

Lighting Maintenance Instruction

Public lighting maintenance

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Document no. LMI 0001

Amendment no. 0

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PRIMARY SYSTEMS	Document No: LMI 0001 Amendment No: 0 Approved By: CE Approval Date: 27/09/2015 Review Date: 27/09/2018
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1.0 PURPOSE

To set out in detail the process to be followed for fault & emergency and planned maintenance of lamps, luminaires, columns and brackets on Endeavour Energy's public lighting network, and for *Nightwatch* assets.

2.0 SCOPE

This instruction covers the fault and emergency process for rectifying faulty luminaires and lamps connected to overhead and/or underground mains that are reported as faulty by the general public and public lighting customers. It includes periodic bulk lamp replacement (BLR) and patrols for identification and repair of faulty luminaires on the public lighting network.

It does not include the maintenance requirements of streetlight columns.

3.0 REFERENCES

- Company Policy (Network) 9.6.8 - Public Lighting
- Company Procedure GAM 0078 - Data Collection for Public Lighting
- Company Procedure GPE 0069 - Polychlorinated Biphenyl Management
- Company Procedure GSU 0006 - Disposal of Surplus Goods and Equipment
- Company Procedure GSU 0009 - Disposal of Scrap Metal
- Endeavour Energy Public Lighting Management Plan 2009-2014
- Endeavour Energy Network Management Plan December 2013 Review
- Endeavour Energy Electrical Safety Rules
- Environmental Management Standard EMS 0007 - Waste management
- Mains Maintenance Instruction MMI 0001 - Routine above and below ground, pole and line inspection and treatment procedure
- Mains Maintenance Instruction MMI 0003 - Routine external structural inspection of streetlight columns and LV pillars
- Mains Maintenance Instruction MMI 0022 - Routine electrical inspection and maintenance of streetlight columns, LV pillars and associated electrical terminations
- Branch Workplace Instruction WAE 2026 - *Nightwatch* installation and maintenance
- Annexure 1: Guide for Replacement of Broken or Unserviceable Luminaires
- Annexure 2: Public Lighting Scenarios
- AS/NZS1158 series of standards pertaining to the lighting of roads and public places
- NSW Department of Industry & Commerce - Public Lighting Code
- ENA National Electricity Network Safety Code (Doc 01-2008)

4.0 DEFINITIONS AND ABBREVIATIONS

AER

Australian Energy Regulator

Category P lighting

Lighting applicable to roads and other outdoor public areas for which the visual requirements of pedestrians are dominant, for example, local roads, pathways, public activity areas, connecting elements and outdoor car parks.

bulk lamp replacement (BLR), also called GLR or group lamp replacement

Programmed replacement of all lamps on the system within the period specified. The cleaning of luminaries is generally undertaken in conjunction with the BLR program.

Category V lighting

Lighting applicable to roads on which the visual requirements of motorists are dominant, for example, traffic routes.

CIC

Customer Interaction Centre

delayed access fault

fault where access is not denied but is delayed due to external factors, such as wet weather, traffic conditions, and road works.

DNSP

Distribution Network Service Provider

fault

A luminaire that is not producing light or whose light output is either materially lower than normal operation or is ineffective.

FSC

Field Service Centre

fault report

An instance of the Public Lighting Service Provider receiving a report of a fault through its call centre or website.

LGA

local government area

lamp lumen depreciation factor (LLDF)

Ratio of luminous flux of a lamp at a given time in its life to the initial luminous flux. Plotted as a graph but usually expressed in hours at which luminous flux of a lamp falls to 70% of initial luminous flux.

luminaire maintenance factor (LMR)

Ratio of the LOR of a luminaire at a given time to the initial LOR. This provides a measure of the reduction of light output of the luminaire due to dirt accumulation and deterioration of the optical surfaces of the luminaire with time.

Light output ratio (LOR)

The ratio of total luminous flux emitted by a luminaire to that emitted by the lamp.

Lamp survival factor (LSF)

Fraction of the total number of lamps in a lighting scheme that continue to operate at a given time under defined conditions and switching frequency. Plotted as a graph but expressed in hours at which 50% of a given batch of lamps are still operating.

lighting scheme

an arrangement of luminaires designed to provide lighting in compliance with a prescribed lighting sub category.

luminaire

Apparatus that distributes, filters or transforms the light transmitted from one or more lamps and which includes, except for the lamps themselves, all the parts necessary for fixing and protecting the lamps and, where necessary, circuit auxiliaries together with the means for connecting them to the electrical supply.

maintenance factor

Ratio of the light flux emitted from a luminaire at a given time to that emitted initially.

Maintenance Factor = Lamp lumen depreciation factor X Luminaire maintenance factor (the factor does not take account of the effect of the failure of individual luminaires within the group of luminaires involved in the calculation).

maintenance cycle

Repetition of the lamp replacement and/or cleaning intervals

maintenance regime

Maintenance nominated for a lighting scheme to determine its ongoing compliance.

maintained value

Specified value of any relevant light technical parameter below which that parameter must not fall in order to determine continuing compliance of a lighting scheme.

network faults

Faults on the network (major faults) that interrupt power supply to luminaires (such as faults on zone sub, pad sub or major supply cables).

nil access fault

Streetlight fault where access to repair the street light is denied by the public lighting customer.

Nightwatch floodlight

Floodlight installed on Endeavour Energy's network for the purpose of lighting a customer's premises

Outage Management System (OMS)

Streetlight faults reported by the general public and public lighting customers by telephone or Internet are logged onto the street lighting webpage of OMS by Endeavour Energy Call Centre employees. Street light faults identified by Endeavour Energy crews are also logged into the OMS. This system forms the basis of the street light maintenance fault repair process.

Photo-electric-cell (PEC)

Used for automatic switching on and off the light depending upon the natural light level.

Public Lighting

Lighting for the generality of roads and outdoor public areas (for example, parks, reserves, pedestrian zones, footpaths, cycle paths, car parks and other public areas).

public lighting customer

A council (as defined by the *Local Government Act 1993*), or a local, State or Federal government agency that has authority over areas with public lighting.

public lighting system

All public lighting network assets on Endeavour Energy's overhead and underground distribution network.

regulated asset base (RAB)

Value of Endeavour Energy owned assets calculated by AER

streetlight control point (SLCP)

An electrical device that switches a group of street lights on and off. An audio frequency (AF) signal, photo-electric (PE) cell, solar time switch (astronomical clock) or cascade supply may control SLCP activation.

streetlight maintenance crew

Employees responsible for maintenance of Endeavour Energy's public lighting system.

streetlight network faults

Supply minor cable faults that interrupt supply to a luminaire (for example, supplying underground cable or overhead line faults).

streetlight patrols

Regular day or night patrols of specified streets as a visual check that luminaires are operating correctly.

supply faults

All faults of major/minor cables that interrupt supply to a luminaire.

TM1

A reporting database using data extracted from Ellipse and other financial databases.

underground mains

Underground cable supply system used for the distribution of electricity.

5.0 ACTIONS

Endeavour Energy's streetlight maintenance program covers fault and emergency repairs, BLR programs and street light patrols.

Any change in the rate code due to a maintenance event shall be updated in the asset data base. An overview of the process is shown in the following flowchart.

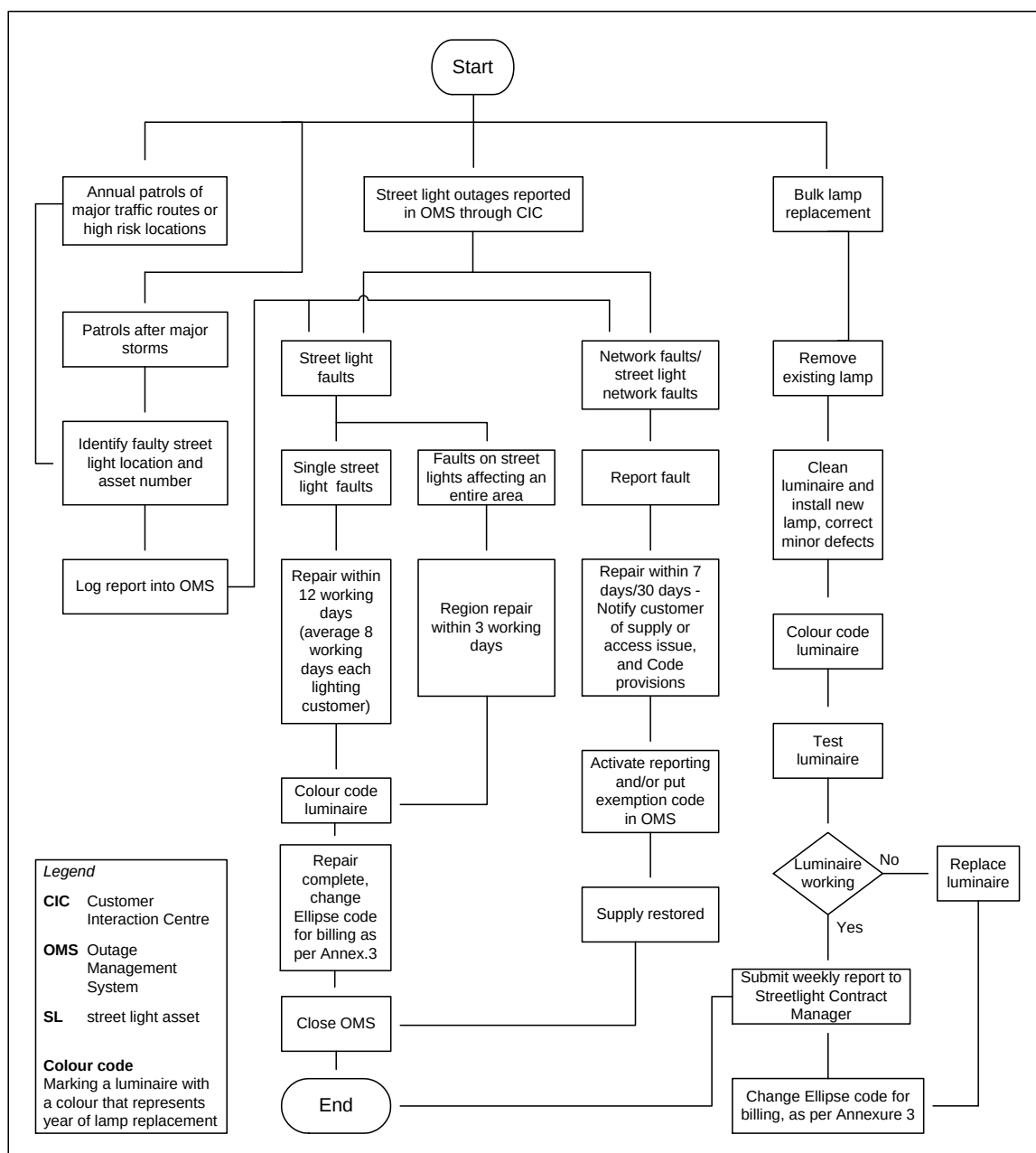


Figure 1: Street light maintenance flowchart

Note: Street light asset refers to the luminaire (including lamp), outreach/bracket, streetlight pole/column, ragbolt and foundation.

5.1 Fault and emergency repairs

5.1.1 *Delayed or nil access faults*

Where the repair of a streetlight fault is delayed due to a temporary lack of access, a follow up trouble order is to be created in OMS, the customer notified of the delay, and the trouble order left open until completed.

Where access to repair a streetlight fault is denied, the public lighting customer is to be notified of the access issue and OMS closed.

5.1.2 *Single street light faults*

Single street light faults must be repaired within an average of eight working days for each public lighting customer each year from receipt of a fault report, and must not exceed 12 working days for any specific fault, except for faults outlined in clauses 5.1.4 and 5.1.5 of this document.

Single street light faults must not be closed in OMS until fully repaired.

5.1.3 *Faults on street lights affecting an entire area*

Faults on street lights affecting a group of three or more lights, shall be repaired more quickly. Street light faults must not be closed in OMS, until fully repaired.

5.1.4 *Fault report/s:*

Where the customer provides the fault report/s in the form of a material list of faults, Endeavour Energy will nominate a reasonable timeframe, being not more than 30 days from receipt of the list of faults, to repair the streetlights (excluding network faults or underground cable/overhead line faults).

5.1.5 *Supply faults*

5.1.5.1 *Network faults or underground cable/overhead line faults*

Response time to repair streetlights as a consequence of network faults, underground cable faults or overhead line faults may take longer than 12 working days. For such faults, Endeavour Energy may nominate a longer time frame. Endeavour Energy will contact the customer who lodged the fault report, notifying the nature of the fault and extended repair time.

It is recognised that longer response times may be unavoidable in the following circumstances:

- severe weather conditions, large scale power outages and high risk situations where public safety and the restoration of power to consumers receive priority; and
- where repairs are required in remote locations as agreed with the customer.

OMS is to be updated, but the record left open until the fault is fully repaired.

5.2 Bulk lamp replacement (BLR)

The BLR program is part of Endeavour Energy's maintenance regime, which is critical to maintain correct lighting levels. The design of a lighting scheme takes into account a nominated maintenance factor, which is an indicator of the maintenance cycle chosen for the life of the designated scheme.

BLR intervals are determined on the basis of the maintenance factor (which is a product of lamp lumen depreciation factor and luminaire maintenance factor) and lamp survival factor.

Both lamp lumen depreciation factor and lamp survival factor are indicators of the life of a lamp, and identify the need to replace a lamp before it reaches the end of its economic (or rated) life, whichever is lower.

All lamps, except LED luminaires, shall be subject to bulk lamp replacement (BLR) at a three or four year interval. As LEDs have a long expected life, and is not replaceable individually, Endeavour Energy has adopted the policy of running LEDs to failure. Therefore LEDs are excluded from the BLR (refer to 5.2.1)

Four year interval will be applicable only to high pressure sodium lamps on V (vehicle) category roads.

- All luminaires, including the visor and the housing, shall be thoroughly cleaned both inside and out at the time of BLR.
- All faulty PECs shall be replaced at the time of bulk lamp replacement.

The BLR program shall confirm all public lighting assets details in Ellipse such as, but not limited to, rating, type, bracket/outreach and number.

The BLR program shall also identify failed or missing public lighting elements and record the number and type of PECs replaced within a particular council area.

5.2.1 LED luminaires cleaning cycle

LED luminaires are equipped with a self-cleaning visor and an optical chamber with an IP66 classification, offering a dust tight interior resulting in the highest level of protection against dust. Also, significantly less heat is generated on the lenses of LED luminaires than high intensity discharge lamps. These features are expected to result in significantly less dust accumulating on the lens than has been historically experienced on outdoor luminaires with other technologies. For this reason, considerably lower luminaire dirt depreciation (LDD) on LED luminaires is expected. The cleaning cycle of the optical chamber of LED lanterns within Endeavour Energy's network are therefore required to be cleaned on a six yearly cycle. Periodic testing will be conducted on installed LED's up until the six year period to monitor that the lighting levels are maintained at acceptable levels.

5.3 Common requirements for maintenance of luminaires

5.3.1 Replacement of existing broken or unserviceable luminaires

At the time of fault and emergency repairs or BLR, any broken or unserviceable fluorescent, mercury, low pressure and high pressure sodium luminaires shown in column 2 of Annexure 1 - Guide for Replacement of Broken or Unserviceable Luminaires, must be replaced with the luminaire type/s shown in column 3. Any replacement must be recorded in Ellipse, with a changed rate code in Tariff Class 3 for all replaced luminaires.

5.3.2 Date indicator

All luminaires where lamps are replaced through fault and emergency repairs or BLR shall be colour coded (permanently marked with the coloured date indicator that shows year in which replacement has been done).

Any changes must be recorded in Ellipse.

5.3.3 Testing

All luminaires that are repaired shall be tested. Any luminaire identified as non-functional after testing shall be repaired/replaced. The purpose of testing is to determine a luminaire is functioning correctly after it has been repaired.

5.3.4 Lamp and luminaire disposal

All used lamps and luminaires must be disposed of through Endeavour Energy's environmentally responsible asset disposal process.

All lamps either recovered from either BLR process or blown must be processed in accordance with Environmental Management Standard EMS 0007 – Waste Management, section 5.10.

Both Endeavour Energy maintenance crews and ASPs shall, after maintenance or replacement, return lamps to their nearest depots. All lamps shall be placed in their appropriate bins located within the depots.

All luminaires identified as broken or unserviceable shall be processed in accordance with Company Procedure GSU 0006 - Disposal of Surplus Goods and Equipment. The luminaires identified for disposal shall be processed under Company Procedure GSU 0009 - Disposal of Scrap Metal. Endeavour Energy maintenance crews shall, after maintenance or replacement, return the luminaires to the nearest FSC.

5.4 Replacement of streetlight assets

The company carries out replacement of streetlight assets, comprising of luminaires, brackets/outreaches and pole/column. This can be part of regular maintenance, unplanned maintenance, pole/column inspection, after annual patrols and after vehicle impact. The responsible officer/manager shall determine that the rate codes of street light assets are updated, as shown in Annexure 2 - Public Lighting Scenarios, of this document.

5.5 Annual patrols

Annual patrols are designed to identify and report faulty luminaires on category V illuminated roads and at high risk public locations.

Annual patrols shall be conducted on all metro roads, highways, main traffic routes and alternate traffic routes marked as purple or yellow in the truckies, taxis and professional drivers' version of the *UBD* street directory. Patrols shall also include publicly illuminated locations such as train stations, major bus stops, taxi ranks and entrances to schools, hospitals and public car parks.

Freeways and motorways that are marked in green, as well as light traffic roads and trafficable roads marked in white, orange or pink, are excluded from this annual patrols.

All non-functional luminaires shall be repaired within the time frames specified in clause 5.1.1 of this document.

5.6 Major storm patrols

Major storms patrols are designed to identify and report faulty luminaries and other faulty elements of public lighting schemes after major storms. Major storm patrols shall be conducted along major traffic routes, stations and other key high risk public areas, within one month after major storms.

5.7 Streetlight column inspection

Streetlight columns shall be inspected in accordance with Mains Maintenance Instruction MMI 0003 - Routine external structural inspection of streetlight columns and LV pillars and Mains Maintenance Instruction MMI 0022 - Routine electrical inspection and maintenance of streetlight columns, LV pillars and associated electrical terminations.

5.8 Streetlight bracket inspection

Streetlight brackets, fixing and wiring shall be inspected in accordance with Mains Maintenance Instruction MMI 0001 - Routine above and below ground, pole and line inspection and treatment procedure.

5.9 Maintenance of *Nightwatch* floodlights

The *Nightwatch* service is not patrolled by Endeavour Energy employees. Maintenance of *Nightwatch* floodlights is not carried out on a routine basis. The service shall be maintained only at a customer's request.

If there is a fault/defect with the *Nightwatch* service, the customer will contact the Customer Interaction Centre (CIC) to initiate the maintenance process in OMS. The customer will

nominate that the light to be repaired is a *Nightwatch* service and provide details of the nature of the fault with the service.

5.10 Proposed treatment of public lighting charges for various maintenance scenarios

There are seven scenarios of possible public lighting charge treatment for various maintenance events, as shown in Annexure 2 - Public Lighting Scenarios.

6.0 AUTHORITIES AND RESPONSIBILITIES

Chief Engineer has the authority and responsibility for approving this instruction.

Manager Primary Systems has the authority and responsibility for endorsing changes to this instruction.

Network Mains Manager has the authority and responsibility for monitoring the application of this instruction.

Program Director Maintenance has the authority and responsibility for:

- monitoring compliance with the requirements of this instruction: and
- providing appropriate quarterly bulk lamp replacement progress reports to the Senior Engineer Lighting Solutions.

Streetlight Contract Manager has the authority and responsibility for providing accurate data relevant for auditing of public lighting maintenance works.

Regional Manager has the authority and responsibility for monitoring all relevant information including change of rate code, after any streetlight maintenance for regional activities, is entered into Ellipse.

Senior Engineer Lighting Solutions has the authority and responsibility for:

- monitoring that this instruction remains up to date; and,
- conducting random audits of the public lighting maintenance works.

Regional Maintenance Crew has the authority and responsibility for accurately entering all relevant data including change of rate codes into Ellipse, after maintenance of street light assets.

7.0 DOCUMENT CONTROL

Content coordinator: Network Mains Manager

Distribution coordinator: Standards Process Coordinator

Annexure 1: Guide for Replacement of Broken or Unserviceable Luminaires

Luminaire type	Existing luminaire	Replacement luminaire
Fluorescent		
	2 x 20 Watt	StreetLED18 (22W)
	1 x 36 Watt	StreetLED18 (22W)
Mercury		
	50 Watt	StreetLED18 (22W)
	80 Watt	StreetLED18 (22W)
	125 Watt	70 W metal halide
	250 Watt	150 W high pressure sodium
	400 Watt	250 W high pressure sodium
Low pressure sodium		
	55 Watt	100 W high pressure sodium
	90 Watt	150 W high pressure sodium
	135 Watt	250 W high pressure sodium
	180 Watt	400 W high pressure sodium
High pressure sodium		
	120 Watt	100 W high pressure sodium
	310 Watt	400 W high pressure sodium
	360 Watt	400 W high pressure sodium
	600 Watt	Refer to Streetlight Contract Manager
	2 x 400 Watt	Refer to Streetlight Contract Manager

Annexure 2: Public Lighting Scenarios

Scenario	Customer request	Endeavour Energy initiated	Maintenance event
1. Luminaire is replaced before the end of its life through a maintenance event.			No residual value paid. Asset stays in the asset base until it reaches the end of its life. Customer pays annuity rates on new luminaire installed.
2. Luminaire is replaced after the end of its useful life through a maintenance event.			No residual value, customer moves to annuity rates for new luminaire.
3. Luminaire on a wood pole is replaced as wood pole has reached the end of its life.			If network pole – No residual value payable on old luminaire (old luminaire removed from asset base). Customer moves to annuity rate for new luminaire (no charge for new pole). If a customer dedicated pole - No residual value payable on the luminaire (old luminaire removed from the asset base). Customer moves to annuity rate for whole installation including pole.
4. Luminaire on a steel column is replaced through a maintenance event as the column has reached the end of its life.			No residual value payable on old luminaire (old luminaire removed from asset base). Whole installation moves to annuity rates. (It has been assumed that steel columns are dedicated to the customer and not used for network purposes.)
5. Entire Street Lighting installation	Residual value to be paid and assets removed from the Regulated Asset		

installed or replaced at the request of the customer.	Base. Tariffs on new installation would change to annuity rates.		
6. Entire Street Lighting installation is installed or replaced as an incidental consequence of any other project.		No residual value paid for old installation (value is removed from the Regulated Asset Base). Customer moves to annuity rates for new Street Lighting installation.	
7. Network removed from existing network wooden pole and now dedicated to public lighting user.		Customer not charged for use of pole until pole reaches the end of its life. When pole reaches end of its life the entire installation is replaced and customer moves to annuity rates for the whole installation. Pole must remain in Regulated Asset Base.	

General principles based on above analysis

Scenario	Customer requested	Endeavour Energy initiated	Maintenance event
Luminaire / Bracket or Outreach / Column or Pole changed at end of life.	No residual value. Customer moves to annuity rates for new asset/s only.	No residual value. Customer moves to annuity rates for new asset/s.	No residual value. Customer moves to annuity rates for new asset/s.
Luminaire / Bracket or Outreach / Column or Pole changed before end of life.	Customer pays residual value, old asset/s removed from asset base and customer pays annuity rates on new asset/s.	No residual value paid, asset/s removed from asset base and customer pays annuity rates on the new asset/s.	No residual value paid but asset stays in the asset base until it reaches the end of its life. Customer pays annuity rates on new asset/s.

Maintenance Event: It may be difficult to determine whether an individual luminaire was changed before the end of its life or not. Given this, Endeavour Energy believes that the treatment of “before” or “at the end of its life” should be consistent.