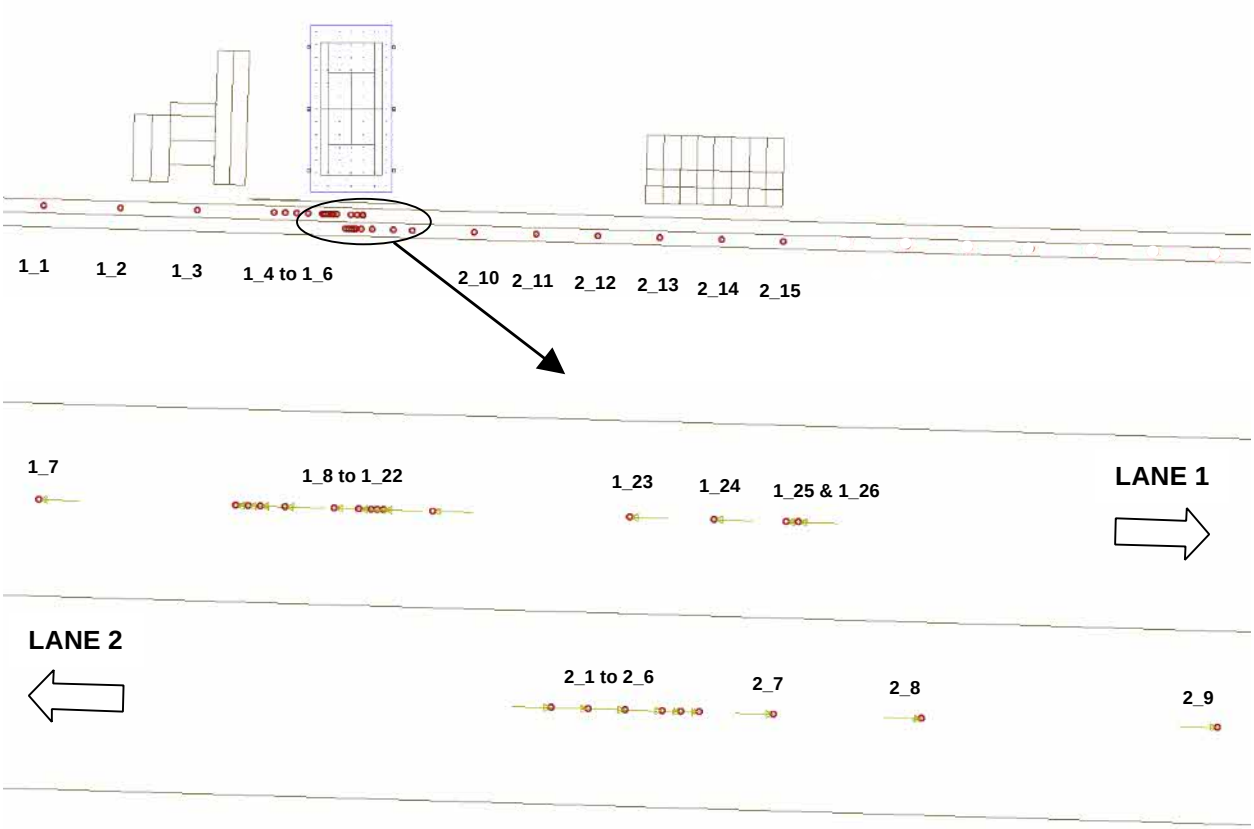

Figure 3 Locations of calculation points for veiling luminance (L_v) and threshold increment (TI): top – overall view of all calculation points considered; bottom – detailed view of road section by tennis court. Calculation points are labelled 1_1 to 1_26 for lane 1 and 2_1 to 2_15 for lane 2.

At each calculation point, the initial illuminances produced by each of the six luminaires on a plane normal to the line of sight were determined. Considering an average observer age of 23 years and following the recommendations given in BS EN 12464-2 and BS EN 13201-3, veiling luminance and threshold increment were calculated. As recommended in BS EN 12464-2 for situations where no road lighting is provided, an adaptation luminance of 0.1 cd/m^2 was considered in the calculation.

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3 Findings

The calculation results are shown in Table 2.

Table 2 Calculation results for veiling luminance (L_v) and threshold increment (TI).

Lane	Calculation point	Coordinates relative to centre of tennis court			Veiling luminance L_v (cd/m^2)	Threshold increment TI (%)
		X (m)	Y (m)	Z (m)		
Lane 1 (nearest to tennis court)	1_1	-54.96	-17.36	1.5	0.000	0.0
	1_2	-41.21	-17.76	1.5	0.000	0.0
	1_3	-27.47	-18.17	1.5	0.000	0.0
	1_4	-13.72	-18.58	1.5	0.000	0.1
	1_5	-11.70	-18.64	1.5	0.000	0.1
	1_6	-9.67	-18.70	1.5	0.000	0.1
	1_7	-7.64	-18.76	1.5	0.000	0.1
	1_8	-5.09	-18.84	1.5	0.000	0.1
	1_9	-4.93	-18.84	1.5	0.000	0.2
	1_10	-4.77	-18.85	1.5	0.000	0.2
	1_11	-4.45	-18.86	1.5	0.000	0.2
	1_12	-3.81	-18.87	1.5	0.001	0.3
	1_13	-3.73	-18.88	1.5	0.001	0.3
	1_14	-3.65	-18.88	1.5	0.001	0.3
	1_15	-3.57	-18.88	1.5	0.001	0.3
	1_16	-3.49	-18.88	1.5	0.001	0.3
	1_17	-3.33	-18.89	1.5	0.001	0.4
	1_18	-3.25	-18.89	1.5	0.001	0.4
	1_19	-3.17	-18.89	1.5	0.001	0.4
	1_20	-2.53	-18.91	1.5	0.001	0.5
	1_21	-1.26	-18.95	1.5	0.002	0.8
	1_22	-0.62	-18.97	1.5	0.002	0.9
	1_23	0.02	-18.99	1.5	0.002	1.0
	1_24	1.11	-19.02	1.5	0.002	0.9
	1_25	2.05	-19.05	1.5	0.002	0.8
	1_26	2.21	-19.05	1.5	0.002	0.8
Lane 2 (farthest from tennis court)	2_1	-1.00	-21.46	1.5	0.026	10.8
	2_2	-0.52	-21.47	1.5	0.026	10.6
	2_3	-0.04	-21.49	1.5	0.029	12.0
	2_4	0.44	-21.50	1.5	0.028	11.6
	2_5	0.68	-21.51	1.5	0.028	11.3
	2_6	0.92	-21.52	1.5	0.027	11.0
	2_7	1.88	-21.54	1.5	0.022	9.1
	2_8	3.80	-21.60	1.5	0.013	5.4
	2_9	7.64	-21.71	1.5	0.001	0.4
	2_10	11.03	-21.82	1.5	0.000	0.2
	2_11	22.09	-22.14	1.5	0.000	0.0
	2_12	33.16	-22.47	1.5	0.000	0.0
	2_13	44.23	-22.80	1.5	0.000	0.0
	2_14	55.29	-23.13	1.5	0.000	0.0
	2_15	66.36	-23.46	1.5	0.000	0.0

The calculation results indicate that using a 3m high, 2% transmittance net screening on the front fence, in addition to the luminaire deflectors as described in Section 1 and shown in Figures 1 and 2, will allow the proposed scheme to achieve veiling luminance (L_v) and threshold increment (TI) values below the maximum ILP guideline benchmarks, which are 0.037 cd/m^2 and 15%, respectively.

Therefore, there is no risk of glare to drivers on either lane of the adjacent highway.

4 Conclusion and recommendations

Floodlighting is being proposed to the front court at Chipperfield Tennis Club in Kings Langley, WD4 9BS. This consists of six LED flood lights mounted on 6m high columns, three on each side of the tennis court, all fitted with one or several deflectors. 2m high net screening (30% transmittance) is also proposed for the front fence.

BRE have been commissioned to undertake a study to assess the impact of obtrusive light from the proposed tennis court floodlighting on the adjacent highway. Specifically, this study assesses the potential of the proposed floodlighting to cause glare to drivers on the adjacent highway.

The assessment is based on calculation of veiling luminance (L_v) and threshold increment (TI) at multiple points placed at various distances along the centre line of each lane, and at 1.5m above road level. The calculated values are compared against maximum ILP guideline benchmarks for unlit roads.

The calculation results indicate that there is no risk of glare to drivers on either lane of the adjacent highway. Using a 3m high, 2% transmittance net screening on the front fence, in addition to the luminaire deflectors, will allow the proposed scheme to achieve veiling luminance (L_v) and threshold increment (TI) values below the maximum ILP guideline benchmarks.

5 References

1. Hertfordshire County Council. Roads in Hertfordshire: Highway Design Guide 3rd Edition. January 2011. References section available from https://www.hertfordshire.gov.uk/media-library/documents/highways/development-management/references-highways-design-guide.pdf
2. Department for Communities and Local Government. Lighting in the Countryside - Towards Good Practice. July 1997. Available from https://webarchive.nationalarchives.gov.uk/20120920012017/http:/www.communities.gov.uk/documents/planningandbuilding/pdf/158352.pdf
3. Ministry of Housing, Communities and Local Government. Guidance documents cancelled by the planning practice guidance suite. March 2014. Available from https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/287414/Local_Planning_WMS_Deposited_paper.pdf
4. Institution of Lighting Professionals. Guidance Note 01/21: The Reduction of Obtrusive Light. Available from https://theilp.org.uk/publication/guidance-note-1-for-the-reduction-of-obtrusive-light-2021/
5. British Standards Institution. BS EN 12464-2:2014. Light and lighting. Lighting of work places. Outdoor work places. London, BSI.
6. British Standards Institution. BS EN 13201-3:2015. Road lighting. Calculation of performance. London, BSI.