

PHILIPS

sense **and** simplicity

Efficient Lighting for Industries

Lighting Need for Professional Industrial - *Lighting for safety and quality*

- Physical needs
 - Adequate lighting levels
 - Minimise glare / fatigue
 - Safety
- Emotional needs
 - Working comfort
 - Working ambience
- Social needs
 - Environmental concerns
 - Social responsibility



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Industrial applications

Contents

- Industry lighting standards
- Luminaire selection
- Automotive Industry
- Electronics Industry
- Power Sector
- Steel Plants
- Warehousing / distribution centres

Industry Standards for illumination

- IS 3646 – Code of Practice for interior illumination
- IS 6665 – Code of Practice for Industrial Lighting
- EN 12464 – Lighting of work places – Indoor work places part 1

Mounting ht & Luminaire selection

- Fluorescent Luminaires
 - Industrial batten
 - Industrial batten with reflector
 - 4 lamp high bay
- HID luminaires
 - 150w medium bay
 - 250w medium bay
 - 400w high bay

Fluorescent Luminaires – part 1

- Mounting ht: 3 – 4 m
- Typical lux levels: 150 lx – 300 lx

Luminaire	Lamp combination	Lamp type
TMC 55	2 x 36w	Trulite / Super 80 NG
TMC 501	2 x 36w	Trulite / Super 80 NG
TMS 021	2 x 36w	Trulite / Super 80 NG
TMS 122	2 x 28w	TL 5 HE

Fluorescent Luminaires – part 2

- Mounting ht: 4 - 6m
- Typical lux levels: 150 lx – 300 lx

Luminaire	Lamp combination	Lamp type
TMS 122	2 x 54w	TL 5 HO

Fluorescent Luminaires – part 3



TPS325 OPEN VERSION



TPS325 CLOSED VERSION

Why TL5 solution?????



- **Instant re start**
 - The fluorescent system has instant re-strike and hence no prolonged darkness due to power interruptions.
- **Mains voltage variations**
 - The fluorescent system delivers a better percentage of light output as compared to HID lamps when subjected to fluctuations in mains voltage.
- **CCT / CRI**
 - The fluorescent system has significantly better CRI.
- **Lamp Life**
 - Choice of Xtreme family of lamps in TL5 HO.
- **Green factors**
 - Lower Hg content
 - Better luminous efficacy

Where do we propose Master TL5



- In general in areas where
 - Frequent power supply breakdowns and / or voltage fluctuations
 - CRI is important
 - Improved PF system is reqd
 - Lesser harmonic distortion is desirable
 - Maintenance / access for maintenance is difficult
 - Lesser clear height available for luminaire installation
 - Use of acti viva versions for TL5 54w where an energizing environment is desired.

5m ht 150 lux target

Luminaire	target lux level	Quantity	Average	Minimum	Maximum	min/ avg	min / max	Installed power	W / sqm
HPK 225 / CDM ET 150w WB	150	75	159	86	212	0.54	0.41	165	4.1
TPS 325 / 428 Open	150	85	159	81	280	0.51	0.29	114	3.2
TPS 325 / 428 Closed	150	95	150	91	227	0.61	0.40	114	3.6
MPF 922 MHNTD 150w	150	90	160	102	210	0.64	0.49	165	5.0
TMS 122 / 254 with GMS 122	150	84	153	95	184	0.62	0.52	120	3.4

For low height and low lux level – the optics is still too narrow. A better solution is 2 x TL5 HO 54w 840 solution. Eg: Pentura with reflector



7m ht 150 lux target

Luminaire	target lux level	Quantity	Average	Minimum	Maximum	min/ avg	min / max	Installed power	W / sqm
HPK 225 / HPI BU 250w WB	150	56	155	112	181	0.72	0.62	272	5.1
TPS 325 / 454 Open	150	56	160	101	236	0.63	0.43	204	3.8
TPS 325 / 454 Closed	150	64	152	109	207	0.72	0.53	190	4.1
MPF 923 HPIT 250w	150	56	155	103	180	0.66	0.57	272	5.1
TPS 325 / 454 Open TOP	150	45	152	96	242	0.63	0.40	231	3.5
TPS 325 / 454 Closed TOP	150	52	152	95	232	0.63	0.41	218	3.8



9m ht 150 lux target

Luminaire	target lux level	Quantity	Average	Minimum	Maximum	min/ avg	min / max	Installed power	W / sqm
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HPK 225 / HPI BU 250w NB	150	52	151	103	204	0.68	0.50	272	4.7
TPS 325 / 454 Open	150	56	151	107	188	0.71	0.57	204	3.8
TPS 325 / 454 Closed	150	68	153	113	179	0.74	0.63	190	4.3
TPS 325 / 454 Open TOP	150	48	150	99	109	0.66	0.91	231	3.7
TPS 325 / 454 Closed TOP	150	56	155	111	191	0.72	0.58	218	4.1

5m 300 lux

Luminaire	target lux level	Quantity	Average	Minimum	Maximum	min/ avg	min / max	Installed power	W / sqm
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TPS 325 / 428 closed	300	192	301	187	363	0.62	0.52	114	7.3
TMS 122 / 254 with GMS 122	300	175	303	184	332	0.61	0.55	120	7.0
TPS 325 / 428 open	300	168	310	191	404	0.62	0.47	114	6.4
MPF 922 / MHNTD 150w	300	175	313	190	382	0.61	0.50	165	9.6
HPK 225 / CDM ET 150w WB	300	145	305	212	375	0.70	0.57	165	8.0

For higher lux level – TPS 325 / 428 open version is better solution from energy point of view.

From installation point of view – Optibay CDM ET 150w WB is a better solution



7m 300 lux

Luminaire	target lux level	Quantity	Average	Minimum	Maximum	min/ avg	min / max	Installed power	W / sqm
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HPK 225 / HPI BU 250w WB	300	110	300	197	320	0.66	0.62	272	10.0
TPS 325 / 454 Open	300	105	302	207	357	0.69	0.58	204	7.1
TPS 325 / 454 Closed	300	126	302	200	348	0.66	0.57	190	8.0
TPS 325 / 454 Open TOP	300	90	301	199	371	0.66	0.54	231	6.9
TPS 325 / 454 Closed TOP	300	102	301	198	363	0.66	0.55	218	7.4
MPF 923 HPIT 250w	300	110	301	192	339	0.64	0.57	272	10.0

From energy & installation point of view – TPS 325 / 454 OPEN – TOP is a better solution



9m 300 lux

Luminaire	target lux level	Quantity	Average	Minimum	Maximum	min/ avg	min / max	Installed power	W / sqm
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HPK 225 / HPI BU 250w NB	300	110	313	214	350	0.68	0.61	272	10.0
TPS 325 / 454 Open	300	112	306	184	344	0.60	0.53	204	7.6
TPS 325 / 454 Closed	300	133	303	179	342	0.59	0.52	190	8.4
TPS 325 / 454 Open TOP	300	96	298	198	336	0.66	0.59	231	7.4
TPS 325 / 454 Closed TOP	300	114	309	197	353	0.64	0.56	218	8.3

TPS 325 / 454 OPEN TOP version is better solution

5m 500 lux

Luminaire	target lux level	Quantity	Average	Minimum	Maximum	min/ avg	min / max	Installed power	W / sqm
HPK 225 / CDM ET 150w WB	500	245	506	385	545	0.76	0.71	165	13.5
TPS 325 / 428 Open	500	272	495	341	568	0.69	0.60	114	10.3
TPS 325 / 428 Closed	500	324	504	364	550	0.72	0.66	114	12.3
MPF 922 MHNTD 150w	500	288	503	324	634	0.64	0.51	165	15.8
TMS 122 / 254 with GMS 122	500	288	514	304	550	0.59	0.55	120	11.5

For higher lux level – TPS 325 / 428 open version is better solution from energy point of view.

7m 500 lux

Luminaire	target lux level	Quantity	Average	Minimum	Maximum	min/ avg	min / max	Installed power	W / sqm
HPK 225 / HPI BU 250w NB	500	174	500	373	567	0.75	0.66	272	15.8
TPS 325 / 454 Open	500	174	506	338	565	0.67	0.60	204	11.8
TPS 325 / 454 Closed	500	210	502	336	552	0.67	0.61	190	13.3
TPS 325 / 454 Open TOP	500	147	495	334	584	0.67	0.57	231	11.3
TPS 325 / 454 Closed TOP	500	168	499	335	564	0.67	0.59	218	12.2
MPF 923 HPIT 250w	500	186	507	315	570	0.62	0.55	272	16.9

TPS 325 / 454 OPEN TOP version is better solution from energy point of view.



9m 500 lux

Luminaire	target lux level	Quantity	Average	Minimum	Maximum	min/ avg	min / max	Installed power	W / sqm
HPK 225 / HPI BU 250w NB	500	180	508	332	543	0.65	0.61	272	16.3
TPS 325 / 454 Open	500	186	505	323	573	0.64	0.56	204	12.6
TPS 325 / 454 Closed	500	217	498	301	559	0.60	0.54	190	13.7
TPS 325 / 454 Open TOP	500	162	507	338	573	0.67	0.59	231	12.5
TPS 325 / 454 Closed TOP	500	175	494	300	559	0.61	0.54	218	12.7

TPS 325 / 454 OPEN TOP version is better solution from installation & energy point of view.

Summary

- For low mounting heights (5m) and low lux levels (150 lux) - TMS 122 / 254 with GMS 122 reflector is the best solution.
- For low heights (5m) and higher lux levels (300 lux, 500 lux) – TPS 325 / 428 OPEN is the best solution.
- For higher heights (7m) and higher lux levels (300 lux, 500 lux) – TPS 325 / 454 OPEN TOP is best solution.
- For higher heights (9m) and high lux levels (300 lux) – TPS 325 / 454 OPEN TOP is best solution.
- For height (9m) and higher lux level (500 lux) – there is no great energy saving between OPEN NORMAL and OPEN TOP. However, OPEN TOP has lesser quantity which will be an installation benefit.

Luminaire selection - HID

250w solution

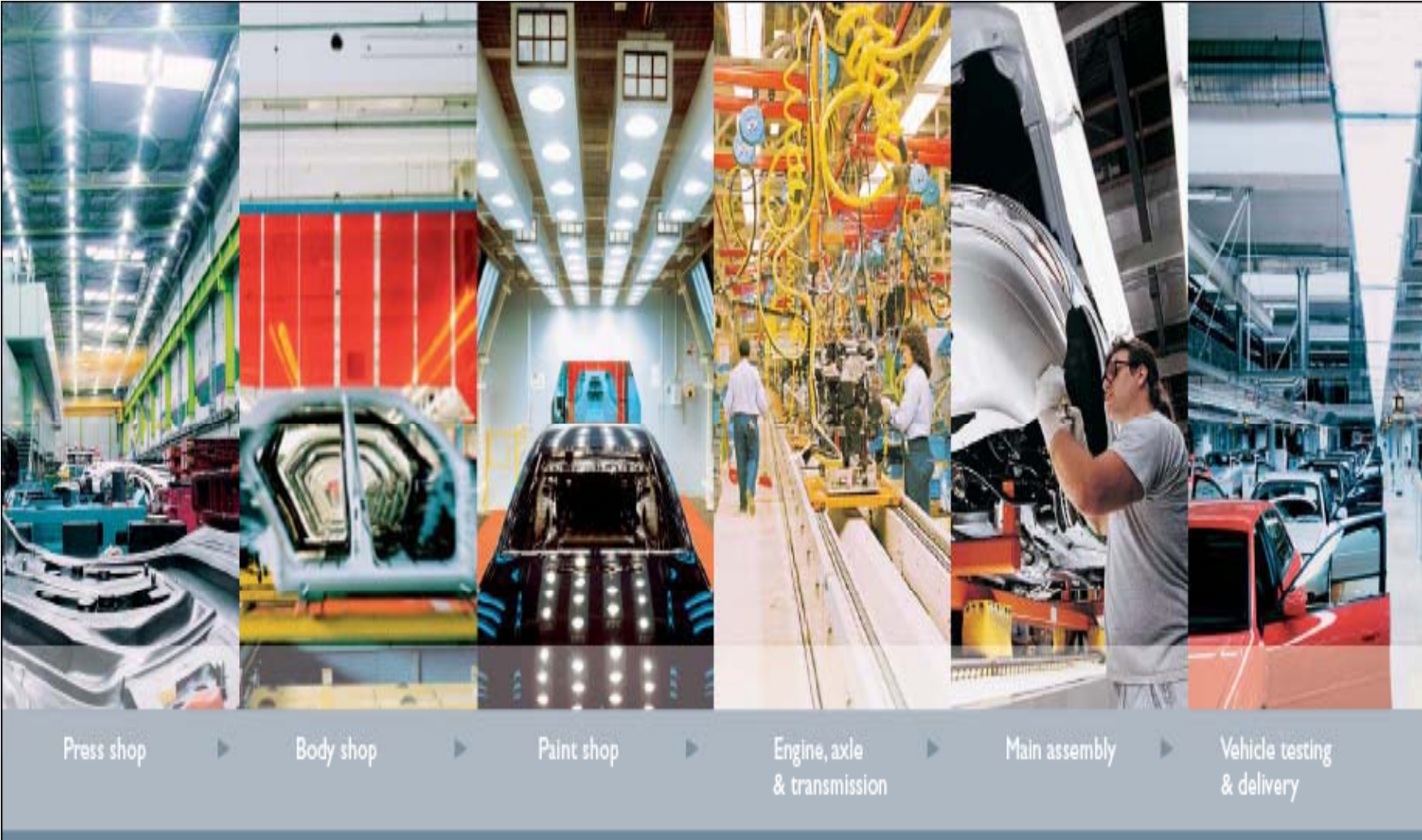
- Typically used from 7m – 9m WB
- Typically used from 9m – 11m NB

400w solution

- Typically used in heights above 12m
- Only available in NB version



Automotive Industry



Automotive Industry

- Areas covered:
 - Press Shop
 - Body shop
 - Paint Shop
 - Paint Inspection Area
 - Assembly Line
 - Vehicle testing & delivery

Press shop

- General arrangement:
 - Typical mounting ht: 15 – 24 m
 - Gantry cranes present
- Basic Lighting requirements:
 - Luminaire placement should account for presence of tall machinery
 - Generally use NB luminaires to achieve the reqd lux levels
 - Localised lighting may be reqd around key machines
 - Vibration proof / high IP luminaires needed
- Typical Installation methodology
 - High bay luminaires mounted on ceiling achieving high lux level & high uniformity
 - Average lux level: 200 – 300 lx
 - Min / avg > 0.5
 - Ra > 60



Body shop

- General arrangement:
 - Typical mounting ht: 6m – 9m
 - Dusty atmosphere and dark materials
 - Automated / manual welding lines
- Basic Lighting requirements:
 - High lighting levels needed to compensate for the dark luminance
 - Inspection area requires good glare control
 - pleasant working ambience
 - High uniformity is desirable
 - Localised fluorescent lighting with excellent glare in inspection areas.
- Typical Installation methodology
 - Medium bay (WB) luminaires mounted on ceiling achieving high lux level & high uniformity
 - Average lux level: 500 lx
 - Min / avg > 0.7
 - Ra > 80



Paint Shop

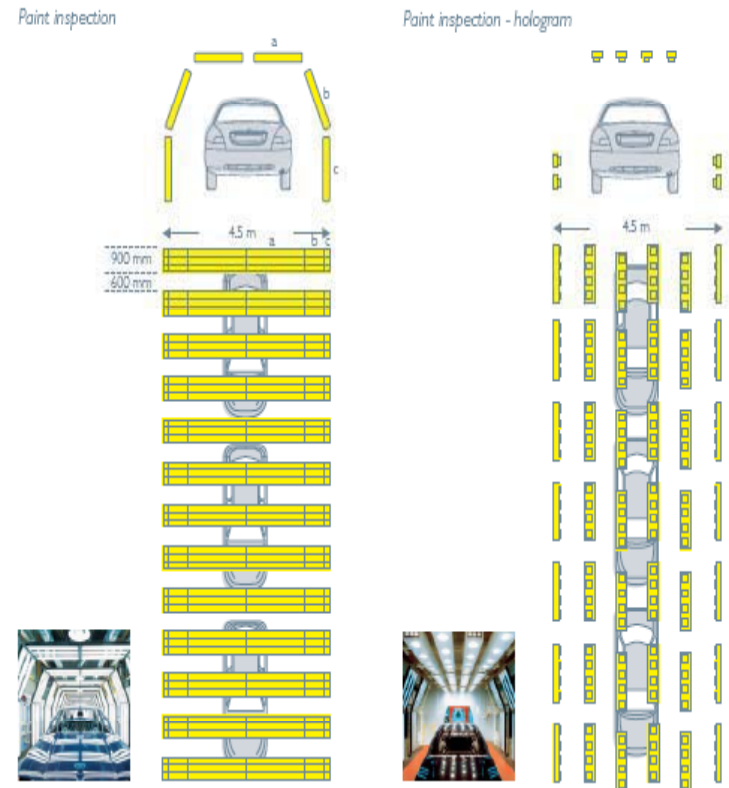
- General arrangement:
 - Complex process
 - Continuous process / partly automated
- Basic Lighting requirements:
 - High lighting levels with good uniformity in horizontal / vertical & slanting surface
 - Inspection area requires good glare control
 - Luminaires to be designed with ease of maintenance in mind
 - Good CRI for early detection of faults
- Typical Installation methodology
 - Wide beam white painted reflectors for general lighting
 - Closed high IP luminaires near the process area



Paint Inspection area – sample installation scheme

- Paint Shop area:
 - Average lux level: 300 – 500 lx
 - Uniformity: > 0.5
 - Color temperature preferred: 4000K
 - CRI > 80

- Paint Inspection area
 - Average: > 1000 lx
 - Uniformity: > 0.8
 - CRI > 80



Special note:

- 1) For color comparison CRI > 90 is recommended
- 2) For Inspection area – luminance distribution has to be alternately high & low

Assembly line

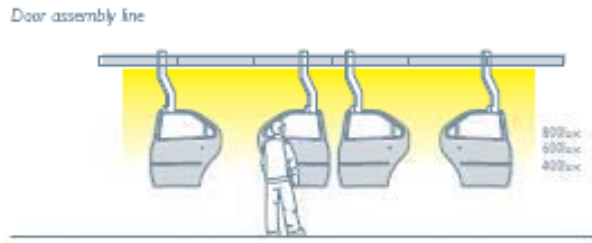
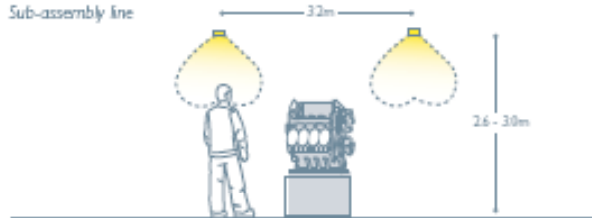
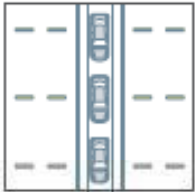
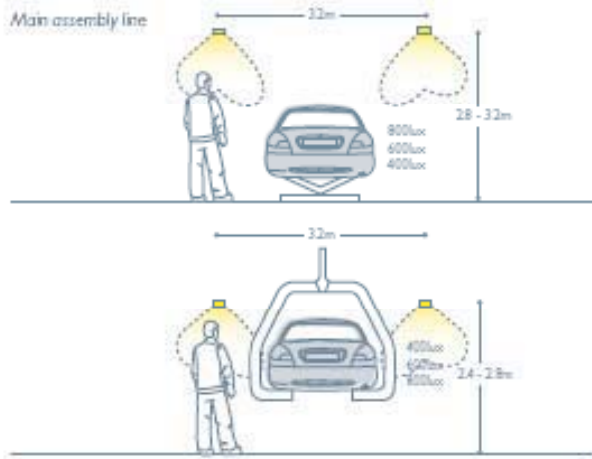
- General arrangement:
 - Engine parts assembly
 - Aluminium parts are die cast and forged in a heavy industrial environment
- Basic Lighting requirements:
 - Adequate lighting levels needed for various tasks
 - Pleasant working ambience
 - High uniformity is desirable
 - Localised fluorescent lighting with excellent glare control in inspection areas.
- Typical Installation methodology
 - Average lux levels: 300 – 500 lx
 - Uniformity: > 0.7
 - CRI > 60

Special note:

Higher lux levels needed for inspection areas

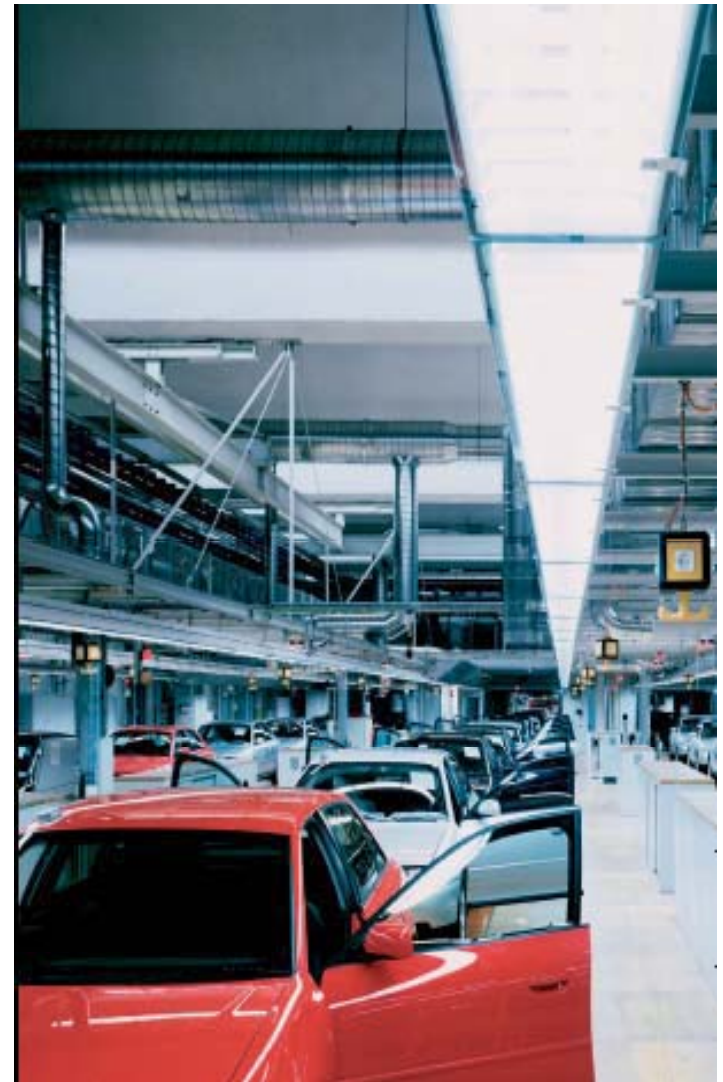


Practical solution concepts



Vehicle testing & delivery

- General arrangement:
 - Typically similar to large maintenance & repair halls
 - Final exterior & interior inspections are performed
 - Final coating (if reqd) before despatch to dealer
- Basic Lighting requirements:
 - General lighting for good visibility
 - Localised additional lighting for inspection areas
 - Good uniformity is desirable
- Typical Installation methodology
 - Industrial reflectors / medium bay luminaires for general lighting
 - Average lux level: 300 - 500 lx
 - Min / avg > 0.7
 - Ra > 80



Electronics assembly line

- General arrangement:
 - Typical mounting ht of 3 – 4m
 - High illuminance with good uniformity
 - Excellent glare control is required
- Typical Installation method:
 - Recessed / surface mounted luminaires
 - Generally used in continuous rows
 - D6 / D8 optics preferred
- Typical Lighting requirements:
 - Average: 500 – 1500 lux
 - $E_{min} / E_{avg} > 0.7$
 - CRI > 80
 - Low glare



Cleanroom system

- General system
 - Specially constructed area with strict environmental control
 - The lighting system should not compromise the clean room
 - Classified in terms of permitted presence of dust
- Typical Installation method:
 - Recessed / surface mounted luminaires
 - Needs to meet cleanroom standards
- Typical Lighting requirements:
 - Average: 750 – 1000 lux
 - $E_{min} / E_{avg} > 0.7$
 - CRI > 80
 - Low glare



Power generating plants

- Typical areas
 - Turbine generator building
 - Control rooms
 - Boiler areas
 - Switchyard
 - DG Control room
 - Pump houses
 - Road / landscape areas

Electrical Power station – Sparanise, Italy



Client

Calenia Energia S.p.a - EGL

Architect

Frigerio Design Group, Genoa, Italy

Light sources

Philips MASTERColour TL5 and LED

Luminaires

Philips TBS230, TCS398 and FCW 196, Pacific TCW 216, SPK100 high-bay with protection glass, Philips Tempo 3 floodlight and TrafficVision SGS305/306

Turbine generator building

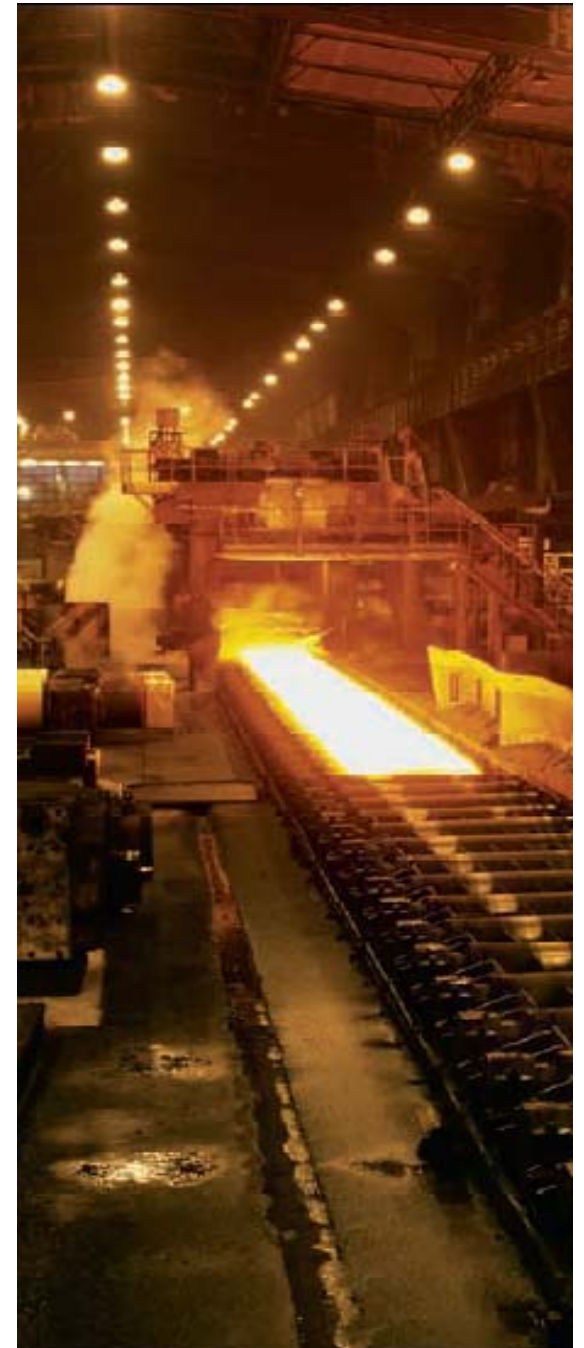
1.1	General (auxiliary equipment areas)	150-200	Industrial well glass vitreous enamel reflector integral mounted control gear / industrial bulk head with integral mounted control gear	1x70 W / 1 x 150 W HPSV lamp	HPK 105 / 70w SON
1.2	Cable vault	100			
1.3	All switchgear room area (including off-site building control room)	200-250	Industrial type with vitreous enamel reflector	2x40W/36W fluorescent lamp (F.L.)	TKC 24 / 236
1.4	TG Building operating floor	200	Industrial high bay with anodized aluminum reflector	1x 400 W HPSV lamp	HPK 225 / SON 400w NB
1.5	Unit control room	500	Decorative recessed with wide angle mirror optic anti glare type	2x40W/36W fluorescent lamp (F.L.)	
1.6	Battery rooms	150	Corrosion proof	2x40W/36W F.L.	TMX 95 / 236
1.7	TG building ground, mezzanine floor, and misc. floors	150-200	Industrial well glass with integral control gear	1x 70 W HPSV	HPK 105 / 70w SON
1.8	Air washer room and A/C plant room	150-200	Totally enclosed vapour proof clear acrylic cover	2x40W/36W F.L.	
1.9	Unloading and maintenance bay	250	Industrial high bay	250 W HPSV lamp (for mounting height > 9 m)	HPK 225 / SON 250w WB
1.1	Electrical laboratory, chemical laboratory (air-conditioned)	250	Decorative recessed with wide angle mirror optic anti-glare type	2x40W/36W F.L.	TBS 088 / 236 C5
1.11	Chemical laboratory (non-air-conditioned)	250	Industrial type with vitreous enamel reflector	2x40W/36W F.L.	TKC 24 / 236

2 Boiler Area				
2.1	Boiler area and platforms, ESP areas and platforms	50-100	Dust proof / dust tight well glass fixture	70 W HPSV lamp HPK 105 / 70w SON
2.2	Mill bay feeder floor tippler floor	150	Dust proof / dust tight increased safety well glass	70 W HPSV lamp HPK 105 / 70w SON
2.3	ESP control room	300	Same as in unit control room	2x40W/36W F.L.
3 Transformer Yard & Switchyard				
3.1	General	20	Flood light medium beam type	1 x 250 W HPSV lamp SWF 330 / SON T 250w SK
3.2	Near equipment	35	Dust proof/dust tight well glass on fire partition walls	1 x 70 W HPSV HPK 105 / 70w SON
4 Various Off-Site Buildings				
4.1	Equipment room (DG set room)	150-200	Industrial type with vitreous enamel reflector upto mounting height of 8M OR	2x40W F.L. TKC 24 / 236
4.2	Switchgear rooms	200-250	Industrial high bay for mounting heights above 8M	150 / 250 W HPSV lamp HPK 225
4.3	Outside working areas	70	Flood light medium beam	250 W HPSV lamp SWF 330
5 Coal Handling Plant				
5.1	Conveyors enclosed	100	Dust proof well glass with reflector wire guard integral mounted control gear box	1 x 70 W HPSV lamp HPK 105 / 70w SON
5.2	Underground conveyor tunnel	40	Flame proof industrial bulk head with integral control gear box	70 W HPMV lamp Regret
5.3	Crusher house, Junction towers	100	Dust proof / dust tight well glass with reflector wire guard integral mounted control gear	1 x 70 W HPSV lamp HPK 105 / 70w SON
5.4	Coal yard	15-25	Flood light	1 x 400 W HPSV lamp SWF 330
5.5	Coal unloading, track hopper stacker reclaimer	25-50	Flood light	1 x 400 W HPSV lamp SWF 330
5.6	Control room	300	Same as in unit control room	2 x 40 W/36 W F. L.

6 Pre Treatment Plant					
6.1	General	150-200	Corrosion proof	2 x 40 W F.L.	TMX 95 / 236
7 Fuel Oil Tank Farm area					
7.1	Fuel oil area pump house	100-150	Flame proof well glass	1x70W HPMV lamp	regret
8 Road & Yard Lighting					
8.1	Roads	10	Street light with clear acrylic cover cut-off type with integral mounted control gear	1x70W HPSV lamp	SRX 066 / 70w
8.2	Perimeter (compound) lighting	20-Oct	---Do---	--Do--	SRX 066 / 70w
8.3	Yard lighting	15-20	General purpose flood light. To be provided along with lightning masts also at equipment levels on the towers.	250W/400W HPSV	SWF 330
8.4	Parking area	50	General purpose flood light, high/medium beam flood light	1x250W HPSV	SWF 330
9 Ash Handling System					
9.1	Ash slurry pump house	100-150	Industrial well glass	70W HPSV lamp	HPK 105 / 70w SON
9.2	Ash water pump house	100-150	Industrial well glass	70W HPSV lamp	HPK 105 / 70w SON
9.3	Compressor room	100-150	Industrial well glass	70W HPSV lamp	HPK 105 / 70w SON
9.4	Vacuum pump house	100-150	Industrial well glass	70W HPSV lamp	HPK 105 / 70w SON
9.5	Recycle water pump house	100-150	Industrial well glass	70W HPSV lamp	HPK 105 / 70w SON
9.6	FA silo area	25-50	Flood light medium beam	1x250 W HPSV	SWF 330
9.7	Hydro bin area	25-50	Flood light medium beam	1x250 W HPSV	SWF 330
9.8	Control room	300	Industrial type with vitreous enamel reflectors	2x40 W FL lamp	TKC 24 / 236
10	Filter water pump house	100-150	Industrial well glass	70W HPSV lamp	HPK 105 / 70w SON
11	Fire water pump house	100-150	Industrial well glass	70W HPSV lamp	HPK 105 / 70w SON
12 Service Building/ Administration Building					
12.1	Main office areas cabins (air conditioned areas)	350	Decorative recessed type with mirror optic reflector	2 x 40 W/36 W F.L.	
12.2	Main office areas, cabins with false ceiling but non-air-conditioned	350	--do--	--do--	TBS 088 / 236 M2
12.3	Main office areas, cabin non air - conditioned areas without false ceiling	350	Decorative with wide angle mirror reflector	--do--	TCS 306 / 236
Divison, MMMM dd, yyyy, Reference					

Steel Plants

- Cold Roll Mill
 - Typical hts: 15m – 25m
 - Can use MH solution
 - Installation may be dependent on truss arrangement
 - Philips solution: HPK 225 or HPK 205
- Hot Strip Mill
 - Typical ht: 15m – 25m
 - Usually prefer SON solution
 - Installation may be dependent on truss arrangement
 - Philips solution: HPK 225 or HPK 205

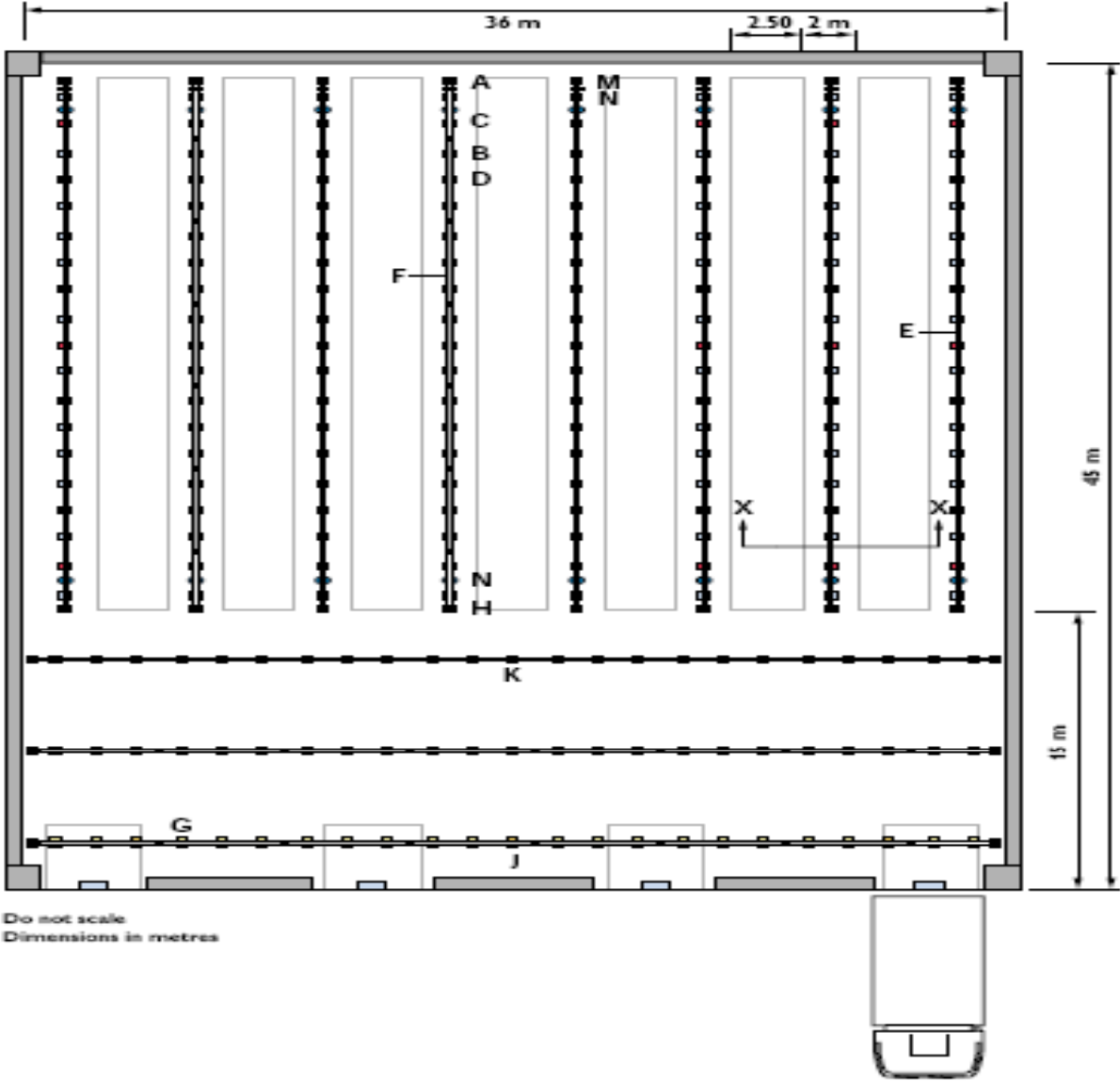


PHILIPS

Warehousing / Distribution centres



Typical arrangement



Open receipt & despatch

- General arrangement:
 - Typical mounting ht of 7 – 8m
 - Adequate illuminance with good uniformity
- Typical Installation method:
 - surface mounted luminaires
 - Trunking systems
- Typical Lighting requirements:
 - Average: 200 – 500 lux
 - $E_{min} / E_{avg} > 0.6$
 - CRI > 60
 - Low glare



Rack Storage

- General arrangement:
 - Typical mounting ht of 7 – 8m
 - Adequate illuminance with good uniformity
 - Aisle width typically 2m
- Typical Installation method:
 - surface mounted luminaires
 - Trunking systems
- Typical Lighting requirements:
 - Average: 200 lux
 - Vertical: > 100 lux
 - Emin / E avg > 0.5
 - CRI > 60
 - Low glare

QUESTIONS

