

Asian Electronics Ltd  
ESCO Project Division

**ENVIRONMENTAL MANUAL**  
**FOR ENERGY SAVING**  
**STREETLIGHTING PROJECT**  
**FOR**  
**INDORE MUNICIPAL CORPORATION**

**Prepared By :**  
**Asian Electronics Ltd.**  
**Esco - Project Division**  
**68, MIDC, Satpur, Nashik- 422007**  
**Ph. : +91-253-2365000, Fax : +91-253-2365010**  
**E-mail: aeltha@vsnl.com, URL: www.aelgroup.com**

## TABLE OF CONTENTS

NO.	TITLE	PG.NO.
1.	<b>1.1 SUMMARY</b>	2
	<b>1.2 PROJECT OVERVIEW &amp; DESCRIPTION OF THE PROJECT ACTIVITY</b>	4
2.	<b>DESCRIPTION OF PROJECT AREAS</b>	8
	<b>2.1 INDORE City Plan</b>	9
3.	<b>PROJECT IMPACTS AND MITIGATION OF IMPACTS</b>	10
	<b>3.1 Short term Impacts &amp; Mitigation</b>	10
	<b>3.2 Long term Impacts &amp; Mitigation</b>	11
4.	<b>PROPOSED PLAN OF ACTION FOR PROJECT ON ENVIRONMENTAL ASPECTS</b>	12
	<b>4.1 Handling / Storing of used / damaged light bulbs</b>	12
	<b>4.2 Flow Chart showing Co-ordination at site</b>	13
	<b>4.3 Removed fittings and lamps records</b>	14
	<b>4.4 Lamps failed during O&amp;M period</b>	17
	<b>4.5 Replacement of Lamp record during maintenance</b>	18
5.	<b>SAFETY OF WORKERS</b>	19
	<b>5.1 Safety Measures for street lighting Installation &amp; Maintenance</b>	19
	<b>5.2 First Aid</b>	21
	<b>5.3 Safety guidelines for workmen</b>	22
	<b>5.4 Safety devices and tools</b>	22
	<b>5.5 Safety kit expenditure</b>	
	<b>5.6 Safety kit distribution record</b>	
6.	<b>INSTALLATION AND REMOVAL OF ELECTRIC POLES</b>	26

## 1.1 EXECUTIVE SUMMARY

The existing HPSV & HPMV fixtures that light the roads are provided by the multi company and do not light the walkway sufficiently enough to meet Corporation safety standards .

In support of the much required energy conservation measures the Municipal Corporation of INDORE decided to replace old streetlight fittings using Sodium Vapour & FTL lamps with new T-5 energy saving street lighting fixtures in entire city. It also controls the switching on-off operation of the switching points by installing a timer panel.

No significant long-term losses or impacts to resources are anticipated with this project.

While this project will be located near historic structures, no structures or other historic resources are expected to be significantly impacted.

Disturbance of existing trees and shrubs will be avoided. Impacts to vehicle traffic in the area are expected to be moderate during installation and care already had been taken for that.

The direction of traffic flow through the site during installation were coordinated with the City of INDORE. After completion, there will be no significant vehicle traffic impacts as only maintenance will be carried out for the new streetlights and timer panels.

The proposed project will not generate significant demands on natural resources of the immediate or surrounding area.

This area is also not a significant wildlife habitat as it consists of paved streets and walkways, and lawn and landscaped areas.

The scope of energy saving street lighting project involves removal of the old streetlights and installation of energy saving streetlights using T5 fluorescent lamps and electronic ballasts. It further requires the company to provide maintenance support over the entire project period. The only polluting item used during the project period are the lamps. As the lamps contain very small amounts of mercury , which is a hazardous material, the company has to focus on the careful handling, storage and disposal of old removed lamps and the fluorescent lamps failed during installation and maintenance period.

The company will follow the environmental policies of the government of India, with specific guidelines on “ Environmentally Sound Mercury Management in the Fluorescent Lamp sector” given by the Task Force comprising of member of MOEF, CPCB, IRTC, BEE , NIOH . These guidelines outline the details on the handling, storage and disposal of the Fluorescent and other lamps.

AEL will train its staff to follow the safety measures to be adopted during the installation and maintenance of the streetlights. Safety tools such as safety belts , helmets, gloves will

be provided to the staff for installation and maintenance of the streetlights. AEL will ensure the safety of the technicians and staff working in the field.

## **1.2 PROJECT OVERVIEW & DESCRIPTION OF THE PROJECT ACTIVITY:**

The purpose of the project activity is to implement street lighting improvements as a Demand-side Management (DSM) strategy to save electricity consumption and reduce municipalities' energy budget using performance contracting under ESCO business.

Public street lighting represents a significant load for India. It is the responsibility of the municipal corporations and the state electricity boards to provide this service to the country. In several municipalities, the electricity required for this service is not metered, providing little incentive for system improvement. Street lighting has to be invoiced at a preferred rate by most of the utilities. This incurs large financial losses to the state electricity board. With a demand of more than 1,000 MW, public lighting represents approximately 1% of the total electricity consumed in India. Even if this represents a small percentage of the total consumption, it is an interesting segment due to its high potential for energy savings (average of 33% of the consumption).

The project will rely on an approach that was demonstrated by Econoler International and Asian Electronics Ltd in two pilot projects in India (at Indore and Ujjain) that received a financial support from the Canadian International Development Agency (CIDA). This route has yielded measured savings of close to 60% without reduction in lux levels. These two Projects established the validity of the concept, processes and formats for record and reporting for those to follow.

The present CDM Project replicates the scheme in 8 municipalities spread in India. The technology was changed to full replacement of existing FTL / HID fittings by energy-saving T5 lamp-based fittings with electronic ballast and load management system, viz,

- Replacement of low efficiency T12 FTL (40W) driven by magnetic ballast with high efficiency T5 FTL ( 28W) driven by electronic ballast
- Replacement of low efficiency single lamp HPS/MV/MH 70/125/150/250W driven by magnetic ballast with high efficiency multi-lamp T5 (14/24W) driven by constant wattage electronic ballast.
- Installation of Load Management System (LMS) panels at the Switching Points (SP)<sup>1</sup> to improve energy consumption of all fixture types including the T5 Fluorescent Tube Light installed at the respective SP.

Before implementation of the project, the municipalities had a lot of difficulties to maintain a good street lighting service for citizens. About 10 to 20% of fixtures were not operating because of an illegal connection, burned tube light or broken fixtures. The only way of upgrading the service to an acceptable level was to replace more and more fixtures with the same technology that the municipalities were used to. Another issue

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<sup>1</sup> A switching point is a metering point in the street light electricity network.

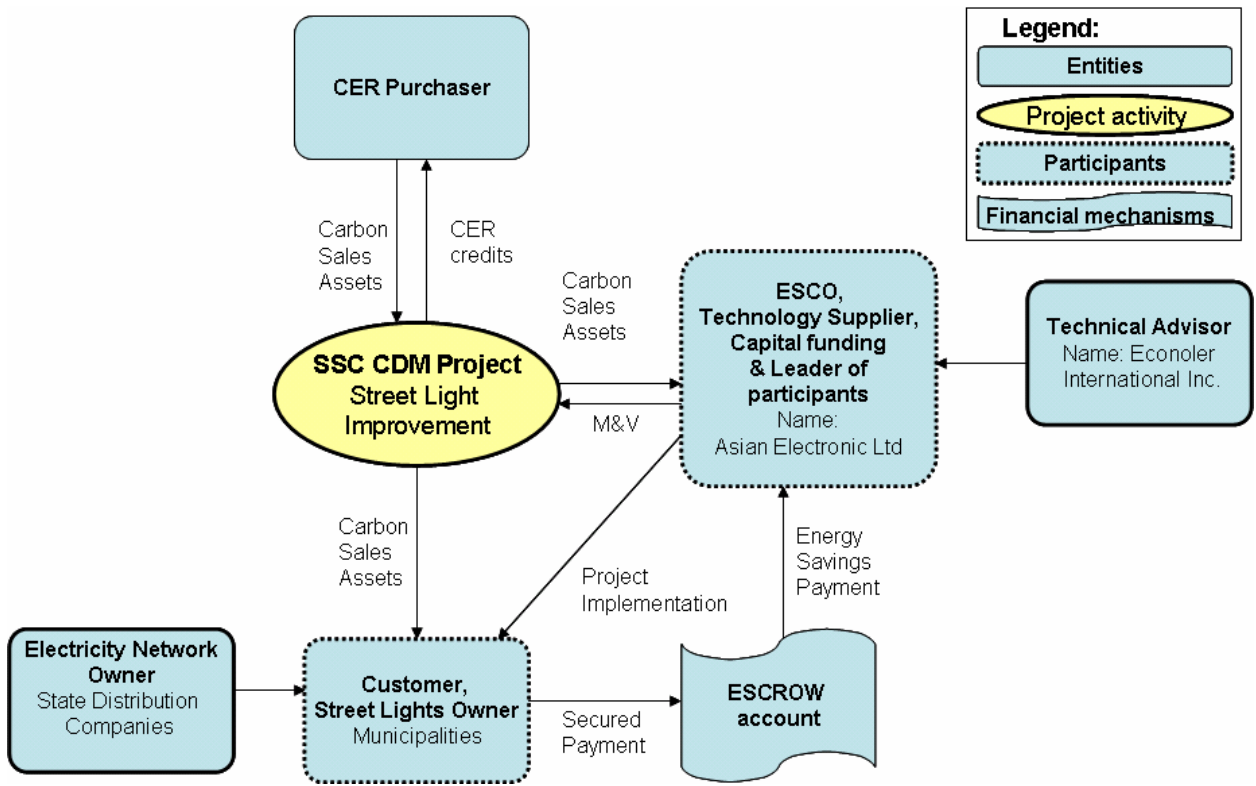
related to street lighting in India is the improper energy metering where monthly energy bills are not made as per the tariff based on the actual meter readings or energy bills for non-metered are based on the connected load and the monthly operating hours.

The project proponent had been able to convince the municipalities to choose more expensive, but more efficient, equipment using the following arguments:

- It would be financed through a third party and implemented using a performance contracting concept. This means it provided the technology, entire funding and Monitoring & Verification (M&V) after the construction. If there is no saving, the project promoter will not get paid.
- The opportunity exists to leverage a portion of the required financing through the sale of Certified Emission Reduction (CER).
- The revenues generated by energy savings and CER will be shared between AEL and the participating municipalities after deduction of expenses.
- Revenue and costs will be allocated to the set of ESCO projects covered in proportion to the CERs generated by the respective project to the total of CERs generated by all projects.

### Project structure

The project structure and relations between the project entities are presented in the following figure.



**Figure 1: Energy Efficient Street Lighting CDM Project Activity Structure**

**Asian Electronic Limited:** AEL is a private international company and was the lead participant of this SSC CDM project. As an ESCO, AEL signed a performance contract with its customers (the municipalities) and guaranteed the savings. AEL assumed the entire project implementation for its customers. This means it provided the technology, entire funding and Monitoring & Verification (M&V) after the construction. It also provided M&V for the CER accreditation procedure. It was furthermore responsible for maintaining the service to an acceptable level by ensuring a minimum number of fixtures turned off.

**Municipalities:** The Municipalities were the project sponsors. They are public entities. The Municipalities were AEL's customers. They pay AEL's services after the construction based on energy savings achieved. The typical payment is secured in an escrow account that will cover the monthly bills, but allow the municipalities to utilize any potential saving from reduced consumption. This provides the municipalities with incentive to adopt the projects and ensure they are maintained.

**Distribution Companies:** Distribution companies are wholly owned by State Electricity Boards (SEB). SEBs are state Government owned companies responsible for the electricity production. They are stakeholders in the energy savings project and could provide support for upgrading the metering system for this DSM project.

**Econoler International:** EII is a Canadian private company and acted as the project developer. EII was a technical advisor for the implementation of the Street Light Improvement Program and also provided carbon consulting.

**Technology and Measures** The replacement of existing fixtures by efficient T5 fluorescent tube lights leads to significant reduction in the power usage. Also, both Sodium and Mercury Vapour HID fittings can be replaced with new design multi-tube T5 streetlights which have been working successfully in pilot installations for the last two years and more. This option has yielded energy savings up to 60% and power factor (PF) better than 0.95 compared to 0.6 to 0.7 normally observed in old installations. A new dimming technology could also be integrated to the street lighting system to further reduce their energy usage during low traffic hours (usually after midnight). However, for public security reasons, this dimming is often limited to about 20%. These modifications to the existing street lighting system will also result in the reduction of power demand and distribution line losses in the network. With energy saving of 60% and PF improvement from 0.7 to 0.95, the KVA demand could reduce by as much as 70%. System measurements revealed that the wiring of the street lighting system is often stretched to the limit with significant overheating and high line losses associated with the connected load and power factor. Using a more efficient technology will significantly allow reducing line losses of the street lighting system. The combination of the technology change, and reduced line losses also effectively reduces or eliminates system saturation, thus doing away with overloading &/or making available capacity for additional fittings without requiring a complete rewiring of the system.

In the framework of this project, these two measures have been carried out:

**(a) Replacement of low efficiency T12 Fluorescent Tube Light (40W) with magnetic ballast with high efficiency T5 Fluorescent Tube Light (28W) with electronic ballast**

The high efficiency devices installed can save electricity up to 40-45% without reducing light level if they replace T12 fixtures because of the following characteristics. The luminous efficiency is 104 lumens/W (T5 triphosphor on electronic ballast) and even more if considering the retrofit shield effect. In comparison, the T12 efficiency is about 70 lumens/W.

**(b) Replacement of low efficiency single lamp HPS/MV/MH 70/125/150/250W driven by magnetic ballast with high efficiency multi-lamp T5 (14/24W) driven by constant wattage electronic ballast.**

The high efficiency devices installed can save electricity up to 60% with the required light level if they replace HID fixtures. T5 FTLs have a much longer lamp life of around 20 000 hrs which is much higher than the average HID lamps having life of nearly 10 000 hrs under field conditions and electronic ballast yields to power factors higher than 0.95 as compared with 0.6 to 0.7 of HID lamp driven by magnetic ballast.

**(c) Installation of Load Management System (LMS) panels at the switching points to improve the energy consumption of all other fixture types.**

This incidentally will also improve the consumption of the T5 Fluorescent Tube Light installed at the respective switching point. The LMS can save electricity up to 35% when it is installed on a SP:

- Controlled operation of the fixtures through advanced microprocessor technology (like dimming light during low traffic hours).
- Maintains the input voltage wave form without inducing any noise and harmonics.
- Equipped with a voltage monitor to protect the fixtures from operating at too low or too high voltage.

The fixtures types found in significant number in municipalities are presented in the following table.

**Table 1 : Types of Fixtures and Energy Efficiency Measure Related to each Type**

Low-efficiency Fixture Description, Before Project Implementation	High-efficiency Fixture Description AND/OR Energy Efficiency Measure Taken During Project Implementation	Savings Forecast
1x40W T12, 4' T12 Tube light with magnetic ballast	1x24W, 4' T5 tube with Electronic ballast	40 to 45%
70W SVL/80WMVL with magnetic ballast	2x14W 2' (or 1x24W 4') T5 Streetlight, with electronic ballasts	60%
150W SVL/125W MVL with magnetic ballast	5x14W or 4x14W 2' T5 Streetlight	55 to 60%
250W SVL/MVL with Magnetic Ballast	4x24W 2' T5 Streetlight	60%
Alternatively		
HID lamps of all types	Controlled Load Management Panel	30-35%

## 2. DESCRIPTION OF PROJECT AREAS:

The project boundary is the physical, geographical location of each measure (each piece of equipment) installed.

In case of the project, the project boundary is the physical, geographical location of each replaced fixture so the project boundary has the same limit than the municipalities. The project boundaries were precisely defined during the baseline measurement campaign performed along with an Investment Grade Energy Audit . For this purpose, a complete list of all fixtures actually replaced is prepared. The project excludes all equipment that is out of this list. The following figure illustrates an example of the project in INDORE, Maharashtra.

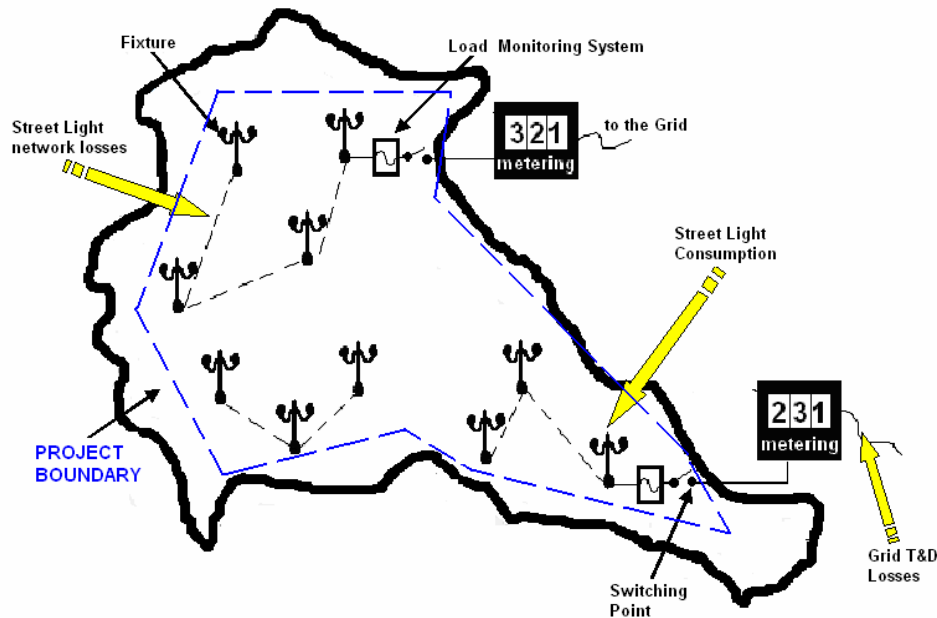


Figure 2: Boundaries of Street Lighting Project in INDORE, Maharashtra.

1. Proposed Plan of Action for the Project on Environmental aspects (will cover all the three issues as highlighted above) including responsible persons, budget if any required.
2. **Handling / Storing used/damaged light bulbs** (replaced or installed under the project as well as rejects) put out of use – proper storage before ultimate disposal in line with guidelines being developed by BEE.
3. **Safety of Workers** – Provision of personal protective equipment, traffic arrangements during installation of equipment, and emergency procedures in case of shocks, falls or other accidents.
4. **Installation and Removal of electric poles** – precautions to be taken to avoid any impact on locally important cultural resources such as shrines, temples or any important items found accidentally during excavation.



### 3. PROJECT IMPACTS AND MITIGATION OF IMPACT

Normally, these impacts can be divided into short-term installation related impacts and long-term impacts; however, with this project there are no significant long term detrimental impacts. The short-term impacts include installation traffic and noise, dust, increased sediment transport from the site, and disruption of vehicle and pedestrian traffic. The AEL and the Municipal Corporation of INDORE has worked with the State and local governments to ensure that all ordinances and laws are complied with during installation and operation of the facility. The specific impacts and mitigation measures are detailed below:-

#### 3.1 Short-Term Installation Impacts and Mitigation

The impacts related to installation will likely include local increases in traffic, noise, dust, and sediment transport from the site, and disruption of vehicle and pedestrian traffic. These items will be addressed by the AEL to installation the facility and will include the following:

**(a) Traffic** – For traffic control and safety, installation vehicles will enter and leave the site at controlled points only. Workers will be used to direct vehicles and pedestrians to facilitate the movement of installation vehicles. Installation barriers will be erected for safety and to direct pedestrian traffic safely around the installation site. Traffic flow through the site will be coordinated with the City of INDORE as necessary.

**(b) Noise** - Site work activities are restricted to daytime operations. Attempts are also be made to limit unnecessary noises during the day so as to limit impact to the adjoining buildings containing offices, classroom, and residences. This is a short-term impact that will cease when the installation is completed.

**(c) Dust** – As the project involves only replacement of streetlights, no digging activity takes place , thus no dust is generated.

**(d) Particulates in Air** - Particulate emissions will be controlled by the off-site disposal of installation and removal debris. Burning of such materials will not be allowed on the site. Any lead, mercury and plastic containing materials will be removed by licensed abatement contractors using appropriate means to limit particulate emissions.

**(e) Generated Wastes** - Environmentally deleterious materials generated by the replacement activities, such as old or broken lamps will be stored separately & disposed in an appropriate, legal, and safe manner. In the event that hazardous wastes are generated during elimination, the contractor will properly dispose of them off site in accordance with appropriate disposal regulations

### 3.2 Long-Term Impacts and Mitigation

There is a potential for historic facility impacts, however, these are not expected to be significant.

**1. Wastes:** The operation of these lighting fixtures will not generate waste except failed lamps which will be stored separately and disposed as per the BEE guidelines.

**2. Vegetation and Habitat Loss:** Careful coordination will occur so as not to disturb any existing landscaping.

**3. Water Consumption:** This project will not result in any change in water consumption at Municipal Corporation Area of INDORE.

**4. Water Quality:** No water quality impacts are anticipated.

**5. Noise:** The operation of these lighting fixtures will not generate any noise.

**6. Historic Facility Impacts:** The Site is located near historic structures; for example, it is located directly across Nehru Garden. However, this project will improve the view of the Garden Street by eliminating HPSV/HPMV and installing T-5 energy efficient light fixtures.

**7.** Parks, rivers, and other recreational areas will not be impacted.

**8. Traffic:** No long term impacts to local traffic are anticipated.

**9.** Wildlife refuges, wetlands, wilderness areas, and other important natural areas will not be impacted.

**10.** Public or private water supplies and/or significant water supply watersheds will not be impacted.

**11.** Endangered, threatened, or rare plants, animals or insects will not be measurably impacted by this project. No unique or other important terrestrial vegetation will be impacted. The site consists of a paved road, walkways, and lawn areas.

**12.** This project will not impact geologic or mineral resources. There are no significant geologic or mineral resources at the Site.

<b>4. PROPOSED PLAN OF ACTION FOR PROJECT ON ENVIRONMENTAL ASPECTS:</b>
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**Handling / Storing of used / damaged light bulbs:**

**4.1 Old lamps removed during installation**

During installation of new energy saving streetlights, old streetlights are removed and stored in the corrugated box along with the lamps fitted into the old fittings in case of sodium vapor lamps. In case of replacement of old fluorescent tube light fittings, the lamps are carefully removed first followed by the fitting. The lamps are kept in a separate box. A record sheet (given below) is maintained while removing the old fittings mentioning the number of lamps removed.

These old removed fittings & lamps are transported daily to the place of storage ( store depots / ward office stores ) given by the corporation. The old fittings are then kept in a proper store room under lock & key. The units are not allowed to be used for re-installation.

Any lamps broken during the removal, transportation or storage of the old fittings are carefully collected and kept in a separate corrugated box for further disposal. The box is kept properly in the stores.

The responsibility of the old fittings and lamps stored rests with the respective Jr.E./ A.E. stores in-charge / J.E/ A.E. (ward office) in-charge in the respective municipal corporations. Data format from site is being given below for reference:-

The old removed lamps will be safely stored and disposed off as per the guidelines on “ Environmentally Sound Mercury Management in the Flourescent Lamp sector” given by the Task Force comprising of member of MOEF, CPCB, IRTC, BEE , NIOH . These guidelines outline the details on the handling, storage and disposal of the Flourescent and other lamps.



### 4.3 Removed Fittings and Lamps Record during installation

#### Energy Saving Streetlight Project: Indore Municipal Corporation

Record No.:IMC/R-09-08/

Date	No of fittings removed	Type of Fittings 40w/150w/ 250w/400w	No of fixtures/covers broken during installation	No. of fixtures lamp missing	Remarks
27-Sep-08	118	250w/70w/ 150w	Nil	Nil	No Covers
28-Sep-08	120	40w	18	Nil	No Covers
1-Oct-08	84	250w	4	Nil	No Covers
2-Oct-08	118	40w	3	Nil	No Covers
3-Oct-08	191	150w	Nil	Nil	OK
4-Oct-08	195	250w	Nil	Nil	OK
5-Oct-08	186	40w	8	Nil	No Covers
6-Oct-08	156	250w/70w/ 150w	129	Nil	No Covers
7-Oct-08	185	125w	Nil	Nil	OK
8-Oct-08	110	150w/400w	Nil	Nil	OK
9-Oct-08	84	250w	Nil	Nil	OK
10-Oct-08	71	40w	69	Nil	No Covers
11-Oct-08	144	250w	Nil	Nil	OK
12-Oct-08	124	40w	29	Nil	No Covers
13-Oct-08	148	150w/400w	Nil	Nil	OK
14-Oct-08	133	150w	Nil	Nil	OK
16-Oct-08	74	250w	6	Nil	No Covers
17-Oct-08	147	40w	56	Nil	No Covers
18-Oct-08	123	125w	4	Nil	No Covers
19-Oct-08	149	250w	Nil	Nil	OK
21-Oct-08	133	40w	78	Nil	No Covers
22-Oct-08	174	125w	1	Nil	No Covers
23-Oct-08	100	250w	15	Nil	No Covers
24-Oct-08	98	40w	78	Nil	No Covers
25-Oct-08	125	125w	1	Nil	No Covers
26-Oct-08	157	250w	Nil	Nil	OK
27-Oct-08	119	40w	147	Nil	No Covers
3-Nov-08	184	125w	1	Nil	No Covers
4-Nov-08	218	250w	9	Nil	No Covers
5-Nov-08	157	40w	34	Nil	No Covers
6-Nov-08	168	125w	Nil	Nil	OK
7-Nov-08	174	150w	7	Nil	No Covers
8-Nov-08	221	250w/70w/ 150w	Nil	Nil	OK
9-Nov-08	46	40w	18	Nil	No Covers
12-Nov-08	162	150w	1	Nil	No Covers

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13-Nov-08	98	40w	129	Nil	No Covers
14-Nov-08	117	150w	11	Nil	No Covers
15-Nov-08	150	250w	4	Nil	No Covers
16-Nov-08	33	150w/400w	134	Nil	No Covers
18-Nov-08	120	125w	Nil	Nil	OK
19-Nov-08	124	250w	9	Nil	No Covers
20-Nov-08	118	150w	11	Nil	No Covers
21-Nov-08	195	150w/400w	86	Nil	No Covers
27-Nov-08	101	150w	Nil	Nil	OK
28-Nov-08	173	250w	Nil	Nil	OK
29-Nov-08	261	40w	132	Nil	No Covers
30-Nov-08	114	125w	1	Nil	No Covers
1-Dec-08	160	150w	5	Nil	No Covers
2-Dec-08	117	250w	1	Nil	No Covers
3-Dec-08	129	250w/70w/ 150w	214	Nil	No Covers
4-Dec-08	126	125w	6	Nil	No Covers
5-Dec-08	162	150w	4	Nil	No Covers
6-Dec-08	156	250w	6	Nil	No Covers
7-Dec-08	185	40w	11	Nil	No Covers
8-Dec-08	110	125w	1	Nil	No Covers
9-Dec-08	84	40w	21	Nil	No Covers
10-Dec-08	71	40w	43	Nil	No Covers
11-Dec-08	144	125w	2	Nil	No Covers
12-Dec-08	124	150w	6	Nil	No Covers
13-Dec-08	148	250w	Nil	Nil	OK
14-Dec-08	133	250w	11	Nil	No Covers
15-Dec-08	75	250w	15	Nil	No Covers
16-Dec-08	74	250w	Nil	Nil	OK
17-Dec-08	147	150w/400w	168	Nil	No Covers
18-Dec-08	123	125w	14	Nil	No Covers
19-Dec-08	149	250w	9	Nil	No Covers
20-Dec-08	179	40w	68	Nil	No Covers
21-Dec-08	133	250w	4	Nil	No Covers
22-Dec-08	174	40w	79	Nil	No Covers
23-Dec-08	100	150w	1	Nil	No Covers
24-Dec-08	98	250w	4	Nil	No Covers
25-Dec-08	125	150w/400w	169	Nil	No Covers
26-Dec-08	157	150w	4	Nil	No Covers
27-Dec-08	119	250w	Nil	Nil	OK
28-Dec-08	184	250w/70w/ 150w	112	Nil	No Covers
29-Dec-08	218	125w	6	Nil	No Covers
30-Dec-08	218	250w	11	Nil	No Covers
31-Dec-08	254	40w	98	Nil	No Covers
2-Jan-09	156	125w	5	Nil	No Covers
3-Jan-09	185	250w	19	Nil	No Covers
4-Jan-09	110	40w	121	Nil	No Covers
5-Jan-09	84	125w	3	Nil	No Covers

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6-Jan-09	71	250w	Nil		OK
7-Jan-09	144	250w	Nil	Nil	OK
8-Jan-09	124	40w	119	Nil	No Covers
9-Jan-09	148	125w	5	Nil	No Covers
10-Jan-09	133	40w	67	Nil	Covers Not Available
11-Jan-09	75	250w	Nil	Nil	OK
12-Jan-09	74	40w	19	Nil	No Covers
13-Jan-09	147	40w	105	Nil	No Covers
14-Jan-09	123	125w	2	Nil	No Covers
15-Jan-09	149	250w	15	Nil	No Covers
16-Jan-09	179	40w	46	Nil	No Covers
17-Jan-09	133	250w	Nil	Nil	OK
18-Jan-09	174	40w	367	Nil	No Covers
19-Jan-09	100	150w/400w	16	Nil	Covers Not Available
20-Jan-09	98	250w	48	Nil	No Covers
21-Jan-09	125	250w	73	Nil	No Covers
22-Jan-09	157	40w	398	Nil	No Covers
23-Jan-09	119	125w	21	Nil	No Covers
25-Jan-09	113	250w	67	Nil	No Covers
26-Jan-09	218	40w	191	Nil	No Covers
27-Jan-09	254	250w	Nil	Nil	OK
28-Jan-09	218	40w	169	Nil	No Covers
29-Jan-09	156	125w	7	Nil	No Covers
30-Jan-09	143	250w	67	Nil	No Covers
31-Jan-09	110	150w/400w	569	Nil	No Covers
1-Feb-09	84	125w	12	Nil	No Covers
2-Feb-09	71	250w	105	Nil	No Covers
3-Feb-09	144	40w	378	Nil	No Covers
4-Feb-09	124	250w	2	Nil	No Covers
5-Feb-09	148	40w	469	Nil	No Covers
6-Feb-09	133	250w	Nil	Nil	OK
7-Feb-09	75	40w	201	Nil	No Covers
8-Feb-09	74	125w	4	Nil	No Covers
9-Feb-09	147	250w	19	Nil	No Covers
10-Feb-09	123	40w	123	Nil	No Covers
11-Feb-09	149	250w	Nil	Nil	OK
12-Feb-09	179	40w	104	Nil	No Covers
13-Feb-09	133	125w	4	Nil	No Covers
14-Feb-09	174	250w	197	Nil	No Covers
15-Feb-09	100	40w	191	Nil	No Covers
16-Feb-09	98	250w	109	Nil	No Covers
20-Feb-09	184	250w	43	Nil	No Covers
21-Feb-09	218	250w	67	Nil	No Covers
22-Feb-09	218	125w		Nil	No Covers

Store Incharge  
IMC, INDORE

Site-Incharge  
Asian Electronics Ltd

#### **4.4 Lamps failed during the O & M period:**

During the O & M (operation & maintenance) period of the project, the fittings are being monitored for failures in lamps. The faulty lamps are replaced with new lamps. The faulty lamps are brought back to the maintenance depot / office and stored safely in corrugated box. These lamps are stored until further instructions of disposal as per BEE norms are received.

The responsibility of storage of these lamps rests with the Service in-charge of the company in the respective cities. A data format is being attached for reference that is being maintained at site.

The fluorescent lamps failed during the O&M period will be safely stored and disposed off as per the guidelines on “ Environmentally Sound Mercury Management in the Fluorescent Lamp sector” given by the Task Force comprising of member of MOEF, CPCB, IRTC, BEE , NIOH . These guidelines outline the details on the handling, storage and disposal of the Fluorescent and other lamps.

#### 4.5 Monitoring and reporting mechanism for replaced lamps during maintenance

##### Energy Saving Streetlight Project: INDORE Municipal Corporation

Record No.:IMC/11-08

Month	No of lamps changed		No of fixtures lamp missing/damaged		Remarks
	2Ft	4Ft	2ft	4ft	
Oct- 08	2	209	0	17	2Nos. Fixtures Broken
Nov- 08	11	83	2	0	
Dec- 08	83	55	1	6	
Jan-09	81	53	0	0	5 Nos. of Diffusers Broken
Feb-09	34	229	4	12	
March-09	59	106	1	0	17 Nos. of Diffusers Broken
April-09	62	178	0	3	1Nos. of Diffusers Broken
Oct- 08	89	156	0	5	
Nov- 08	52	160	2	0	
Dec- 08	33	216	0	0	
Jan-09	47	182	0	0	
Feb-09	64	230	0	0	
March-09	87	196	0	0	4 Nos. of Diffusers Broken
April-09	78	283	0	0	
May-09	48	184	0	0	

Service In charge

## 5. SAFETY OF WORKERS:

The installation of the new fittings is done by workers as per the safety guidelines given. Firstly the installation is done during the day-time with the entire power supply to the fittings shut OFF. This is done by removing the fuse from the feeder points. Before the start of installation the concerned corporation officials are informed about the exact location of the work, in order to avoid any accidental switching ON of the power by another maintenance team.

While installation the workers are provided with helmet, rubber gloves, rubber shoes, insulated tools and safety belts.

Proper care is taken to divert the traffic while carrying on the installation. Sign boards indicating “Work in progress” are put on the road where necessary. One worker is always standing on the road ahead of the ladder & diverting the traffic.

The workers are provided with proper extension type ladders for installation of streetlights above 7 meters. The ladders are provided with safety platforms covered from all sides for safety of the worker. At lower heights wooden ladder is used for removing the fittings for repairs.

Proper medical kit is carried containing bandages & medicines. Wooden ladders/ bamboos are kept handy in case of any emergency of shock.

All the workers are covered under state insurance scheme. This gives them free medical treatment in case of any accident or illness in their dedicated hospitals. In case of any accident the workers are given first aid at the nearest medical center / hospital. If required the worker is then taken to the ESIC hospitals for further treatment.

### 5.1 SAFETY MEASURES FOR INSTALLATION AND MAINTENANCE OF STREETLIGHTS

- A. Safety** requires proper planning of work, proper usage of safety tools, exercise of good judgment and intelligent supervision. Experience proves that majority of the accidents are preventable.
- (i) Prevention of accidents requires the wholehearted co-operation of all employees of the organization. A capable mentally alert employee will avoid accidents.
  - (ii) A careless man is a liability to the Organization. He is dangerous to himself, his fellow workers, the public and the Organization.
  - (iii) Accidents do not just happen. Accidents are the result of unsafe acts or unsafe conditions or a combination of both.
- B. Unsafe Acts:** Which may cause accidents, include the following:
- (i) Opening and Closing of switches without authority or warning, Pushing ladders on road without giving attention towards traffic, failure to place warning signs or

signals where needed.

- (ii) Working unsafely such as throwing materials or tools, at another worker, jumping from vehicles and platforms, or unnecessary haste.
- (iii) Not using the safety tools provided.
- (iv) Using unsafe equipment, wrong tools for the job, or using hands instead of hand tools.
- (v) Working on live electrical equipment unless necessary (with safety precautions) in cases of energy meter installations at switching points.
- (vi) Working while ladder is in unsafe/tilted position.
- (vii) Distracting, teasing, practical joking, horseplay, quarrelling or annoying.
- (viii) Failure to use safe clothing or protective equipment such as failure to use rubber gloves, helmet.

**C. Unsafe conditions:** Which may result in accidents include the following:

- (i) While working with ladder on roads, which are skewed, widthwise from center it is always possible the ladder itself will tilt and it will be unsafe to climb on it to replace a fixture on pole.
- (ii) There can be overhead utility LT/HT lines while the fixture on pole might be at few inches from those lines. All anticipated hazards should be pointed out to workers.

**D. General Instructions for Safety**

**(i) Responsibility of Individuals:**

Definite responsibility of individuals is to act so as to provide

- Safety to himself.
- Safety to his fellow employees.
- Protection to the Public.
- Protection to the Organization property.
- Every employee is expected to study the Safety Manual, familiarize himself with its contents and apply them to work. Ignorance of Rules and Regulations will result in accidents to himself and his co-workers.
- Whenever in doubt regarding any rules and regulations, he should consult his Supervisor.
- Before attempting any work under conditions that he considers to be unsafe, he is required to bring them to the attention of the person-in-charge of the work and seek his advice.
- It will be the duty of every employee to report promptly to his Supervisors any dangerous or improper condition of equipment he notices.

**(ii) Personal Conduct:**

- Use of intoxicating liquor while on job is strictly prohibited. No employee shall report for work while he is under the influence of liquor and no supervisor shall knowingly permit a man to go to work while he is under the influence of liquor.

- Practical joking and horseplay while on the job is strictly prohibited.
- No employees shall distract the attention of another worker from his job unless he thinks that the worker is doing something, which is dangerous.
- Any employee who endangers his own or other's safety by violating the foregoing requirements of personal conduct shall render himself liable to disciplinary action.

**( iii ) Always Be Careful ( A B C ):**

The workman should place himself in a safe position while working to avoid falling, stumbling, or moving backwards against live parts.

The workman should satisfy himself regarding the safe working conditions before starting the work. The care exercised by others should be checked.

## **5.2 FIRST AID**

### **(a) Removal from Contact**

If the person is still in contact with the apparatus that has given the shock, switch off the electric circuit at once, if there is switch, fuse or circuit breaker close at hand, if not, lose no time from proceeding to remove the body from contact with the live conductor.

- Do not touch the victim's body with bare hands, but if rubber gloves are not at hand, pull him off the live conductor by his coat, shirt, etc., if they are not wet or fold your coat, or some dry article such as a news- paper into three or more folds/ thickness, and using this as a pad, take hold of the body and pull it away from the circuit. An operating rod or a broom handle may be used to raise the body or to detach the wires from it. A good plan is to stand on a dry board or stool or on a few layers of thick newspaper or bundle of dry sacking and remove the victim away from the live apparatus.

### **(b) Treatment from Electric Shock, Asphyxiation**

- In most of the cases of electric shock and collapse, it is the lungs and the diaphragm (the thin sheet of muscles which lies below the lungs) that have stopped working and there is a very good chance of revival by applying artificial respiration quickly.
- In case of severe shock, respiration is seldom established under one hour while three to four hours or more might be found necessary to restore normal breathing. It is therefore, essential that in all cases of electric shock where the condition of the patient is doubtful or the patient is unconscious or not breathing, artificial resuscitation should be continued until the patient breathes normally or until the doctor has pronounced life extinct.

### **5.3 SAFETY GUIDELINES FOR WORKMEN**

- While working for installation or maintenance, first ensure that the power is switched OFF to the network of streetlights by removing the fuses on load side.
- Carry all the safety tools and always uses a safety belt when climbing on the ladder or pole. Clamp the safety belt on the ladder or the main pole while changing the fitting.
- Wear rubber gloves or gauntlets for touching any electrical parts inside or near switching point.
- During maintenance work with the switching point e.g. timer, contactor maintenance, ensures that is accompanied by an assistant with an effective torch light if working at night.
- Before a technician undertakes any work on a pole or any other line support, he should first make a complete inspection from the ground of the position of all live wires, in order to determine the amount of precautions to be adopted and should inspect his insulating equipment and operating tools and tackles for their good condition before he attempts to do the actual work.
- Usually pushing type aluminum ladders tend to become vulnerable due to vibrations they encounter on uneven roads as the nut bolts get loosened so it is needful to have through checkup periodically say after one weeks use and necessary steps are to be taken so that ladder can be used without any risk to anybody.
- While climbing on ladder he should have his hands free and after reaching the work platform he should wear the safety belt tied to the ladder.

### **5.4 SAFETY DEVICES & TOOLS**

The following are the minimum requirements of safety devices and special tools:

- a. Safety Helmets
- a. Rubber Gloves
- b. Safety Belts
- e. Ladders
- f. Ropes
- g. Hand Tools kit
- h. First aid box containing Dettol, bandage, burnol, cotton, painkiller pills.

### **5.5 SAFETY DEVICES & TOOLS EXPENDITURE**

The major safety kit comprising of Safety Helmet, Safety Belt, Rubber Gloves, Ropes, Hand Tool Kit and First Aid Box have costed around Rs.1500 per kit. Five kits are being used for installation and maintenance purposes.

## 5.6 Daily records of Safety Kit distribution during installation

### Energy Saving Streetlight Project: Indore Municipal Corporation

Safety Kit includes: helmet, rubber gloves, rubber shoes, insulated tools, safety belts & first aid box given to five teams.

Date	Site Location	No. Of Technicians	Safety Equipments Used	Duration Of use	
				From Time	To Time
27-Sep-08	Sirpur	18	Safety Kit ( 5 nos)	8.00 am	5.00pm
28-Sep-08	hukumchand colony	23	Safety Kit ( 5 nos)	8.30 am	5.00pm
1-Oct-08	laxmibai nagar	20	Safety Kit ( 5 nos)	8.00 am	5.30pm
2-Oct-08	maharana pratapnagar	26	Safety Kit ( 5 nos)	9.00 am	5.30pm
3-Oct-08	banganga	22	Safety Kit ( 5 nos)	9.00 am	5.30pm
4-Oct-08	bhagat singh nagar	24	Safety Kit ( 5 nos)	8.40 am	5.00pm
5-Oct-08	niranjanpur	22	Safety Kit ( 5 nos)	8.30 am	5.00pm
6-Oct-08	khajrana	21	Safety Kit ( 5 nos)	8.30 am	5.00pm
7-Oct-08	Vijay nagar	23	Safety Kit ( 5 nos)	8.30 am	5.00pm
8-Oct-08	I T I	23	Safety Kit ( 5 nos)	8.30 am	5.00pm
9-Oct-08	bhamor	23	Safety Kit ( 5 nos)	8.30 am	5.00pm
10-Oct-08	nanda nagar	23	Safety Kit ( 5 nos)	8.30 am	5.00pm
11-Oct-08	subhash nagar	24	Safety Kit ( 5 nos)	8.30 am	5.00pm
12-Oct-08	pardeshipua	24	Safety Kit ( 5 nos)	9.00 am	5.30pm
13-Oct-08	shilnath camp	25	Safety Kit ( 5 nos)	9.00 am	5.30pm
14-Oct-08	bhagiathpura	21	Safety Kit ( 5 nos)	9.00 am	5.30pm
16-Oct-08	Sadar bazar	23	Safety Kit ( 5 nos)	9.00 am	5.30pm
17-Oct-08	junariashala	24	Safety Kit ( 5 nos)	9.00 am	5.30pm
18-Oct-08	Darvid nagar	21	Safety Kit ( 5 nos)	9.00 am	5.30pm
19-Oct-08	panchkuiya	19	Safety Kit ( 5 nos)	9.00 am	5.30pm
21-Oct-08	priydarshni	19	Safety Kit ( 5 nos)	8.40 am	5.00pm
22-Oct-08	devi indra	23	Safety Kit ( 5 nos)	8.40 am	5.00pm
23-Oct-08	malhargamnmain	24	Safety Kit ( 5 nos)	8.40 am	5.00pm
24-Oct-08	chipabhakal	26	Safety Kit ( 5 nos)	8.40 am	5.00pm
25-Oct-08	imli bazar	26	Safety Kit ( 5 nos)	8.40 am	5.00pm
26-Oct-08	rajwara	24	Safety Kit ( 5 nos)	8.30 am	5.00pm
27-Oct-08	devi ahliya	25	Safety Kit ( 5 nos)	8.30 am	5.00pm
3-Nov-08	m.g. road	23	Safety Kit ( 5 nos)	8.30 am	5.00pm
4-Nov-08	shivaji nagar	21	Safety Kit ( 5 nos)	8.30 am	5.00pm
5-Nov-08	rustamka garden	18	Safety Kit ( 5 nos)	8.00 am	5.00pm
6-Nov-08	Ram singh bhai	23	Safety Kit ( 5 nos)	8.30 am	5.00pm
7-Nov-08	patnipura	20	Safety Kit ( 5 nos)	8.00 am	5.30pm
8-Nov-08	Lig	26	Safety Kit ( 5 nos)	9.00 am	5.30pm
9-Nov-08	jagjivanram nagar	22	Safety Kit ( 5 nos)	9.00 am	5.30pm
12-Nov-08	Vivekanand nagar	24	Safety Kit ( 5 nos)	8.40 am	5.00pm
13-Nov-08	palasia main	23	Safety Kit ( 5 nos)	8.00 am	5.00pm
14-Nov-08	nehu nagar	24	Safety Kit ( 5 nos)	8.30 am	5.00pm
15-Nov-08	panchamkifail	18	Safety Kit ( 5 nos)	8.00 am	5.00pm
16-Nov-08	vallabh nagar	23	Safety Kit ( 5 nos)	8.30 am	5.00pm
18-Nov-08	South tukoganj	20	Safety Kit ( 5 nos)	8.00 am	5.30pm
19-Nov-08	choti gawaltoli	26	Safety Kit ( 5 nos)	9.00 am	5.30pm
20-Nov-08	dolat ganj	22	Safety Kit ( 5 nos)	9.00 am	5.30pm

Asian Electronics Ltd  
ESCO Project Division

21-Nov-08	southa thora	24	Safety Kit ( 5 nos)	8.40 am	5.00pm
27-Nov-08	jawahar marg	22	Safety Kit ( 5 nos)	8.30 am	5.00pm
28-Nov-08	bada saafa	21	Safety Kit ( 5 nos)	8.30 am	5.00pm
29-Nov-08	molana azad	23	Safety Kit ( 5 nos)	8.30 am	5.00pm
30-Nov-08	biyabani	23	Safety Kit ( 5 nos)	8.30 am	5.00pm
1-Dec-08	Machli bajar	23	Safety Kit ( 5 nos)	8.30 am	5.00pm
2-Dec-08	Kailashnatk	23	Safety Kit ( 5 nos)	8.30 am	5.00pm
3-Dec-08	Laxman singh chouhan	24	Safety Kit ( 5 nos)	8.30 am	5.00pm
4-Dec-08	dwarkapuri	24	Safety Kit ( 5 nos)	9.00 am	5.30pm
5-Dec-08	sudama nagar	25	Safety Kit ( 5 nos)	9.00 am	5.30pm
6-Dec-08	Lalbahadur sahati	21	Safety Kit ( 5 nos)	9.00 am	5.30pm
7-Dec-08	rajmahal	23	Safety Kit ( 5 nos)	9.00 am	5.30pm
8-Dec-08	Hamu colony	24	Safety Kit ( 5 nos)	9.00 am	5.30pm
9-Dec-08	harsiddhi	21	Safety Kit ( 5 nos)	9.00 am	5.30pm
10-Dec-08	marimata	19	Safety Kit ( 5 nos)	9.00 am	5.30pm
11-Dec-08	holkar	19	Safety Kit ( 5 nos)	8.40 am	5.00pm
12-Dec-08	katakpura	23	Safety Kit ( 5 nos)	8.40 am	5.00pm
13-Dec-08	navlakkha	24	Safety Kit ( 5 nos)	8.40 am	5.00pm
14-Dec-08	tilak nagar	26	Safety Kit ( 5 nos)	8.40 am	5.00pm
15-Dec-08	tirupati nagar	26	Safety Kit ( 5 nos)	8.40 am	5.00pm
16-Dec-08	residency	24	Safety Kit ( 5 nos)	8.30 am	5.00pm
17-Dec-08	azad nagar	25	Safety Kit ( 5 nos)	8.30 am	5.00pm
18-Dec-08	Ambedkar	23	Safety Kit ( 5 nos)	8.30 am	5.00pm
19-Dec-08	Vishnu puri	21	Safety Kit ( 5 nos)	8.30 am	5.00pm
20-Dec-08	bijalpur	18	Safety Kit ( 5 nos)	8.00 am	5.00pm
21-Dec-08	rajendra nagar	23	Safety Kit ( 5 nos)	8.30 am	5.00pm
22-Dec-08	Sirpur	20	Safety Kit ( 5 nos)	8.00 am	5.30pm
23-Dec-08	hukumchand colony	26	Safety Kit ( 5 nos)	9.00 am	5.30pm
24-Dec-08	laxmibai nagar	22	Safety Kit ( 5 nos)	9.00 am	5.30pm
25-Dec-08	maharana pratapnagar	24	Safety Kit ( 5 nos)	8.40 am	5.00pm
26-Dec-08	banganga	23	Safety Kit ( 5 nos)	8.00 am	5.00pm
27-Dec-08	bhagat singh nagar	24	Safety Kit ( 5 nos)	8.30 am	5.00pm
28-Dec-08	niranjanpur	18	Safety Kit ( 5 nos)	8.00 am	5.00pm
29-Dec-08	khajrana	23	Safety Kit ( 5 nos)	8.30 am	5.00pm
30-Dec-08	Vijay nagar	20	Safety Kit ( 5 nos)	8.00 am	5.30pm
31-Dec-08	I T I	26	Safety Kit ( 5 nos)	9.00 am	5.30pm
2-Jan-09	bhamor	22	Safety Kit ( 5 nos)	9.00 am	5.30pm
3-Jan-09	nanda nagar	24	Safety Kit ( 5 nos)	8.40 am	5.00pm
4-Jan-09	subhash nagar	22	Safety Kit ( 5 nos)	8.30 am	5.00pm
5-Jan-09	pardeshipua	21	Safety Kit ( 5 nos)	8.30 am	5.00pm
6-Jan-09	shilnath camp	23	Safety Kit ( 5 nos)	8.30 am	5.00pm
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16-Jan-09	imli bazar	21	Safety Kit ( 5 nos)	9.00 am	5.30pm
17-Jan-09	rajwara	19	Safety Kit ( 5 nos)	9.00 am	5.30pm
18-Jan-09	devi ahliya	19	Safety Kit ( 5 nos)	8.40 am	5.00pm



## **6. INSTALLATIONS AND REMOVAL OF ELECTRIC POLES:**

The nature of work involves only removal of old streetlight fittings & installation of new fittings. We do not remove any electric poles; no digging work is involved during the course of the work.

The nature of our work , removal of old fittings & replacement with new energy saving fittings does not affect the lighting at night for any areas including local cultural areas, as the work is completed only during the daytime.