



Replacement and Management Project of Street Lights in Bangladesh

**Supplied by Joint Venture of
Korea & Bangladesh Team**

January, 2020

1. CAT Lighting Company Description

CAT Lighting Co., Ltd is a professional company specializing in AC LED Lightings.

CAT Lighting has been developing products with fresh ideas using cutting-edge drives for the rapidly changing LED Lighting market.

We constantly research for creative items and the development of advanced technologies based on **accumulated technologies** in order to be recognized around the world, and will make continuous efforts for the best products on behalf of **convenience for our clients and the 'quality first' principle.**

We always strive to challenge to identify the needs of changing times and what customers want and this is what our company will lead supreme customer satisfaction.

| | |
|------------------|---|
| • Address | Headquarters: 35, Pyeongcheon-ro 199beon-gil, Bupyeong-gu, Incheon, Republic of Korea - 1 st Assembly Factory : 35, Pyeongcheon-ro 199beon-gil, Bupyeong-gu, Incheon, Republic of Korea - 2 nd Assembly Factory : 70, Hwahap-ro 720beon-gil, Unam-ri, Eunhyeon-myeon, Yangju-si, Gyeonggi-do, Republic of Korea |
| • Tel. | +82-70-4696-5468 |
| • Fax. | 8231-400-3972 |
| • Website | http://www.catlighting.co.kr |

2. Corporate History

- 2014.07 CAT Lighting Co., Ltd. was established.
- 2015.02 35W E type D&COB development completed
- 2015.03 35W, 40W 70W, 80W, 105W, 120W, 150W, 160W, 250W Luminaire(Lenz, Heat sink,....) development completed
- 2015.04 50W AC Direct LED Drive IC development and prototype complete release
- 2015.04 LED Street Lights (LED Illuminator Mechanism for heat dissipation device)
registered patent (Application No. 10-2014-0180171)
- 2015.05 Participated in KOREA EUREKA DAY 2015 exhibition
 - Sponsored by the Ministry of Industry and Energy
- 2015.08 35, 40, 70, 80, 105, 120W (E-type) acquired KC certificate (OEM for MOA Technology co.,Ltd)
- 2015.08 Started "A-type 40W D&COB type LED Light source" development
- 2015.10 Signed MOU with Rangdong ( **Rang Dong**), the best lighting company in Vietnam
- 2015.11 Released the world's first "High power 40W D&COB type LED Light source"
- 2015.11 Concluded a joint contract with Rangdong in Vietnam for the "R & D project for materials and parts in Korea and Vietnam" ordered by the Ministry of Commerce, Industry and Energy
- 2016.04 1'st P.O from Rangdong
- 2016.05 Signed mass production agreement with "ITSWELL" for D & COB light source
- 2016.07 Signed MOA for co-production with IMNOVESA, an LED company in Ecuador
- 2016.08 Signed Contract for co-production with KHANG BINH Trading Co.,Ltd in VIETNAM
- 2016.11 Signed a distributorship agreement with Balaji Industrial group, India's renewable energy company
- 2016.11 Acquired patent for driving control circuit of LED lighting device (Patent No. 10-1678592)

3-1. AC Direct LED Driver IC

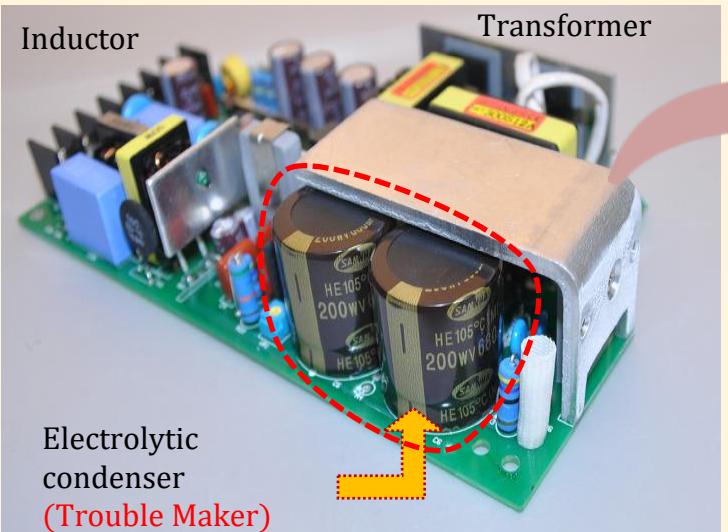
AC-DC Converter(SMPS) **X**

Over Heat **X**

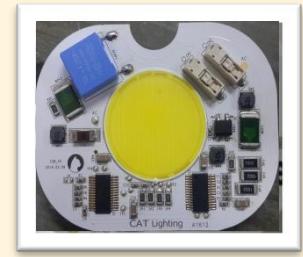
Over Voltage **X**

AC/DC Converter(SMPS)

Risk: Short Life Time than Led's



AC Direct LED Driver IC



Lifetime: Over 60,000 hours

Patented Technology : AC direct LED driver capable of handling Overvoltage

Patent NO : 10-1403861(Korea)
PCT : /KR2013/012367
USA : 14/141,528
CHINA : 201410155525.

- Be applied OVP*, OTP* Technology
- World first D&COB type (Drive & LED Chip On Board)

3-2. Light Efficiency

120 Degree Lenz

Compare

CAT's 160 Degree Glass Lenz

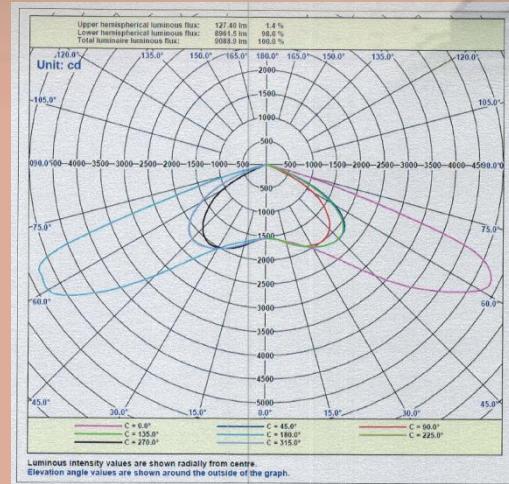
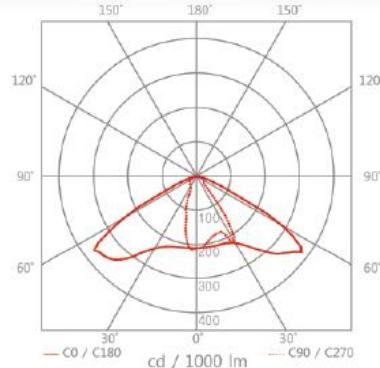


Hot Spot

Wide Angle



LED PHOTOMETRIC DATA

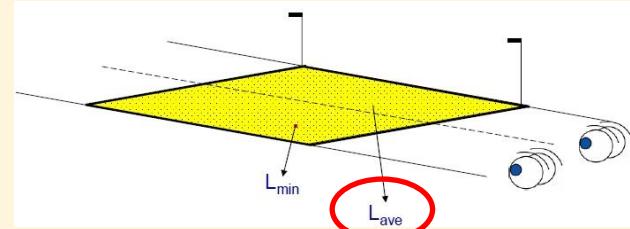


3-2. Light Efficiency _ Lighting Classes

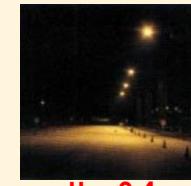
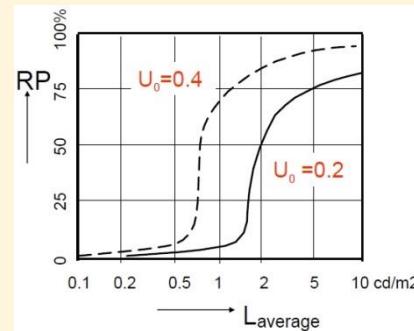
| LIGHT CLASS | All Roads | | | Roads with few Junctions |
|-------------|---------------------------------|---|---------------------------------|---|
| | Lav. (cd/m ²) (min) | U _o L _{min} /L _{avg} (min) | TI(%) Threshold increment (max) | U ₁ L _{min} /L _{max} |
| M1 | 2.0 | 0.4 | 10 | 0.7 |
| M2 | 1.5 | 0.4 | 10 | 0.7 |
| M3 | 1.0 | 0.4 | 10 | 0.5 |
| M4 | 0.75 | 0.4 | 15 | - |
| M5 | 0.5 | 0.4 | 15 | - |

| | | | | |
|-----------------------|------|------|---|------|
| CAT lighting 80W- M3 | 1.75 | 0.76 | 4 | 0.61 |
| CAT lighting 120W- M3 | 2.58 | 0.8 | 5 | 0.78 |

Lav. (cd/m²)



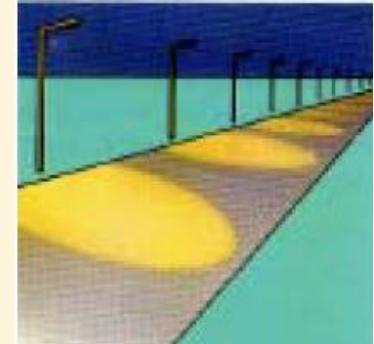
U_o L_{min}/L_{avg}(min)



TI (%)

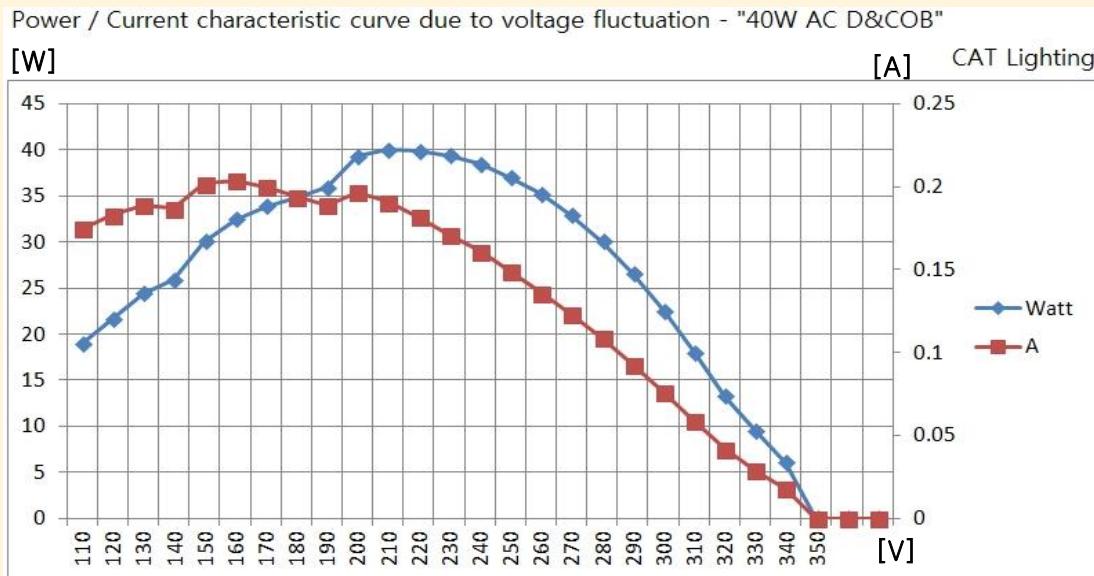
| Threshold Increment | |
|-----------------------|------------|
| Threshold increment % | Assessment |
| > 20 | Bad |
| 10 | Moderate |
| < 10 | Good |

U₁ L_{min}/L_{max}



3-3. Over Voltage Protection (OVP)

- Output current control circuit by AC voltage detection
- “AC Drive IC” inside designed for 700VDC (HM35UH700 manufacturing process)
- Response to transient voltages (110V ~ 440VAC)



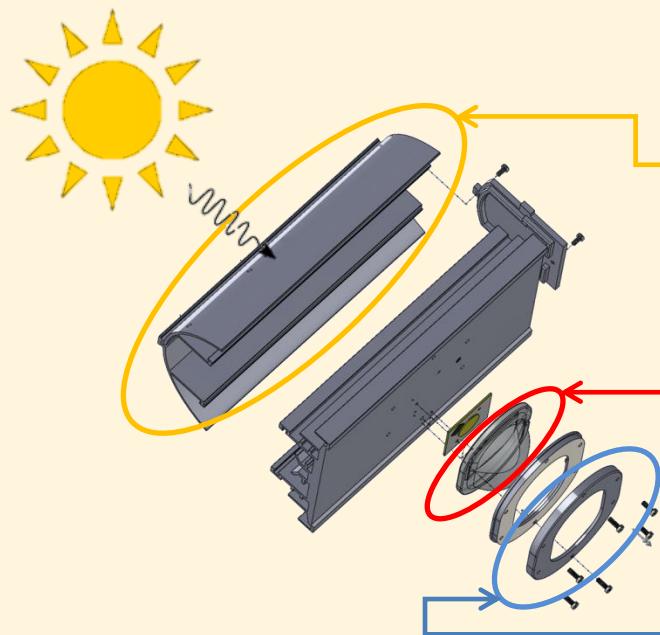
Explanation : In some countries biggest problem is overvoltage where the nominal input voltage is 230VAC but it can go anywhere from 310V to 440VAC for longer durations (2-8 hours). In order to cope with this problem, CATLIGHTING's intelligent drive IC reduces the output slowly from the point where the input power is 240V. When the power is 350V, it cuts off the power close to zero and it works normally when the problem of GRID is resolved.

3-4. SUN & Water Protection

Sun Protection

IP66

"NO" Sand scratch Glass Lenz



Sun Protection - Blocked radiant heat by upper cover

Glass Lenz - **NO Sand scratch** & **NO Yellowing**

IP66 Water Proof Packing

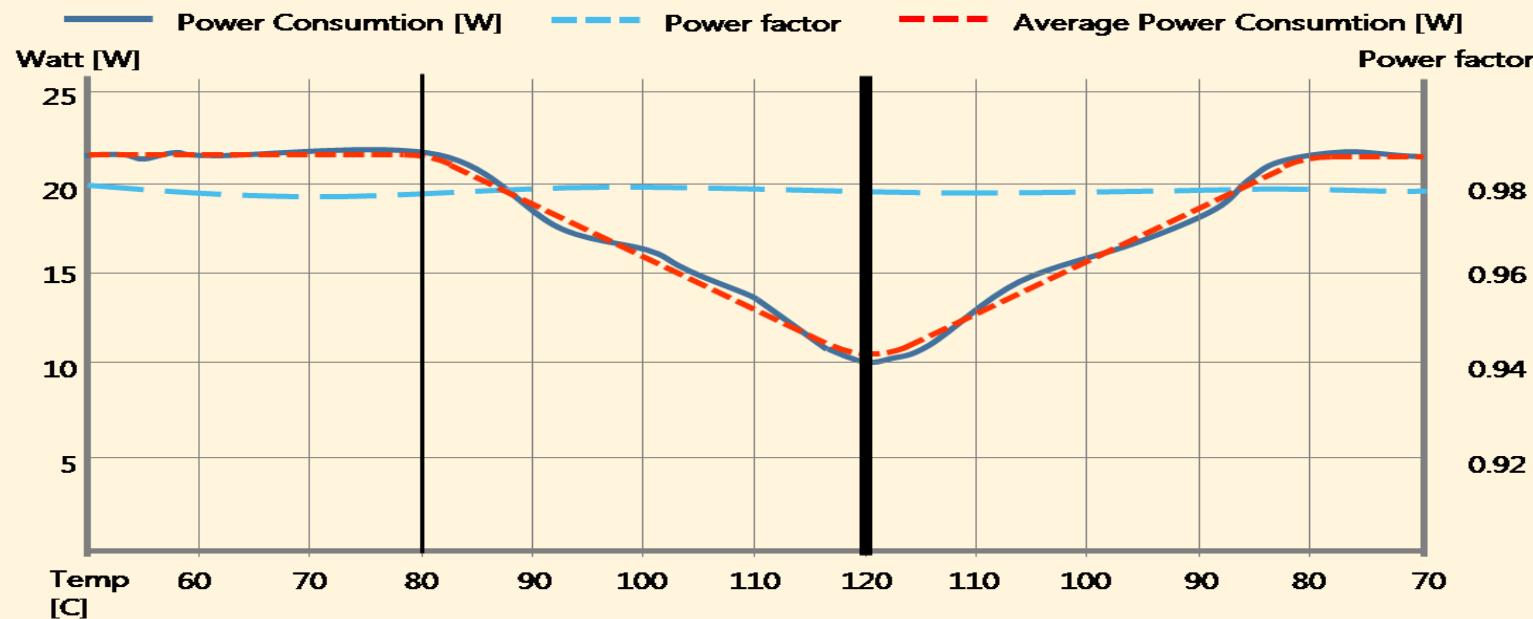
-Excellent packing structure which realizes
the waterproof performance grade IP66

- Patented Technology : Streetlights mechanism compounds
that prevent the LED destruction by radiant heat

Patent NO : 10-2015-0017975(Korea)

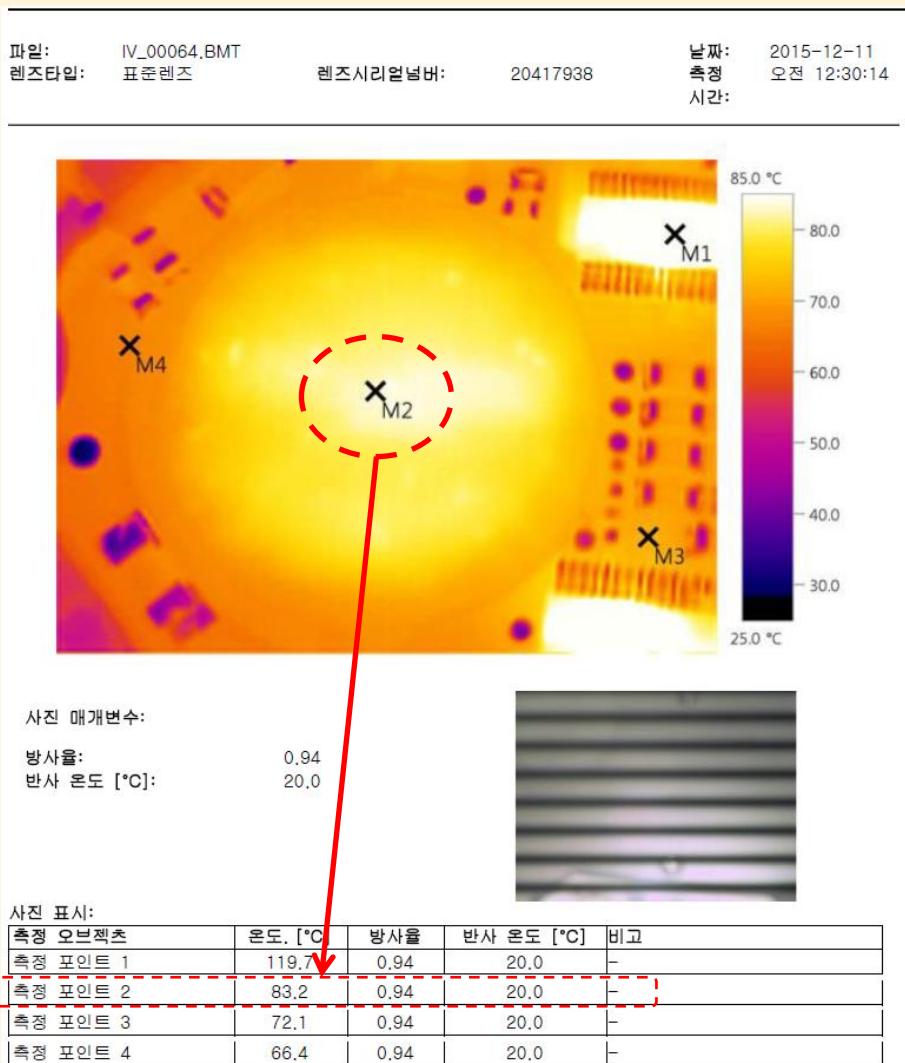
3-5. Over Temperature Protection(OTP)

- OTP Measured data

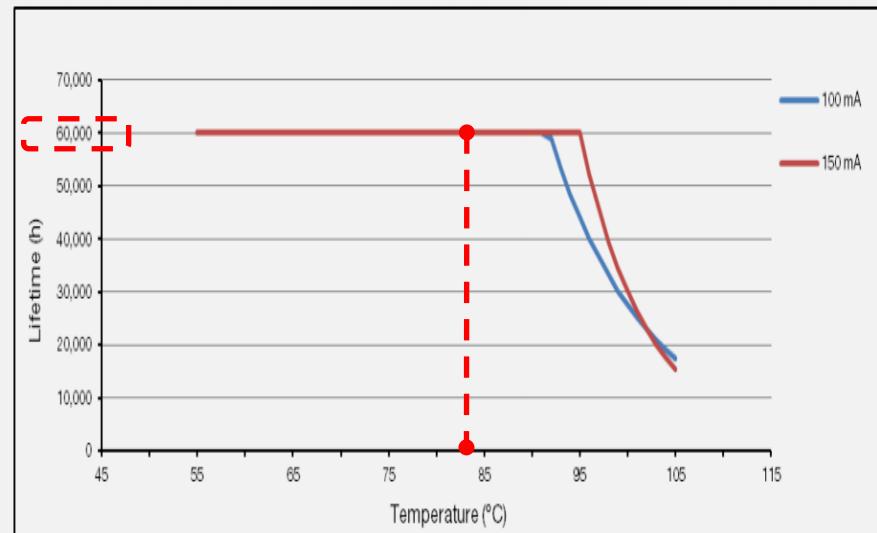


Explanation : When the IC ambient temperature increased 80 degrees by any factors from outside, Driver IC reduce transmission power to the LED, Functions to raise the provided output, till temperature turns down below 80 °C

3-5. Over Temperature Protection(OTP)



L_{70} Temperature Interpolation Graph



<LED Temperature and Lifetime Graph>

Comparison

- AC Direct Drive IC : Instability resolution of SMPS
- Due to the excellent heat dissipation design Tc point temperature of 65 degrees realization
- Over Voltage Protection(Max 450V @ 220V), Over Temp Protection Technology
- Automatic shutdown voltage : 350V
- Selectable Beam Angle 140/160 degree
- Material : Special designed Aluminium 100%
- Tempered Glass Lenz (NO Yellowing, NO Sand Scratching)
- Optional PLC(Power Line Control) or WIFI Remote Control
- Minimum Lifetime 60,000h
- Luminous Efficiency : Around 130lm/w

| Required Total Luminous Flux (M3) | Sodium Lamp | LED type | Power | Luminous Efficacy | Total Luminous Flux | Save Energy |
|-----------------------------------|-------------|--------------|---------------------------------|-------------------|---------------------|-------------|
| Over 10,000lm | 250W | CAT's AC LED | 80W | 130lm/w | 10,400 Lumen | 68% |
| | | DC LED | 120W -LED 105W - SMPS 15W | 100lm/w | 10,500 Lumen | 50% |

Comparison

AC Direct LED

vs

DC LED

| Item | unit | CAT Lighting | compare | CREE |
|---------------------|------------------------------|---|--------------------------------|---|
| Model | | LEOPARD 80 | | XSP2™ — BXSPA02/G |
| Power | W | 80 | ← Lower power consumption | 101 |
| Type | | AC Direct | ← Long Life Cycle | DC - SMPS |
| Power Factor | | 0.99 Real power consumption →80/0.99=80.8watt | ← Lower Rear power consumption | 0.9 Real power consumption →101/0.9=112.2watt |
| Total Luminous Flux | lm | 10,400 | = | 10,680 |
| Luminous Efficacy | lm/W | 130 | ← Higher | 105 |
| Color Temperature | K | 4000~6000 | = | 4000~6000 |
| LENZ | | Tempered GLASS | ← NO! Yellowing | Poly carbonate |
| CRI(Ra) | - | 70~75 | = | 70~75 |
| Size (DxWxH) | mm | 180x420x143 | ← smaller | 368x665x117 |
| dimming | | Designed with 0-10V dimming capabilities | = | Designed with 0-10V dimming capabilities |
| Weight | Kg | 5.5 | ← Lighter | 12 |
| IP | | 66 | | ? |
| Warranty | Luminaire | 10 | ← Long Life Cycle | 10 |
| | LED Engine (Power supply) | 10 | | 3 |

3-6. Type of Products

AC Direct Street Lights



LEOPARD 20



LEOPARD 40



LEOPARD 80



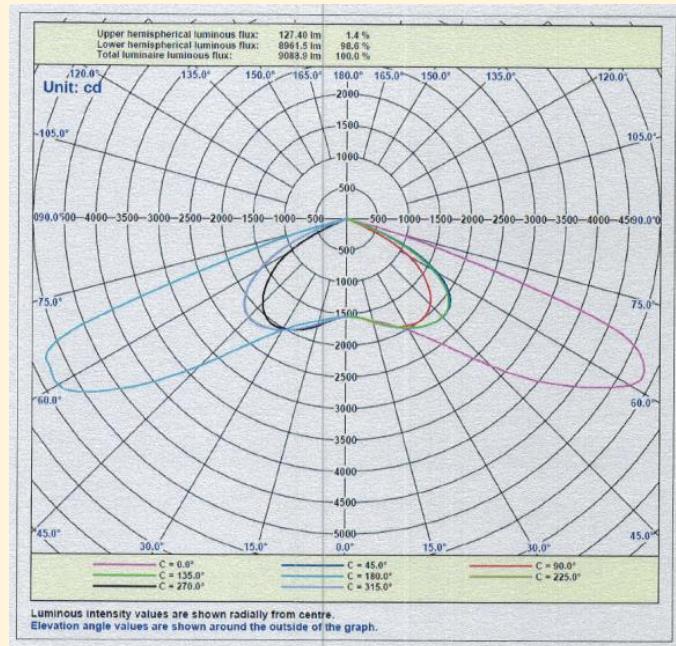
TIGRESS 120



TIGRESS 160

Feature

- Directly connected to AC Power
- High Power Efficiency : 91%
- **High Power Factor : >0.99**
- Low THD : <15
- Robust Performance (OVP, OTP)
- Long Lifetime : >60,000Hr
- Minimal external components
- 20W, 35W, 40W, 80W, 120W, 160W, 240W (@110/220VAC)
- Color Temp : 3000~6500k
- **Luminous efficiency : Around 130 lm/W**
- IP : 66



DC type Flood Lights



EFD-300B

■ Application



■ Features

- High luminance efficiency
- Exceptional energy savings
- Long life span (>50,000hr)



■ Specifications

| NO | Items | Symbol | Specifications | | Unit | Remarks |
|----|-----------------------|--------|--------------------------|--------|------|-----------|
| 1 | Power consumption | P | 300 | 400 | W | |
| 2 | Input Voltage | Vin | 90~305V | | VAC | 50Hz/60Hz |
| 3 | Total Luminance flux | F | 36,000 | 46,000 | lm | |
| 4 | Luminance efficiency | | >120 | >115 | lm/W | |
| 5 | Color temperature | CCT | 3,000~5,700 | | K | |
| 6 | Color Rendering | Ra | >75 | | | |
| 7 | Radiation angle | | 20°(A) & 40°(B) & 60°(C) | | Deg | |
| 8 | Operating temperature | Topr | -30 ~ +55 | | °C | |
| 9 | Size | | 499x340x292 | | mm | |
| 10 | Weight | | 13.5 | | Kg | |
| 11 | Warranty | | 3 | | Year | SMPS |
| 12 | Converter type | | External | | | |

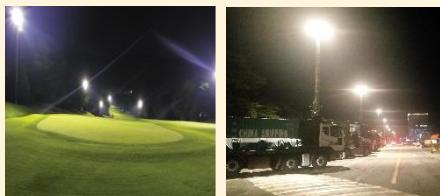
Notice: All the product specifications can be changeable according to the development requirements.
and Designs and structural features are patent applied for intellectual property protection.

DC type Flood Lights



EFD-600B/800B

Application



Features

- High luminance efficiency
- Exceptional energy savings
- Long life span (>50,000hr)



Specifications

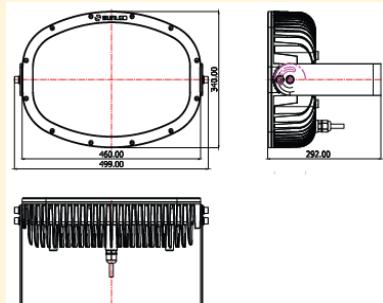
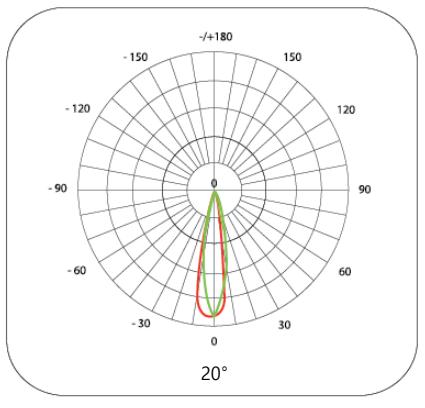
| NO | Items | Symbol | Specifications | | Unit | Remarks |
|----|-----------------------|--------|--------------------------|--------|------|-----------|
| 1 | Power consumption | P | 600 | 800 | W | |
| 2 | Input Voltage | Vin | 90~305V | | VAC | 50Hz/60Hz |
| 3 | Total Luminance flux | F | 72,000 | 92,000 | lm | |
| 4 | Luminance efficiency | | >120 | >115 | lm/W | |
| 5 | Color temperature | CCT | 3,000~5,700 | | K | |
| 6 | Color Rendering | Ra | >75 | | | |
| 7 | Radiation angle | | 20°(A) & 40°(B) & 60°(C) | | Deg | |
| 8 | Operating temperature | Topr | -30 ~ +55 | | °C | |
| 9 | Size | | 639x420x312 | | mm | |
| 10 | Weight | | 19 | | Kg | |
| 11 | Warranty | | 3 | | Year | SMPS |
| 12 | Converter type | | External | | | |

Notice: All the product specifications can be changeable according to the development requirements.
and Designs and structural features are patent applied for intellectual property protection.

DC type Flood Lights

■ Distribution curve & Dimension

- 300/400W



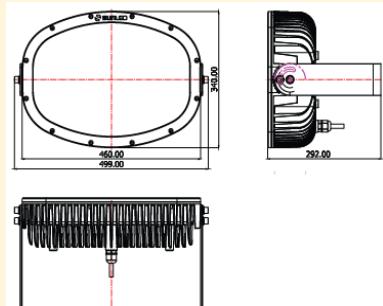
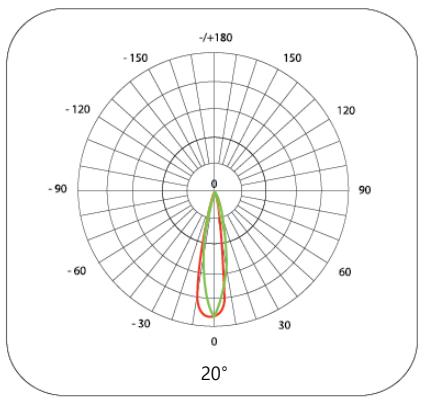
※ Dimension : 499 x 340 x 292mm

※ ILLUMINATION(Ix)

(ex : 300W)

| M | 20° | 40° | 60° |
|------|------|-----|-----|
| 10M | 2473 | 842 | 377 |
| 20M | 618 | 211 | 94 |
| 40M | 155 | 51 | 24 |
| 60M | 69 | 25 | 12 |
| 80M | 39 | 13 | 6 |
| 100M | 25 | 8 | 3 |
| 200M | 6 | 2 | 1.5 |

- 600/800W



※ Dimension : 639 x 420 x 312mm

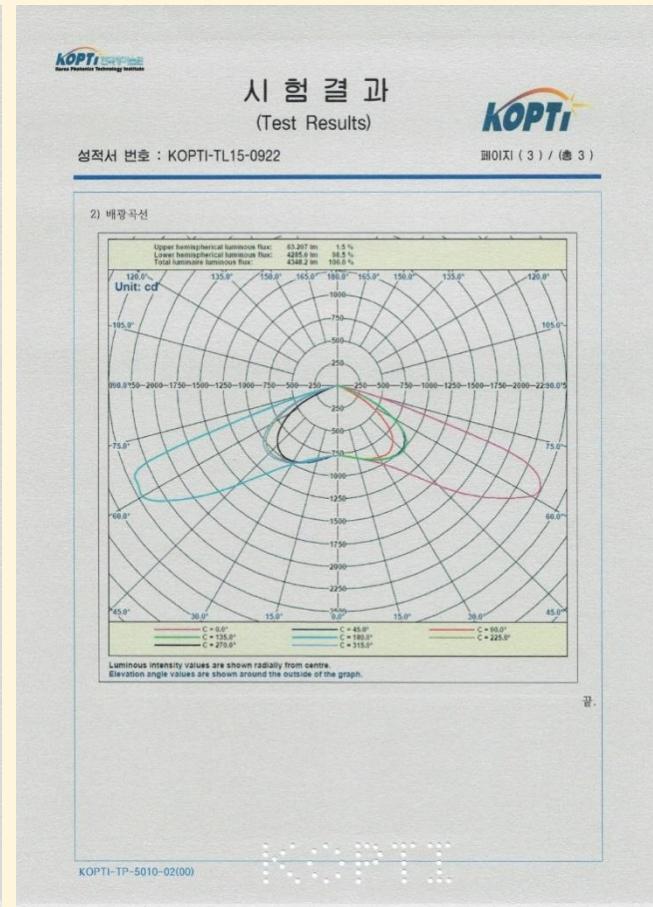
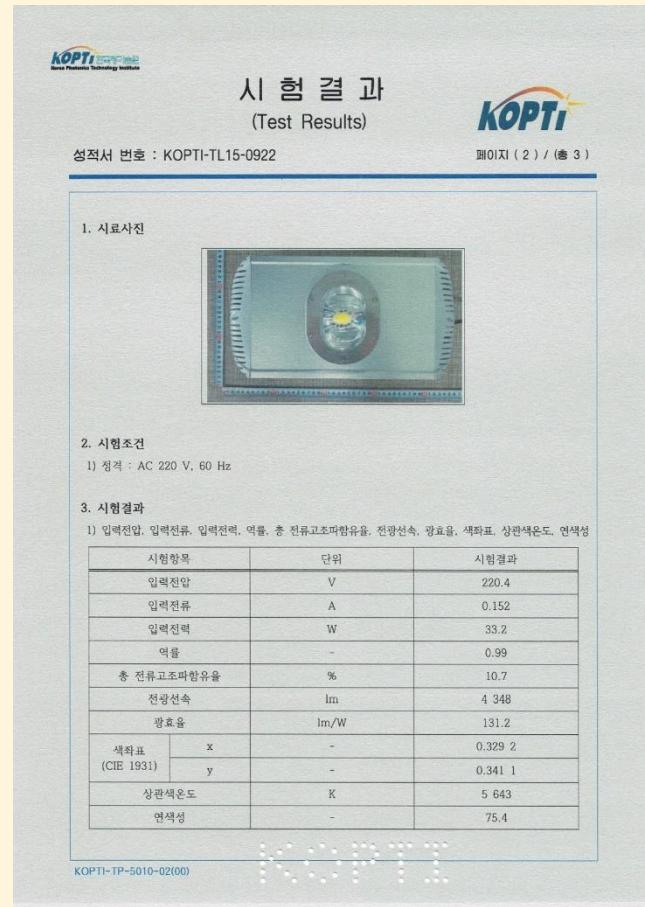
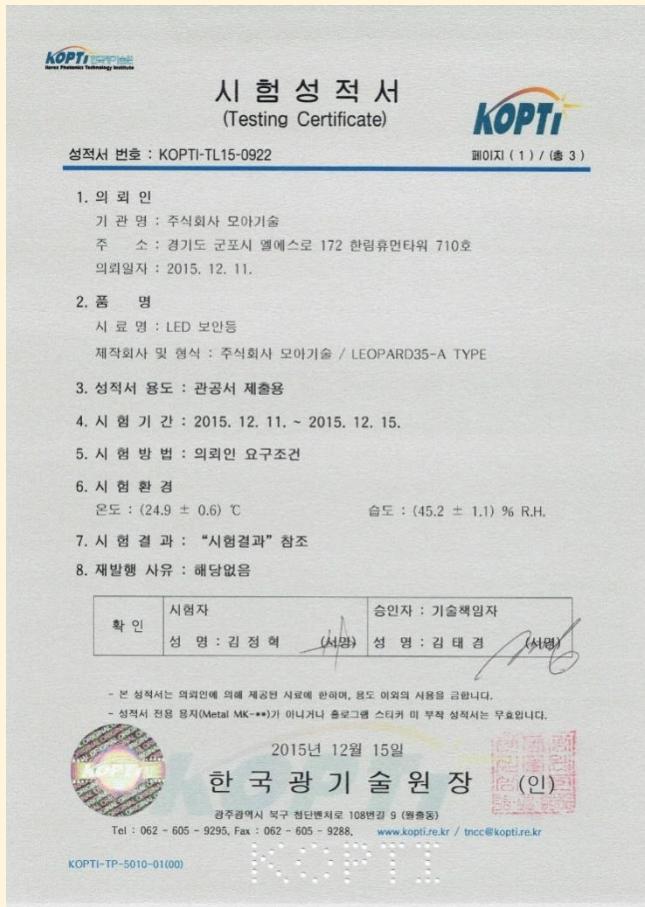
※ ILLUMINATION(Ix)

(ex : 600W)

| M | 20° | 40° | 60° |
|------|------|------|-----|
| 10M | 4148 | 1518 | 674 |
| 20M | 1087 | 380 | 168 |
| 40M | 259 | 95 | 42 |
| 60M | 115 | 42 | 19 |
| 80M | 65 | 24 | 11 |
| 100M | 42 | 15 | 7 |
| 200M | 11 | 4 | 2 |

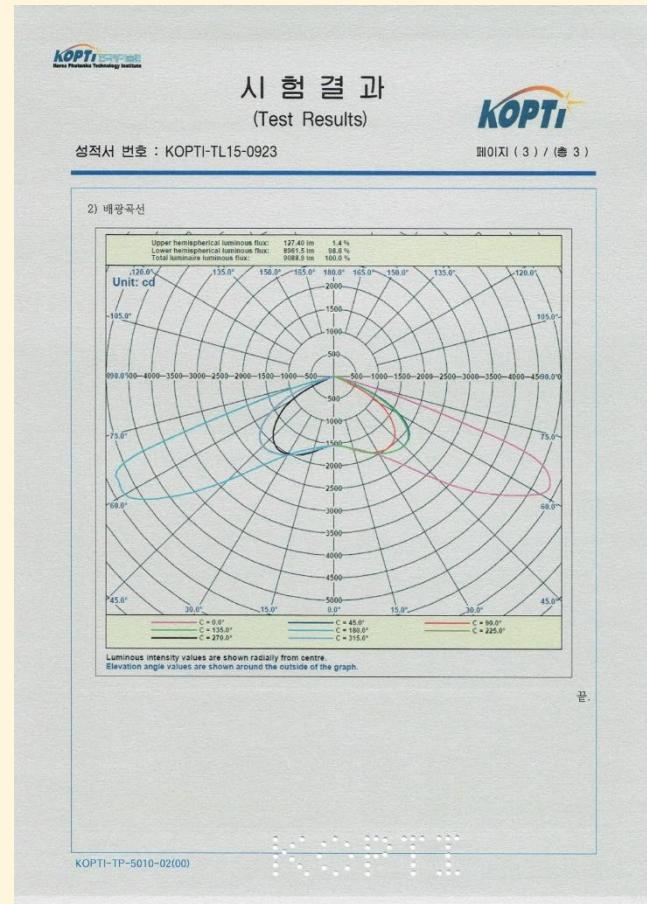
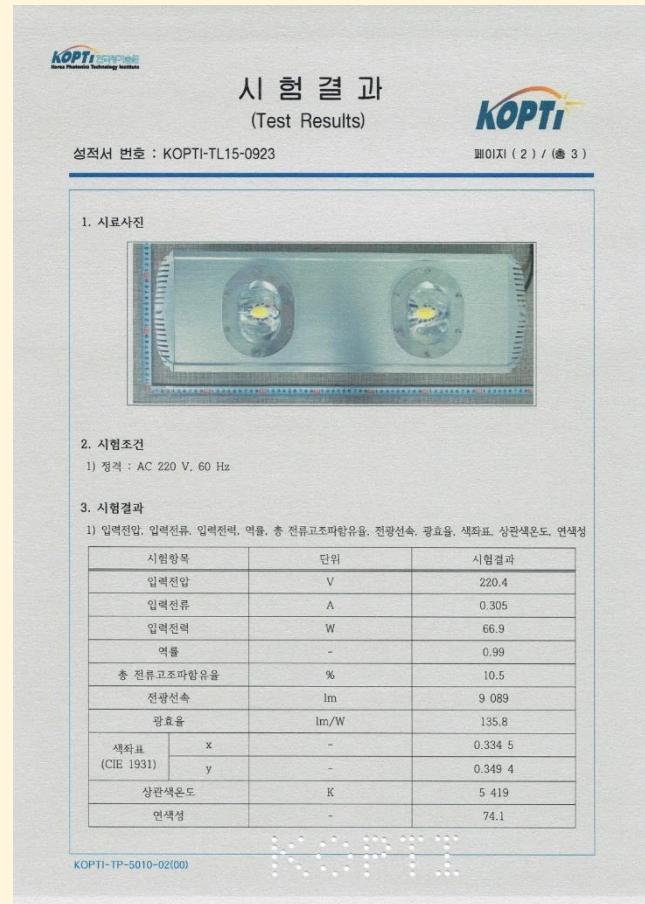
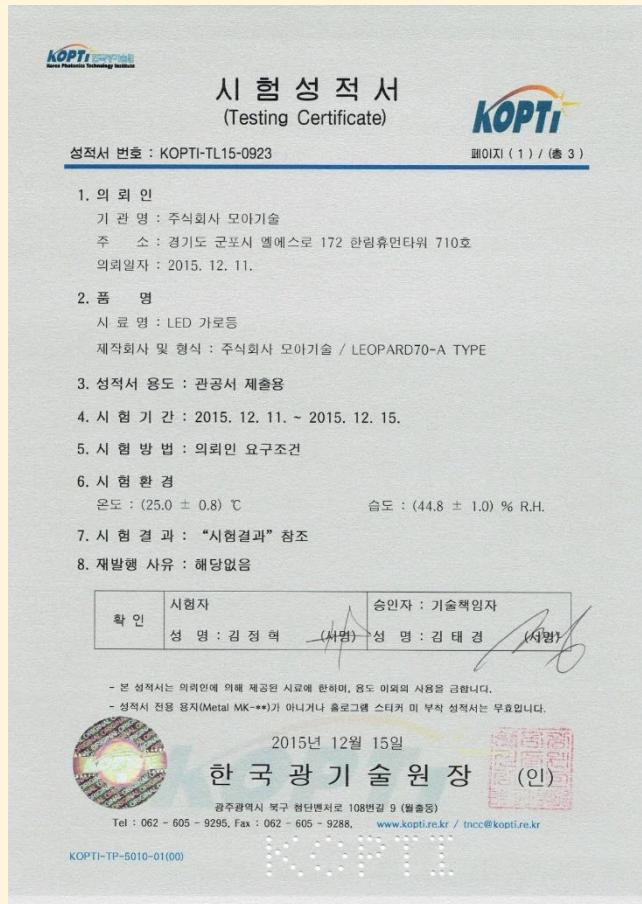
3-7. Test Reports

LEOPARD 35-A type



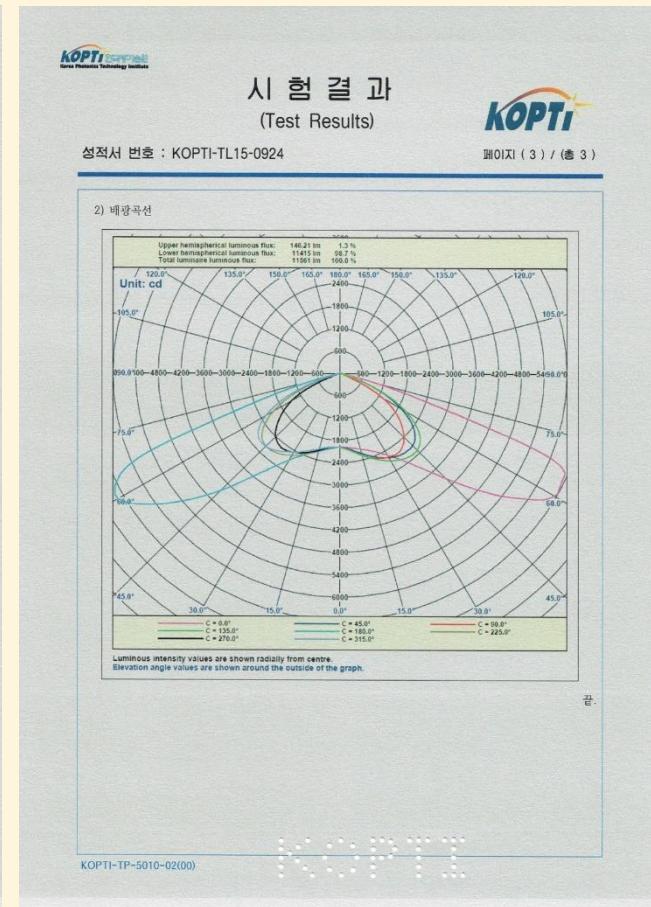
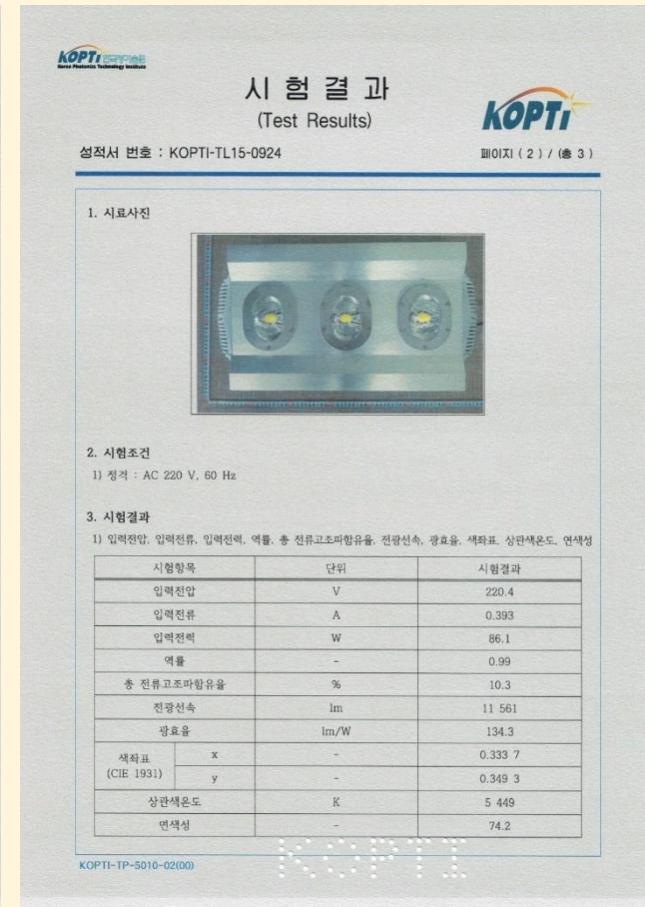
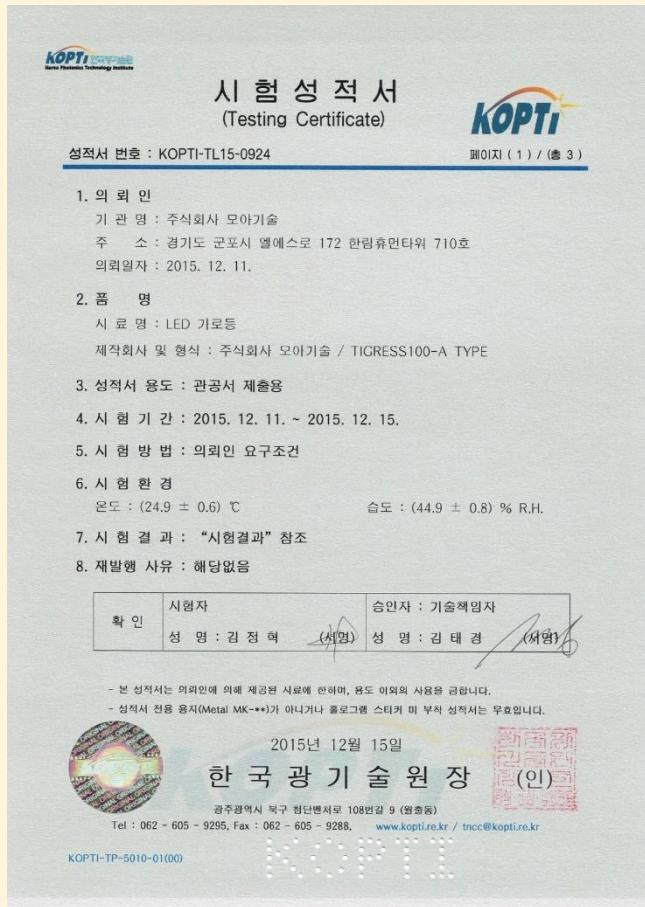
3-7. Test Reports

LEOPARD 70-A type



3-7. Test Reports

TIGRESS 100-A type



3-8. Installation Pictures

Security Light(35W) : Militopia Golf Course



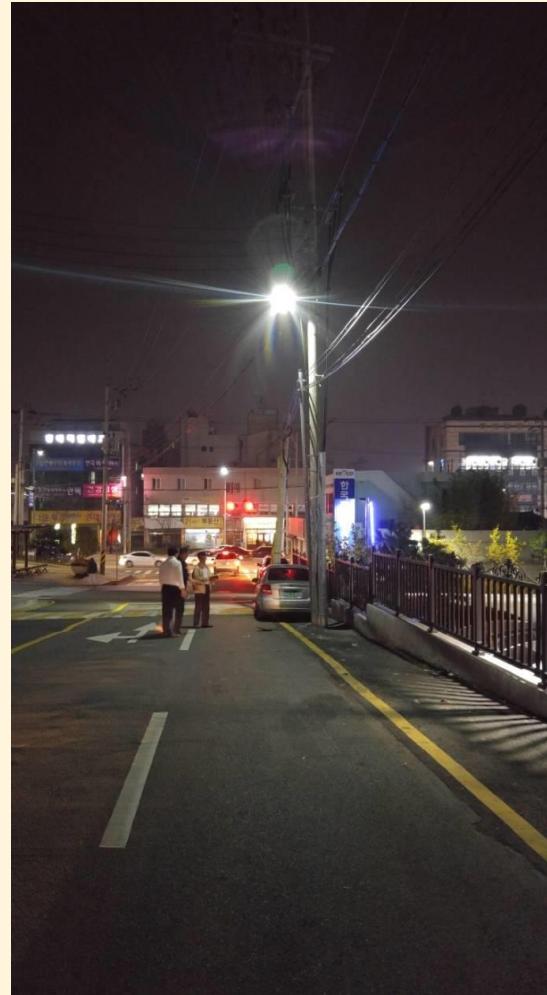
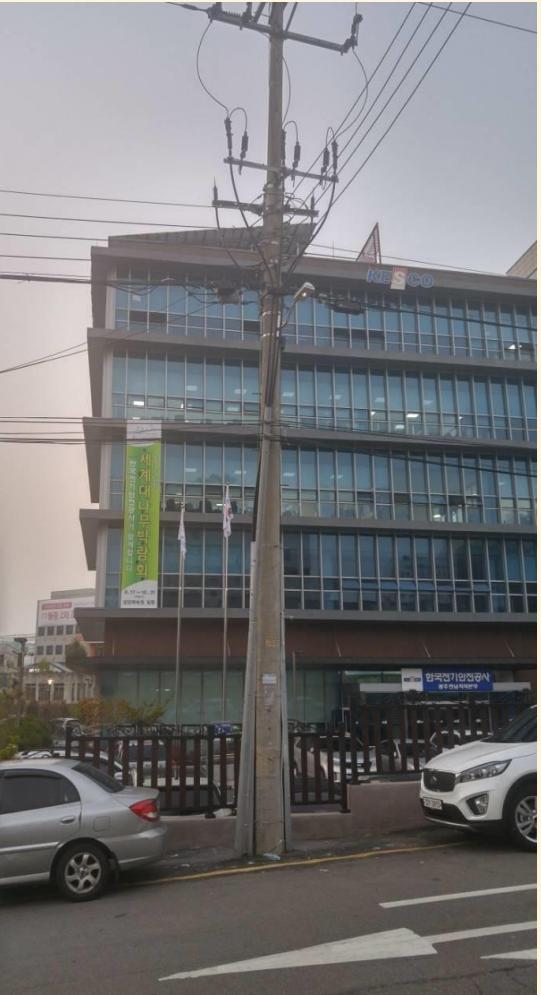
3-8. Installation Pictures

Security Light(40W) : Gwang Ju City



3-8. Installation Pictures

Security Light(40W) : Gwang Ju City



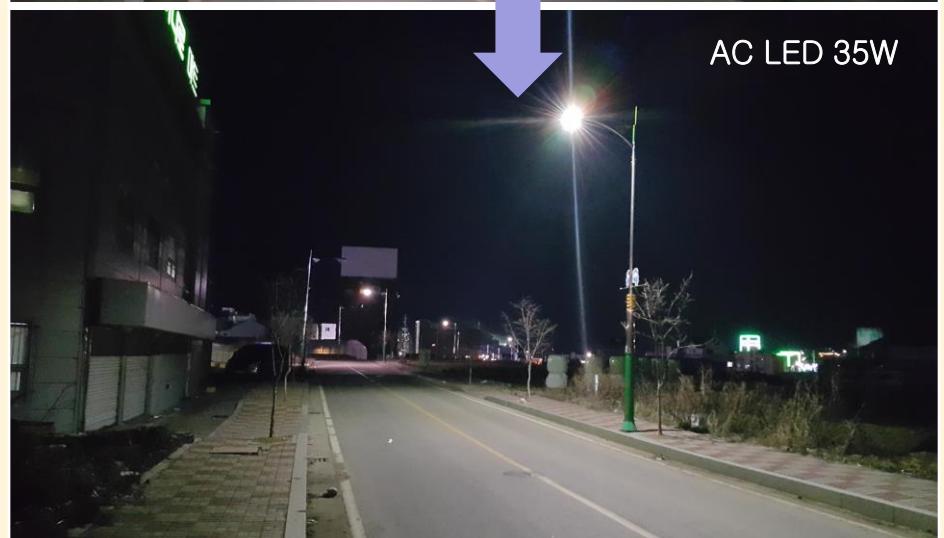
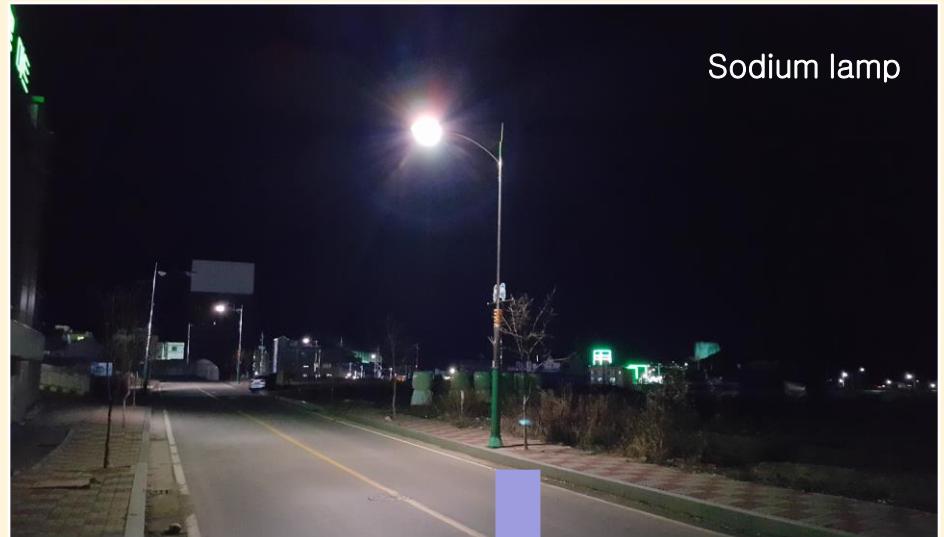
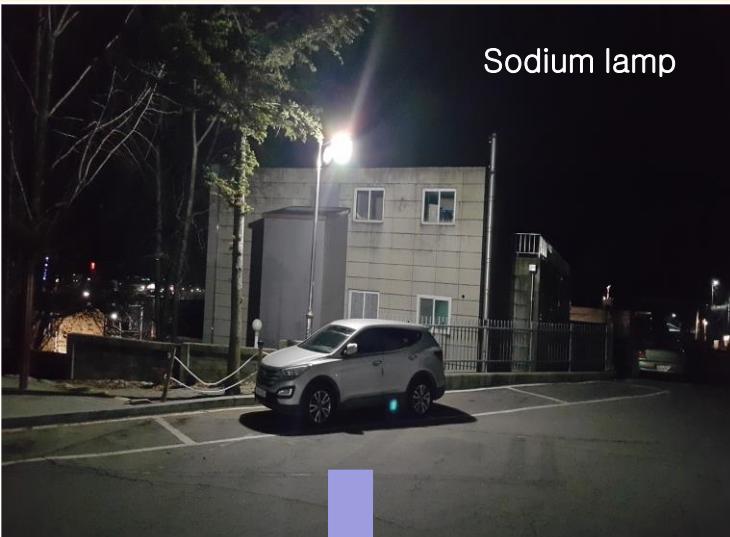
3-8. Installation Pictures

Security Light(40W) : GwangJu City



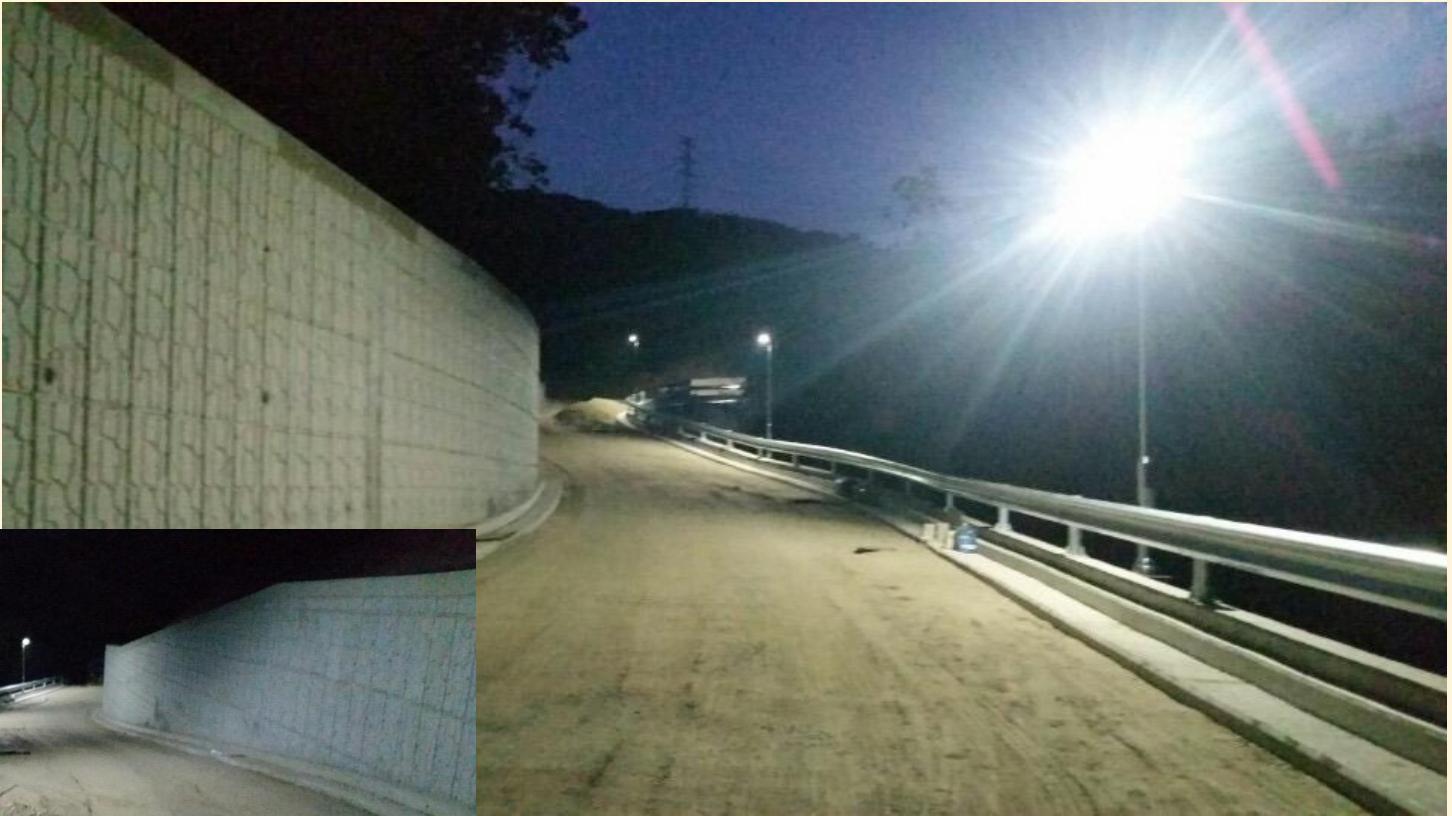
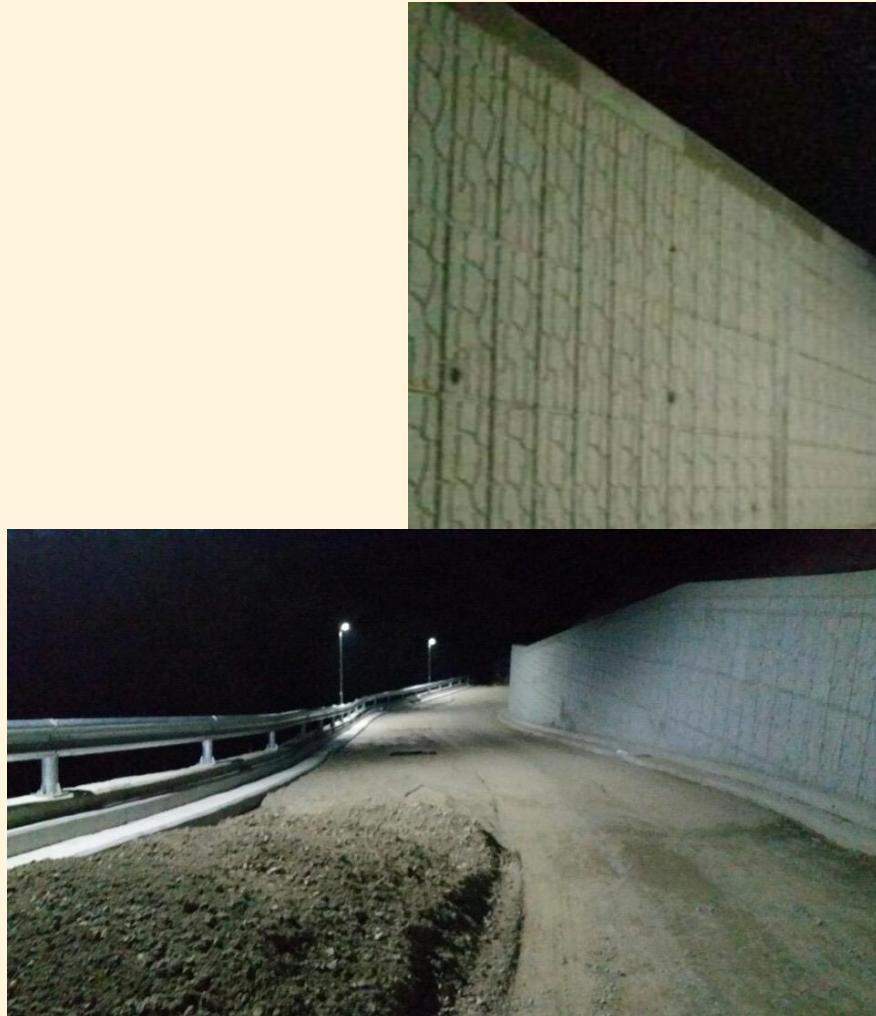
3-8. Installation Pictures

Security Light(40W) :InJeCity



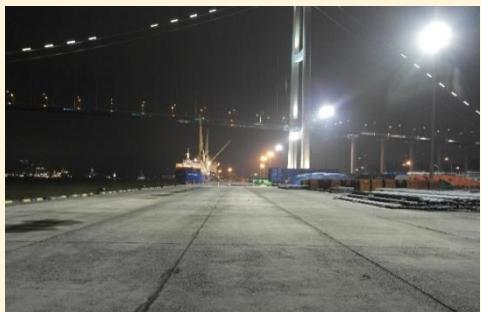
3-8. Installation Pictures

Security Light(40W) : Church Saemoonan Driveway



3-8. Installation Pictures

Flood Light : PORT (Light Tower & Crane)



3-8. Installation Pictures

Flood Light : SPORTS (Golf Course Light Tower)



3-8. Installation Pictures

Flood Light : SPORTS (Stadium Light Tower)



4. Patent & Certification

Patent



- Driving control circuit of LED lighting device
(Patent No. 10-1678592)



- LED Street Lights (LED Illuminator Mechanism for heat dissipation device)
(Patent No. 10-1525379)

4. Patent & Certification

Certification – KC & Registration of Broadcasting & Communication Equipments

| | | |
|--|------------|--|
| 100-100-100-100-100 | | |
| 방송통신기자재등의 적합등록 필증 <i>Registration of Broadcasting and Communication Equipments</i> | | |
| 상호 또는 성명 <i>Trade Name or Register</i> | ㈜파마리카 | |
| 기록화면 명칭 <i>Image Screen Name</i> | LED 모니터기구 | |
| 기본도록명 <i>Base Model Name</i> | LEOPARD 35 | |
| 파생도록명 <i>Some Model Number</i> | | |
| 등록번호 <i>Registration No.</i> | | MSP-BSM-Mon-LEDPA005 |
| 제조사/제조(요구)국가 <i>Manufacturer/Country of Origin</i> | | (주) 모아이지스 / 한국 |
| 등록면허증명 <i>Copy of Registration</i> | | 2019-08-10 |
| 기타 <i>Others</i> | | 위 기자재는 천리, 멀티프로토콜 4세대에 따른 통합제품으로 충전합니다. It is verified that foregoing equipment has been registered under the Clause 3, Article 58-2 of Radio Waves Act. |
| | | 2019년08월(연) 08월(연) 10일(일) |
| 국립전파연구원장 <i>Director General of National Radio Research Agency</i> | |  |
| <small>※ 국립전파연구원은 이전에 출판한 저작권자 표시와는 다른 저작권 표시를 사용하는 경우 저작권 침해로 간주됩니다. ※ 저작권자 표시는 저작권자와 저작권자명을 표기하는 경우 저작권을 인정하는 행위입니다.</small> | | |

430-002-0247-0000

방송통신기자체등의 적합등록 면증

Registration of Broadcasting and Communication Equipments

상호 또는 성명
Trade Name or Register

(주) 모아기술

기밀번호 명칭
Trade Name

LED 모니터용 카드

기밀번호 명칭
Trade Name

LEOPARD 35

화생모델명
Item Model Number

등록번호
Registration No.

N50P-BEM-Mon-LEOPARD35

제조사(한국)(영문)국적
Manufacturer,Country of Origin

(주) 모아기술 / 한국

등록면허증명
Code of Registration

2015-08-10

기타
Others

위 기자는 「전파법」 제8조(국외·제3항)에 따라 등록면허증을 충전합니다.

It is verified that foregoing equipment has been registered under the Clause 3,
Article 5c-2 of Radio Waves Act.

2015년 08월 10일(일) 10월(일)

Director General of National Radio Research Agency

※ 국립전파과학원은 정부출연기관으로서 국가·정부·지방자치단체·민관 합동으로 국립전파과학원을 설립하는
원칙으로서 국립·정부·지방·민관 합동으로 설립할 것을 원칙으로 한다.

2041-1544-0421-A721

방송통신기자재등의 적합등록 험증
 Registration of Broadcasting and Communication Equipments

상호 또는 성명

(주)포마리온

Business Name

AC DIRECT LED LIGHT

기밀도록명

Tigress 100

Base Model Number

과정도록명
 (주)포마리온

등록번호

MSIP-BDM-Mox-Tigress100

제조사/제조국(주)명

(주)포마리온 / 한국

도록일자/등록일

2015-09-14

기타
 Others

위 기록에는 본인명, 제조번호 40자내외, 회사 등록번호 등을 충당합니다.

It is verified that foregoing equipment has been registered under the Clause 3,

Article 56-2 of Radio Waves Act.

2015년09월14일(일) 2015년09월14일(일)

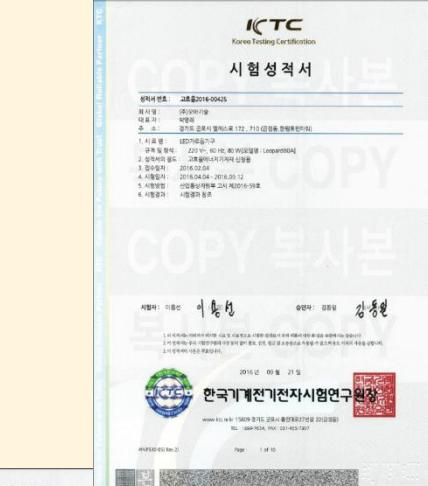
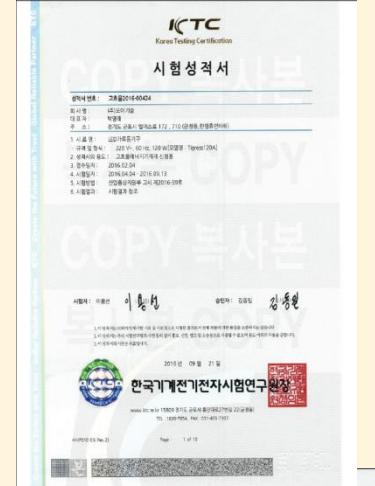
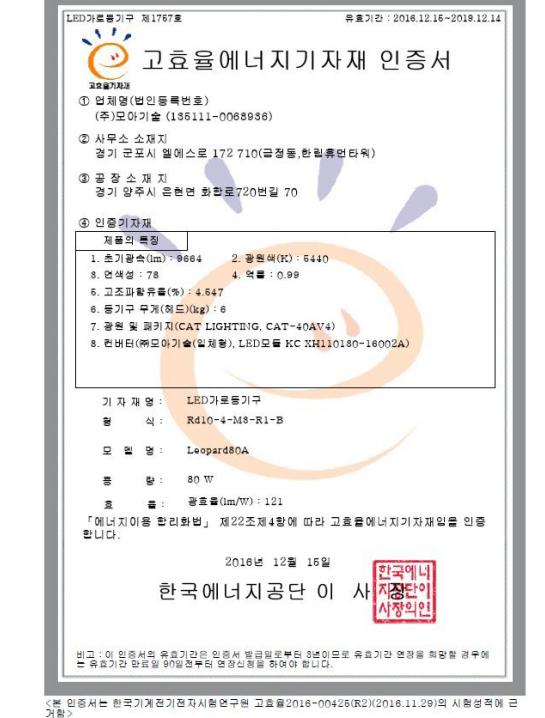
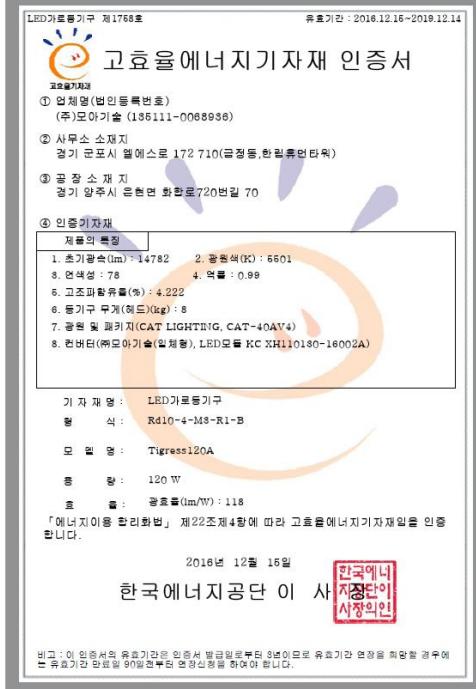
국립전파연구원장
 Director General of National Radio Research Agency

※ 본인명은 본인의 성명으로, 제조번호는 40자내외로 적어주시기 바랍니다.
 회사명은 회사명을 표기하시는 경우 회사명을 표기해주시기 바랍니다.

| | |
|--|---|
| 2017-1544-0208-0001 | |
| 방송통신기자재등의 적합등록 법증 <i>Registration of Broadcasting and Communication Equipments</i> | |
| 장소 등록 <i>Trade Name or Register</i> | ㈜보아기술 (주)Boa Technology |
| 기기 등록 명칭 <i>Equipment Name</i> | LED 조명기기 LEOPARD TU |
| 기기 등록 번호 <i>Item Model Number</i> | |
| 과별로 일련 Item Model Number | |
| | |
| 등록번호 <i>Registration No.</i> | MSPB-BEM-Mon-LEOPARDTU |
| 제조사/제조국(호국)국가 <i>Manufacturer/Country of Origin</i> | (주)보아기술 / 한국 (주)Boa Technology / Korea |
| 등록일자 <i>Date of Registration</i> | 2015-08-25 |
| 기타 <i>Others</i> | |
| 위 기기 제조, 판매, 제조도입(제작)방법에 따라 등록처별증을 청취합니다. It is verified that the broadcasting equipment has been registered under the Clause 3, Article 3-2 of Radio Wave Act. | |
| 2015년08월 (날짜) 20일(일자) 2015년08월 (날짜) 25일(일자) | |
| 국립전파연구원장 <i>Director General of National Radio Research Agency</i> | |
|  * 국립전파연구원은 대한민국 과학기술정보통신부 산하 기타공공기관으로서 국립전파기술 연구·개발·보급·인증·관리 및 국제협력·교류 등을 목적으로 합니다. | |

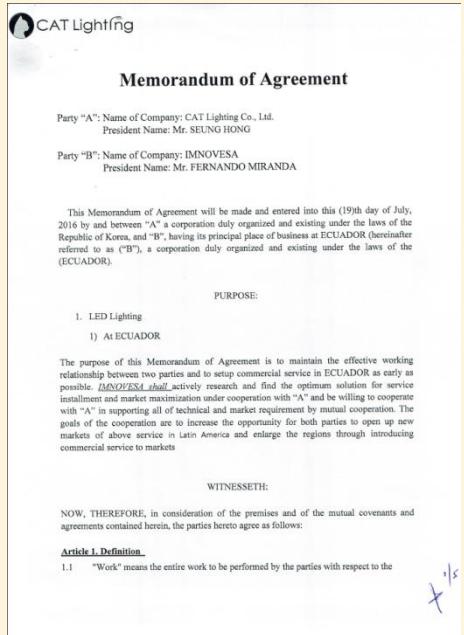
4. Patent & Certification

Certification – High efficiency energy equipment certificate



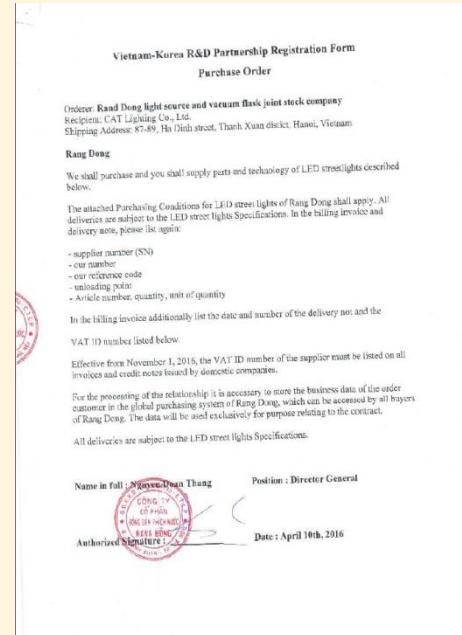
4. Patent & Certification

Contract



- MOU :
VIETNAM RANGDONG

• PO :
VIETNAM RANGDONG



| | | | | |
|---|---|---|---------|------------|
| 1) 신청자명 | 산업통상자원부 광고 제2015-492호 | | 3) 접수번호 | ND41400002 |
| 한-베트남 소재부품 공동 R&D 사업계획서 | | | | |
| 4) 관리책임자 | 국적 | 국내 | | |
| | 국적 | AC Drive IC에 이용되는 35W급 고광도 LED光源 (130lm/W) 및 가로등 개발 영문 | | |
| 5) 산업부품분류 (가중치 %) | 소분류(1위) | COB 35W class high-efficiency light source (130lm/W) and street lights Development of AC Drive IC | | |
| | 소분류(2위) | 주거지역 (1) 소분류(3위) | | |
| 6) 주관기관 | 제작기간 | 100 | | |
| | 제작일 | 법인명 주식회사 케라미드 사업자등록번호 134-87-38184 법인登記日 2014.7.11 주소 | | |
| 7) 출판책임자 | 제작일 | 1억원 주 소 경기도 안산시 삼uss구 양성로 226 7층 (1호, 1층) (15489) 성 명 홍 승 부 서 우편번호 402-830-2041 직 위 대표이사 전화 070-4696-5468 E-mail hs@keramid.co.kr 팩스 010-5544-5468 | | |
| | 총 출판기간 | 2015. 9. 1 ~ 2016. 5. 31 (6 개월) | | |
| 9) 사업비(천원) | 구분 | 주관기관 (주)케라미드 60,000,000 부수출판금 60,000,000 20,000,000 20,000,000 100,000,000 민관금 5,000,000 부수당금 현금 45,000,000 계 110,000,000 20,000,000 20,000,000 150,000,000 | | |
| | 기타 | 법인登記자 회사명(영문) 회사명(한글) 대표자명 E-mail 베키브레이드 기업 광성지 상무 010-4239-034 briant@enbrain.co.kr | | |
| 10) 참여기관 | Rang Dong 베트남날기 Nguyen Duu Thang DG S84-388-543 caloco@vnn.vnn.vn n | | | |
| 11) 참여기업 | 주관기관과 참여기관 중, 2개 이상(1개, 2개, 중인기업) ()개 부안제조() 일반제조() | | | |
| 12) 보안등급 | 설 명 영 수 전화 070-4696-6181 부서/직위 연구소/책임 대표이사 010-5792-3957 | | | |
| *산업기술혁신촉진법 제 67조, 같은 법 시행령, 산업기술혁신사업, 공동 유통망 및 국제기술협력사업, 제 2항 관리자 지침의 규정에 따른 소관부처(광고부서), 공동 R&D 사업을 수행하는 사업자(제작자) 사업자(제작자)에 대한 민관연계 지원부처(부처명) 등 신청자와 베트남 기관과 관리를 위한 개인정보 활용에 동의합니다. | | | | |
| 2015년 11월 20일 | | | | |
| 출판책임자 : | | 대표이사 | 홍승 | |
| 주관기관 : | | 주식회사 케라미드 220-82-08387 사업자등록번호 134-87-38184 사업주소 강남구 테헤란로 900 사업자등록번호 134-87-38184 사업주소 강남구 테헤란로 900 | | |

- MOA :
ECUADOR IMNOVESA

5. Mass Product Company Profile



• ITS WELL : Light Source



• CAT Lighting Assembly Line

5-1. Sub-Sister Company Profile (Light source Mass Product Line)



✓ Company Name : ITS WELL Co., Ltd.

✓ President : Mr. JIN KIM

✓ Established Date : Apr. 10, 1997

✓ Employee : 274

✓ LED PKG Capacity



20KK/M



120KK/M



70K/M

CERTIFICATE OF REGISTRATION



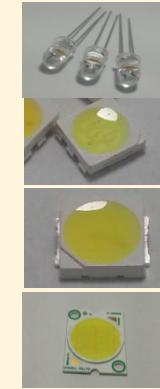
ISO14001

ISO9001

TS16949

LM-80 Test Report

LM80 Tested Model

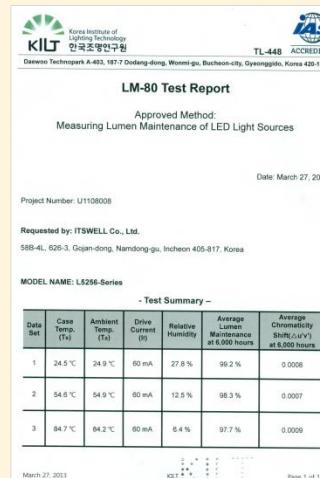


*Size: 5mm THT
*Power: 0.2W
*Frame: Round

*Size: 5.4*5.0*1.6
*Power: 0.2W
*Frame: PLCC 6

*Size: 5.4*5.0*1.2
*Power: 0.5W
*Frame: PLCC 2

*Size: 30*26*1.5
*Power: 10W
*AI. Mirror PCB



www.itswell.com

5-1. ITSWELL Competitiveness

Experience

18 years of Long Experience in LED Packaging Industry

Variety

Wide Range of Product Line up for Various Applications

Service

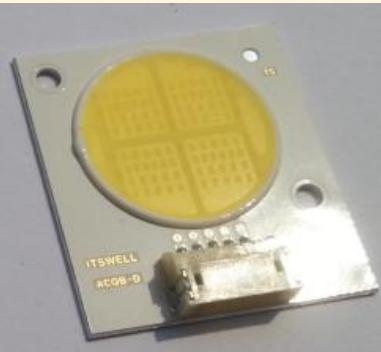
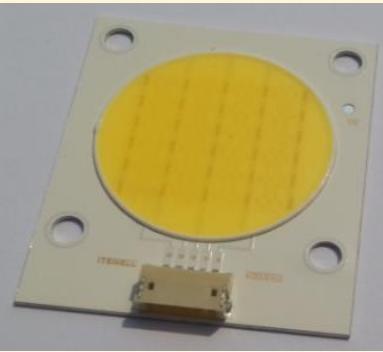
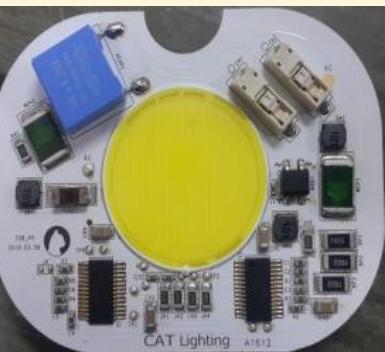
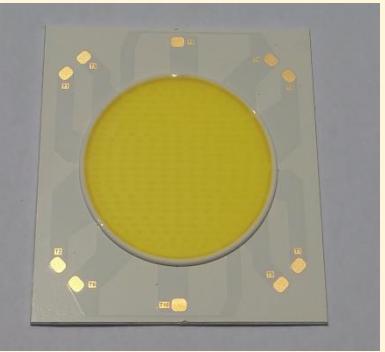
Prompt Response/ Action/ Delivery (3days - max. 2weeks)

Customization

Unequalled Products Customization Service Providing



5-1. ITSWELL Customer Value Creation - Modulization

| Model | IWA-B20R5-XXX | IWA-B40R5-XXX | OEM(CAT-40A) | IWC-B120R2-P7-AS252F | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------|--|--|--|--|----|--------|-----|---------|-----------|------|------|-----|---------|--------|--------------------------|--|------|---------|--------|----|--------|-----|---------|------------|------|------|-----|---------|--------|--------------------------|---|------|---------|--------|----|--------|-----|---------|------------|------|-----|-----|---------|--------|--------------------------|---|------|---------|--------|-----|--------|------------------------|---------|------------|------|----|-----|---------|--------|--------------------------|
| Image |     | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Spec. | <table border="1"> <tr> <td>Size</td><td>30 * 27</td></tr> <tr> <td>Pd (W)</td><td>20</td></tr> <tr> <td>Vf (V)</td><td>220</td></tr> <tr> <td>lv (lm)</td><td>1885@90mA</td></tr> <tr> <td>lm/W</td><td>94.2</td></tr> <tr> <td>CRI</td><td>Typ. 80</td></tr> <tr> <td>CCT(K)</td><td>3000, 4000 5000, 5700</td></tr> </table> | Size | 30 * 27 | Pd (W) | 20 | Vf (V) | 220 | lv (lm) | 1885@90mA | lm/W | 94.2 | CRI | Typ. 80 | CCT(K) | 3000, 4000 5000, 5700 | <table border="1"> <tr> <td>Size</td><td>47 * 40</td></tr> <tr> <td>Pd (W)</td><td>40</td></tr> <tr> <td>Vf (V)</td><td>220</td></tr> <tr> <td>lv (lm)</td><td>3890@180mA</td></tr> <tr> <td>lm/W</td><td>97.3</td></tr> <tr> <td>CRI</td><td>Typ. 80</td></tr> <tr> <td>CCT(K)</td><td>3000, 4000 5000, 5700</td></tr> </table> | Size | 47 * 40 | Pd (W) | 40 | Vf (V) | 220 | lv (lm) | 3890@180mA | lm/W | 97.3 | CRI | Typ. 80 | CCT(K) | 3000, 4000 5000, 5700 | <table border="1"> <tr> <td>Size</td><td>69 * 56</td></tr> <tr> <td>Pd (W)</td><td>40</td></tr> <tr> <td>Vf (V)</td><td>220</td></tr> <tr> <td>lv (lm)</td><td>5200@180mA</td></tr> <tr> <td>lm/W</td><td>130</td></tr> <tr> <td>CRI</td><td>Typ. 75</td></tr> <tr> <td>CCT(K)</td><td>3000, 4000 5000, 5700</td></tr> </table> | Size | 69 * 56 | Pd (W) | 40 | Vf (V) | 220 | lv (lm) | 5200@180mA | lm/W | 130 | CRI | Typ. 75 | CCT(K) | 3000, 4000 5000, 5700 | <table border="1"> <tr> <td>Size</td><td>50 * 54</td></tr> <tr> <td>Pd (W)</td><td>120</td></tr> <tr> <td>Vf (V)</td><td>256@450mA 130@900mA</td></tr> <tr> <td>lv (lm)</td><td>7750@900mA</td></tr> <tr> <td>lm/W</td><td>65</td></tr> <tr> <td>CRI</td><td>Typ. 80</td></tr> <tr> <td>CCT(K)</td><td>3000, 4000 5000, 5700</td></tr> </table> | Size | 50 * 54 | Pd (W) | 120 | Vf (V) | 256@450mA 130@900mA | lv (lm) | 7750@900mA | lm/W | 65 | CRI | Typ. 80 | CCT(K) | 3000, 4000 5000, 5700 |
| Size | 30 * 27 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pd (W) | 20 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Vf (V) | 220 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| lv (lm) | 1885@90mA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| lm/W | 94.2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CRI | Typ. 80 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CCT(K) | 3000, 4000 5000, 5700 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Size | 47 * 40 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pd (W) | 40 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Vf (V) | 220 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| lv (lm) | 3890@180mA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| lm/W | 97.3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CRI | Typ. 80 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CCT(K) | 3000, 4000 5000, 5700 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Size | 69 * 56 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pd (W) | 40 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Vf (V) | 220 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| lv (lm) | 5200@180mA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| lm/W | 130 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CRI | Typ. 75 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CCT(K) | 3000, 4000 5000, 5700 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Size | 50 * 54 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pd (W) | 120 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Vf (V) | 256@450mA 130@900mA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| lv (lm) | 7750@900mA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| lm/W | 65 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CRI | Typ. 80 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CCT(K) | 3000, 4000 5000, 5700 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| main Appl. |  bulb  Par lamp |  MR16  D/L |  Factory light |  Security light  street light  guide light | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

5-1. ITSWELL Customer Value Creation - Modulization



- ✓ Cumulated Experience in optoelectronic technology
- ✓ Specialized in Design & Engineering development
- ✓ Prompt response & action to customer request
- ✓ Modulization Support with custom specification



* Customer Requirement → Study+Analysis → Solution Offer → Evaluation → Supply

B-1. Assembly Line Setup plan

Line set up plan

| Item | M1 | M2 | M3 | M4 | M5 | M6 | M7 | M8 | M9 | M10 | 비고 |
|------------------------------------|----|----|----|----|----|----|----|----|----|-----|--|
| Equipment delivery | | | | | | | | | | | - |
| facility construction | | | | | | | | | | | - |
| Line set up | | | | | | | | | | | - |
| Line balance (refinement) | | | | | | | | | | | Improvement (Assembly) |
| Raise the efficiency of production | | | | | | | | | | | Part reform, Workers training, lower defect rate |

A manpower supply and demand plan

| Item | M1 | M2 | M3 | M4 | M5 | M6 | M7 | M8 | M9 | M10 | 비고 |
|---|------------|----|----|----|-----|-----|-----|-----|-----|-----|--------------------|
| employment of manpower | Manager | | 2 | | | | | | | | Total 2 persons |
| | Inspection | | 10 | | | | | | | | Total 10 persons |
| | Assembly | | 15 | 30 | 34 | | | | | | Total 34 persons |
| | Logistics | | 3 | 5 | 9 | | | | | | Total 9 persons |
| Length of stay (LED engineer/S.Korean) | 2 | 2 | 2 | 2 | 1 | 1 | | | | | |
| Length of stay (RCMS engineer/S.Korean) | | | | 3 | 3 | | | | | | |
| | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | |
| CAPA' (/month) | 0 | | | | 15k | 23k | 23k | 25k | 25k | 25k | Total 180k (1Year) |

B-2. Equipment and personnel input plan of Streetlight replacement work

1. Structure of the streetlight installation team

| DESCRIPTION | SPECIFICATION | QUANTITY | UNIT COST(USD) / 1day | AMOUNT(USD) |
|---|------------------|----------|-----------------------|--------------|
| VAN | 1ton, rental fee | 1 | 200 | 200 |
| Bucket vehicle | 1ton, rental fee | 1 | 300 | 300 |
| Electrician | | 2 | 200 | 400 |
| General worker | | 1 | 100 | 100 |
| Daily workload / 1 team = 20units installation | Sub total | | | 1,000 |

2. Cost for 1Team installation

| DESCRIPTION | SPECIFICATION | QUANTITY | UNIT COST(USD) | AMOUNT(USD) |
|-------------|---------------|----------|----------------|-------------|
| 1 Team | 20units /1day | 4,350 | 1,000 | 4,350,000 |

1. 1 team 20Units install / 1day x 25days x 50Teams = 25,000 units / month

2. At least three supervisors are required

3. Installation plan

| Item | M1 | M2 | M3 | M4 | M5 | M6 | M7 | M8 | M9 | M10 | M11 | M12 | Remark |
|--------------------------------------|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-------------------------|
| Luminaire production | | | | | 15k | 23k | 23k | 25k | 25k | 25k | 25k | 19k | 180,000units |
| Luminaire Installation | | | | | | 15k | 23k | 23k | 25k | 25k | 25k | 25k | - |
| Luminaire's controller Import | | | | | 15k | 23k | 23k | 25k | 25k | 25k | 25k | 19k | - |
| Controller for PowerBox Installation | | | | | | 300 | 460 | 460 | 500 | 500 | 500 | 500 | |
| RCMS Installation and Test | | | | ★ | | | | | | | | | Commissioning, training |

4. Organization for maintenance

| DESCRIPTION | SPECIFICATION | QUANTITY | UNIT COST(USD) | AMOUNT(USD) |
|--------------------|--------------------------------|----------|----------------|--------------------|
| VAN | 1ton, used car | 3 | 10,000 | 30,000 |
| Bucket vehicle | 1ton, used car | 3 | 25,000 | 75,000 |
| Supervisor vehicle | Used car | 3 | 15,000 | 45,000 |
| Supervisor | RCMS | 2 | | |
| " | Field | 3 | | |
| Electrician | | 6 | | |
| General worker | | 12 | | |
| Help desk | | 2 | | |
| RCMS Server | Main server (Location : KOREA) | 12 | 3,000 | 36,000(Every year) |

C. Factory Set-up

1. Requirements of “Made In Bangladesh”

- Must be manufactured and assembled the product over 52% in parts' weight, number and costs in local.

2. Support patent application in Bangladesh (Patented Technology : Streetlights mechanism compounds that prevent the LED destruction by radiant heat)

3. Meet the requirements by supplying AC Direct LED COB, Lens.

4. Technical support of Korean manufacturing supervisor

5. Simple and Low cost product line

- Need conveyer assembly line only compare with DC LED line that must have SMT line

- Setting up 3-SMT line costs more than USD 2.5 million

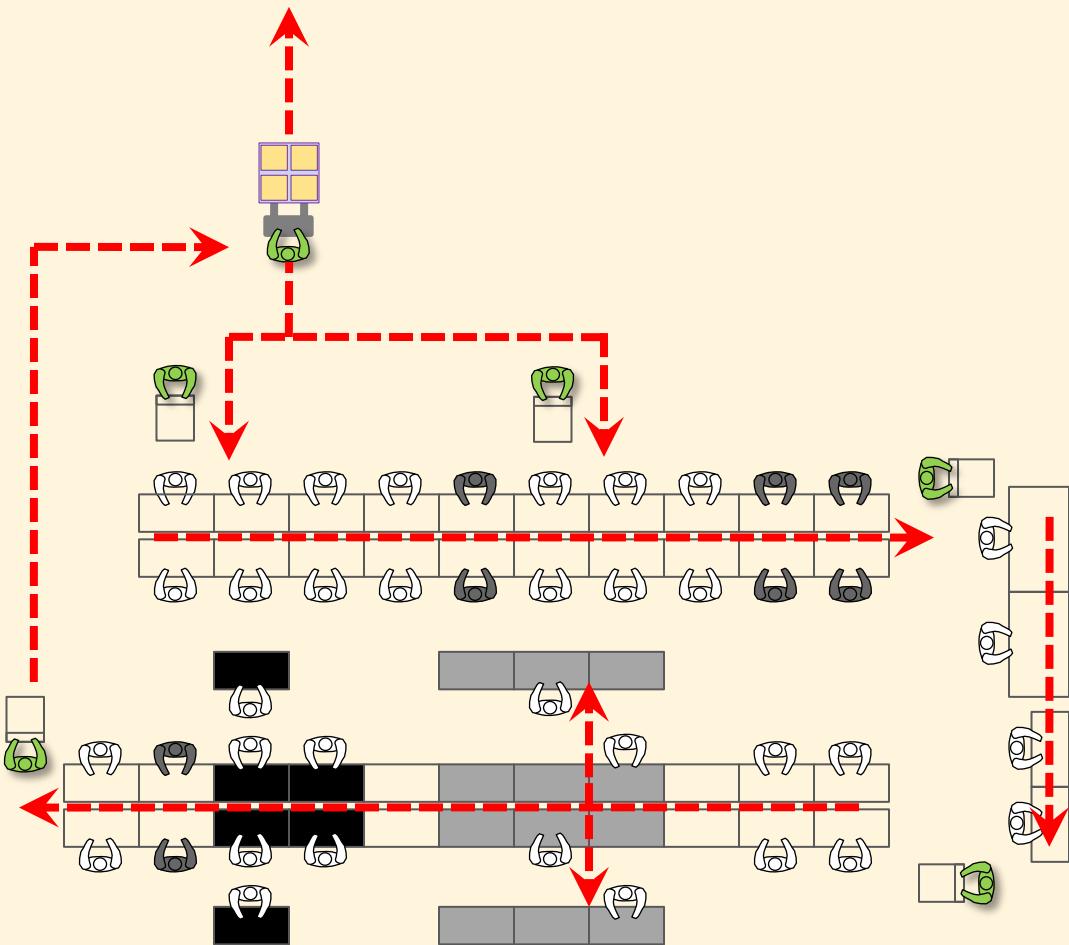
6. Expected profit ratio of Bangladesh JV : 25% ~ 46% (depends on the local situation)

| Product Line |  |  |  |
|--------------|--|---|--|
| DC LED | Required(\$400,000) | Required(\$400,000) | Required |
| AC LED | Not required | Not required | Required |

ASSEMBLY LINE (Outdoor Lighting Fixture)

Aging equipment
 Electric-optical Inspection equipment

To Ware house



| Process | Main Work | The Number |
|----------------|-----------|------------|
| Assembly | LINE | 34 |
| Inspection | LQC | 6 |
| | OQC | 2 |
| Logistics | LINE | 6 |
| Step (Manager) | LINE | 1 |
| | QC | 1 |

The total number : 50 persons

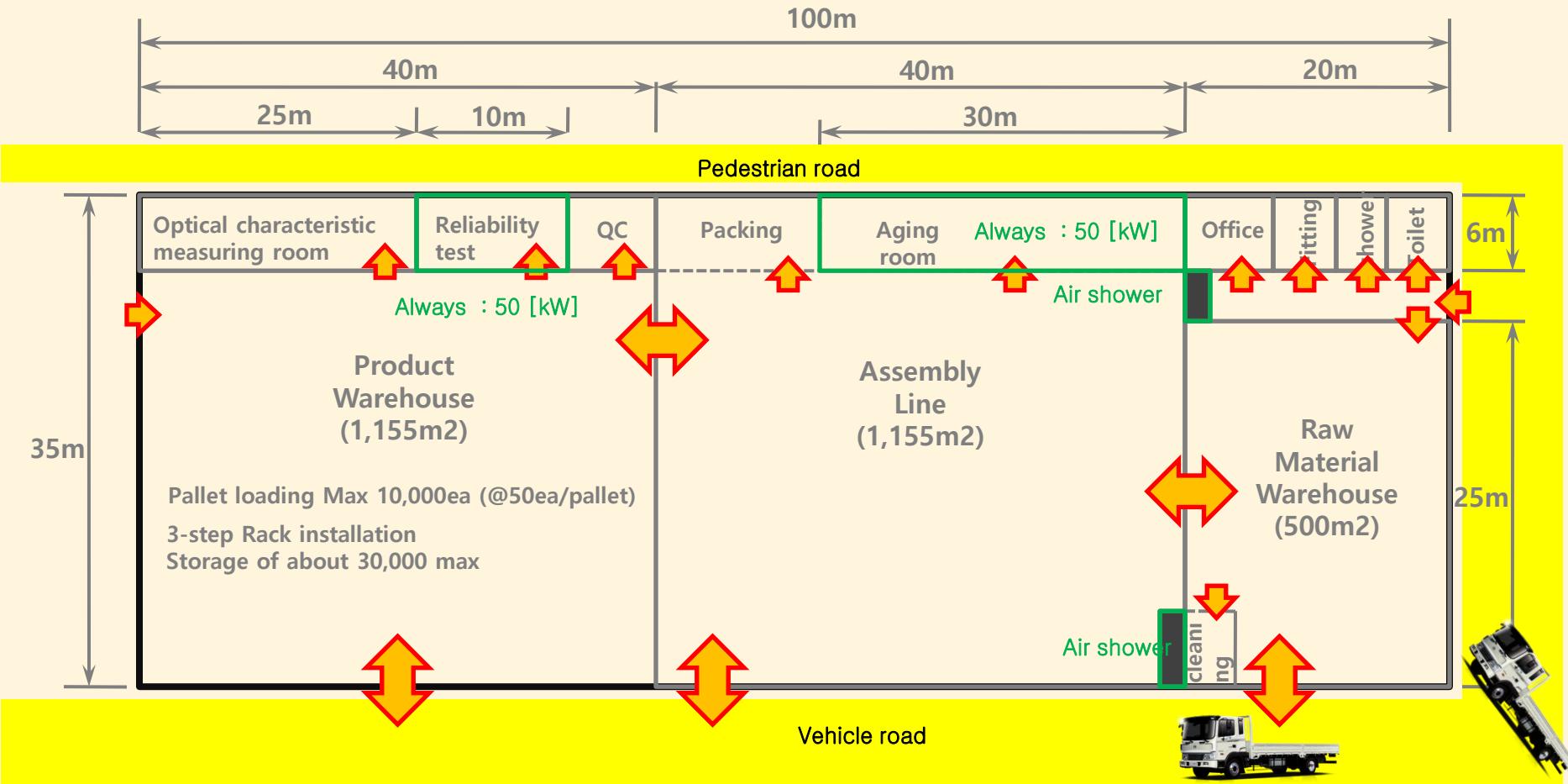
| |
|---------------------------------------|
| Production Capacity(26 Day / Month) |
| 15,600 EA |
| Production Capacity(10Hr / Day) |
| 600 EA |
| Process |
| 18 |
| Tact Time(production time for 1 set) |
| 60 sec |

LED Factory 3,500m²

Lighting load : 25 [W/m²]

Individual switchboard

General entrance
Vehicle moving door
way



Secure directional space for vehicles

Production Equipments

| DESCRIPTION | SPECIFICATION | QUANTITY |
|-----------------------------------|--|----------|
| LINE TABLE | SUB Cell 1 PCS / 1200*600 | 20 |
| LINE TABLE | ASM Cell 1 PCS / 2400*600 | 10 |
| Working Cart | SUS 1000*500 (Special design) | 20 |
| Table Cart | SUS 1200*600 (Special design) | 10 |
| Forklift truck | - | 2 |
| Hand Lift | - | 5 |
| Cabinet | - | 8 |
| LQC Tester & JIG | Optical, Input power analyzer (All inspection) | 6 |
| EARTH LINE | - | 1 |
| Aging & ON-OFF Test | 4 LINE * 3Section * 4Stage * 6ch (288ch test) | 1 |
| Lab packaging JIG | - | 1 |
| Packing JIG | - | 2 |
| Bar cord system | - | 6 |
| Label plotter | - | 1 |
| Bar cord plotter | - | 1 |
| Hand drill & machine tool | Torque driver, Soldering machines, etc., | 1 |
| IP Test Buckets (stainless steel) | IP Test | 2 |
| Drying machine | - | 2 |
| Pallet rack | | 24 |
| LIGHTING Lays way type | ACLED | 400 |

Test Equipments

| DESCRIPTION | SPECIFICATION | | QUANTITY |
|---------------------------------|---------------|-------------------|----------|
| Slidacs (300V) | 3KVA | 3KVA | 2 |
| Illuminometer | CL-200 | 69*174*35 | 2 |
| Withstand tester | TOS-5051A | AC/DC 0~5kV | 2 |
| AC Power Source | PCR-500M | 500VA, AC135/270 | 1 |
| Push-pull gauge | ARF-20 | 0~200N | 1 |
| Ground Continuity Tester | TOS-6200 | 30A, 0.001~1.200Ω | 1 |
| Slidacs (500V) | - | 500V 1KVA | 1 |
| Data logger | MV20000 | 20Ch. | 1 |
| Power meter | WT210 | WT210 | 1 |
| Insulation Resistance Tester | MY40-01 | 0~1000V/2GΩ | 2 |
| Stop watch | HS-3 | 1sec | 1 |
| DC power supply | OPM-2003D | 200V, 3A, 500W | 2 |
| Leakage current meter | 3156 | 500µA ~ 75mA | 2 |
| Precision Granite Surface Plate | | 1500*1000 | 1 |
| Impact Tester | I-501 | 0.50J | 1 |
| MULTI TESTER | - | - | 3 |
| Aging & ON-OFF Test | EB-A100 | 10ch. | 1 |
| Micro meter | - | - | 1 |
| Vernier Calipers | - | - | 3 |
| Test Chamber | - | - | 2 |
| Goniophotometer | - | - | 1 |
| Spectroradiometer | - | - | 1 |

D. BOM of LED Lamp

| Name of Equipments | Spec |
|-----------------------------|--------------------------------|
| Glass Lenz | |
| Lenz cover | |
| Lenz rubber | |
| Power cover | |
| Power rubber | |
| Heat conduction pad | |
| Bolt | M10_100L |
| Bolt | M10_40L |
| Bolt | M8_15L |
| Bolt | M8_8L |
| Nut | M10 |
| Washers | M10 |
| Power cable Harness | 40W / 80W / 120W / 160W |
| 40W ACLED COB(Light Source) | |
| Front/Rear cover | SUS304 |



Thank You

for your support