

BASEBALL

NEW SOUTH WALES

Baseball NSW Lighting
Standards Policy

August 2021

2.2 Baseball and softball

2.2.1 General

Baseball and softball are high-speed outdoor sports in which the ball may travel at speeds in excess of 60 m/s. There is potential danger arising from the possibility of collision and contact between players and between players and the ball. At higher levels of play, the main difference is not the absolute ball velocity, but the increased level of pitching skill, e.g. curve balls, and velocity variation. Therefore, higher lighting levels are appropriate.

In addition to the major direction of ball travel between the pitcher and the batter, there is considerable ball travel between the other three bases and the pitcher. Commonly employed luminaires may be so bright as to cause disability glare to players and spectators alike, consequently suitable pole heights, locations, and luminaire aiming are therefore essential for sufficient visual performance for participants, officials, and spectators.

It is important that good contrast be provided between the ball and its background, especially in the pitcher and batter zones. This is facilitated by the provision of vertical illuminance. In addition, the provision of illumination over the whole of the field, and in the space above is important to facilitate the judgement of ball flight.

2.2.2 Light Technical Parameters (LTPs)

The LTPs shall be in accordance with the applicable values in Table 2.2.1.

Table 2.2.1 — LTPs for baseball and softball

Level of play ^a	Grid	Average horizontal maintained illuminance (\bar{E}_h)	Minimum horizontal uniformity		Minimum vertical maintained illuminance (E_{vmin}) ^b	Max. glare rating (GR)	Minimum colour rendering index (R_a)
			(E_{hmin}/\bar{E}_h) (U_1)	(E_{hmin}/E_{hmax}) (U_2)			
Training (non-competition)	Infield	300	0.50	0.30	n/a	n/a	65
	Outfield	200	0.30	0.20	n/a	n/a	65
Softball — Recreational, club/local competition	Infield	300	0.60	0.40	100	50	65
	Outfield	200	0.50	0.30	60	50	65
Baseball — Club/local competition	Infield	500	0.60	0.40	150	50	65
	Outfield	300	0.50	0.30	100	50	65
Baseball and Softball — State/major competition	Infield	750	0.70	0.50	300	50	65
	Outfield	500	0.60	0.40	200	50	65
Softball — National	Infield	750	0.70	0.50	300	50	80
	Outfield	500	0.60	0.40	200	50	80
Baseball — National	Infield	1 500	0.80	0.70	500	45	80
	Outfield	1 000	0.60	0.50	300	50	80
^a For international competitions refer to specific sport governing body requirements. ^b The ratio of the vertical illuminance at points H and P should be between 0.5 and 2, it is recommended that it should be between 0.75 and 1.5.							

2.2.3 Calculation and measurement grids

Calculations and measurements of horizontal illuminance shall be made at ground level for a grid of points covering both the infield and outfield areas in accordance with Figures 2.2.1 and 2.2.2.

Calculations and measurements of vertical illuminance shall be made parallel to the ground, and 1 m above ground level for the following positions and directions (see Figure 2.2.3):

- (a) *Infield area* — At home base (H) facing towards the pitcher's mound/plate (P), and at the pitcher's mound/plate (P) facing towards home base (H);
- (b) *Outfield area* — At each of the six outfield points (RF1/2, CF1/2, LF1/2) facing as shown.

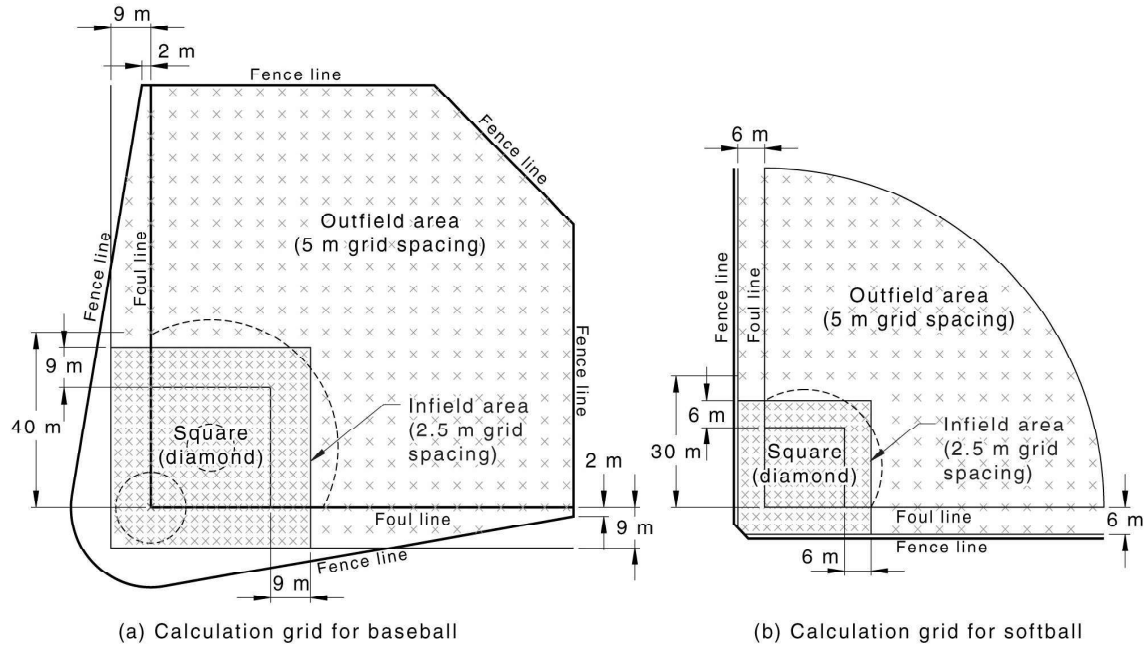


Figure 2.2.1 — Calculation grids for horizontal illuminance for baseball and softball

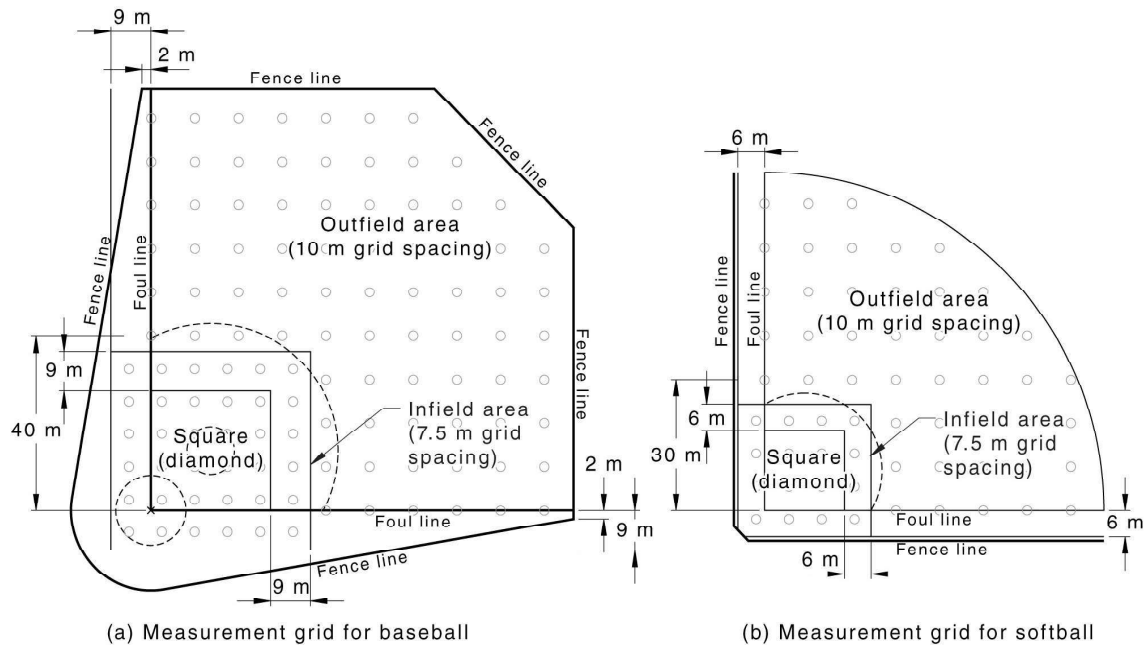
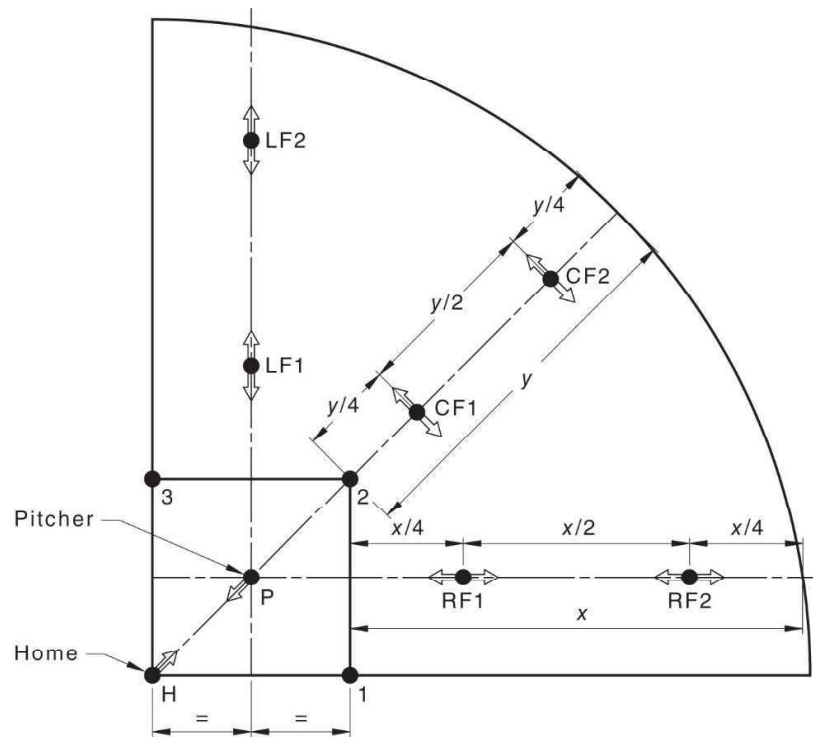


Figure 2.2.2 — Measurement grids for horizontal illuminance for baseball and softball



The arrow (\Rightarrow) indicates the direction of the surface normal of the plane for the calculation of vertical illuminance, viz. the orientation of the light meter. Points 1, 2, and 3 are exclusively for GR observers for baseball state/major competition and national level of play.

Figure 2.2.3 — Locations and directions for vertical illuminance points, and GR observer positions for baseball and softball

2.2.4 Glare control

2.2.4.1 General

The restriction of disability glare is an important safety consideration because the visibility of a ball approaching at high speed may be reduced, giving an increased risk of injury. Discomfort glare should also be limited for participants, officials, and spectators.

The principal means of controlling glare involves a combination of the following measures:

- (a) The luminaire mounting height should be in accordance with Clause 2.2.4.2.
- (b) Poles should be located in accordance with Clause 2.2.4.3.
- (c) Luminaires should be aimed in accordance with Clause 2.2.4.4.
- (d) Glare rating shall be calculated in accordance with Clause 2.2.4.5.

2.2.4.2 Luminaire mounting height

The minimum luminaire mounting height to the lowest luminaire should be in accordance with Table 2.2.2.

Table 2.2.2 — Minimum mounting height for luminaires

Level of play	Minimum height of the lowest luminaire (h)
Baseball	

Club/Local/State/Major competition	25 m
National	30 m or h whichever is higher
Softball	
Recreational/Club/Local competition	20 m
State/Major competition/National	25 m or h whichever is higher

If applicable, the minimum mounting h should be determined in accordance with Clause 1.6, where h is calculated by the following equation:

$$h = 0.6 \times d$$

where

d = the horizontal distance from the pole(s) under consideration to the applicable point on the FOP specified below (see Figure 2.2.4):

- (a) For A and B poles—the pitcher's plate;
- (b) For C poles—the nearest point on the field that is —
 - (i) for baseball—65 m from the home plate; and
 - (ii) for softball—45 m from the home plate.

The above relationship is intended to ensure that an angle of at least 30° will be provided between the horizontal and a line from the specified point on the FOP to the lowest luminaire.

2.2.4.3 Luminaire locations

The locations of the poles are critical to the effective lighting of the playing field. Pole locations for baseball and softball should be as shown in Figure 2.2.4. The 8-pole layout is recommended where pragmatic, and for superior quality.

For national baseball competition play, the 8-pole layout should be used. A 6-pole layout is more suitable for fields with smaller outfields.

Luminaires should be located away from the critical lines of sight for players during a game. In Figure 2.2.4, the triangular areas extending from each infield base form an exclusion zone 20° wide. If the luminaires are located outside these triangular areas, the ball will not pan through the luminaire bank in the line of sight of the player, thereby reducing direct glare for infielders. To prevent glare affecting players in the outfield, luminaires should not be located behind the home plate in the 90° triangular area bordered by the extension of the base lines.

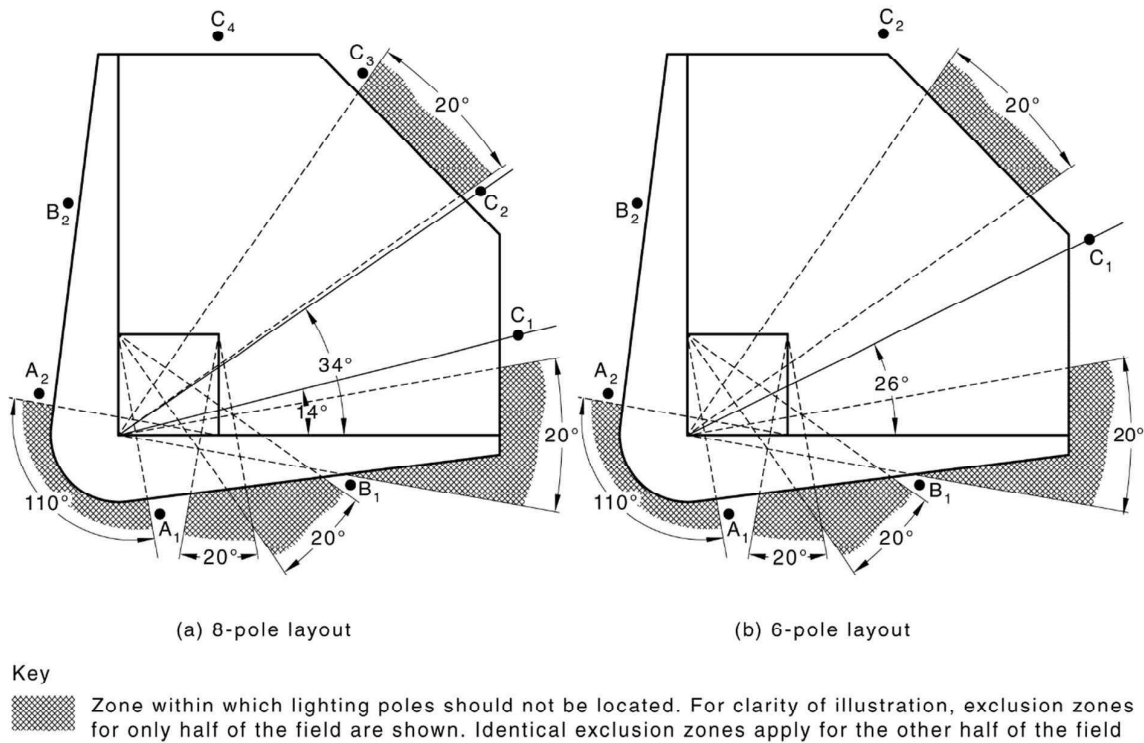


Figure 2.2.4 — Luminaire locations and exclusion zones for baseball and softball

2.2.4.4 Luminaire aiming

The luminaires located on “A” poles serve to illuminate the pitcher, batter, catcher and plate umpire, and the ball in flight within the infield area. Since most of the game is played between the pitcher and batter, these are the most critical pole locations. Generally, a minimum of three luminaires on each of the two infield “A” poles are needed; one aimed towards home plate, one toward the pitcher, and one toward first or third base.

The “B” poles serve to illuminate the front of the batter and catcher, the side of the ball facing the infield players, and the infielders themselves so they can be seen by players in the outfield. Generally, at least half of the luminaires on the “B” poles should be aimed toward the infield. The rest should be aimed toward the outfield to light the front side of the ball when it is thrown in from the outfield.

The “C” poles are in locations beyond the outfield fence. They light the deep outfield and provide lighting on the side of the ball facing the outfielders when there is a line drive or high flyball hit into this area.

The maximum intensity from nadir (the downward vertical axis) should be restricted to less than or equal to 65° for “A” poles, and less than or equal to 70° for B and C poles.

2.2.4.5 Glare rating

For typical fields a diffuse reflectance factor between 0.25 for natural grass (outfield) and 0.50 for sand (infield) usually applies. The maximum GR is applicable to each of the observer positions shown in Figure 2.2.3. If the lighting system is symmetrical, then the number of observer points may be reduced. Observers shall be at a height of 1.5 m above the FOP, and shall —

- (a) for observer positions H and P — view all of the calculation points specified by the infield calculation grid of Figure 2.2.1, and for observer positions RF1/2, CF1/2, LF1/2 (and for 1, 2,

3 if applicable), view a regular grid of points spaced at not more than 5 m × 5 m fitted evenly within the perimeter of the combined infield and outfield area such that all points inside that perimeter are no greater than a grid spacing of the boundary, see Figure 2.2.1; or

- (b) have a viewing angle of 2° below horizontal, and viewing directions in azimuth of equal angular steps of 15°.

2.2.5 Batting cages and bullpens

2.2.5.1 General

This Clause applies to lighting for outdoor bullpens and batting cages.

2.2.5.2 Light Technical Parameters (LTPs)

The LTPs shall be in accordance with the applicable values in Table 2.2.3.

Table 2.2.3 — LTPs for batting cages and bullpens

Level of play	Average horizontal maintained illuminance (\bar{E}_h)	Minimum horizontal uniformity (E_{hmin}/\bar{E}_h) (U_1)	Minimum vertical maintained illuminance (E_{vmin})	Vertical uniformity gradient per 2 m		Maximum glare rating (GR)	Minimum colour rendering index (R_a)
				G	UG		
Club/local competition	300	0.70	100	≤ 40 %	1.67	45	65
Local Club and regional Competition	500	0.70	150	≤ 30 %	1.43	40	65
State/major competition ^{a, b}	1 000	0.70	300	≤ 20 %	1.25	40	65

^a Where the batting cage or bullpen is used for warming up for a game held at a ground with higher illuminance levels, e.g. for TV broadcast, then a higher level should be considered to acclimate the batter/pitcher.

^b Where the practice pitch is used for high performance training and high-speed video is employed, higher illuminances may be appropriate together with additional vertical illuminance analysis. A competent lighting designer should be consulted.

NOTE: Where fencing is used, a light loss can be expected, actual losses will depend on the net transmittance factor, When measuring, values can be expected to be lower due to the attenuation of net.

2.2.5.3 Calculation and measurement grids

Calculations and measurements of horizontal illuminance and uniformity shall be made at the level of the playing surface. Calculations and measurements of vertical illuminance and uniformity shall be made at 1 m above the playing surface, parallel to the ground, and facing in the directions of both the pitcher and batter.

Calculations and measurements of horizontal and vertical illuminance, and uniformity shall use a regular grid of points evenly spaced evenly about the midpoint of the pitching distance at as shown in Figure 2.2.5. The calculation and measurement points are coincident.

Dimensions in metres

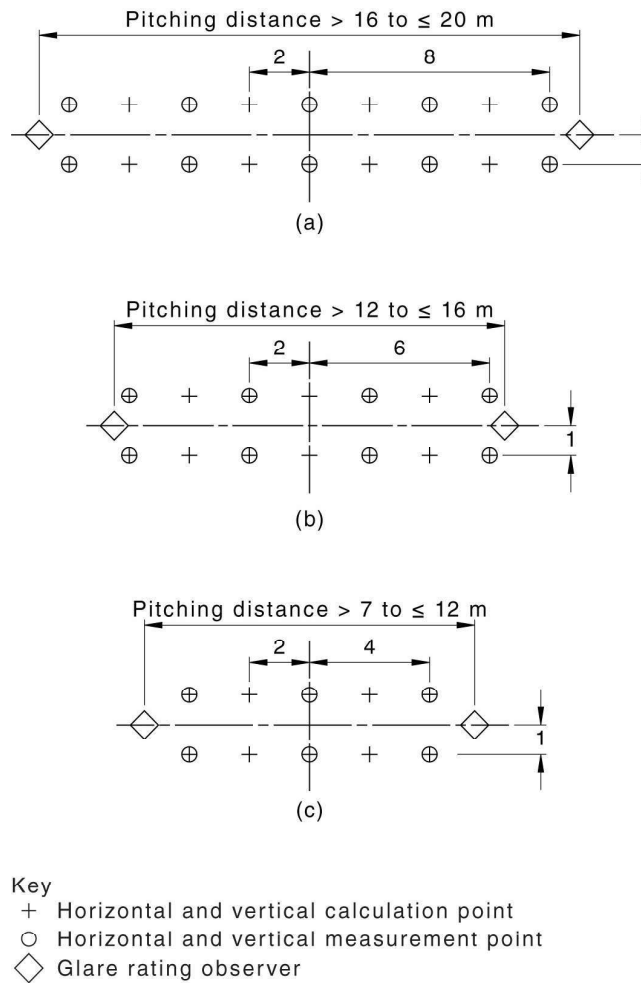


Figure 2.2.5 — Grid points and GR observer points for baseball and softball batting cages and bullpens

2.2.5.4 Glare control

2.2.5.4.1 *General*

The principal means of controlling glare involves a combination of the following measures:

- (a) The luminaire mounting height should be in accordance with Clause 2.2.5.4.2.
- (b) Poles should be located in accordance with Clause 2.2.5.4.3.
- (c) Glare rating shall be calculated in accordance with Clause 2.2.5.4.4.

2.2.5.4.2 *Luminaire mounting height*

For bullpens and batting cages luminaire heights should not be less than the formula shown in Clause 1.6 where d is the horizontal distance from a point immediately below the furthest luminaire(s) under consideration to the pitcher (bullpen) or batter (batting cage). Additionally, luminaires should be installed at not less than 6 m.

2.2.5.4.3 *Luminaire locations*

For bullpens and batting cages, poles should be located as shown in Figures 2.2.6, 2.2.7 or 2.2.8.

Dimensions in metres

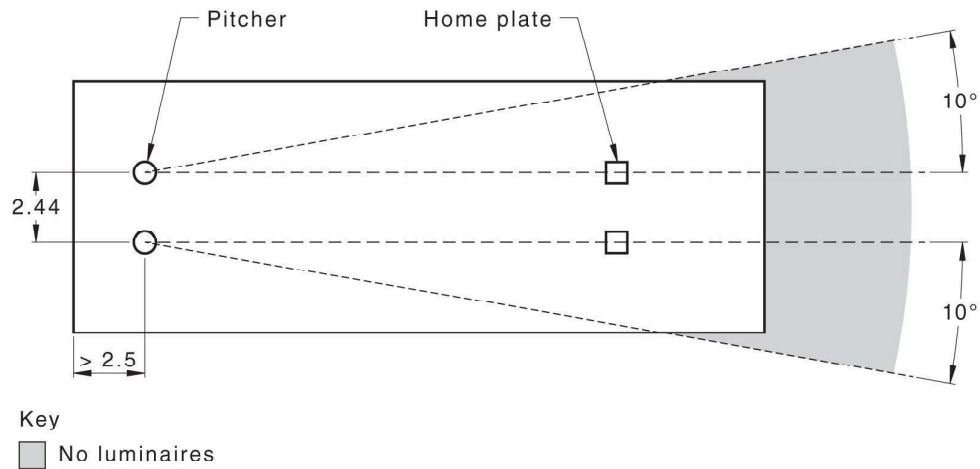


Figure 2.2.6 — Exclusion zones for baseball and softball (2 lane) bullpens

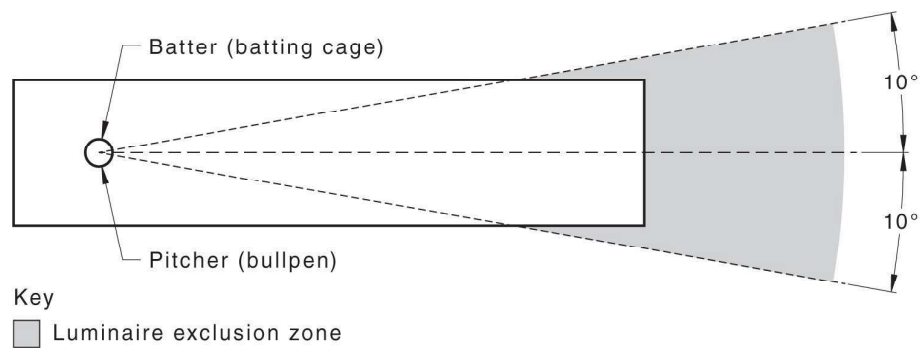


Figure 2.2.7 — Exclusion zones for baseball and softball (one lane) bullpens and a single batting cage

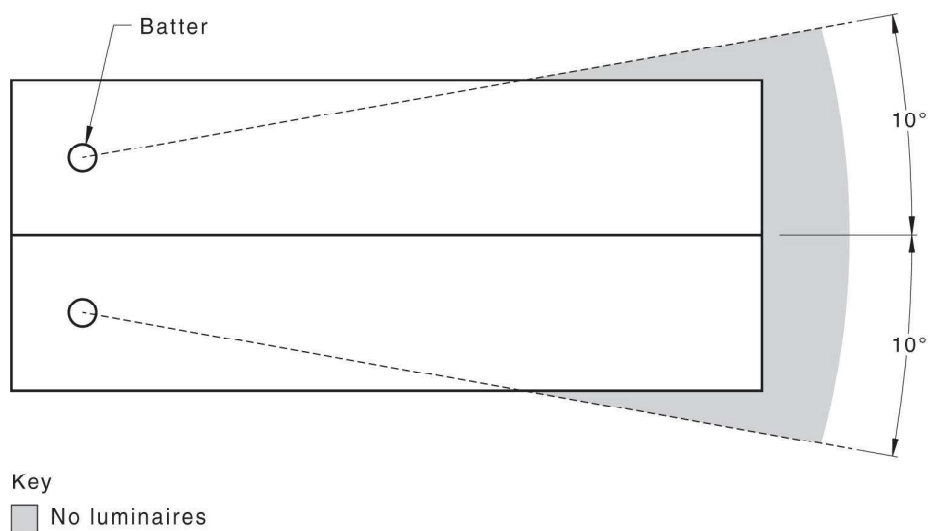


Figure 2.2.8 — Exclusion zones for baseball and softball multiple adjacent batting cages

2.2.5.4.4 *Glare rating*

A diffuse reflectance factor of 0.35 for synthetic grass usually applies. The maximum GR is applicable at the following observer positions, see Figure 2.2.5:

- (a) *For bullpens* — The pitcher.
- (b) *For batting cages* — The pitcher and batter.

Observers shall be at a height of 1.5 m above the surface. Each observer shall either —

- (i) view all of the calculation points specified by the horizontal calculation grid points of Figure 2.2.5; or
- (ii) have a viewing angle of 2° below horizontal, and viewing directions in azimuth that are —
 - (A) *for bullpens* — at the pitcher towards home plate; or
 - (B) *for batting cages* — at the batter towards the pitcher, and at the pitcher towards the batter.