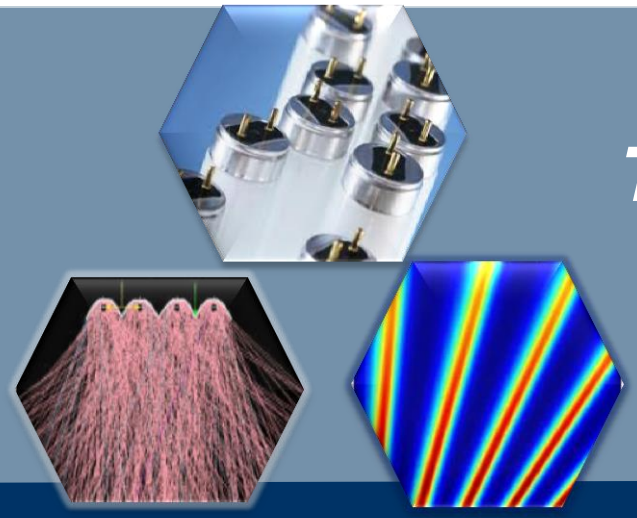
KAJIAN TEKNOLOGI



T8 to T5 Retrofitting

USPMA,CKE, IP JKR MALAYSIA
UNIT STANDARD, PENGUJIAN DAN MAKMAL AKREDITASI
CKE, IBU PEJABAT JKR MALAYSIA

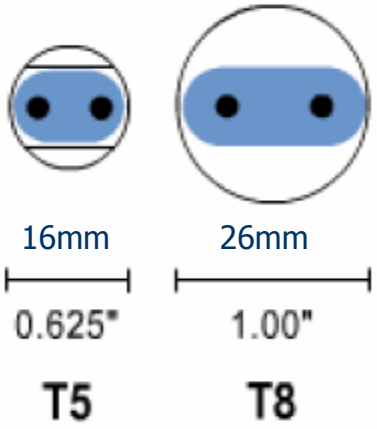
Kandungan

1. **T5 Fluorescent Lamps**
2. ***Characteristics and findings of T5 Lamp Systems***
3. ***Retrofitttting*?**
4. **Kajian produk T5- retrofit**
5. **Kesimpulan**

Characteristics and findings of T5 Lamp systems

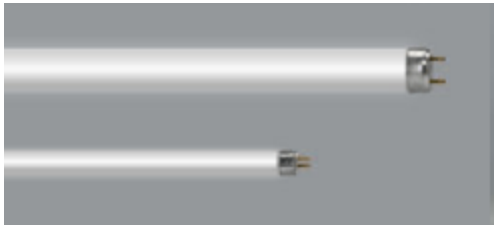
Apa maksud T5?

- T= Tubular
- Diameter tube 5/8 "(16mm)



Diameter dan Panjang Tube T5 berbeza dengan Tube T8

NOMINAL LENGTH(ft)	Actual Length(mm)	
	T5	**T8**
2	550	600
4	1150	1200
*according to MS IEC 60081		

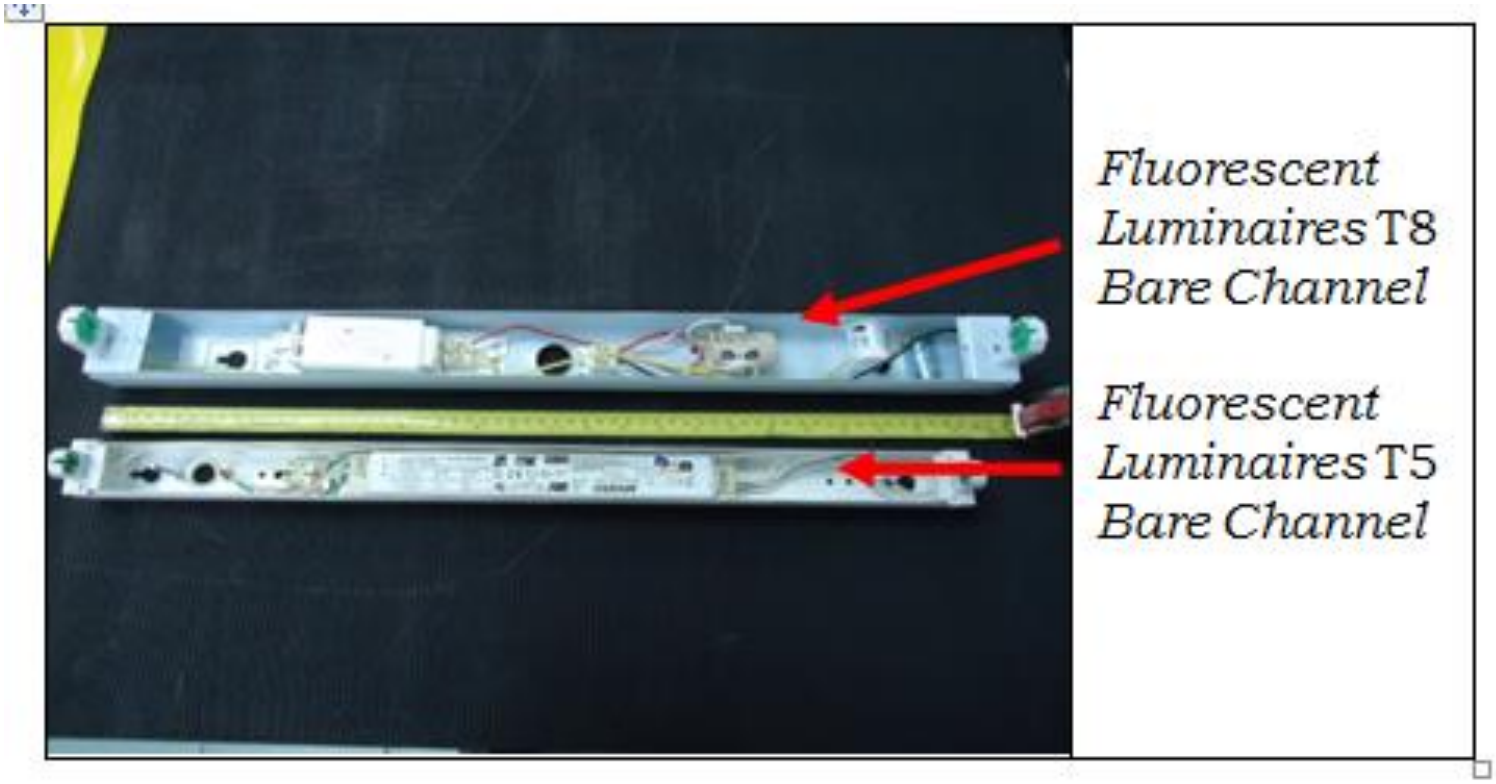


Characteristics and findings of T5 Lamp systems

- ***Smaller luminaire design/compact***
- ***Higher efficacy than T8 lamps (100lm/W)***
- ***Only operate with high frequency electronic control gear(Ballast)***
- ***Optimum light output at 35° C***
- ***Not interchangeble with T8 tubes***

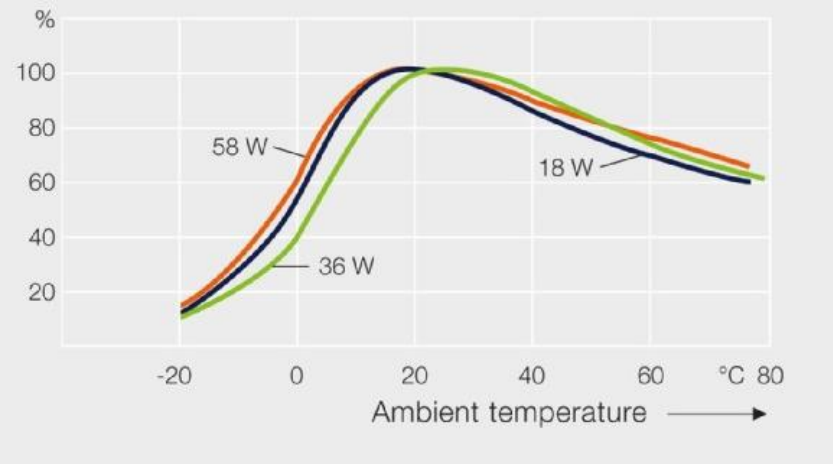
  (different pin base connection,shorter length).
- ***Only for use in dedicated light fittings/Luminaires that have specifically designed reflectors that take advantage of narrower sized light source.***
- ***Smaller light source = less light obstruction = more light from fitting.***

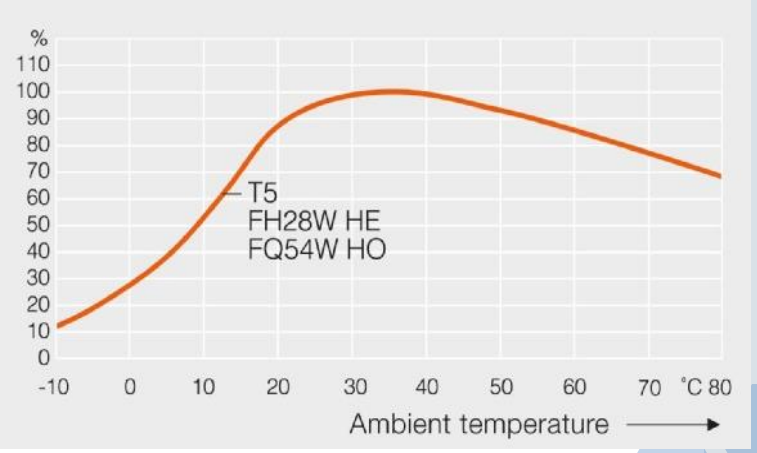
❑ Smaller luminaire design/compact



❑ Higher efficacy than T8 lamps

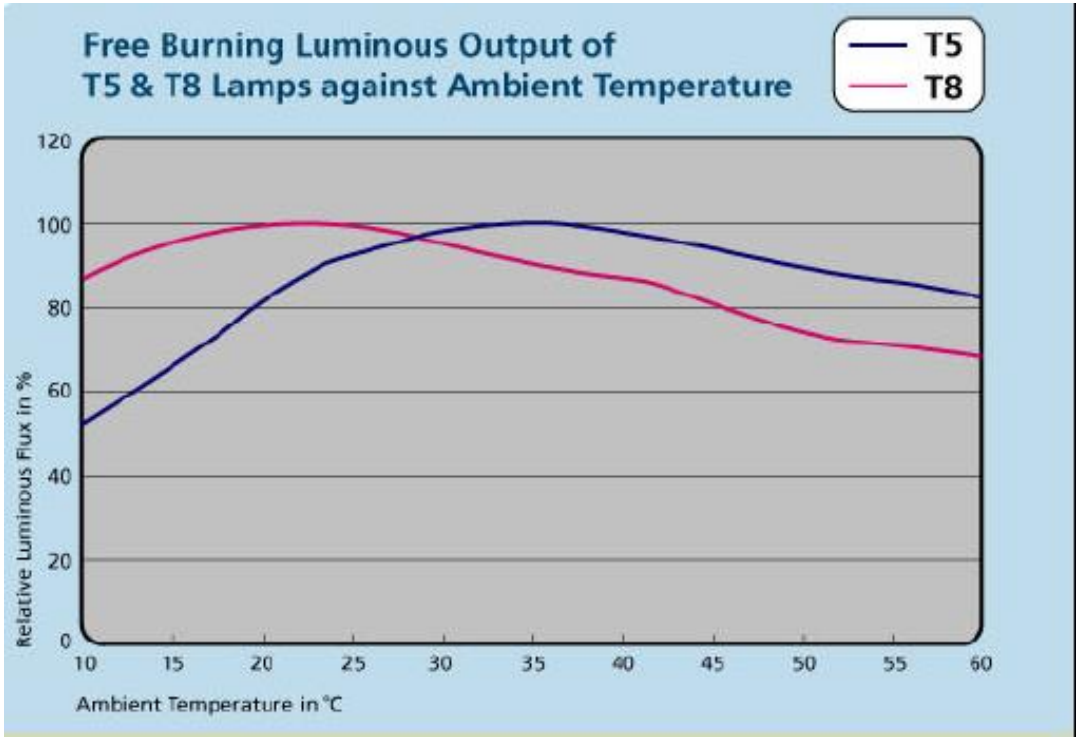
Type	T8 (Lumilux T8 /865) 36W	T5 (Lumilux T5 HE /865) 28W
Diameter (Inch)	8/8 (26mm)	5/8 (16mm)
Colour Rendering Index (CRI)	≥80	86
Luminous Efficiency (lm/W)	90	103
Light Output at Ambient Temperature of 25°C (Lumens)	**3250**	**2400**
Light Output at Ambient Temperature of 35°C (Lumens)	**±3000**	**2750**





Findings on T5 system

- *Optimum light output at 35° C*



- Gambarajah menunjukkan perbezaan tahap kecerahan lampu T5 dan T8 mengikut suhu.
- Tahap kecerahan **T5** berada pada tahap **maksimum** pada **suhu persekitaran 35°C**
.
- Tahap kecerahan **T8** berada pada tahap **maksimum** pada **suhu persekitaran 25°C**
- T5 mempunyai keupayaan pencahayaan yang lebih baik di dalam en*closed* luminaires

- ***Only operate with high frequency electronic control gear(Ballast)***

	T8	T8 (E ballast)	T5
Control Gear System	Electromagnetic ballast	High frequency Electronic Ballast	High frequency Electronic Ballast
	P.F. correction capacitor		
	Starter		

- **Not interchangeble with T8 tubes**

  (different pin base connection,shorter length).

NOMINAL LENGTH(ft)	Actual Length(mm)	
	T5	**T8**
2	550	600
4	1150	1200
*according to MS IEC 60081		

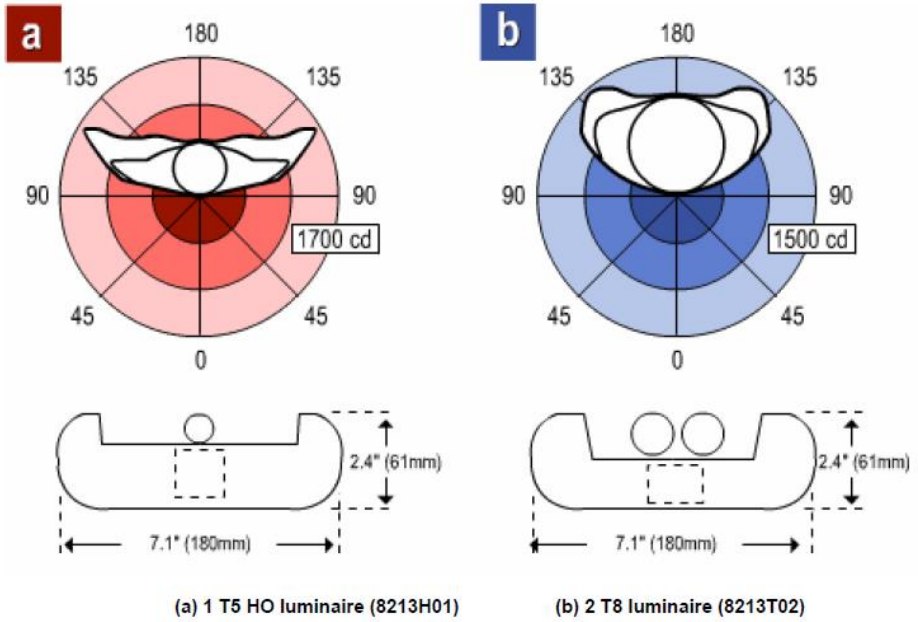
- ***Only for use in dedicated light fittings/Luminaires that have specifically designed reflectors that take advantage of narrower sized light source.***

T5

T8

- ***Smaller light source = less light obstruction = more light from fitting.***

Figure 10-2. Luminous Intensity Distribution of T5 HO and T8 Luminaires



(a) 1 T5 HO luminaire (8213H01) (b) 2 T8 luminaire (8213T02)

Quoted from Specification Sheets of Minuet from Ledalite

Retrofitting to T5 lamps

- Terdapat adaptor khas di pasaran bagi pemasangan Tube T5 ke dalam fitting T8. Jenis- jenis Adaptor :

1. *Replacement of the existing lamp with an new "Luminaire" using T5 lamps that plug into existing lamp holders.*

Retrofitting to T5 lamps...samb

2. Addition of control gear that plugs onto one end of the T5 lamp. the existing starter removed and a bridging device installed

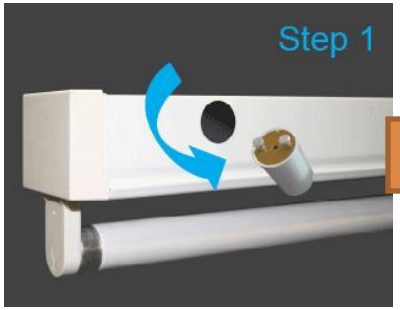
Kajian produk :T5- Retrofit

Technical Information

Jenama	:	
Model	:	Shift -2 T5/28W
Kadaran Watt	:	28 W
Kadaran Voltan	:	240 V @ 50 Hz
Power Factor	:	0.99
Supply Current	:	0.12 A
Lumen Output	:	Standard T5 28W lamp
THD (A_{THD})	:	21.22%
		(Pengujian Lampu di dalam bare channel fitting)
Standard Rujukan	:	MS IEC 60598-1:2006 MS IEC 60598-2-1:1997 IEC 60929:1990+A1(1994)+A2(1996) Cl. 12.1 MS IEC 60400:1999 CL 17. AS/NZS CISPR 15 :2006
No. Laporan Ujian	:	SIRIM : 2010EL0153 (Fixed to Class 1 T8 fitting) LIGHTLAB INTERNATIONAL: LL1004602E-R01 (tested with EM-Ballast)

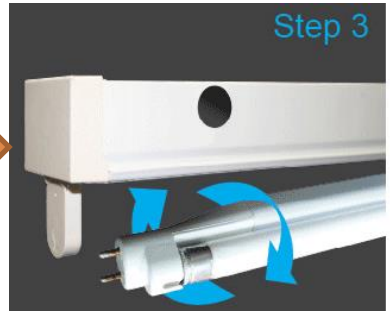
Kajian produk :T5 Retrofit..samb

Tatacara Pemasangan (CONTOH)



Remove starter

Remove original T8 Lamp



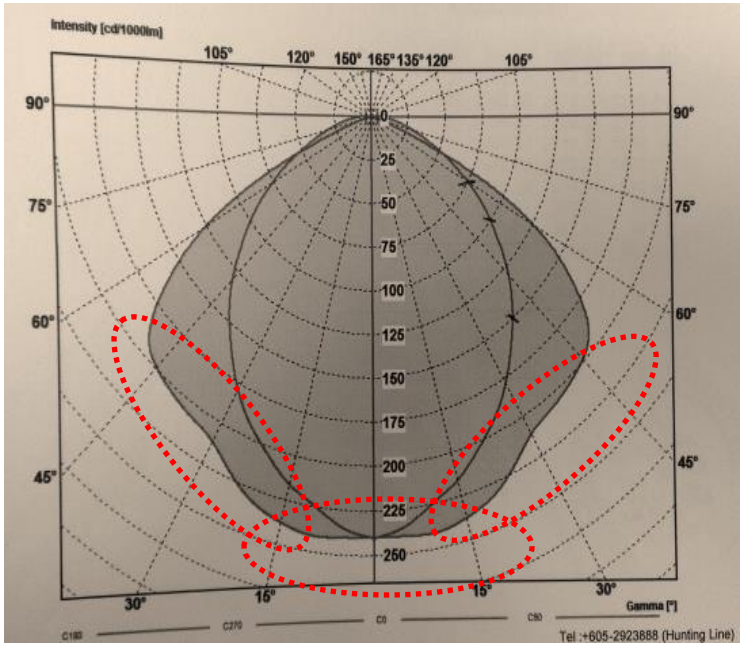
Insert T5 retrofit Luminaire into existing lamp holder

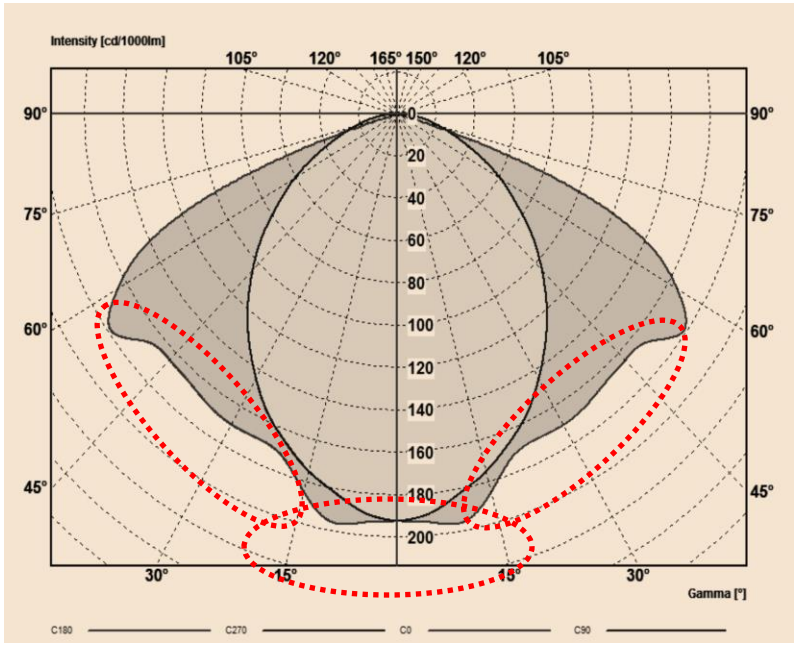
Switch on T5 Lamp

LUMINAIRE IN LUMINAIRE?

Kajian produk : T5 Retrofit..samb

Perbandingan fotometrik (Nota: skala tidak sama)





T8 Fitting C/W T8 Fluorescent tube(36W x 2)

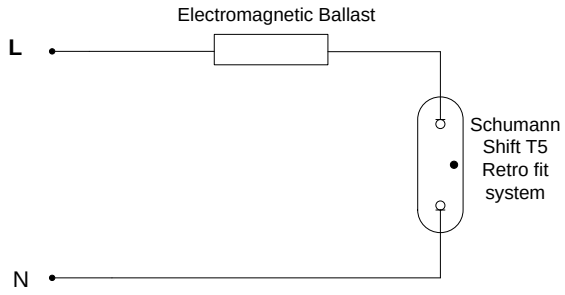
Power : 83.1241 W
LOR : 62.4%
Maximum intensity : 240cd/klm

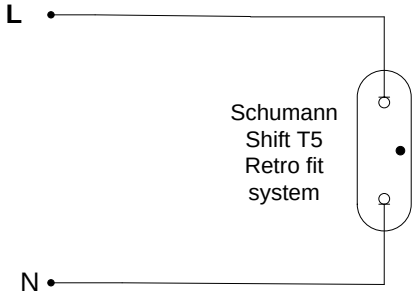
T8 Fitting C/W T5 Retrofit (28W x 2)

Power 57.078 W
LOR : 54.4%
Maximum intensity : 192.3 cd/klm

- LOR berkurangan sebanyak 8.0% daripada 62.4 % kepada 54.4%
- *System Efficacy* iaitu meningkat sebanyak 4% (50.30 lm/W kepada 52.48 lm/W

Ujian *Electrical Measurement*





WITH EM-BALLAST

Perkara	Circuit	Ballast	Lamp
Voltage (V)	240.00	74.60	246.67
Current (A)	0.19	0.12	0.12
Wattage (W)	28.11	0.66	27.46
Power Factor (pf)	0.99	0.07	0.94

WITHOUT EM_BALLAST

Perkara	Circuit	Ballast	Lamp
Voltage (V)	241.52	0.00	239.62
Current (A)	0.32	0.32	0.31
Wattage (W)	28.00	0.01	27.60
Power Factor (pf)	0.37	ERROR	0.35

Tanpa EM-Ballast menyebabkan

1. Power factor menurun
2. Humming.
3. Input current meningkat

Kajian produk : T5 Retrofit..samb

KESIMPULAN

- **Berdasarkan pengujian *Electrical Measurement,* didapati produk perlu menggunakan *electromagnetic ballast* sedia ada untuk mendapatkan keupayaan yang optimum, antaranya ialah *Power Factor*(pf).**

- **Bagi produk sebagai *retrofit*, didapati keupayaan fotometri asal tidak dapat dicapai. Terdapat pengurangan penggunaan ada kebanyakan parameter fotometri yang disemak(seperti LOR dan maximum Intensity) dan ini tidak akan mencapai tahap rekabentuk asal pemasangan.**

- **Fluorescent Luminaire T8 di dalam penggunaan JKR menggunakan Power Factor Correction capacitor yang perlu ditanggalkan.**

Standards Requirements

IECEE CTL DECISION SHEET
DSH 0814 Year 2010

*"”The **organisation modifying a luminaire has full responsibility for the converted luminaire** with respect to **safety, EMC compatibility, lamp operation, marking, illuminance, environmental features, lighting distribution and legal responsibilities**. This product **can only be certified together with the conversion unit**, i.e. a **complete recertification must be done**. This **responsibility remains even if the converted luminaire is subsequently returned to its original condition** (i.e. removal of the conversion unit), since damage to the original luminaire may have occurred. This is also applicable to similar products containing LEDs.”*

Permasalahan di dalam penggunaan Retrofit

- **Requirement to standard(MS IEC 60598- safety and construction)**
  - Pengujian dan pensijilan semula?
  - Safety requirements?
- **Performance requirement.**
  - Lighting requirement?
  - Same as Original fixture Design
- **Legal Requirements**
  - Change of responsibility?
  - Void of original manufacturer warranty

Kesimpulan

- Berdasarkan kajian yang telah dijalankan, adalah dicadangkan produk **produk jenis *retrofit* T8-T5 tidak digunakan di dalam projek-projek JKR**

Rujukan

- **CTL Decision sheet –DSH 0814 (2010)**
- **Philips Application guide to Fluorescent Lamp Control Gear**
- **NLPIP Lighting answers- T5 Fluorescent Systems**
- **Laporan Kajian Bahan- T5 Retrofit Jenama Schumann Shift**

END OF SLIDE

SEKIAN , TERIMA KASIH