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**SCREENS FOR
 DIGITAL CINEMA PROJECTORS
 DATA SHEET**

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Optimising capital and operating costs:

- Digital cinema projectors can lose a substantial amount of the light theoretically available, depending on the set-up used to achieve film formats; the lamp life point; and the type of lamp used. Other elements in the optical path (e.g. port glass) can also reduce the available light.
- The incident light on the screen may be significantly less than the lumens stated for the projector; in extreme cases it could be only 50%.
- Achieving SMPTE recommended screen brightness level may require powerful lamps.
- Gain screens can be used to achieve higher brightness levels by making the best use of the available light.

Lumens required to achieve 14 FL (55 Cd/m2)

Screen width	30ft	40ft	50ft	60ft	70ft
Screen gain	9.1m	12.1m	15.2m	18.3m	21.3m
0.8	6700	11900	18600	26900	36500
1.0	5400	9500	14900	21500	29200
1.4	3800	6800	10600	15300	20900
1.8	3000	5300	8300	12000	16200
2.2	2500	4300	6800	9800	13300

Incident light on axis. Cinemascope aspect ratio screen

Lumens required to achieve 14 FL (55 Cd/m2)

Screen width	30ft	40ft	50ft	60ft	70ft
Screen gain	9.1m	12.1m	15.2m	18.3m	21.3m
0.8	8500	15100	23600	34000	46400
1.0	6800	12100	18900	27200	37100
1.4	4900	8600	13500	19400	26500
1.8	3800	6700	10500	15100	20600
2.2	3100	5500	8600	12400	16900

Incident light on axis. Flat aspect ratio screen

- Using a gain screen may enable smaller lamps to be used. Cost savings can be significant.

Lamps (kw)	user price \$	warranty life (hrs)	lamps p.a.	lamp cost \$p.a.	power cost \$p.a.	operating cost \$p.a.	\$per. hr
2	800	2400	1.7	1333	800	2133	0.53
3	900	1400	2.9	2571	1200	3771	0.94
4	1250	1000	4.0	5000	1600	6600	1.65
4.5	1200	1000	4.0	4800	1800	6600	1.65
6	1800	600	6.7	12000	2400	14400	3.60

Assuming 4000 hours annual usage. Costs based on US exhibitor example.

- Using a lamp with power one level lower can almost halve operating costs.
- Selecting a smaller lamp may enable a smaller projector model to be used. This can reduce initial capital costs.

Harkness Perlux screens are available in different gain levels

	Peak gain	Half gain angle
Perlux 140	1.4	50 degrees
Perlux 180	1.8	34 degrees
Perlux 220	2.2	25 degrees

Gain is measured to British Standard BS 5550

- It is recommended to use a curved frame with Perlux screens; with 1.4 gain screens this is less critical.
- See 'Screen Surfaces for Digital Cinema' leaflet for product specifications and frame recommendations.

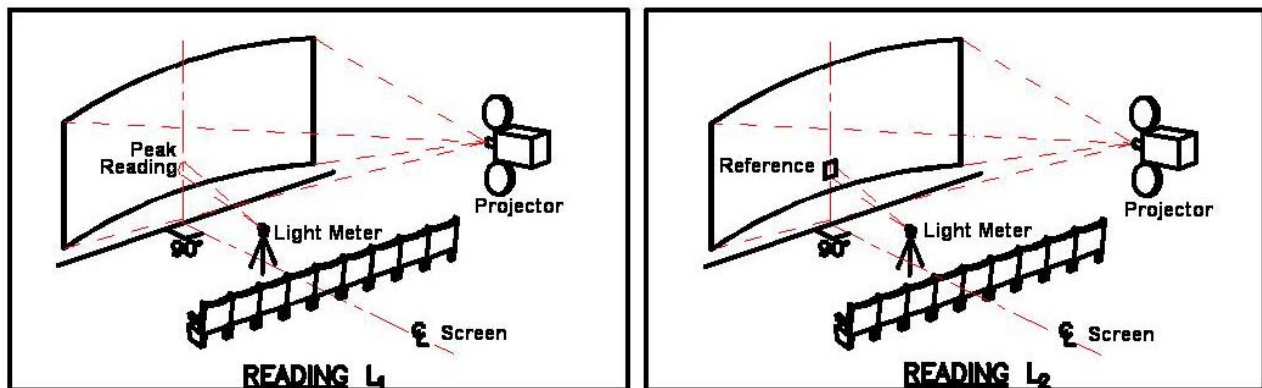
Screen / lamp recommendations

Screen width		Screen gain	Lamp power kw
30ft	9.1m	1	1.5
35ft	10.7m	1	2
		1.4	1.5
40ft	12.1m	1	3
		1.4	2
45ft	13.7m	1.4	3
		1.8	2
50ft	15.2m	1.4	4
		1.8	3
55ft	16.8m	1.4	4.5
		1.8	3
60ft	18.3m	1.4	6
		1.8	4.5
65ft	19.8m	1.8	6
		*1.4	6
70ft	21.3m	1.8	6
		*1.4	6
		*1.8	4.5

*Assumes anamorphic lens is used.

Measuring gain level of screen in existing theatres

- This is relatively easy to do this using a light meter and a reference standard.



- Gain = $L_1 \div L_2$
- Should also measure absolute light levels in foot lamberts.
- Harkness can provide reference standard. See data sheet (DS-073) for full details of method.

Digital 3D applications

- If 3D content is to be shown, other considerations apply; please consult with Harkness on screens for 3D applications.

Summary

- In new build and retrofit, consider screen gain together with projector model and lamp power rating to minimise capital and operating costs.
- In theatres already equipped with digital projectors, consider replacing screen with higher gain to reduce operating costs.