



LED Strobes

The New Generation

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Strobes – A Summary of Existing Technology

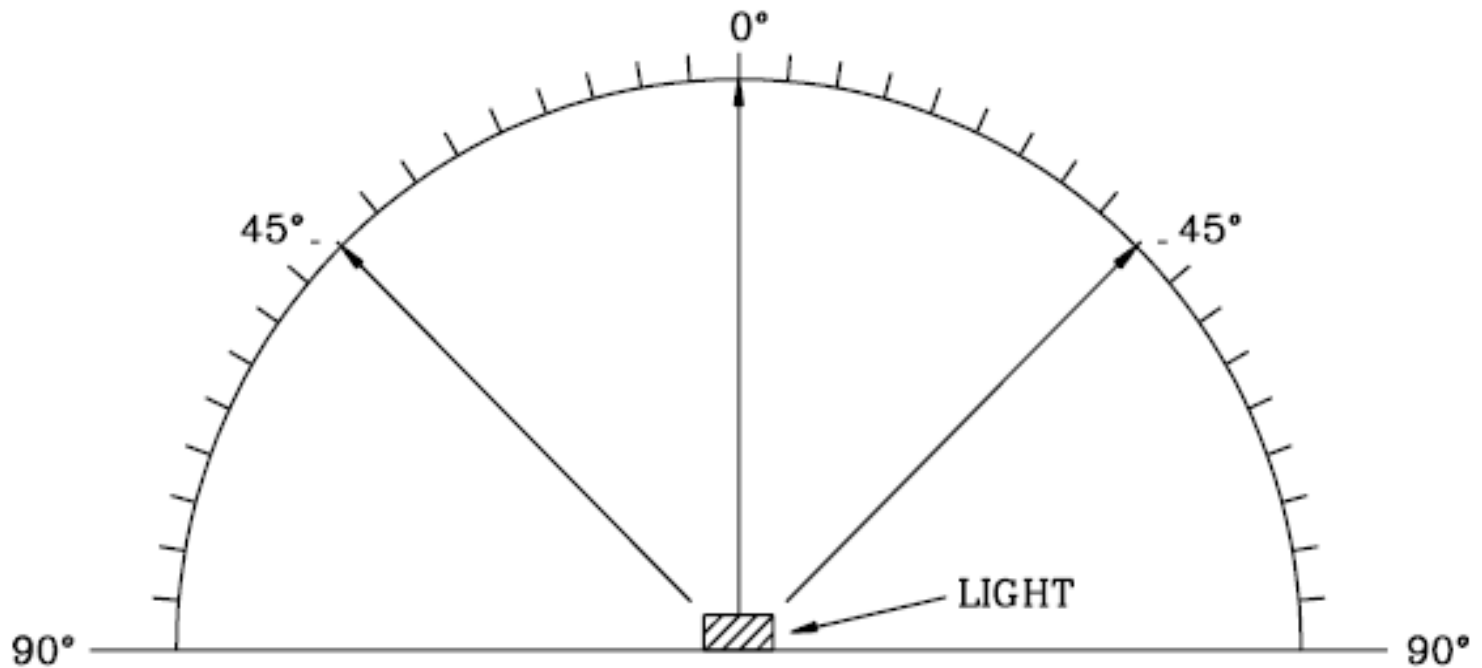
- Most strobes are made using xenon flash tubes
- Such strobes have a very short high intensity flash of about 0.1m sec
- Somewhat delicate construction because of the glass tube used
- Large and bulky units
- Have high voltage inside the units

Strobe Requirements

- Must meet ULC performance requirements for dispersion
- Candela rating is based upon testing at various angles
- For a theoretical strobe rating of 100 Candela (cd), the on axis Candela measurement must be at least 100 cd however, all other angles must at least meet the 100 cd derating
- Front view of derating

Horizontal Dispersion

Figure 5
Light output – Horizontal dispersion
(Reference 7.3.1.8)



Horizontal Dispersion Ratings

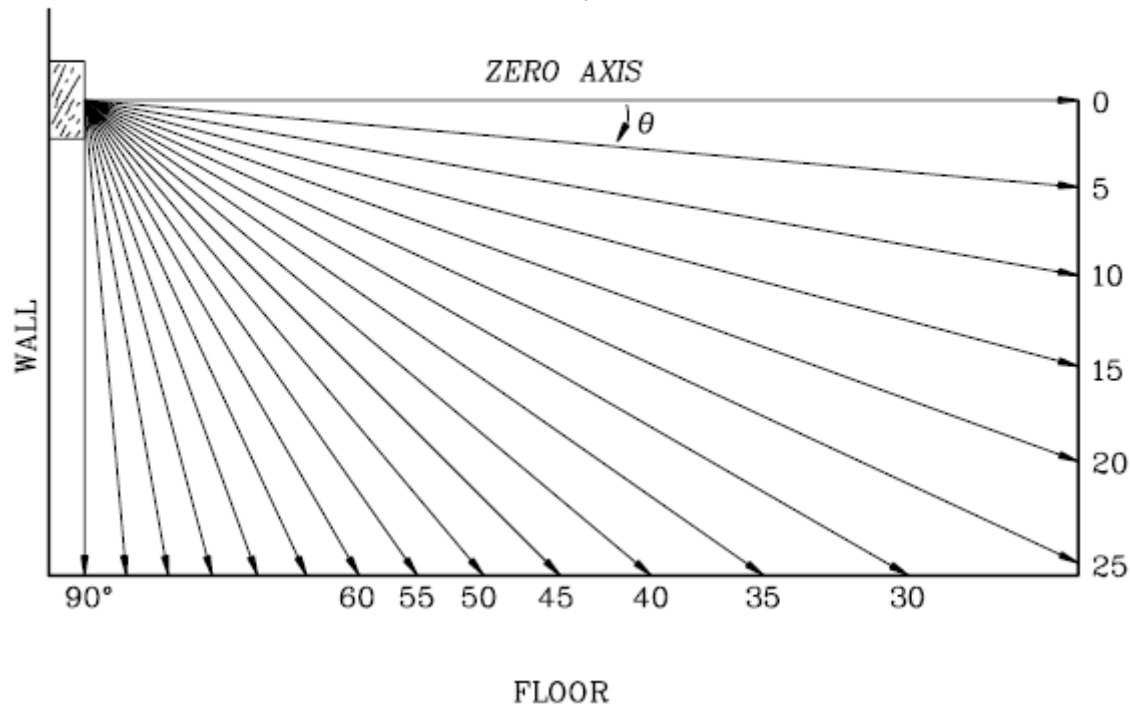
Table 27.1
Required minimum percentage for horizontal dispersion

Degrees ^a	Percent of rating
0	100
5 – 25	90
30 – 45	75
50	55
55	45
60	40
65	35
70	35
75	30
80	30
85	25
90	25
Compound 45 to the right	24
Compound 45 to the left	24

^a Tolerance of ± 1 degree is permitted.

For Wall Mounted Unit – Vertical Dispersion Angles Measured

Figure 6A
Light output – Vertical dispersion, wall to floor
(Reference [7.3.1.8])



SM.314A

For Wall Mounted Unit – Vertical Dispersion Values

Table 8B
Required minimum percentage for vertical dispersion wall to floor
Reference 7.3.1.8(b)

Degrees ^a	Percentage of candela rating
0	100
5 – 20	90
35	65
40	46
45	34
50	27
55	22
60	18
65	16
70	15
75	13
80	12
85	12
90	12

^a Tolerance of $\pm 1^\circ$ is permitted.

Compound Angles – Minimum Performance

Table 8C
Required minimum percentage for vertical dispersion in both x and y planes ceiling to wall and floor

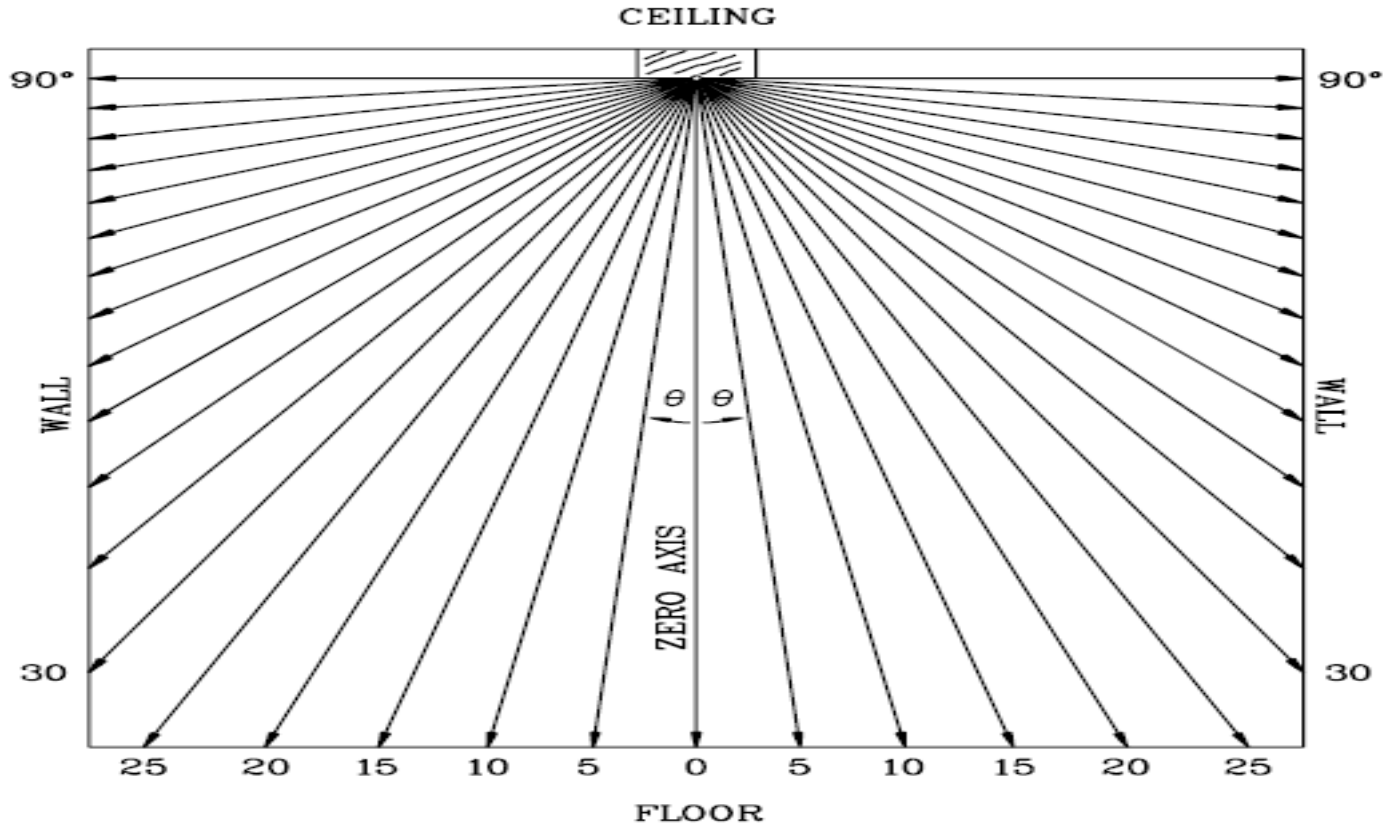
Reference 7.3.1.9(a)

Degrees ^a	Percentage of candela rating
0	100
5 – 25	90
30 – 45	75
50	55
55	45
60	40
65	35
70	35
75	30
80	30
85	25
90	25
Compound 45° to the right	24
Compound 45° to the left	24

^a Tolerance of $\pm 1^\circ$ is permitted.

Ceiling Units Dispersion Angles

Figure 6B
Light output – Vertical dispersion, ceiling to walls and floor
(Reference 7.3.1.9)



LED Strobes – Theoretical Advantages

- Small size of light source
- Low power in comparison to other technologies – more efficient conversion to light
- Long life because solid state
- Rugged structure by itself
- No UV generated when operated
- Wide operating temperature
- Low electrical noise

LED Strobes – Theoretical Advantages (continued)

- Uses lower voltage as compared to other technologies
- Low profile potential for aesthetic design
- Colour may be able to be controlled electronically
- More white colours available

Challenges in Design

- Can the LED total light output meet the light output summed over all ULC requirements?
- LED specs from all manufacturers are for continuous operation – strobe is short high bursts of power followed by idle state
 - Is reliability affected if average power is low but bursts are high?
 - Does this stress device or stress leads used for soldering

Challenges in Design (continued)

- How to design a lens to shape light to ULC requirements?
- How to deal with heat dissipation within a unit?
- How to protect a lens so it can pass ULC impact (frontal test) and jarring (rear test)?
- How long does LED have to be on to get equivalent light?
Will this affect perception?

Installation Standards Requirements

- Installation standards are S524 for Canada and NFPA 72 for the US
- Requirements NFPA -72 - 2013 and before

NFPA - 72 - 2013

18.5.3 Light, Color and Pulse Characteristics

18.5.3.1 The flash rate shall not exceed two flashes per second (2 Hz) or be less than one flash every second (1 Hz) throughout the listed voltage range of the appliance.

18.5.3.2 A maximum pulse duration shall be 0.2 seconds with a maximum duty cycle of 40 percent.

18.5.3.3 The pulse duration shall be defined as the time interval between initial and final points of 10 percent of maximum signal.

NFPA - 72 - 2016

To the requirements for NFPA – 72 – 2013 are added the following:

18.5.3.2 The maximum light pulse duration shall be 20 milliseconds with a maximum duty cycle of 40 percent.

Exception: Lights used to meet the requirements of 18.5.5.5 (Spacing in Corridors) shall be permitted to be listed and labeled to have pulse durations up to 100 milliseconds.

Results with Lens

	Horizontal		Vertical Dispersion,		Vertical Dispersion		Vertical Dispersion,	
	Dispersion for FHS-		Wall to Floor for		X-Plane for FHS-		Y-Plane for FHS-	
	400 and FS-400		FHS-400 and FS-400		400C and FS-400C		400C and FS-400C	
	Mircom	ULC	Mircom	ULC	Mircom	ULC	Mircom	ULC
	%	%	%	%	%	%	%	%
±0	149	100	148	100	150	100	155	100
±5	146	90	149	90	149	90	153	90
±10	143	90	153	90	149	90	152	90
±15	138	90	135	90	145	90	152	90
±20	134	90	104	90	139	90	146	90
±25	128	90	101	90	130	90	130	90
±30	123	75	94	90	121	75	122	75
±35	116	75	92	65	114	75	115	75
±40	106	75	84	46	111	75	111	75
±45	99	75	75	34	110	75	108	75
±50	92	55	68	27	110	55	108	55
±55	87	45	65	22	107	45	105	45
±60	82	40	61	18	100	40	101	40
±65	78	35	58	16	88	35	89	35
±70	75	35	54	15	72	35	72	35
±75	73	30	49	13	59	30	59	30
±80	72	30	43	12	60	30	61	30
±85	81	25	40	12	55	25	58	25
±90	53	25	30	12	42	25	45	25
Compound ±45°	42	24			79	24	83	24

Results – Wall Strobe



Results – Wall Horn Strobe



Results – Ceiling Strobe



Results – Ceiling Horn Strobe





Thank You

Questions and Discussion