Whitecroft lighting

Foil

Integrated lighting, acoustics and services

Foil - Pioneering the perfect combination

With the growing demand for organisations to reduce their carbon footprint, the design of buildings has entered a more challenging era. The overriding aim is to create the most comfortable and effective conditions possible, but with the additional emphasis on achieving environmental and economic objectives.

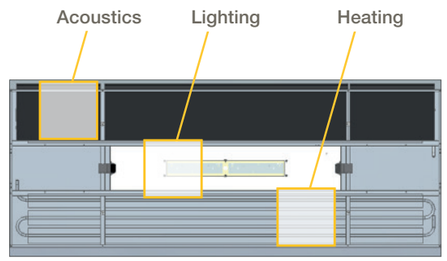
Optimising light, sound and temperature

The drive towards open soffit design brings the benefit of greater daylight penetration and a more open feel, but increases reverberation times. Foil delivers an elegant solution to the acoustic design challenges, with integrated sound absorbing wings that can greatly contribute to meeting the overall acoustic reverberation standard.

Foil has for many years been a market leading lighting solution, with its ground breaking combination of quality lighting and acoustic performance. Foil combines the latest in LED lighting technology with the acoustic performance of its predecessors, to bring LED technology without the expected increase in capital cost. The efficiency of Foil means that an area can be lit with fewer luminaires, keeping capital costs neutral as well as driving down energy usage. The integration of additional services presents further opportunity for a reduced build programme and ensures a clutter free environment.

Increased window sizes also lead to a lack of wall space for traditional radiators. Foil can integrate heating elements into the luminaire body, delivering highly efficient heating solutions that free up wall space for more productive uses.

Foil is equally at home in education and commercial environments, bringing high quality lighting, heating and acoustics to any open soffit application.



A brighter and more productive environment

Helping teaching staff to perform at their best

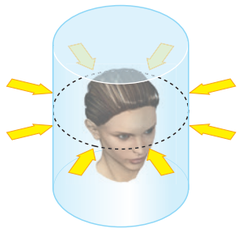
Research has shown that good quality lighting schemes will have a positive effect on educational outcomes. The qualitative aspects of a lighting scheme are defined in both the Priority Schools Building Programme and CIBSE LG5. These tackle room surface lighting levels, cylindrical illuminance, brightness and colour rendition.

Improving workplace performance

Lighting in the workplace has been discovered to affect productivity and effectiveness of workers. The combination of direct and indirect lighting balances contrast to all room surfaces for a more productive environment.

Lighting for better communication

Perhaps the best measure of the quality of a lighting scheme is cylindrical illuminance, this measures light in a 360° cylinder. Lighting schemes with higher levels of cylindrical illuminance will aid facial recognition, resulting in improved communication and understanding.



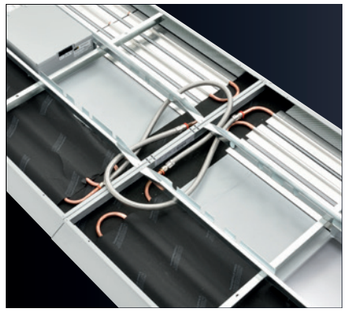
Controlling glare and increasing comfort

Foil employs a number of features to ensure visual comfort from all angles of view. High quality diffusers are used to soften the point source of light without reducing light transmission which when combined with the uplighting feature, ensures an extremely comfortable visual appearance without disability or glare.

Excellent acoustics, radiant heating and cooling

Changes in the way spaces are designed has led to the exposure of more hard surfaces and an increased impact on noise levels. Perforated side panels contain special sound absorbing materials to address reverberation requirements and improve the acoustic environment. Inclusion of anechoic material in the luminaire removes the likelihood of acoustic panels being rendered ineffective by being damaged or covered.

The indoor climate has a big influence on our general well-being. Integration of radiant heating and cooling ensures even temperature distribution across the full height of the room to create comfort for the occupiers of the space. With activation over both sides, Foil Radiant delivers effective and efficient heating and cooling without occupying valuable floor or wall space.



Integrating services for faster build schedules

Foil allows easy integration of additional services, creating a more appealing ambience with an uncluttered ceiling. Segregated cable ways incorporate luminaire control, data and power services. Luminaire infill panels can be modified to accommodate items such as speakers, smoke detectors, fire alarms and sprinkler heads. All of this flexibility means that systems can be pre-configured and fitted before being delivered to site, decreasing build schedule dramatically.


Sprinkler heads


Smoke detection

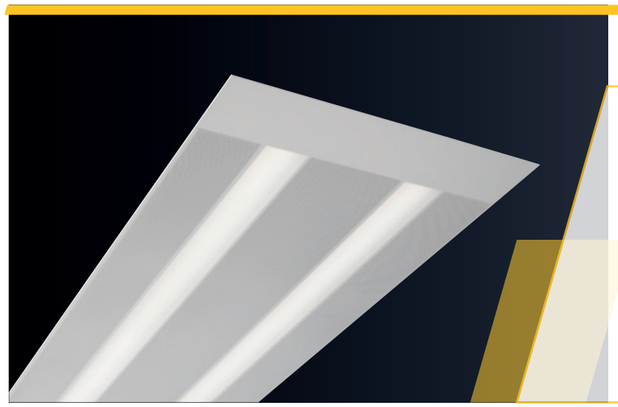

Public address


Lighting controls


Emergency lighting

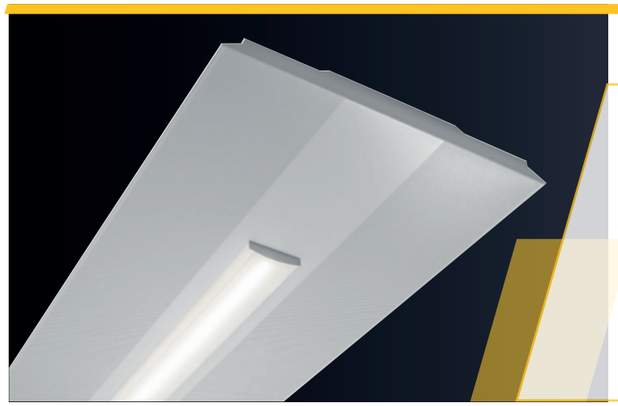
The Foil Range

Foil XS-Line



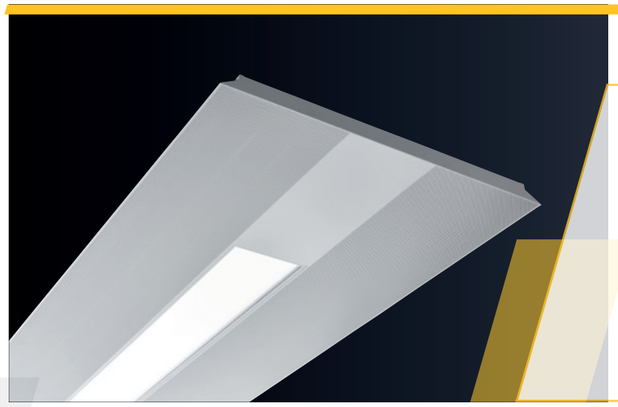
The flagship luminaire in the Foil range, Foil XS-Line combines the highest quality lighting with unsurpassed acoustic performance. Foil XS-Line's twin micro-polymer diffusers optimise uniformity and soften the point source of light without compromising light transmission. The twin diffuser layout is further enhanced with a 25% uplighting feature, adding brightness to the ceiling plane and reducing contrast between ceiling and luminaire.

Foil SRD



When budget is paramount, Foil SRD combines the best features of XS-Line with a lower cost, single lighting element. The reeded diffuser protrudes slightly from the body, allowing light to wash across the luminaire surface reducing contrast. Foil SRD offers compliant acoustic performance and service integration features as XS-Line, but more luminaires may be required to meet the requirements of BB93 in larger spaces.

Foil Radiant



Foil Radiant adds the ability to integrate Zehnder radiant panels into the body of the luminaire, combing heating, lighting and acoustics into a single unit. This is ideal in areas where space dictates that radiators cannot be wall mounted, giving flexibility to space management. Foil Radiant is highly efficient and evenly distributes heating throughout the room, delivering savings of over 20% against traditional heating systems. Installation is simple, with flexible hoses integrated into each unit.

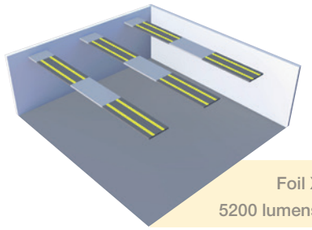
Foil Range

Product feature	Foil XS-Line	Foil SRD	Foil Radiant
Chamfered 30° body edge for a slimline appearance	✓	✓	✓
Direct / Indirect light distribution (75/25)	✓	✓	✓
Perforated side panels with 48mm acoustic absorbing material	✓	✓	
40% extra acoustic absorbing material further improves acoustics *	✓		
Perforated side panels with 30mm acoustic absorbing material			✓
Integrated heating and cooling			✓
Range of infill panels for continuous mounting	✓	✓	✓
Steel body with colour finish in silver or white	✓	✓	✓
Micropolymer diffuser twin-line configuration	✓		
Extruded reeded polycarbonate lowered diffuser		✓	
Hexaprism diffuser central in-line configuration			✓
IP20 as standard	✓	✓	✓
IP44 version available	✓	✓	✓
Service integration of speakers, smoke detectors, fire alarms, and sprinkler heads	✓	✓	✓

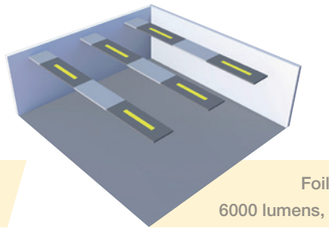
** Additional 40% when compared with Foil SRD*

Application Guide

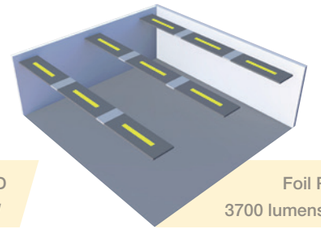
55m² Standard Classroom



Foil XS-Line
5200 lumens, 45W



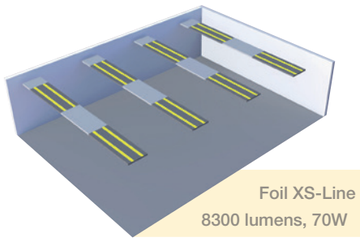
Foil SRD
6000 lumens, 43W



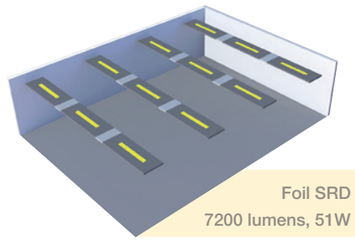
Foil Radiant
3700 lumens, 30W

55m² Standard Classroom				
Criteria	**Target (LG5)**	**Foil XS-Line**	**Foil SRD**	**Foil Radiant**
Average light level	300	353	402	376
Uniformity	0.6	0.63	0.65	0.68
Wall illuminance	50% / 75lux	53% / 187lux	55% / 220lux	50% / 188lux
Ceiling illuminance	30% / 50lux	48% / 170lux	49% / 198lux	52% / 196lux
Cylindrical @ 1.2m	150	157	182	151
Modelling	0.3-0.6	0.41	0.42	0.38
UGR Limit	19	≤19	≤19	≤19
Cd/m²	≤3000 where VDT use	2530	2489	1986

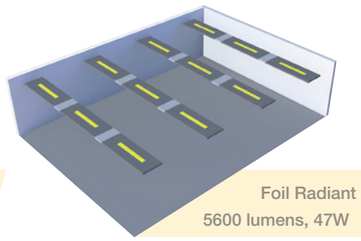
90m² Office Space / Technology Classroom



Foil XS-Line
8300 lumens, 70W



Foil SRD
7200 lumens, 51W



Foil Radiant
5600 lumens, 47W

90m² Office Space / Technology Classroom				
Criteria	**Target (LG5)**	**Foil XS-Line**	**Foil SRD**	**Foil Radiant**
Average light level	500	561	615	499
Uniformity	0.6	0.64	0.66	0.62
Wall illuminance	50% / 75lux	52% / 293lux	57% / 350lux	50% / 248lux
Ceiling illuminance	30% / 50lux	43% / 242lux	48% / 294lux	52% / 257lux
Cylindrical @ 1.2m	150	249	283	195
Modelling	0.3-0.6	0.41	0.43	0.37
UGR Limit	19	≤19	19.5	≤19
Cd/m²	≤3000 where VDT use	1171	2978	2997

Heating and Cooling Performance Data

Heating Performance

K	7.3161
n	1.1466

Δt (K)	Output
70	955
68	923
66	892
64	861
62	831
60	800
58	770
56	739
55	724
54	709
52	679
50	649

Δt (K)	Output
48	619
46	590
44	561
42	531
40	503
38	474
36	445
34	417
32	389
30	361
28	334
26	307

Δt (K)	Output
24	280
22	253
20	227
18	201
16	176
14	151
12	126
10	103

Cooling Performance

K	9.2275
n	1.083

Δt (K)	Output
15	173
14	161
13	148
12	136
11	124
10	112
9	100
8	88
7	76
6	64
5	53
4	41
3	30
2	20
1	9

ESFA Technical Standards and Performance in Schools

When referring to the ESFA (Education & Skills Funding Agency's) Output Specification "Annex 2F Mechanical Services and PHE (Technical Annex) v7", it is important to note that the Radiant Temperature Asymmetry (RTA) within each space should be calculated considering the radiant panel 'active area' and not the entire panel area if only part of the panel is active. For Foil Radiant, there is the option of activating either one (single) or two (dual) sides of the panel; this is equivalent to either 33% or 66% of the panel face area being active, so in the case of our standard 2,200 x 900 mm panel (1.98m² total face area), the active areas shall take into account formulae in BS 7726 or reference tables in Annex 2F with 0.65m² for the single activation panel or 1.3m² for dual sided activation.

For a seated person, the difference in plane radiant temperature between the upper and lower parts of the space shall be taken with respect to a small horizontal plane 0.6m above floor level in accordance with CIBSE Guide A Section 1.6.6.4 (2015 Edition). RTA should not exceed 7K for sedentary activity the only exception should be for vulnerable pupils e.g. those with low mobility. To that end, the RTA should be reduced to 5K.

Additional factors to consider

- The design shall take account of the mean water temperature, size of radiant panels and the available mounting height
- The arrangement of panels should ensure an even distribution of heat
- Radiant panels shall 'not be located directly above teaching walls or… (an occupant is) standing for prolonged periods of time' unless RTA calculations deem that the installation is suitable
- The option of integrating luminaires and acoustic absorbers within radiant panels shall be considered
- The surface temperature of ceiling mounted radiant panels in classrooms or offices shall be 'limited to meet BS EN 15251'

Radiant Temperature Asymmetry, RTA = 7K			
		RTA = 7K	RTA = 5K
Flow/Return Temperature (°C)	Assumed Emitter Temperature (°C)	Panel width (mm)	Panel width (mm)
		900	900
		Minimum panel height above finished floor level (m)	Minimum panel height above finished floor level (m)
50/30	40	< 2.4	< 2.4
60/40	50	2.55	3.20
70/40	55	2.85	3.55
70/50	60	3.2	4.0
80/60	70	3.75	4.60
82/71	76.5	4.1	5.0

Acoustic Performance Data

Fully compliant with DCSF Building Bulletin 93

DCSF Building Bulletin 93 clearly defines the acoustic performance standards for reverberation time. Most installations would include acoustic wall cladding to meet the requirement. Acoustic wall panels can be time consuming and costly to install. With acoustic material integrated into the Foil luminaire, significant savings can be made in both build programme and material cost.

Type of room	New Build T_{mf} (seconds)	Refurbishment T_{mf} (seconds)
Nursery school	≤0.6	≤0.8
Primary school classrooms	≤0.6	≤0.8
Secondary school classrooms	≤0.8	≤1.0
Open-plan teaching areas	≤0.5	≤1.2
Open-plan resource areas	≤0.5	≤1.2
Music classrooms	≤1.0	≤1.0
Small lecture rooms	≤0.8	≤1.0
Larger lecture rooms	≤1.0	≤1.0
Study rooms	≤0.8	≤1.0
Libraries	≤1.0	< 1.2
Science laboratories	≤0.8	≤1.0
Drama studios	≤1.0	≤1.0
Design and Technology	≤0.8	≤1.0
Art rooms	≤0.8	≤1.0
Audio-visual, video conference rooms	≤0.8	≤0.8
Atria, circulation spaces not used for teaching and learning	≤1.5	≤2.0
Dance studio	≤1.2	≤1.5
Interviewing/counselling rooms	≤0.8	≤0.8
Office, medical room, staff room	≤ 1.0	≤ 1.2
Dining rooms	≤1.0	≤1.5

DCSF BB93: Performance standards for reverberation in teaching and study spaces - mid-frequency reverberation time, T_{mf}, in finished but unoccupied and unfurnished rooms

Equivalent Sound Absorption Area

Foil XS-Line / Foil SRD

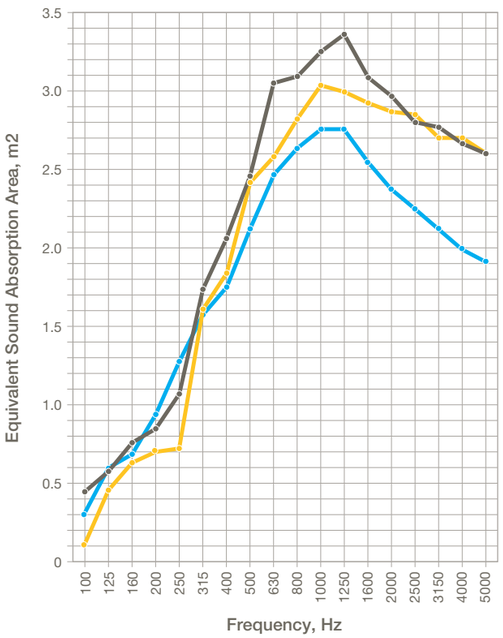
Empty Room:
Temperature: 16.2°C **Humidity:** 55%RH **Pressure:** 1008 mbar

Room with Sample:
Temperature: 16.2°C **Humidity:** 55%RH **Pressure:** 1008 mbar

Foil Radiant

Empty Room:
Temperature: 16.3°C **Humidity:** 50%RH **Pressure:** 1022 mbar

Room with Sample:
Temperature: 15.0°C **Humidity:** 52%RH **Pressure:** 1022 mbar



800mm wide Foil XS-Line with 48mm layer of compressed fibre acoustic material

800mm wide Foil SRD with 48mm layer of compressed fibre acoustic material

900mm wide Foil Radiant with 30mm layer of compressed fibre acoustic material

Freq Hz	T1 sec	T2 sec	Equivalent Sound Absorption Area, m²
50*	3.91	3.54	0.2
63*	4.16	3.12	0.7
80*	5.87	4.58	0.4
100	6.23	4.73	0.4
125	7.31	4.91	0.6
160	6.95	4.32	0.8
200	6.79	4.1	0.8
250	7.34	3.01	1.1
315	7.43	3.01	1.7
400	6.61	2.58	2.1
500	5.53	2.17	2.4
630	5.25	1.85	3.0
800	5.56	1.87	3.1
1000	6.04	1.86	3.2
1250	5.78	1.79	3.4
1600	5.21	1.83	3.1
2000	4.81	1.82	2.9
2500	4.26	1.79	2.8
3150	3.54	1.65	2.8
4000	2.86	1.5	2.7
5000	2.19	1.3	2.6
6300*	1.6	1.09	2.4
8000*	1.28	0.92	2.4
10000*	0.92	0.69	2.8

Freq Hz	T1 sec	T2 sec	Equivalent Sound Absorption Area, m²
50*	4.59	3.99	0.4
63*	4.66	3.37	1.0
80*	3.94	3.59	0.3
100	6.17	5.83	0.1
125	6.75	5.40	0.4
160	6.46	4.83	0.6
200	6.94	4.94	0.7
250	7.03	4.98	0.7
315	6.87	3.61	1.6
400	5.92	3.13	1.8
500	5.26	2.58	2.4
630	5.12	2.46	2.6
800	5.33	2.39	2.8
1000	5.62	2.34	3.0
1250	5.56	2.34	3.0
1600	5.13	2.27	2.9
2000	4.55	2.15	2.9
2500	3.98	1.99	2.9
3150	3.33	1.81	2.7
4000	2.69	1.56	2.7
5000	2.17	1.34	2.6
6300*	1.59	1.07	2.4
8000*	1.21	0.86	2.3
10000*	0.91	0.66	2.6

Freq Hz	T1 sec	T2 sec	Equivalent Sound Absorption Area, m²
50*	4.23	4.07	0.1
63*	5.05	3.9	0.6
80*	5.20	4.42	0.3
100	7.32	5.99	0.3
125	6.88	4.94	0.6
160	6.33	4.52	0.7
200	6.40	4.09	0.9
250	7.14	3.82	1.3
315	6.83	3.36	1.6
400	6.27	3.05	1.7
500	5.63	2.61	2.1
630	5.17	2.33	2.5
800	5.44	2.28	2.6
1000	5.78	2.28	2.8
1250	5.52	2.23	2.8
1600	5.00	2.25	2.5
2000	4.51	2.21	2.4
2500	3.98	2.13	2.2
3150	3.29	1.96	2.1
4000	2.65	1.74	2.0
5000	1.97	1.43	1.9
6300*	1.41	1.11	1.9
8000*	1.21	0.98	1.9
10000*	0.80	0.69	1.9

* Denotes frequencies outside the range covered by BS EN ISO 354:2003
T1, empty room reverberation time. T2, room reverberation time with sample Chamber Volume 300m³ - 800mm suspension height - individual luminaire
Full independent test reports available on request

800mm wide Foil XS-Line with 48mm layer of compressed fibre acoustic material

800mm wide Foil SRD with 48mm layer of compressed fibre acoustic material

900mm wide Foil Radiant with 30mm layer of compressed fibre acoustic material

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