

**Report on Comparison of Costs between
Type D (5 A) and Type G (13 A)
Switched Socket Outlets**

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1. Preamble

With the objective of reducing deaths by accidental electrocutions to at most 20 by 2020, the Public Utilities Commission along with Sri Lanka Police, electricity licensees, provincial councils, local authorities and other governmental and non-governmental bodies have been implementing various awareness-based mitigation measures to contain the root causes identified by the Commission. As a result of aforesaid measures, from 2012 to 2015, number of electrocutions reduced by 58% to 77 deaths. The Commission is of the view that sustainable reduction of electrocutions requires the implementation of strict standards to address very specific root causes.

Different types of plugs and sockets are used in Sri Lanka. To make a connection to a wall socket, to which the plug on an appliance does not often fit, electricity users adopt a variety of methods and devices, most of which are unsafe and cause the connection to be unreliable.

PUCSL has decided to create an enabling environment, issue the necessary regulations and facilitate the participation of other regulatory agencies to ensure that Sri Lanka systematically moves to using one type of plugs and socket outlets. Accordingly, PUCSL has decided that the Type G plug and socket outlet to be the only national standard to be used in Sri Lanka.

In the public consultation process, concerns were expressed by the public, about the possible increase of expenses when the new single standard type G is gradually made mandatory. To address the issue of costs, PUCSL adopted the following approach:

- (a) No re-wiring or replacement of sockets of existing households would be required, at all.
- (b) If a type D (5 A) socket in an existing household breaks, a specially made replacement of type G (6 A) will be available in the market. Therefore, re-wiring because a socket breaks, would not be required.
- (c) A comprehensive study by a panel of Chartered Engineers from various stakeholder institutions was commissioned, to compare the costs of wiring a new house, with the common existing practice type D (5 A) Vs type G (13 A).

Details of (c) are given in this paper, and the conclusions prove that, wiring for type G sockets is marginally cheaper than that of the other two types of sockets for lower income households, while adhering to IET wiring standards.

2. Types of Houses

The study divided the types of houses who are concerned about the cost of wiring, on the basis of floor area.

Type 1: Low Income House	< 50 m²
Type 2: Lower Middle Income House	50 m² < A < 100 m²
Type 3: Middle Income House	> 100 m²

3. Typical Arrangement of Socket Outlets and Circuits

Following tables show the circuit arrangements for the three cases of typical households in Sri Lanka. The number of sockets for each type of households is defined based on the policy of using type D (5 A) sockets for regular requirements, and type G (13 A) sockets for high power requirements and the number of circuit arrangements is defined in accordance with the IET Wiring Regulations, for a mix of 5 A and 13 A sockets, and with 13 A sockets only.

Case 1: Typical arrangement of 5 A and 13 A socket outlets and circuits (Area < 50 m²)

Room	Case 1A: Design with a mix of 5 A and 13 A sockets			Case 1B: Design with only 13 A sockets	
	No. of Socket Outlets		No. of Circuits	No. of Socket Outlets	No. of Circuits
	5 A	13 A		13 A	
Bed Rooms (1 room)	2	-	1	2	1 (radial circuit Ref. Appendix 15 of IET Wiring Regulations)
Living Room	4	-	2	4	
Pantry/kitchen	-	1	1 (dedicated)	1	

Case 2: Typical arrangement of 5 A and 13 A socket outlets and circuits (50 m² < Area < 100 m²)

Room	Case 2A: Design with a mix of 5 A and 13 A sockets			Case 2B: Design with only 13 A sockets	
	No. of Socket Outlets		No. of Circuits	No. of Socket Outlets	No. of Circuits
	5 A	13 A		13 A	
Bed Rooms (3 rooms)	6	-	2	6	2 (radial circuits Ref. Appendix 15 of IET Wiring Regulations) 1 (dedicated radial circuit for pantry/kitchen)
Living Room	6	-	2	6	
Pantry/kitchen	2	1	2 (1 dedicated circuit)	3	

Case 3: Typical arrangement of 5 A and 13 A socket outlets and circuits (Area >100 m²)

Room	Case 3A: Design with a mix of 5 A and 13 A sockets			Case 3B: Design with only 13 A sockets	
	No. of Socket Outlets		No. of Circuits	No. of Socket Outlets	No. of Circuits
	5 A	13 A		13 A	
Bed Room (3 rooms)	6	-	2	6	3 (radial circuits Ref Appendix 15 of IET Wiring Regulations) 1 (dedicated radial circuit for pantry/kitchen)
Living Room	6	-	2	6	
Other areas	4	-	2	4	
Pantry	4	1	3 (1 dedicated circuit)	5	

A summary of all the cases considered above is given in the following table.

Type of House	Case	A: Design with a mix of 5 A and 13 A sockets		No. of Circuits	B: Design only with 13 A sockets	
		Proposed Number of Socket Outlets			Proposed Number of Socket Outlets	No. of Circuits
		5 A	13 A		13 A	
Low Income House (Area < 50m ²)	1	6	1	4	7	2
Lower Middle Income House (50m ² < Area < 100m ²)	2	14	1	6	15	3
Middle Income House (Area > 100m ²)	3	20	1	9	21	4

4. Cabling and Costs

This section summarizes the size of cables required for each circuit arrangement and their wiring costs.

4.1 Cable Sizing

Two types of cables are specified for the circuits in accordance with the standards.

- **Type 1:** 5 A socket outlets (maximum 3 sockets per circuit), 1.5mm² CU/PVC/PVC twin cable + 2.5mm² CU/PVC earth cable
- **Type 2:** 13 A socket outlets, 2.5mm² CU/PVC/PVC twin cable + 2.5mm² CU/PVC earth cable

4.2 Summary of Wiring Costs

The study defines four categories of circuits: one category for 5 A sockets, and three categories for 13 A sockets, as described below.

Type of Sockets	Circuit type with type of sockets and their numbers	Cost for the wiring (Rs.)	Wiring Category
5 A Sockets	2 x 5A Socket Outlets	7,292	Cat 5A-2
	3 x 5A Socket Outlets	10,077	Cat 5A-3
13 A Sockets	1 x 13A Socket Outlet	4,277	Cat 13A-1
	6 x 13A Socket Outlets	21,456	Cat 13A-6
	7 x 13A Socket Outlets	25,032	Cat 13A-7

Costs of cabling were calculated on the basis of standard costs of manufacturers, and the results are shown in the following table.

Type of House	Mix of 5 A and 13 A Sockets					
	Case	Number of Socket Outlets		No. of Circuits	Wiring Category	Total Wiring Cost (Rs.)
		5 A	13 A			
Low Income House (Area< 50m ²)	1A	6	1	4	Cat 5A-2 (3 Nos) + Cat 13A-1	26,153
Lower Middle Income House (50m ² <Area<100m ²)	2A	14	1	6	Cat 5A-3 (4 Nos) + Cat 5A-2 + Cat 13A-1	51,877
Middle Income House (Area>100m ²)	3A	20	1	9	Cat 5A-3 (4 Nos) + Cat 5A-2 (4 Nos) + Cat 13A-1	73,753
13 A Sockets only						
Low Income House (Area< 50m ²)	1B		7	2	Cat 13A-1 + Cat 13A-6	25,733
Lower Middle Income House (50m ² <Area<100m ²)	2B		15	3	Cat 13A-7 (2 Nos) + Cat 13A-1	54,340
Middle Income House (Area>100m ²)	3B		21	4	Cat 13A-7 (3 Nos) + Cat 13A-1	79,372

5. Circuit Breakers

Circuit arrangements described above have to be accompanied with properly rated circuit breakers. The costs of the circuit breakers for each case are given below:

Type of House	Case	Mix of 5 A and 13 A Sockets			
		No. of Circuits	MCB	Unit Price (Rs.)	Total Amount (Rs.)
Low Income House (Area< 50m ²)	1A	4	10A SP 6kA MCB	480	1,920
Lower Middle Income House (50m ² <Area<100m ²)	2A	6	10A SP 6kA MCB	480	2,880
Middle Income House (Area>100m ²)	3A	9	10A SP 6kA MCB	480	4,320
13 A Sockets only					
Low Income House (Area< 50m ²)	1B	2	16A SP 6kA MCB	480	960
Lower Middle Income House (50m ² <Area<100m ²)	2B	3	16A SP 6kA MCB	480	1,440
Middle Income House (Area>100m ²)	3B	4	16A SP 6kA MCB	480	1,920

SP: single pole, MCB: miniature circuit breaker

6. Conclusion

The total cost of wiring and circuit breakers for each type of household, for the mixed 5 A and 13 A option, Vs the 13 A only option, are summarised below.

Type of House	Case	Mix of 5 A and 13 A Sockets			
		Wiring Category	Wiring Cost (Rs.)	Cost for MCB (Rs.)	Total Cost (Rs.)
Low Income House (Area < 50m ²)	1A	Cat 5A (3 Nos)+ Cat 13A-1	26,153	1,920	28,073
Lower Middle Income House (50m ² <Area<100m ²)	2A	Cat 5A-3 (4 Nos) + Cat 5A-2 + Cat 13A-1	51,877	2,880	54,757
Middle Income House (Area>100m ²)	3A	Cat 5A-3 (4 Nos) + Cat 5A-2 (4 Nos) + Cat 13A-1	73,753	4,320	78,073
13 A sockets only					
Low Income House (Area < 50m ²)	1B	Cat 13A-1+ Cat 13A-6	25,733	960	26,693
Lower Middle Income House (50m ² <Area<100m ²)	2B	Cat 13A-7 (2 Nos)+ Cat 13A-1	54,340	1,440	55,780
Middle Income House (Area>100m ²)	3B	Cat 13A-7 (3 Nos)+ Cat 13A-1	79,372	1,920	81,292

The difference of the total cost of wiring in the two cases is graphically shown in the figure below. This shows that, the total cost of wiring for low income households will be marginally reduced while there will be a slight increase of cost for lower middle income households and middle income households and hence, there will not be huge burden on the people by moving to a single standard with 13A socket outlets which are safer than the 5A socket outlets.

