SAMPLE QUANTITIES REPORT

Electrical quantities

Example house: G+1, 1,000 sq ft per floor

PREPARED FOR	LOCATION	REPORT ID	DATE
Example house (sample)	Lucknow, Uttar Pradesh	NS-EL-SAMPLE	29 October 2026

This is a sample report
It is a real report from the same calculations a paid report uses, made for an example house (G+1, 1,000 sq ft on each floor, Lucknow). It is not your project and nothing in it applies to your plot. Your own report uses your plot, floors and city, so its figures will differ.

Your wiring at a glance

HOMES
1
One house

ROOMS COUNTED
13
3 bedrooms, 3 bathrooms, 1 kitchen

WIRING LEVEL
Standard
Room-wise points of the BIS draft IS 4648

DESIGN LOAD
10.5 kW
At least 75 W per m² (draft IS 4648)

SUPPLY
Three-phase
Chosen from the design load; your electricity board decides

BOARDS
One on every floor
With a 30 mA RCCB on each

AIR CONDITIONERS
1
Each on its own circuit

EARTHING
2 electrodes
Counted for the whole building

What to order

The main totals. The line under each figure is the range the real number is likely to fall in.

POINTS AND SOCKETS	COPPER WIRE	CONDUIT	CIRCUITS
124 counted	2,790 m	696 m	28 on 2 boards
87 to 174	2,093 to 3,767 m	557 to 905 m	22 to 35 circuits

How to use this report
This is a code-based planning estimate worked out from the answers you gave, not a design for your drawings. Use it to plan, to check a contractor's quantities for gross errors and to order the first lots. Where a figure rests on an assumption, the report says so. Final quantities come from the drawings and the professional who signs them.

Points and sockets, room by room

Counted from the room-wise tables of the BIS draft IS 4648, in proportion to each room's size.

ROOM	NUMBER	LIGHTS	FANS	EXHAUST	BELLS	6 A	6/16 A	TV, DATA

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ROOM	NUMBER	LIGHTS	FANS	EXHAUST	BELLS	6 A	6/16 A	TV, DATA
Hall or living room	1	6	1	0	0	11	1	2
Kitchen and dining	1	2	1	1	1	4	4	0
Bedroom	3	18	4	0	0	26	4	6
Bathroom	3	6	0	3	0	3	0	0
Passage	2	2	0	0	0	4	0	0
Entrance	1	1	0	0	1	1	0	0
Balcony	1	1	0	0	0	1	0	0
Wash area or dry balcony	1	1	0	0	0	0	0	0
Staircase	2	4	0	0	0	0	0	0
Terrace and stair room	1	2	0	0	0	1	0	0
Gate and porch	1	2	0	0	0	0	0	0
Parking	1	2	0	0	0	2	0	0
All rooms and common areas		**47**	**6**	**4**	**2**	**53**	**9**	**8**

Room sizes are shared out of your floor area, so a larger home gets more points in each room. Lights, fans and sockets rise with the room size (per 12 m²); exhaust fans, bells and TV and data points are counted per room.

Outlets with a circuit of their own

ITEM	NUMBER
Air conditioner outlets, 20/25 A	1
Water heater outlets, 6/16 A	3
Washing machine and dishwasher outlets, 6/16 A	2
Pump outlets	1

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Circuits and breakers

Each circuit has its own breaker, and a board has one spare way.

CIRCUIT	NUMBER	BREAKER	CABLE	BASIS
Lights and fans	7	6 A	1.5 mm², 2 + earth	Up to 8 points on a circuit (draft IS 4648 cl 6.2.1)
Bathroom lights and exhaust fans	2	6 A	1.5 mm², 2 + earth	Bathrooms on a circuit of their own (draft IS 4648 cl 6.2.1)
6 A sockets	7	10 A	2.5 mm², 2 + earth	Up to 8 sockets on a circuit; the sources disagree on this limit
6/16 A sockets	5	16 A	2.5 mm², 2 + earth	Two 6/16 A outlets on a circuit (CPWD GS 3.10 iii; draft IS 4648 cl 6.2.2)
Air conditioner	1	20 A	4 mm², 2 + earth	One circuit for each air conditioner (draft IS 4648 cl 6.2.2)
Water heater	3	16 A	2.5 mm², 2 + earth	One circuit for each water heater
Washing machine and dishwasher	2	16 A	2.5 mm², 2 + earth	One circuit for each washing machine and each dishwasher (the Standard level adds the dishwasher; the draft cl 6.2.2 asks for one at 2 kW or more, and its Table 6 gives a dishwasher 1.5 kW)
Transfer pump	1	16 A	2.5 mm², 2 + earth	One circuit for each pump
All circuits	**28**			

Distribution boards

BOARD	NUMBER	SIZE	INCOMING BREAKER	SHOCK PROTECTION
Ground floor	1	24 way, Three-phase (TPN)	32 A, 4-pole	40 A, 4-pole, 30 mA
First floor	1	8 way, Single-phase (SPN)	32 A, 2-pole	40 A, 2-pole, 30 mA

A board's size is its outgoing ways, rounded up to the sizes sold: 4, 6, 8, 12, 16, 18, 24 or 32.

Mains, rising mains and sub-mains

Cable from the meter to each board, sized by the design load, which is this tool's choice (draft IS 4648 Table 4 sizes the mains by connected load).

RUN	CABLE	NUMBER	LENGTH EACH (M)	CONDUIT
Meter to the main board	4 × 6 mm² + 6 mm² earth	1	10.0	32 mm
Main board to the first floor board	2 × 6 mm² + 6 mm² earth	1	7.0	25 mm

Copper wire to buy

Wire up to 6 mm² is sold in coils of 90 m, and larger sizes by the metre. Every figure includes 5% for cutting waste.

SIZE	COLOUR	LENGTH NEEDED (M)	WITH 5% WASTE (M)	COILS	TO BUY
1.5 mm²	Red	257	270	3	270 m

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SIZE	COLOUR	LENGTH NEEDED (M)	WITH 5% WASTE (M)	COILS	TO BUY
1.5 mm²	Black	257	270	3	270 m
1.5 mm²	Green-yellow	168	177	2	180 m
2.5 mm²	Red	344	361	5	450 m
2.5 mm²	Black	344	361	5	450 m
2.5 mm²	Green-yellow	344	361	5	450 m
4 mm²	Red	11	11	1	90 m
4 mm²	Black	11	11	1	90 m
4 mm²	Green-yellow	11	11	1	90 m
6 mm²	Red	17	18	1	90 m
6 mm²	Yellow	10	11	1	90 m
6 mm²	Blue	10	11	1	90 m
6 mm²	Black	17	18	1	90 m
6 mm²	Green-yellow	17	18	1	90 m
All sizes		**1,818**	**1,909**		**2,790 m**

Red is the live wire, black the neutral and green-yellow the earth. A three-phase supply adds yellow and blue lines to the mains only.

Conduit to buy

PVC conduit in 3 m lengths, with 5% for cutting waste.

SIZE	RUN (M)	WITH 5% WASTE (M)	3 M LENGTHS	TO BUY
20 mm	640	672	225	675 m
25 mm	7	7	3	9 m
32 mm	10	11	4	12 m
All sizes	**657**	**690**	**232**	**696 m**

Switches, sockets, boxes and fittings

ITEM	NUMBER
Modular switch, 6 A, one-way (lights, fans, exhaust fans)	57
Electronic fan regulator, step type	6
Modular socket with switch, 6 A, 3-pin	53
Modular socket with switch, 6/16 A	11
Socket, 20/25 A, for an air conditioner	1
Isolator switch, double-pole, 32 A, with indicator (air conditioner, water heater)	4
Call bell push	2
Call bell	2

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ITEM	NUMBER
TV outlet	4
Data outlet (RJ45)	4
Media box (TV and data cables meet here)	2
Ceiling rose or connector	55
Fan hook and box	6
Junction box or ceiling box, 20 mm	102
Switch box (GI or PVC) with cover plate, about 4 modules each	35
Conduit bends, 20 mm	95
Conduit couplers	135
Conduit saddles or clips	997
TV cable (coaxial), to buy	35 m
Data cable (Cat 6), to buy	35 m

One switch for each point, as the CPWD point rules count it. In practice lights are grouped on one switch, so the real switch count may be lower. Screws, tape and small items are not counted.

Breakers, shock protection and earthing

ITEM	NUMBER
MCB, 6 A, one-pole, outgoing	9
MCB, 10 A, one-pole, outgoing	7
MCB, 16 A, one-pole, outgoing	11
MCB, 20 A, one-pole, outgoing	1
Incomer MCB, 2-pole, 32 A	1
Incomer MCB, 4-pole, 32 A	1
RCCB, 30 mA, one on every board	2
Meter board for the electricity board’s meter	1
Earth electrode (GI pipe 40 mm × 4.5 m, or a 600 × 600 mm plate)	2
GI earth strip, 25 × 5 mm, from each electrode to the board	20 m
Earth pit cover and chamber	2

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Connected load

What the points could draw if everything ran at once. It is used to size the supply, not to predict your bill.

LOAD	KW
Lights	2.4
Fans and exhaust fans	0.8
6 A sockets	5.3
6/16 A sockets	9.0
Air conditioners	1.5
Water heaters	6.0
Washing machine and dishwasher	3.5
Pumps and EV chargers	1.1
Total connected	**29.5**

Design load: 10.5 kW, the larger of 75 W per m² of carpet area and 0.6 × the large appliances plus 1.5 kW.

Checked against the Indian Standards

PASS Draft IS 4648 cl 6.2.1 (CPWD GS 3.10(i) allows 10 points or 800 W)

Lighting circuits

A lighting circuit carries at most 8 points or 1,000 W, and bathrooms have a circuit of their own. The older standard allows 10 points or 800 W; the stricter limit is used.

PASS CPWD GS 3.10(iii); draft IS 4648 cl 6.2.2

Power circuits

No power circuit has more than two 16 A outlets, and each air conditioner, water heater, washing machine and dishwasher has a circuit of its own. The dishwasher is added at the Standard level whether or not you asked for one.

NOTE Draft IS 4648 Table 4 (CPWD GS 3.12(ii) asks for 4 mm² on power wiring)

Wire size

All wire is copper: 1.5 mm² for lights, 2.5 mm² for sockets, 4 mm² for an air conditioner, with an earth wire of the same size in every circuit. CPWD asks for 4 mm² on power wiring in its own works; the draft IS 4648 allows 2.5 mm² on a socket circuit of up to two outlets, and this report follows the draft. For a long run the electrician should check the voltage drop, which this report does not work out.

PASS Draft IS 4648 cl 6.2.9

Shock protection

A 30 mA residual current breaker (RCCB) is counted on every board. The extra device of up to 300 mA at the point of supply that the draft asks for is not counted.

PASS Draft IS 4648 cl 7

Design load

The design load is the larger of 75 W for every m² of floor (the minimum in the draft IS 4648) and a share of the big appliances. For yours it is about 10.5 kW, so a three-phase supply is counted. Your electricity board fixes the sanctioned load and decides single or three phase.

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NOTE Draft IS 4648 cl 8; IS 3043

Earthing

2 earth electrodes are counted. The number needed depends on the soil, so your electrician must measure the earth resistance after installation.

NOTE CPWD DAR 2016 items 1.7; tender conduit tables

Conduit size

Conduit sizes follow the CPWD analysis (three wires of up to 4 mm² in 20 mm). Some tender specifications allow fewer wires in 20 mm, so an electrician may choose the next size up. This changes the conduit price, not the number of metres.

Please read

- The room-by-room points follow the BIS draft revision of IS 4648 (September 2024), which is not yet published. The published standard of 1968 asks for far fewer sockets. Choose Basic if you want that level.
- Wiring for a lift, a generator, solar panels, a swimming pool or an intercom is not counted.

How far off can this be

- Points and sockets: from 30% below to 40% above the figure shown.
- Copper wire: from 25% below to 35% above the figure shown.
- Conduit: from 20% below to 30% above the figure shown.
- Circuits and boards: from 20% below to 25% above the figure shown.
- Switches, boxes and fittings: from 25% below to 35% above the figure shown.

Assumptions

- Code (draft): lights, fans and sockets for each room follow Tables 2 and 3 of the BIS draft revision of IS 4648 (September 2024). The draft is not published, and a few columns were read by position, so the room-wise counts are a guide. Counts rise in proportion to room area, one step for each 12 m², and are not rounded up to whole blocks (the draft says 10 to 12 m² or part, so the 12 m² and the proportional count are this tool's choice; read strictly, "or part" would round up).
- Code: a point is the whole wire run from the controlling switch to the outlet (CPWD GS 3.4). The wire, conduit, bends, couplers and clips in each point come from CPWD Delhi Analysis of Rates 2016, items 1.1 and 1.7: Group A is 7.5 m of wire and 2.5 m of conduit a point, Group B 10 m and 3.5 m, plus 5%.
- Assumed: homes up to 1,000 sq ft use Group A and homes of 2,500 sq ft or more use Group B, with a straight line between. The CPWD documents do not say where one group ends.
- Code: lighting circuits, power circuits and the one-circuit-for-each-big-appliance rule follow CPWD GS 3.10, IS 4648 cl 7 and the draft cl 6.2. Where they differ, the stricter limit is used (8 lighting points, two 16 A outlets).
- Assumed: up to 8 six-amp sockets share a circuit. The sources disagree (three sockets in CPWD GS 3.10, no clear limit in the draft), so the figure is a modern-practice value and the circuit count is the least certain part of this report.
- Derived: copper wire is 1.01 m for each metre of route (CPWD DAR), with 5% added for cutting waste, and bought in coils of 90 m for sizes up to 6 mm². The 90 m coil is the common pack; no standard fixes it.
- Assumed: the run from a board to the first point of a circuit is 0.6 × the side of the home plus 3 m for lights, 0.7 × plus 3 m for sockets and 0.8 × plus 3 m for large appliances. A socket is tapped from the nearest point over 2.5 to 4 m.
- Assumed: carpet area is 75% of built-up area, and room sizes are shared out of it (hall 1.6, bedroom 1.0, kitchen 0.8, bathroom 0.35 parts), held between sensible limits (a bedroom 9.5 to 20 m², a hall 9.5 to 30 m²). Floor area beyond those limits is taken to be rooms you did not list, which are not counted.
- Derived: design load is the larger of 75 W per m² of carpet area (draft IS 4648 cl 7) and 0.6 × the big appliances plus 1.5 kW. No standard gives a diversity factor for homes. Mains cables take their size from the steps of draft Table 4 applied to the design load; the draft applies that table to the connected load and, from 10 kW, asks for a size worked from the current ratings of IS 732:2019, which this tool does not read. Larger sizes are Assumed.
- Assumed: single-phase up to a design load of 10 kW and three-phase above it. Your electricity board decides this, and the wire and board sizes change if it differs.

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- Assumed: 2 earth electrodes for the building and 10 m of earth strip from each. The number of pits depends on the soil.
- Assumed: one 7.4 kW EV charger circuit for every five parking spaces, at least one, when you ask for EV charging. The wire is 6 mm².
- Assumed: one switch for each point, one fan hook, one regulator and one ceiling rose for each fan; a switch box holds about four modules.

Not counted in this report

- Rooms you did not list, such as a study, a family lounge or a guest room. Add them to the bedroom count if you want them wired.
- The electricity meter, the service connection and the board's own cable up to the meter.
- Lifts, generators, solar panels, battery banks, intercoms, CCTV, security alarms and home automation.
- Light fittings, fans, air conditioners, water heaters, the inverter and its batteries, and the pumps themselves.
- Lightning protection and surge protection devices (IS 2309; IS 732:2019 cl 5.3.5, the clause the BIS draft of IS 4648 gives for surge protection).
- A residual current device of up to 300 mA at the point of supply (draft IS 4648 cl 6.2.9), and the class (B or C) and the short-circuit rating of the breakers, which this report does not state.
- Chasing the walls and making good after the wiring.
- Screws, tape, glands, lugs, ferrules, cable ties and other small items.
- The make, model and finish of any switch, socket or board.

Standards and sources used

- CPWD General Specifications for Electrical Works Part I (Internal) 2013, Sections 2 and 3
- CPWD Delhi Analysis of Rates for Electrical Works (E&M) 2016, items 1.1 to 1.17
- IS 4648:1968 Guide for electrical layout in residential buildings; BIS draft first revision, ETD 20, September 2024
- IS 732:2019 Code of practice for electrical wiring installations (named by the BIS draft of IS 4648; its text was not read)
- IS 3043:2018 Code of practice for earthing (not read in full; earthing counts are Assumed)
- NIMI Electrician trade theory, wiring of a dwelling (Table 1, the area yardstick)

NirmanShastra · India's IS-code construction quantities platform. This report is for estimation and planning only. It is not a substitute for drawings and calculations signed by a licensed professional. Where a figure is an assumption, change it and the quantities change.

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APPENDIX A

Calculation sheet

ElectricalPro: how every figure in this report was worked out

What this sheet is

This sheet shows how each quantity in your ElectricalPro report is worked out from your answers: the lights, fans and sockets in each room, the circuits and breakers they need, the boards, the wire and conduit to buy, and the earthing. It is written so that an electrician, a contractor or a bank's engineer can check the counting without the tool. It counts a wiring job for 1 home; it does not design one.

How to read it

Each row is one step. STEP says what is being found. FORMULA gives it in symbols. WORKING puts the numbers in. RESULT is the answer with its unit. SOURCE names the clause or table the step rests on. The columns take turns being a lighter and a darker cream, so each figure sits under its own heading. Amber rows are inputs: a figure you gave, or a value read from a code table. Green rows are figures that appear in the report. Every sum was carried out at full precision and is shown rounded, so re-keying the rounded numbers by hand may differ in the last digit.

Method in brief

1. Your answers give the number of floors, homes, bedrooms, bathrooms and kitchens and the large appliances. From them the model decides how many distribution boards there are and what each one serves: one for each home in flats, plus a common board; one on each floor in a house (sections 1 and 2).
2. Room sizes are not asked. The carpet area of a board (75% of its built-up area) is shared among its rooms in proportion to a weight for each kind of room, held between a smallest and a largest size. Each room gets its lights, fans and sockets for its size from the room-wise tables of the BIS draft of IS 4648, and the common areas are added (section 3).
3. Connected load is the watts of every point and large appliance added up. The design load is the larger of 75 W for each m² of carpet area and 0.6 × the large appliances + 1.5 kW. The supply is single-phase up to 10 kW and three-phase above it, unless you chose (section 4).
4. Points are grouped into circuits with fixed limits: up to 8 points on a lighting circuit, bathrooms on circuits of their own, up to 8 six-amp sockets and up to 2 sixteen-amp outlets on a socket circuit, and one circuit for each air conditioner, water heater, washing machine, dishwasher, pump, charger and inverter (section 5).
5. Each circuit gets the least copper size for its kind, taken from a table. The model does not work out the current a cable can carry, derate it for grouping or temperature, or calculate the voltage drop, and the sheet says so rather than show a calculation that was not done (section 6).
6. Breakers follow the circuits. Each board gets an incoming breaker chosen from its design load, a 30 mA residual current breaker (RCCB), and a size with one spare way (section 7). The cable from the meter to each board is sized from the design load of that board, and its length comes from the floors it climbs (section 8).
7. Wire and conduit are counted from the points, using the CPWD analysis-of-rates allowance for each point (in two groups that depend on the size of the home), and from the routes of the circuits, using route lengths that are the tool's own. Each metre of route takes 1.01 m of conductor, 5% is added for waste, and the result is rounded up to whole coils of 90 m (wire up to 6 mm²), to the next 5 m (larger wire) and to whole 3 m lengths (conduit) (section 9).
8. Earthing is counted as electrodes, earth strip and pit covers. The number of electrodes is an assumption and the earth resistance is not worked out (section 10).
9. Switches, sockets, boxes and conduit fittings are counted from the points and from the lengths of conduit, and every line of the buy list is rebuilt (section 11).
10. The range printed beside each total is the total multiplied by a low and a high factor of the tool's own (section 12).

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Example house, not your project

11. Every total, table and buy-list line printed here is compared with the same figure in the report. If any one disagrees, this sheet is left out of the report. In the working, up(x) means x rounded up to the next whole number, down(x) means rounded down, and Σ means add up. Figures are carried at full precision and shown rounded, so re-keying the printed numbers can differ in the last digit.

Read this before relying on the sheet

- This counts a wiring job. It does not design it. No cable current rating, derating for grouping or temperature, voltage drop, fault level, conduit fill or discrimination between breakers is worked. Wire sizes are the least sizes for each kind of circuit from a table; IS 732:2019 sizes a cable by its current rating, its grouping and its voltage drop, so a long run, a hot place or a heavy load can need a larger size than shown.
- The mains cable is sized from the design load, not the connected load. Draft IS 4648 Table 4 gives the mains and sub-mains for the total connected load, up to 10 kW. The tool applies the steps of that table to the design load, which is smaller because of its own allowance for diversity (section 4); that is the tool's choice. For a connected load of 10 kW or more the draft asks for a diversity factor, the current worked out, a size taken from the current ratings of IS 732:2019 (Annex T, with derating factors) and one size higher. The tool does not read those tables, so a mains size above the draft's table is an assumption to be confirmed by an electrician or the electricity board.
- The incoming breaker is chosen from the design load alone. It is not compared with the design current or with the current rating of the cable it feeds. For example, for a design load over 9.2 up to 10 kW (single-phase) the tables give a 63 A incomer and a 10 mm² mains cable, and whether that cable can carry 63 A is not checked. Section 7 prints the design current at a stated 230 V (415 V three-phase) and a power factor of 0.9, for information only; the tool uses neither.
- Draft IS 4648 cl 6.2.9 also asks for a residual current device of up to 300 mA at the point of supply. It is not counted. One 30 mA residual current breaker (RCCB) is counted for each board and serves every circuit on it (up to 21 on the largest board here), so a fault on any one circuit trips them all; splitting the circuits between RCCBs is not counted. No earth leakage breaker (ELCB) is counted.
- Breakers are counted by rating only. Their class and short-circuit rating are not stated: the draft (cl 6.2.8) asks for B-class breakers of not more than 6 A on lighting circuits and B or C on power circuits, depending on the load, and a short-circuit rating in kA is not given. The tool does not check any breaker against the fault level.
- Room sizes are not asked. They are shared out of 75% of the built-up area by weights that are the tool's own, and floor area beyond the largest size of a room is taken to be rooms you did not list, which are not counted. The count of points is sensitive to these sizes. Lights, fans and sockets rise in proportion to the area of a room, one step for each 12 m², and are not rounded up to whole blocks. The draft's tables say "per 10-12 m² or part": 12 m² and the proportional count are the tool's choice, and read strictly, "or part" would give a room just over 12 m² twice the points (section 3.3 shows the difference).
- Each tool of the NirmanShastra suite lays out the same house by its own rule. The rooms and room sizes used here are for counting points and will not match the rooms and sizes in the other tools' reports, InteriorPro for one: a living room or a bathroom can be a good deal larger or smaller here than there for the same house. The common areas (stair, terrace, gate and parking points) are fixed counts of the tool, and a terrace and stair-room point is added to the ground floor of every house, even one with a single floor.
- At the Standard level the points in each room follow the BIS draft of IS 4648 (first revision, ETD 20, September 2024), which is not a published standard, and a few columns of its tables were read by position. The published IS 4648:1968 asks for far fewer sockets; choose Basic for that level. The Standard level also adds a dishwasher outlet and circuit to each home that has a washing machine point, although a dishwasher is not one of the questions; the draft's Table 6 gives it 1.5 kW, under the 2 kW at which its cl 6.2.2 asks for a circuit of its own.
- The length of the wire from a board to its first point, from the meter to a board, and from a point to a socket are the tool's own assumptions. They are not measured from a drawing, and a different layout changes the wire and conduit by a good deal. The allowance in each point and the 1.01 m of conductor for each metre of route come from the CPWD analysis of rates; where one group ends and the other starts (1,000 and 2,500 sq ft) is an assumption.
- Wire up to 6 mm² is bought in whole coils of 90 m for each size and colour, and larger sizes by the metre, so the wire to buy is more than the wire counted: here 2,790 m is bought against 1,818 m counted (53% more), of which 5% is waste and the rest is rounding up. The 90 m coil is the tool's choice of pack; a shop may sell part coils or cut lengths, which would lower the quantity to buy.
- The sources disagree on how many 6 A sockets share a circuit (CPWD GS 3.10 allows three). The model allows 8, so the circuit and breaker counts are the least certain part of the report. Circuits are filled by the number of points, not by watts: the draft's load limits on a circuit (1,000 W on lighting, 3,000 W on a power circuit) are not checked.
- The design load is the tool's own: the larger of an area minimum from the draft IS 4648 and a share of the large appliances. No standard read gives a diversity factor for homes. Your electricity board fixes the sanctioned load and decides single-phase or three-phase, and the incoming breaker and cable follow from that.

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example house, not your project

- Earthing is counted, not designed: the number of electrodes is an assumption and the earth resistance is neither calculated nor assumed. It must be measured after installation, and more electrodes added if it is too high (IS 3043 is the code for earthing; it was not read in full).
- A clause number given here for a standard is a pointer to check, not a quotation. The clauses and tables of the BIS draft of IS 4648 named here (cl 6.2.1, 6.2.2, 6.2.8, 6.2.9, 7.2 and 8, and Tables 2 to 6) were re-read against the draft text. The clause numbers given for IS 4648:1968, IS 3043, CPWD GS and CPWD DAR items, and NBC Part 4 are as given in the tool's research notes and were not re-read against the published text.
- Lifts, generators, solar panels, battery banks, intercoms, CCTV, home automation, light fittings, fans and appliances themselves, the meter, lightning protection and surge protection are not counted. The ranges beside the totals are the tool's judgement, not a statistic.

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example house, not your project

1. Your answers and the values worked from them

The answers you gave, and the few figures the model works out from them before it counts anything: how many homes, how many parking spaces, how many pumps, and how many air conditioners each home gets.

1.1 Your answers

STEP	FORMULA	WORKING	RESULT	SOURCE
Building type One home across every floor entered.			**A house**	Your answer
Floors above ground			**2**	Your answer
Bedrooms in the house			**3**	Your answer
Bathrooms in the house			**3**	Your answer
Kitchens in the house			**1**	Your answer
Balconies in the house			**1**	Your answer
Dining room apart from the kitchen			**No**	Your answer
Pooja room			**No**	Your answer
Wash area or dry balcony with a washing machine point At the Standard level a yes also adds a dishwasher outlet and circuit (one for each home, on the ground floor of a house). A dishwasher is not one of the questions.			**Yes**	Your answer
Rooms with an air conditioner			**1**	Your answer
Water heater in every bathroom			**Yes**	Your answer
Inverter for lights and fans			**No**	Your answer
Charger for an electric vehicle			**No**	Your answer
Parking spaces (as given, or the default) The default is one space for a house and none for flats.			**1**	Your answer
Wiring level Room-wise points of the BIS draft of IS 4648.			**Standard**	Your answer
Supply			**Not sure: chosen from the design load**	Your answer
Floor to floor height			**3.00 m**	Engine rule: used when none is given
State and city Not used in the wiring count: the points, wire and fittings do not change with the place.			**Uttar Pradesh, Lucknow**	Your answer

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1.2 Floor areas

STEP	FORMULA	WORKING	RESULT	SOURCE
Ground floor in m²	A (m²) = A (sq ft) × 0.09290304	1,000.00 × 0.09290304	**92.90 m²**	1 ft = 0.3048 m exactly, so 1 sq ft = 0.09290304 m²

FLOOR	BUILT-UP (SQ FT)	BUILT-UP (M²)
Ground floor	1,000.00	92.90
First floor	1,000.00	92.90

1.3 Values worked from the answers

STEP	FORMULA	WORKING	RESULT	SOURCE
Homes in the building A house is one home, whatever the floors.			**1**	Engine rule
Parking spaces counted	spaces = homes if EV charging is asked for and no spaces are given, else the spaces given	EV charging asked for: No; spaces given: 1; homes: 1	**1**	NirmanShastra assumption
Transfer pumps	pumps = 2 if homes ≥ 2, else 1	homes = 1	**1**	NirmanShastra assumption (one working pump and one standing by)
EV charger circuits No charger was asked for.			**None**	Your answer
Air-conditioned rooms counted for each home	rooms = the smaller of the rooms asked for and (bedrooms + 1)	min(1, 3 + 1)	**1**	NirmanShastra assumption (the bedrooms and the hall)

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2. The boards: what each one serves

The model splits the building into distribution boards and counts everything board by board. A board is repeated for every home that has the same one.

2.1 How the boards are chosen

STEP	FORMULA	WORKING	RESULT	SOURCE
A house	One board on each floor that has a bedroom, a bathroom, a kitchen or the hall (the hall is on the ground floor). The ground-floor board takes the supply from the meter; each board above is fed from it by a sub-main.			Engine rule
Rooms shared over the floors	Floor by floor from the ground floor: bedrooms 2, 1; bathrooms 2, 1; kitchens 1, 0; balconies 1, 0. They are shared as evenly as whole numbers allow, the ground floor first. The dining room, pooja room, wash area and entrance are on the ground floor.			NirmanShastra assumption
Air conditioners over the floors	The 1 air-conditioned room is placed from the ground floor up, at most one for each bedroom and the hall on a floor.			NirmanShastra assumption
Carpet area	Carpet area is 75% of the built-up area of the board.			NirmanShastra assumption (carpet share of built-up area)

2.2 The boards

BOARD	COPIES	BUILT-UP EACH (M²)	CARPET EACH (M²)	ROLE	AIR CON	HEATERS	WASHER	DISHWASHER	PUMPS	EV CIRCUITS
Ground floor	1	92.90	69.68	Takes the supply	1	2	1	1	1	0
First floor	1	92.90	69.68	Fed from the main board	0	1	0	0	0	0
Boards in the building	**2**				**1**	**3**	**1**	**1**	**1**	**0**

2.3 Rooms on each kind of board

BOARD	HALL	DINING	KITCHENS	BEDROOMS	BATHROOMS	PASSAGE	ENTRANCE	BALCONIES	WASH AREA	POOJA
Ground floor	1	0	1	2	2	1	1	1	1	0
First floor	0	0	0	1	1	1	0	0	0	0

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3. Points and sockets, room by room and board by board

Room sizes are not asked, so the model shares the carpet area of a board among its rooms and gives each room its lights, fans and sockets for its size. One board is worked in full below; the tables give the rest.

3.1 Room weights and size limits

ROOM	WEIGHT	SMALLEST (M²)	LARGEST (M²)
Hall or living room	1.6	9.5	30
Dining room	0.9	6	14
Kitchen	0.8	5	14
Bedroom	1	9.5	20
Bathroom	0.35	2.8	6
Passage	0.5	3	10
Wash area or dry balcony	0.3	2.5	6
Pooja room	0.25	1.5	3
Balcony (fixed size)		4.5	4.5
Entrance (fixed size)		4	4

3.2 Points the model gives each room (Standard level)

ROOM	LIGHTS	FANS	6 A	6/16 A	EXHAUST	BELLS	TV	DATA
Hall or living room	4	1	8	1	0	0	1	1
Dining room	2	1	2	0	0	0	0	0
Kitchen	2	1	4	4	1	1	0	0
Bedroom	5	1	7	1	0	0	1	1
Bathroom	2	0	1	0	1	0	0	0
Passage	1	0	2	0	0	0	0	0
Entrance	1	0	1	0	0	1	0	0
Balcony	1	0	1	0	0	0	0	0
Wash area or dry balcony	1	0	0	0	0	0	0	0
Pooja room	1	0	1	0	0	0	0	0

3.3 Worked example: Ground floor

STEP	FORMULA	WORKING	RESULT	SOURCE
Board worked here The board with the most points. Every other board is worked the same way; the tables below give them all.			**Ground floor**	Engine rule
Built-up area of this floor			**92.90 m²**	Your answer
Carpet area	carpet = built-up area × 0.75	92.90 × 0.75	**69.68 m²**	NirmanShastra assumption (carpet share of built-up area)

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Area of the balconies and the entrance (fixed sizes)	fixed = balconies × 4.5 + entrance × 4	1 × 4.5 + 1 × 4	**8.50 m²**	NirmanShastra assumption
Total weight of the rooms to be sized	weight = Σ (number of rooms × the weight of that room)	1 × 1.6 + 1 × 0.8 + 2 × 1 + 2 × 0.35 + 1 × 0.5 + 1 × 0.3	**5.90**	NirmanShastra assumption (room weights, table 3.1)
Area for each unit of weight	k = (carpet – fixed rooms) ÷ weight, never below 0	max(0, 69.68 – 8.50) ÷ 5.90	**10.369 m² per unit**	NirmanShastra assumption
Area of one bedroom	area = k × weight, held between the smallest and the largest area	min(20, max(9.5, 10.369 × 1))	**10.37 m²**	NirmanShastra assumption (limits, table 3.1)
How the count rises with the size of a room	The draft gives lights, fans and sockets "per 10-12 m² or part" of a room. The model takes 12 m² as one unit, counts the units in proportion to the area (an 18 m² room is 1.5 units, and any room under 12 m² is one unit) and rounds each count to the nearest whole point. It does not round the area up to whole blocks. That is the tool's choice, and 12 m² is its choice within the draft's 10 to 12 m²; read strictly, "or part" would give a room just over 12 m² two blocks and about twice the points.			Draft IS 4648 Tables 2 and 3 (room-wise points)
Units of floor area in one room	units = the larger of 1 and area ÷ 12 m²	max(1, 10.37 ÷ 12)	**1.0000**	Draft IS 4648 Tables 2 and 3 (room-wise points): 12 m² is the tool's choice; the count is in proportion to the area
Lights in all 2 bedrooms	points = rooms × round(points for each unit × units)	2 × round(5 × 1.0000)	**10**	Draft IS 4648 Tables 2 and 3 (room-wise points)
Fans in all 2 bedrooms	points = rooms × round(points for each unit × units)	2 × round(1 × 1.0000)	**2**	Draft IS 4648 Tables 2 and 3 (room-wise points)
6 A sockets in all 2 bedrooms	points = rooms × round(points for each unit × units)	2 × round(7 × 1.0000)	**14**	Draft IS 4648 Tables 2 and 3 (room-wise points)
6/16 A sockets in all 2 bedrooms	points = rooms × round(points for each unit × units)	2 × round(1 × 1.0000)	**2**	Draft IS 4648 Tables 2 and 3 (room-wise points)
TV points in all 2 bedrooms	points = rooms × points in one room	2 × 1	**2**	Draft IS 4648 Tables 2 and 3 (room-wise points)
Data points in all 2 bedrooms	points = rooms × points in one room	2 × 1	**2**	Draft IS 4648 Tables 2 and 3 (room-wise points)
Comparison: the largest room, hall or living room	units = area ÷ 12 m², as the model counts them	16.59 ÷ 12	**1.3825**	For comparison only
Comparison: whole blocks if "or part" were rounded up (not used)	blocks = up(area ÷ 12 m²)	up(16.59 ÷ 12)	**2**	For comparison only: the report does not use this
Comparison: lights in the hall or living room, as the model counts them	points = rooms × round(points for each unit × units)	1 × round(4 × 1.3825)	**6**	As in the report
Comparison: lights in the hall or living room, with whole blocks (not used)	points = rooms × points for each block × whole blocks	1 × 4 × 2	**8**	For comparison only: the report does not use this
Comparison: 6 A sockets in the hall or living room, as the model counts them	points = rooms × round(points for each unit × units)	1 × round(8 × 1.3825)	**11**	As in the report
Comparison: 6 A sockets in the hall or living room, with whole blocks (not used)	points = rooms × points for each block × whole blocks	1 × 8 × 2	**16**	For comparison only: the report does not use this

3.4 Every room on that board

ROOM	NUMBER	AREA OF ONE (M²)	UNITS	LIGHTS	FANS	EXHAUST	BELLS	6 A	6/16 A	TV	DATA
Hall or living room	1	16.59	1.38	6	1	0	0	11	1	1	1
Kitchen and dining	1	8.30	1.00	2	1	1	1	4	4	0	0

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Bedroom	2	10.37	1.00	10	2	0	0	14	2	2	2
Bathroom	2	3.63	1.00	4	0	2	0	2	0	0	0
Passage	1	5.18	1.00	1	0	0	0	2	0	0	0
Entrance	1	4.00	1.00	1	0	0	1	1	0	0	0
Balcony	1	4.50	1.00	1	0	0	0	1	0	0	0
Wash area or dry balcony	1	3.11	1.00	1	0	0	0	0	0	0	0
Staircase	1			2	0	0	0	0	0	0	0
Terrace and stair room	1			2	0	0	0	1	0	0	0
Gate and porch	1			2	0	0	0	0	0	0	0
Parking	1			2	0	0	0	2	0	0	0
One copy of this board				**34**	**4**	**3**	**2**	**38**	**7**	**3**	**3**

3.5 Points on every board

BOARD	COPIES	LIGHTS	FANS	EXHAUST	BELLS	6 A	6/16 A	TV	DATA
Ground floor	1	34	4	3	2	38	7	3	3
First floor	1	13	2	1	0	15	2	1	1
Whole building (× copies)		**47**	**6**	**4**	**2**	**53**	**9**	**4**	**4**

3.6 Outlets with a circuit of their own

STEP	FORMULA	WORKING	RESULT	SOURCE
Air conditioner outlets	Σ over boards (air conditioners on a board × copies)	1	**1**	Engine rule
Water heater outlets	Σ over boards (heaters × copies); one in every bathroom if asked for	3	**3**	Engine rule
Washing machine and dishwasher outlets The Standard level adds one dishwasher outlet that you did not ask for, one for each home that has the washing machine point. The draft's Table 6 gives a dishwasher 1.5 kW, below the 2 kW at which its cl 6.2.2 asks for a circuit of its own; the model gives it one all the same.	washers + dishwashers (the dishwasher only at the Standard level)	1 + 1	**2**	Engine rule
Pump outlets	pumps worked out in section 1	1	**1**	NirmanShastra assumption
EV charger points	EV circuits worked out in section 1	0	**0**	NirmanShastra assumption
Inverter connections	one for each home whose board takes the supply, if an inverter is asked for	0	**0**	NirmanShastra assumption

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4. Connected load, diversity and design load

Connected load is what every point could draw if all ran at once; it sizes nothing by itself. The design load (maximum demand) is what the supply, the incomer and the mains are sized for. The model allows for diversity only through the 0.6 share it takes of the large appliances.

4.1 Connected load

STEP	FORMULA	WORKING	RESULT	SOURCE
Lights	kW = light points × W for each ÷ 1000	47 × 50 ÷ 1000	**2.35 kW**	Draft IS 4648 Table 5 (load per point): 50 W a light point
Fans and exhaust fans	kW = (fans × W + exhaust fans × W) ÷ 1000	(6 × 75 + 4 × 75) ÷ 1000	**0.75 kW**	Draft IS 4648 Table 5 (load per point): 75 W a fan point; the exhaust fan is taken at the same
6 A sockets	kW = 6 A sockets × W for each ÷ 1000	53 × 100 ÷ 1000	**5.30 kW**	Draft IS 4648 Table 5 (load per point): 100 W a 6 A outlet
6/16 A sockets	kW = 6/16 A sockets × W for each ÷ 1000	9 × 1,000 ÷ 1000	**9.00 kW**	CPWD GS 3.9 (16 A socket): 1000 W
Air conditioners	kW = air conditioners × W each ÷ 1000	1 × 1,500 ÷ 1000	**1.50 kW**	Draft IS 4648 Table 6 (appliance loads)
Water heaters	kW = water heaters × W each ÷ 1000	3 × 2,000 ÷ 1000	**6.00 kW**	Draft IS 4648 Table 6 (appliance loads)
Washing machine and dishwasher	kW = (washing machines × W + dishwashers × W) ÷ 1000	(1 × 2,000 + 1 × 1,500) ÷ 1000	**3.50 kW**	Draft IS 4648 Table 6 (appliance loads)
Pumps and EV chargers	kW = (pumps × W + EV chargers × W) ÷ 1000	(1 × 1,100 + 0 × 7,400) ÷ 1000	**1.10 kW**	NirmanShastra assumption: the pump and the 7.4 kW charger are the model's own values
Total connected load	connected load = the sum of the eight lines above	2.35 + 0.75 + 5.30 + 9.00 + 1.50 + 6.00 + 3.50 + 1.10	**29.50 kW**	What the points could draw if everything ran at once

4.2 Connected load board by board

BOARD	COPIES	LIGHTS	FANS	6 A	6/16 A	AIR CON	HEATERS	WASHER, DISHWASHER	PUMPS, EV	ONE COPY
Ground floor	1	1.70	0.53	3.80	7.00	1.50	4.00	3.50	1.10	23.13
First floor	1	0.65	0.23	1.50	2.00	0.00	2.00	0.00	0.00	6.38
Whole building (× copies)		**2.35**	**0.75**	**5.30**	**9.00**	**1.50**	**6.00**	**3.50**	**1.10**	**29.50**

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4.3 Design load: worked example

STEP	FORMULA	WORKING	RESULT	SOURCE
Consumer worked here			**The whole house**	Engine rule
Carpet area of the house	carpet area = the sum of the carpet areas of the floors	69.677 + 69.677	**139.35 m²**	Engine rule
Large appliances with a circuit of their own	kW = (A/C × W + heaters × W + washer × W + dishwasher × W + pumps × W + EV × W) ÷ 1000	(1 × 1,500 + 3 × 2,000 + 1 × 2,000 + 1 × 1,500 + 1 × 1,100 + 0 × 7,400) ÷ 1000	**12.10 kW**	Draft IS 4648 Table 6 (appliance loads)
Least design load, by floor area	kW = W for each m² of carpet area × carpet area ÷ 1	0.075 × 139.35	**10.45 kW**	Draft IS 4648 cl 7 (design load): not less than 75 W for each m² of carpet area
Design load from the large appliances	kW = share of the large appliances × their kW + base load	0.6 × 12.10 + 1.5	**8.76 kW**	NirmanShastra assumption: the share and the base load are the tool's own; no standard gives a diversity factor for homes
Design load (maximum demand)	design load = the larger of the two	max(10.45, 8.76)	**10.45 kW**	Draft IS 4648 cl 7 (design load)

4.4 Design load of every consumer

CONSUMER	COPIES	CARPET (M²)	LARGE APPLIANCES (KW)	BY AREA (KW)	BY APPLIANCES (KW)	DESIGN LOAD (KW)	SUPPLY
The whole house	1	139.35	12.10	10.45	8.76	10.45	Three-phase

4.5 Single-phase or three-phase

STEP	FORMULA	WORKING	RESULT	SOURCE
Supply taken Chosen from the design load: the largest is 10.5 kW.	three-phase if you chose it, or if the design load is above 10 kW; single-phase if you chose that		**Three-phase**	NirmanShastra assumption: your electricity board decides this

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5. Circuits

Each circuit is one breaker, one run of cable and a limited number of points. The model counts how many circuits each board needs from the points it carries and the large appliances it serves.

5.1 What the model puts on one circuit

CIRCUIT	COPPER (MM²)	BREAKER	WHAT GOES ON ONE CIRCUIT	SOURCE
Lights and fans	1.5	6 A	Up to 8 points, and at least 2 lighting circuits in a home (the bathroom circuits count). The draft also gives 1,000 W; the model counts points only and does not check the watts	Draft IS 4648 cl 6.2.1 note (8 points; CPWD GS 3.10(i) allows 10 points or 800 W)
Bathroom lights and exhaust fans	1.5	6 A	Bathrooms on a circuit of their own, up to 8 points	Draft IS 4648 cl 6.2.1 note (8 points; CPWD GS 3.10(i) allows 10 points or 800 W)
6 A sockets	2.5	10 A	Up to 8 sockets. The sources disagree on this limit (CPWD GS 3.10 allows three), so it is an assumption	Draft IS 4648 Table 4 (wire sizes); Draft IS 4648 cl 6.2.8 (breaker ratings); NirmanShastra assumption
6/16 A sockets	2.5	16 A	Up to 2 outlets	Draft IS 4648 cl 6.2.2; CPWD GS 3.10(iii)
Air conditioner	4	20 A	One circuit for each air conditioner	Draft IS 4648 cl 6.2.2; CPWD GS 3.10(iii)
Water heater	2.5	16 A	One circuit for each water heater	Draft IS 4648 cl 6.2.2; CPWD GS 3.10(iii)
Washing machine and dishwasher	2.5	16 A	One circuit for each washing machine and each dishwasher. The Standard level adds the dishwasher. The draft asks for a separate circuit at 2 kW or more and gives a dishwasher 1.5 kW (Table 6), so the dishwasher circuit is the model's choice	Draft IS 4648 cl 6.2.2; CPWD GS 3.10(iii); NirmanShastra assumption (the dishwasher)
Transfer pump	2.5	16 A	One circuit for each pump	NirmanShastra assumption
EV charger	6	32 A	One circuit for each charging point	NirmanShastra assumption
Inverter	4	16 A	One circuit for each home that has an inverter	NirmanShastra assumption

5.2 Worked example: Ground floor

STEP	FORMULA	WORKING	RESULT	SOURCE
Board worked here The board with the most points.			**Ground floor**	Engine rule
Points on the board	points = lights + fans + exhaust fans + bells	34 + 4 + 3 + 2	**43**	CPWD GS 3.4 (what a point is)
Points in the bathrooms	bathroom points = bathroom lights + bathroom exhaust fans	4 + 2	**6**	Draft IS 4648 cl 6.2.1 note (8 points; CPWD GS 3.10(i) allows 10 points or 800 W)
Lighting points outside the bathrooms	points − bathroom points	43 − 6	**37**	Engine rule
Bathroom circuits	up(bathroom points ÷ 8)	up(6 ÷ 8)	**1**	Draft IS 4648 cl 6.2.1 note (8 points; CPWD GS 3.10(i) allows 10 points or 800 W)

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Lighting circuits	the largest of: 1 if there are lighting points, 2 less the bathroom circuits, and up(lighting points ÷ 8)	max(1, 2 − 1, up(37 ÷ 8))	**5**	Draft IS 4648 cl 6.2.1 note (8 points; CPWD GS 3.10(i) allows 10 points or 800 W)
6 A socket circuits	up(6 A sockets ÷ 8)	up(38 ÷ 8)	**5**	NirmanShastra assumption: the sources disagree on the limit
6/16 A socket circuits	up(6/16 A sockets ÷ 2)	up(7 ÷ 2)	**4**	Draft IS 4648 cl 6.2.2; CPWD GS 3.10(iii)
Air conditioner, water heater, washer and dishwasher circuits	one circuit for each	1 + 2 + 1 + 1	**5**	Draft IS 4648 cl 6.2.2; CPWD GS 3.10(iii)
Inverter circuit	one for each home with an inverter, on the board that takes the supply	0	**0**	NirmanShastra assumption

5.3 Circuits on every board

BOARD	COPIES	LIGHTS	BATH	6 A	6/16 A	AIR CON	HEATER	WASHER, DISHWASHER	PUMP	EV	INVERTER	ONE COPY
Ground floor	1	5	1	5	4	1	2	2	1	0	0	21
First floor	1	2	1	2	1	0	1	0	0	0	0	7
Whole building (× copies)		**7**	**2**	**7**	**5**	**1**	**3**	**2**	**1**	**0**	**0**	**28**

5.4 Circuits in the whole building

CIRCUIT	NUMBER	BREAKER	CABLE
Lights and fans	7	6 A	1.5 mm², 2 + earth
Bathroom lights and exhaust fans	2	6 A	1.5 mm², 2 + earth
6 A sockets	7	10 A	2.5 mm², 2 + earth
6/16 A sockets	5	16 A	2.5 mm², 2 + earth
Air conditioner	1	20 A	4 mm², 2 + earth
Water heater	3	16 A	2.5 mm², 2 + earth
Washing machine and dishwasher	2	16 A	2.5 mm², 2 + earth
Transfer pump	1	16 A	2.5 mm², 2 + earth
All circuits	**28**		

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6. Wire size for each circuit

The report gives the least copper size for each kind of circuit and for the supply cable. They are taken from tables, not worked out from current, derating or voltage drop; this section shows the tables and says plainly what is not checked.

6.1 How the size is chosen

STEP	FORMULA	WORKING	RESULT	SOURCE
What the model does	Each circuit gets the least copper size for its kind (table 6.2). The size does not change with the length of the run, the number of circuits sharing a conduit or the temperature.			Engine rule
What the model does not do	It does not work out the current a cable can carry, derate it for grouping or temperature, calculate the voltage drop, or check fault current. IS 732:2019 sizes a cable by those things, so a long run needs more than the sizes shown here.			Not worked in this model
Copper	All wire is copper. Every circuit carries an earth wire of the same size as its live wire.			Draft IS 4648 Table 4 (wire sizes)

6.2 Least size for each circuit

CIRCUIT	COPPER (MM²)	EARTH WIRE (MM²)	CONDUIT (MM)	BREAKER	SOURCE OF THE SIZE
Lights, fans and the bell	1.5	1.5	20	6 A	Draft IS 4648 Table 4 (wire sizes): 1.5 mm² for point wiring; draft cl 6.2.8: a breaker of up to 6 A on a lighting circuit
6 A sockets: chargers, TV, small appliances	2.5	2.5	20	10 A	Draft IS 4648 Table 4 gives 2.5 mm² from the board to the sockets; draft cl 6.2.8 allows up to 10 A where a circuit has more than two 6 A sockets.
16 A power sockets: fridge, microwave, iron	2.5	2.5	20	16 A	Draft IS 4648 Table 4 gives 2.5 mm² from the board to two 6/16 A outlets; draft cl 6.2.8 gives a 16 A breaker for up to two 16 A outlets.
Water heater, washing machine or dishwasher	2.5	2.5	20	16 A	Draft IS 4648 Table 4 gives 2.5 mm² from the board to one dedicated point of up to 3 kW (geyser, microwave, induction).
Air conditioner (2 to 3 TR)	4	4	20	20 A	Draft IS 4648 Table 4 gives 4 mm² from the board to one 16 or 25 A point of up to 5 kW (an air conditioner of 2 to 3 TR); draft cl 6.2.8 gives 20 or 25 A, with a C-curve breaker for the motor.
Transfer pump	2.5	2.5	20	16 A	NirmanShastra assumption
Inverter	4	4	20	16 A	NirmanShastra assumption
EV charger	6	6	25	32 A	NirmanShastra assumption

6.3 Worked example: the largest supply cable (meter to the main board)

STEP	FORMULA	WORKING	RESULT	SOURCE
Run worked here The run with the largest cable.			**Meter to the main board**	Engine rule
Design load this run is sized for			**10.45 kW**	Draft IS 4648 cl 7 (design load)
Supply			**Three-phase**	Engine rule

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Connected load this run serves			**29.5 kW**	Section 4
How the draft sizes the mains, and what the model does	Draft IS 4648 Table 4 gives the mains and sub-mains for the total connected load, up to 10 kW. The model applies the steps of that table to the design load, which is smaller because it allows for diversity (section 4). That is the tool's choice; the draft does not say to size by design load. Here the connected load is 29.5 kW and the design load 10.45 kW. For a connected load of 10 kW or more the draft asks for a diversity factor, the current worked out, a size taken from the current ratings of IS 732:2019 (Annex T) with further derating factors, and one size higher for future additions. The model reads none of those tables and adds no size, so 6 mm² is the step of the table for 10.45 kW, not a size worked from the current. An electrician or the electricity board should confirm the mains size.			Draft IS 4648 Table 4 (wire sizes)
Copper size from the table below	size = the step of the table that the design load falls in	design load 10.45 kW, three-phase	**6.0 mm²**	NirmanShastra assumption: the draft gives no size for this load or for three-phase
Earth wire	equal to the line wire up to 16 mm², half of it above, to the next size sold	6 mm² line wire	**6.0 mm²**	Draft IS 4648 cl 8 (earth conductor)
Conduit	conduit for this cable set from the conduit table below	6 mm² cable, 3-phase	**32 mm**	CPWD DAR 2016 item 1.7

6.4 Supply cable by design load, single-phase

DESIGN LOAD	COPPER (MM²)	SOURCE
Up to 5 kW	4 mm²	Draft IS 4648 Table 4, applied to the design load
Over 5 up to 7 kW	6 mm²	Draft IS 4648 Table 4, applied to the design load
Over 7 up to 10 kW	10 mm²	Draft IS 4648 Table 4, applied to the design load
Over 10 up to 14 kW	16 mm²	NirmanShastra assumption
Over 14 kW	25 mm²	NirmanShastra assumption

6.5 Supply cable by design load, three-phase

DESIGN LOAD	COPPER (MM²)	SOURCE
Up to 7 kW	4 mm²	NirmanShastra assumption
Over 7 up to 12 kW	6 mm²	NirmanShastra assumption
Over 12 up to 20 kW	10 mm²	NirmanShastra assumption
Over 20 kW	16 mm²	NirmanShastra assumption

6.6 Conduit for a cable set

COPPER (MM²)	CONDUIT, SINGLE-PHASE (MM)	CONDUIT, THREE-PHASE (MM)
Up to 4	20	25
Over 4 up to 10	25	32
Over 10 up to 16	32	40
Over 16 up to 25	32	50
Over 25	40	50

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7. Breakers, RCCBs and distribution boards

One breaker for each circuit, an incoming breaker and an RCCB on every board, and a board with enough ways for its circuits and one spare. The model counts RCCBs; it does not count a separate ELCB.

7.1 Outgoing breakers by rating

STEP	FORMULA	WORKING	RESULT	SOURCE
One-pole MCB, 6 A	breakers = the circuits that use this rating	9 (lighting and bathroom circuits)	**9**	Draft IS 4648 cl 6.2.8 (breaker ratings)
One-pole MCB, 10 A	breakers = the circuits that use this rating	7 (6 A socket circuits)	**7**	Draft IS 4648 cl 6.2.8 (breaker ratings)
One-pole MCB, 16 A	breakers = the circuits that use this rating	5 (6/16 A socket circuits) + 3 (water heater circuits) + 2 (washing machine and dishwasher circuits) + 1 (transfer pump circuits)	**11**	Draft IS 4648 cl 6.2.8 (breaker ratings)
One-pole MCB, 20 A	breakers = the circuits that use this rating	1 (air conditioner circuits)	**1**	Draft IS 4648 cl 6.2.8 (breaker ratings)

7.2 Worked example: sizing ground floor

STEP	FORMULA	WORKING	RESULT	SOURCE
Board worked here The board with the most ways.			**Ground floor**	Engine rule
Outgoing circuits	outgoing = lighting + bathroom + 6 A + 6/16 A + A/C + heaters + washer + dishwasher + inverter + pumps + EV	5 + 1 + 5 + 4 + 1 + 2 + 1 + 1 + 0 + 1 + 0	**21**	Engine rule
Ways needed	ways needed = outgoing circuits + 1 spare way	21 + 1	**22**	NirmanShastra assumption
Board size	the smallest size sold with at least that many ways (4, 6, 8, 12, 16, 24; above the list, the next multiple of 8)	smallest size ≥ 22, 3-phase	**24 ways**	Tender board schedules (a secondary source, not a standard)
Design load for this board			**10.45 kW**	Section 4
Design current (for information, not used by the model) A lower power factor gives a larger current.	I = P ÷ (√3 × V × power factor)	10.45 × 1000 ÷ (√3 × 415 × 0.9)	**16.2 A**	Illustration only: the model does not work this out. 415 V and a power factor of 0.9 are stated here for the sum; the model uses neither
Incoming breaker The rating comes from the design load alone. The model does not compare it with the design current above or with the current rating of the cable it feeds (6 mm² here). The incomer is at or above the design current. Whether that cable can carry 32 A is not checked.	main breaker for the design load, from the table below	design load 10.45 kW, 3-phase	**32 A**	Tender board schedules (a secondary source, not a standard); the steps above 32 A are assumptions

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Residual current breaker (RCCB) rating One 30 mA RCCB serves every circuit of the board (21 here). The extra device of up to 300 mA at the point of supply, which the draft asks for in the same clause, is not counted.	rating = 40 A up to a 40 A incomer, 63 A up to 63 A, else 100 A; sensitivity 30 mA	incomer 32 A	**40 A**	Draft IS 4648 cl 6.2.9 (a 30 mA residual current device on every installation); the rating steps are NirmanShastra assumption

7.3 Every board

BOARD	COPIES	OUTGOING	WAYS	SUPPLY	DESIGN LOAD USED (KW)	INCOMER	RCCB, 30 MA
Ground floor	1	21	24	Three-phase (TPN)	10.45	32 A, 4-pole	40 A, 4-pole
First floor	1	7	8	Single-phase (SPN)	5.23	32 A, 2-pole	40 A, 2-pole

7.4 Incoming breaker by design load, single-phase

DESIGN LOAD	INCOMER	SOURCE
Up to 7 kW	32 A	Tender board schedules (a secondary source, not a standard)
Over 7 up to 9.2 kW	40 A	Tender board schedules (a secondary source, not a standard)
Over 9.2 kW	63 A	NirmanShastra assumption

7.5 Incoming breaker by design load, three-phase

DESIGN LOAD	INCOMER	SOURCE
Up to 15 kW	32 A	Tender board schedules (a secondary source, not a standard)
Over 15 up to 25 kW	63 A	Tender board schedules (a secondary source, not a standard)
Over 25 kW	100 A	NirmanShastra assumption

7.6 Incomer and mains cable side by side (not compared by the model)

SUPPLY	DESIGN LOAD	INCOMER (A)	MAINS CABLE (MM²)
Single-phase	Up to 5 kW	32	4
Single-phase	Over 5 up to 7 kW	32	6
Single-phase	Over 7 up to 9.2 kW	40	10
Single-phase	Over 9.2 up to 10 kW	63	10
Single-phase	Over 10 up to 14 kW	63	16
Single-phase	Over 14 kW	63	25
Three-phase	Up to 7 kW	32	4
Three-phase	Over 7 up to 12 kW	32	6
Three-phase	Over 12 up to 15 kW	32	10
Three-phase	Over 15 up to 20 kW	63	10
Three-phase	Over 20 up to 25 kW	63	16
Three-phase	Over 25 kW	100	16

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7.7 Incomers, RCCBs and meter boards to buy

STEP	FORMULA	WORKING	RESULT	SOURCE
Incomer MCB, 2-pole, 32 A	boards with this incomer, all copies	1	**1**	Engine rule
Incomer MCB, 4-pole, 32 A	boards with this incomer, all copies	1	**1**	Engine rule
RCCB, 30 mA	one on every board, all copies	2	**2**	Draft IS 4648 cl 6.2.9 (a 30 mA residual current device on every installation)
Meter boards	one for each board that takes the supply, all copies	1	**1**	Engine rule

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8. Mains, rising mains and sub-mains

The cable from the meter to each board. Its size comes from the design load of the board (section 6), its length from the number of floors climbed.

8.1 Worked example: meter to the main board

STEP	FORMULA	WORKING	RESULT	SOURCE
Run worked here The run with the most cable.			**Meter to the main board**	Engine rule
Length of the main run			**10.0 m**	NirmanShastra assumption: meter to the main board
Runs of this kind (copies)			**1**	Engine rule
Wire of each line colour	length of wire = run length × runs × 1.01 (the wire is a little longer than its route)	10.0 × 1 × 1.01	**10.1 m**	CPWD DAR 2016 item 1.1: 1.01 m of conductor for each metre of route
Earth wire	same length, in the earth size for this cable	10.0 × 1 × 1.01	**10.1 m**	Draft IS 4648 cl 8 (earth conductor)
Colours	4 line colours: red, yellow, blue, black; and the green-yellow earth.			Earth: draft IS 4648 cl 8 (green-yellow). Line and neutral colours: NirmanShastra assumption (the usual colours)

8.2 Every run

RUN	CABLE	COPIES	EACH (M)	CONDUIT	ALL COPIES (M)
Meter to the main board	4 × 6 mm² + 6 mm² earth	1	10.0	32 mm	10.0
Main board to the first floor board	2 × 6 mm² + 6 mm² earth	1	7.0	25 mm	7.0
All runs					**17.0**

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9. Wire and conduit: lengths and what to buy

Wire and conduit are counted from the points and from the routes of the circuits, board by board, then added up by size and colour and rounded up to the packs they are sold in.

9.1 How a metre is counted

STEP	FORMULA	WORKING	RESULT	SOURCE
A point	A point is the whole run of wire from the controlling switch to the outlet. The wire, conduit, bends, couplers and clips in one point come from the CPWD analysis of rates, in two groups that depend on the size of the home.			CPWD GS 3.4 (what a point is); CPWD DAR 2016 item 1.1
Group A and Group B	Group A is used up to 1,000 sq ft of built-up area and Group B from 2,500 sq ft, with a straight line between the two. The CPWD documents do not say where one group ends, so these limits are an assumption.			NirmanShastra assumption
Routes	The wire from a board to the first point of a circuit is a route. Its length is a share of the side of the home plus 3 m, and the share depends on the kind of circuit (table 9.2). Route lengths are not measured from a drawing.			NirmanShastra assumption
Conductor and waste	Every metre of route takes 1.01 m of conductor. 5% is added for cutting waste. Wire up to 6 mm² is bought in coils of 90 m, larger sizes by the metre in steps of 5 m, and conduit in lengths of 3 m. The 90 m coil is the common pack; no standard fixes it.			NirmanShastra assumption (the tool names CPWD DAR 2016 for this; the item is not known); the pack sizes: NirmanShastra assumption

9.2 In one point, and the routes

IN ONE POINT	GROUP A	GROUP B	SOURCE
Live wire, 1.5 mm² (m)	3	4	CPWD DAR 2016 item 1.1
Neutral wire, 1.5 mm² (m)	3	4	CPWD DAR 2016 item 1.1
Earth wire, 1.5 mm² (m)	1.5	2	CPWD DAR 2016 item 1.1
Conduit, 20 mm (m)	2.5	3.5	CPWD DAR 2016 item 1.7
Couplers	0	2	CPWD DAR 2016 items 1.5 and 1.7
Saddles or clips	4	9	CPWD DAR 2016 items 1.5 and 1.7

9.3 Routes of the circuits

ROUTE	LENGTH	USED FOR
Board to the first light point	0.6 × side of the home + 3 m	Lighting circuits
Board to the first socket	0.7 × side of the home + 3 m	6 A and 6/16 A socket circuits
Board to the appliance	0.8 × side of the home + 3 m	Air conditioner, heater, washer and dishwasher circuits
Ground floor to the charger	0.8 × side of the largest floor + 3 m + floor height × floors up	EV charger circuits
Socket tap from the nearest point	2.5 m + 1.5 m × the Group factor	Sockets in the rooms
Board to the media box	0.5 × side of the home + 3 m	TV and data conduit
Transfer pump	15 m	Pump circuit
Inverter	6 m	Inverter circuit

9.4 Worked example: wire and conduit on Ground floor

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STEP	FORMULA	WORKING	RESULT	SOURCE
Board worked here The board with the most points.			**Ground floor**	Engine rule
Built-up area in sq ft	A (sq ft) = A (m²) ÷ 0.09290304	92.90 ÷ 0.09290304	**1,000.0 sq ft**	1 ft = 0.3048 m exactly
Group factor f	f = (A – A of Group A) ÷ (A of Group B – A of Group A), held between 0 and 1	max(0, min(1, (1,000.0 – 1,000) ÷ (2,500 – 1,000)))	**0.000**	NirmanShastra assumption
Live wire in one point	m = Group A + f × (Group B – Group A)	3 + 0.000 × (4 – 3)	**3.000 m**	CPWD DAR 2016 item 1.1
Earth wire in one point	m = Group A + f × (Group B – Group A)	1.5 + 0.000 × (2 – 1.5)	**1.500 m**	CPWD DAR 2016 item 1.1
Conduit in one point	m = Group A + f × (Group B – Group A)	2.5 + 0.000 × (3.5 – 2.5)	**2.500 m**	CPWD DAR 2016 item 1.7
Points on one copy of the board			**43**	Section 5
Copies of the board			**1**	Section 2
Live wire in the points (the neutral is the same)	length = points × m in one point × copies	43 × 3.000 × 1	**129.0 m**	CPWD DAR 2016 item 1.1
Earth wire in the points	length = points × m in one point × copies	43 × 1.500 × 1	**64.5 m**	CPWD DAR 2016 item 1.1
Conduit in the points	length = points × m in one point × copies	43 × 2.500 × 1	**107.5 m**	CPWD DAR 2016 item 1.7
Socket tap from the nearest point	tap = base + rise × f	2.5 + 1.5 × 0.000	**2.50 m**	NirmanShastra assumption
Route of all the socket taps This is also the conduit in the taps.	route = tap × (6 A sockets + 6/16 A sockets) × copies	2.50 × (38 + 7) × 1	**112.5 m**	NirmanShastra assumption
Wire in the socket taps, each colour	length = route × 1.01	112.5 × 1.01	**113.6 m**	NirmanShastra assumption (the tool names CPWD DAR 2016 for this; the item is not known)
Route to the first point of a lighting circuit	route = share × √A + base	0.6 × √92.90 + 3	**8.78 m**	NirmanShastra assumption
Route of all the lighting circuits This is also the conduit in these circuits.	route = route of one × (lighting circuits + bathroom circuits) × copies	8.78 × (5 + 1) × 1	**52.7 m**	NirmanShastra assumption
Wire in the lighting circuits, each colour	length = route × 1.01	52.7 × 1.01	**53.2 m**	NirmanShastra assumption (the tool names CPWD DAR 2016 for this; the item is not known)
Route to the first point of a socket circuit	route = share × √A + base	0.7 × √92.90 + 3	**9.75 m**	NirmanShastra assumption
Route of all the socket circuits This is also the conduit in these circuits.	route = route of one × (6 A circuits + 6/16 A circuits) × copies	9.747 × (5 + 4) × 1	**87.7 m**	NirmanShastra assumption
Wire in the socket circuits, each colour	length = route × 1.01	87.7 × 1.01	**88.6 m**	NirmanShastra assumption (the tool names CPWD DAR 2016 for this; the item is not known)
Route to the first point of an air conditioner circuit	route = share × √A + base	0.8 × √92.90 + 3	**10.71 m**	NirmanShastra assumption
Route of all the air conditioner circuits This is also the conduit in these circuits.	route = route of one × (air conditioners) × copies	10.71 × (1) × 1	**10.7 m**	NirmanShastra assumption

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Wire in the air conditioner circuits, each colour	length = route × 1.01	10.7 × 1.01	**10.8 m**	NirmanShastra assumption (the tool names CPWD DAR 2016 for this; the item is not known)
Route to the first point of a heater, washer or dishwasher circuit	route = share × √A + base	0.8 × √92.90 + 3	**10.71 m**	NirmanShastra assumption
Route of all the heater, washer and dishwasher circuits This is also the conduit in these circuits.	route = route of one × (heaters + washers + dishwashers) × copies	10.71 × (2 + 1 + 1) × 1	**42.8 m**	NirmanShastra assumption
Wire in the heater, washer and dishwasher circuits, each colour	length = route × 1.01	42.84 × 1.01	**43.3 m**	NirmanShastra assumption (the tool names CPWD DAR 2016 for this; the item is not known)
Route to the media box	route = share × √A + base	0.5 × √92.90 + 3	**7.82 m**	NirmanShastra assumption
Conduit for the TV and data points	length = (TV + data points) × route × copies	(3 + 3) × 7.82 × 1	**46.9 m**	NirmanShastra assumption

9.5 Pump, charger and inverter circuits

STEP	FORMULA	WORKING	RESULT	SOURCE
Route of the transfer pump circuits On the ground floor. 2.5 mm² wire.	route = metres for each pump × pumps	15 × 1	**15.0 m**	NirmanShastra assumption
Wire in the pump circuits, each colour	length = route × 1.01	15.0 × 1.01	**15.2 m**	NirmanShastra assumption (the tool names CPWD DAR 2016 for this; the item is not known)

9.6 Route lengths on every board

BOARD	COPIES	GROUP FACTOR	LIVE WIRE IN A POINT (M)	LIGHT ROUTE (M)	SOCKET ROUTE (M)	APPLIANCE ROUTE (M)	CHARGER ROUTE (M)	MEDIA ROUTE (M)
Ground floor	1	0.000	3.00	8.78	9.75	10.71	—	7.82
First floor	1	0.000	3.00	8.78	9.75	10.71	—	7.82

9.7 Where the wire and conduit go, whole building

WHERE IT GOES	WIRE (M)	CONDUIT (M)
Points (lights, fans, exhaust fans, bells)	442.5	147.5
Socket taps from the nearest point	469.7	155.0
Lighting circuits	239.5	79.0
Socket circuits	354.4	117.0
Air conditioner circuits	32.5	10.7
Water heater, washer, dishwasher circuits	162.3	53.6
Transfer pump circuit	45.5	15.0
Mains, rising mains and sub-mains	71.7	17.0
TV and data conduit	0.0	62.6
Whole building, before waste	**1,818.0**	**657.3**

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9.8 Worked example: wire to buy

STEP	FORMULA	WORKING	RESULT	SOURCE
Size and colour worked here The size and colour with the most wire.			**2.5 mm², red**	Engine rule
Length needed	length = the sum of the lengths from every source	156.6 (socket taps) + 118.1 (socket circuits) + 54.1 (heaters and washers) + 15.2 (pump)	**344 m**	Sum of sections 8 and 9
With waste	length = needed × 1.05	343.92 × 1.05	**361 m**	NirmanShastra assumption (the tool names CPWD DAR 2016 for this; the item is not known): 5% for cutting waste
Coils of 90 m Wire up to 6 mm² is bought in whole coils of 90 m (the common pack; no standard fixes it), so a size that needs only a little wire still takes one whole coil.	coils = up(length with waste ÷ 90)	up(361.12 ÷ 90)	**5**	Pack size: NirmanShastra assumption
Wire to buy	length = coils × 90	5 × 90	**450 m**	Buy list

9.10 Wire to buy, every size and colour

STEP	FORMULA	WORKING	RESULT	SOURCE
Wire counted, all sizes and colours, before waste	Σ over sizes and colours of the length needed	1,818.0	**1,818 m**	Section 9.7
With waste	length = counted × 1.05	1,818.0 × 1.05	**1,909 m**	NirmanShastra assumption (the tool names CPWD DAR 2016 for this; the item is not known): 5% for cutting waste
Bought in whole coils of 90 m (sizes up to 6 mm²)	Σ over those sizes and colours of the coils × the coil length	2,790.0	**2,790 m**	Pack size: NirmanShastra assumption
Bought by the metre in steps of 5 m (larger sizes)	Σ over those sizes and colours of the length rounded up	0.0	**0 m**	Sold by the metre: NirmanShastra assumption
Wire to buy, all sizes and colours	bought = in coils + by the metre	2,790.0 + 0.0	**2,790 m**	Buy list
More bought than counted 91 m of the extra is waste; the other 881 m is rounding up.	extra = (bought ÷ counted − 1) × 100	(2,790.0 ÷ 1,818.0 − 1) × 100	**53 %**	From the two lines above
Why a small need still buys a coil	The smallest need is 6 mm², yellow: 10.1 m (10.6 m with waste), and 90 m is bought, which is 1 whole coil of 90 m. The 90 m coil is the tool's choice of pack, and a shop may sell a part coil or cut a length, which would bring the quantity to buy down.			NirmanShastra assumption

SIZE	COLOUR	LENGTH NEEDED (M)	WITH WASTE (M)	COILS	TO BUY
1.5 mm²	Red	257	270	3	270 m
1.5 mm²	Black	257	270	3	270 m
1.5 mm²	Green-yellow	168	177	2	180 m
2.5 mm²	Red	344	361	5	450 m
2.5 mm²	Black	344	361	5	450 m
2.5 mm²	Green-yellow	344	361	5	450 m
4 mm²	Red	11	11	1	90 m
4 mm²	Black	11	11	1	90 m
4 mm²	Green-yellow	11	11	1	90 m

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6 mm²	Red	17	18	1	90 m
6 mm²	Yellow	10	11	1	90 m
6 mm²	Blue	10	11	1	90 m
6 mm²	Black	17	18	1	90 m
6 mm²	Green-yellow	17	18	1	90 m
All sizes		**1,818**	**1,909**		**2,790 m**

9.11 Worked example: conduit to buy

STEP	FORMULA	WORKING	RESULT	SOURCE
Size worked here The size with the most conduit.			**20 mm**	Engine rule
Run needed	length = the sum of the lengths from every source	147.5 (points) + 155.0 (socket taps) + 62.6 (TV and data) + 79.0 (lighting circuits) + 117.0 (socket circuits) + 10.7 (air conditioners) + 53.6 (heaters and washers) + 15.0 (pump)	**640 m**	Sum of sections 8 and 9
With waste	length = run × 1.05	640.33 × 1.05	**672 m**	NirmanShastra assumption (the tool names CPWD DAR 2016 for this; the item is not known): 5% for cutting waste
Lengths of 3 m	lengths = up(length with waste ÷ 3)	up(672.35 ÷ 3)	**225**	PVC conduit is sold in 3 m lengths
Conduit to buy	length = lengths × 3	225 × 3	**675 m**	Buy list

9.12 Conduit to buy, every size

SIZE	RUN (M)	WITH WASTE (M)	3 M LENGTHS	TO BUY
20 mm	640	672	225	675 m
25 mm	7	7	3	9 m
32 mm	10	11	4	12 m
All sizes	**657**	**690**	**232**	**696 m**

9.13 TV and data cable

STEP	FORMULA	WORKING	RESULT	SOURCE
TV cable (coaxial), run	run = Σ over boards (points × route to the media box × copies)	3 × 7.82 × 1 + 1 × 7.82 × 1	**31.3 m**	NirmanShastra assumption
TV cable (coaxial), to buy	length = run × 1.05, rounded up to a multiple of 5 m	up(31.28 × 1.05 ÷ 5) × 5	**35 m**	Sold by the metre: NirmanShastra assumption
Data cable (Cat 6), run	run = Σ over boards (points × route to the media box × copies)	3 × 7.82 × 1 + 1 × 7.82 × 1	**31.3 m**	NirmanShastra assumption
Data cable (Cat 6), to buy	length = run × 1.05, rounded up to a multiple of 5 m	up(31.28 × 1.05 ÷ 5) × 5	**35 m**	Sold by the metre: NirmanShastra assumption

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10. Earthing

The model counts the electrodes, the strip and the pit covers. It does not design the earthing.

10.1 What is and is not counted

STEP	FORMULA	WORKING	RESULT	SOURCE
What is counted	Earth electrodes, a strip of earth conductor from each electrode to the board, and an earth pit cover and chamber for each electrode. Every circuit and every run of mains carries its own earth wire, which is counted with the wire in section 9.			Draft IS 4648 cl 8 (earth conductor); IS 3043:2018 (earthing, named as the topic only; no clause given)
What is not worked	The number of electrodes needed depends on the soil and on the earth resistance the installation must reach. The model does not work out the resistance of an electrode or set a target value. Your electrician must measure the earth resistance after installation and add electrodes if it is too high.			IS 3043:2018 (earthing, named as the topic only; no clause given)

10.2 Electrodes, strip and pits

STEP	FORMULA	WORKING	RESULT	SOURCE
Earth electrodes	electrodes = 2 for a three-phase house, 1 for a single-phase house	three-phase supply: 2	**2**	NirmanShastra assumption
Earth strip	length = electrodes × metres of strip from each	2 × 10	**20 m**	NirmanShastra assumption
Earth pit covers and chambers	one for each electrode	2	**2**	NirmanShastra assumption
Earth electrodes in the report	electrodes in the buy list	2	**2**	Buy list

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11. Fittings, and everything to buy

The switches, sockets, boxes and conduit fittings, then every line of the buy list in the report, rebuilt from the sheet.

11.1 Conduit fittings by source

WHERE	BENDS	COUPLERS	SADDLES OR CLIPS	JUNCTION BOXES
Points (lights, fans, exhaust fans, bells)	59.0	0.0	236.0	59.0
Socket taps from the nearest point	12.4	46.5	263.5	18.6
Lighting circuits	6.3	23.7	134.4	0.0
Socket circuits	9.4	35.1	198.8	14.0
Air conditioner circuits	0.9	3.2	18.2	1.3
Water heater, washer, dishwasher circuits	4.3	16.1	91.0	6.4
Transfer pump circuit	1.2	4.5	25.5	1.8
Mains, rising mains and sub-mains	1.4	5.1	28.9	0.0
Whole building, before rounding up	**94.8**	**134.2**	**996.4**	**101.1**

11.2 Fittings, switches, sockets and boxes

STEP	FORMULA	WORKING	RESULT	SOURCE
Conduit bends, 20 mm	number = up(the sum over every source)	up(59.0 + 12.4 + 6.3 + 9.4 + 0.9 + 4.3 + 1.2 + 1.4)	**95**	CPWD DAR 2016 items 1.5 and 1.7
Conduit couplers	number = up(the sum over every source)	up(0.0 + 46.5 + 23.7 + 35.1 + 3.2 + 16.1 + 4.5 + 5.1)	**135**	CPWD DAR 2016 items 1.5 and 1.7
Conduit saddles or clips	number = up(the sum over every source)	up(236.0 + 263.5 + 134.4 + 198.8 + 18.2 + 91.0 + 25.5 + 28.9)	**997**	CPWD DAR 2016 items 1.5 and 1.7
Modular switch, 6 A, one-way (lights, fans, exhaust fans) In practice lights are grouped on one switch, so the real count may be lower.	switches = lights + fans + exhaust fans	47 + 6 + 4	**57**	One switch for each point, as the CPWD point rules count it (CPWD GS 3.4)
Electronic fan regulator, step type	regulators = fans	6	**6**	NirmanShastra assumption
Modular socket with switch, 6 A, 3-pin	6 A sockets	53	**53**	NirmanShastra assumption
Modular socket with switch, 6/16 A	6/16 A sockets + outlets for the washing machine and dishwasher	9 + 1 + 1	**11**	NirmanShastra assumption
Socket, 20/25 A, for an air conditioner	one for each air conditioner	1	**1**	NirmanShastra assumption
Isolator switch, double-pole, 32 A, with indicator (air conditioner, water heater)	air conditioners + water heaters	1 + 3	**4**	NirmanShastra assumption
Call bell push	one for each call bell	2	**2**	NirmanShastra assumption
Call bell	one for each call bell	2	**2**	NirmanShastra assumption

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TV outlet	TV points	4	**4**	NirmanShastra assumption
Data outlet (RJ45)	data points	4	**4**	NirmanShastra assumption
Media box (TV and data cables meet here)	one for each board that has a TV or data point, all copies	2	**2**	NirmanShastra assumption
Ceiling rose or connector	lights + fans + bells	47 + 6 + 2	**55**	NirmanShastra assumption
Fan hook and box	one for each fan	6	**6**	NirmanShastra assumption
Junction box or ceiling box, 20 mm Counted in the points and along power circuits.	boxes = up(the sum over every source, table above)	up(101.1)	**102**	NirmanShastra assumption
Modules in all the switch boxes Each fan point is counted as two modules (its switch and its regulator).	modules = lights + fans × 2 + exhaust fans + 6 A + 6/16 A + washers + dishwashers + TV + data + bells + air conditioners	47 + 2 × 6 + 4 + 53 + 9 + 1 + 1 + 4 + 4 + 2 + 1	**138**	NirmanShastra assumption
Switch box (GI or PVC) with cover plate, about 4 modules each A switch box holds about 4 modules.	boxes = up(modules ÷ 4)	up(138 ÷ 4)	**35**	NirmanShastra assumption

11.3 Points and sockets

STEP	FORMULA	WORKING	RESULT	SOURCE
Light, fan, exhaust and bell points	points = lights + fans + exhaust fans + bells	47 + 6 + 4 + 2	**59**	CPWD GS 3.4 (what a point is)
Socket outlets	sockets = 6 A + 6/16 A + washer + dishwasher + air conditioner outlets	53 + 9 + 1 + 1 + 1	**65**	CPWD GS 3.4 (what a point is)

11.4 The whole buy list

ITEM	QUANTITY	UNIT
Copper wire 1.5 mm², red	270	m
Copper wire 1.5 mm², black	270	m
Copper wire 1.5 mm², green-yellow	180	m
Copper wire 2.5 mm², red	450	m
Copper wire 2.5 mm², black	450	m
Copper wire 2.5 mm², green-yellow	450	m
Copper wire 4 mm², red	90	m
Copper wire 4 mm², black	90	m
Copper wire 4 mm², green-yellow	90	m
Copper wire 6 mm², red	90	m
Copper wire 6 mm², yellow	90	m
Copper wire 6 mm², blue	90	m
Copper wire 6 mm², black	90	m
Copper wire 6 mm², green-yellow	90	m
PVC conduit 20 mm	675	m
PVC conduit 25 mm	9	m
PVC conduit 32 mm	12	m
MCB 6 A	9	nos

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MCB 10 A	7	nos
MCB 16 A	11	nos
MCB 20 A	1	nos
Incomer MCB 4-pole 32 A	1	nos
Incomer MCB 2-pole 32 A	1	nos
RCCB 30 mA	2	nos
Distribution board 24 way, three-phase (ground floor)	1	nos
Distribution board 8 way, single-phase (first floor)	1	nos
Light, fan, exhaust and bell points	59	nos
Socket outlets (6 A, 6/16 A, 20/25 A)	65	nos
Earth electrode with pit	2	nos
Modular switch, 6 A, one-way (lights, fans, exhaust fans)	57	nos
Electronic fan regulator, step type	6	nos
Modular socket with switch, 6 A, 3-pin	53	nos
Modular socket with switch, 6/16 A	11	nos
Socket, 20/25 A, for an air conditioner	1	nos
Isolator switch, double-pole, 32 A, with indicator (air conditioner, water heater)	4	nos
Call bell push	2	nos
Call bell	2	nos
TV outlet	4	nos
Data outlet (RJ45)	4	nos
Media box (TV and data cables meet here)	2	nos
Ceiling rose or connector	55	nos
Fan hook and box	6	nos
Junction box or ceiling box, 20 mm	102	nos
Switch box (GI or PVC) with cover plate, about 4 modules each	35	nos

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12. How far the totals can be out

The report shows a range beside each total. This section shows how the range is made and where the doubt is greatest.

12.1 What the ranges are

STEP	FORMULA	WORKING	RESULT	SOURCE
What the range is	Each total at the top of the report has a range beside it. The range is the total multiplied by a low and a high factor for that kind of figure. The factors are the tool's own judgement of how far a count made from a few answers and no drawing can be from the wiring that is built; no standard or survey gives them.			NirmanShastra assumption
Where the doubt is	The sources disagree on how many 6 A sockets share a circuit (CPWD GS 3.10 allows three; the model allows eight), so the circuit count is the least certain part of the report. The room-wise points follow a draft standard, and a few columns of it were read by position. Route lengths of the wire are assumed, not measured.			NirmanShastra assumption; BIS draft of IS 4648, first revision (ETD 20, September 2024)

12.2 The ranges, worked

STEP	FORMULA	WORKING	RESULT	SOURCE
Points and sockets: total in the report			**124 points and sockets**	The total at the top of the report (sections 3, 5 and 9)
Points and sockets: low end	low = total × low factor	124.0 × 0.7	**87 points and sockets**	NirmanShastra assumption
Points and sockets: high end	high = total × high factor	124.0 × 1.4	**174 points and sockets**	NirmanShastra assumption
Copper wire: total in the report			**2,790 m**	The total at the top of the report (sections 3, 5 and 9)
Copper wire: low end	low = total × low factor	2,790.0 × 0.75	**2,093 m**	NirmanShastra assumption
Copper wire: high end	high = total × high factor	2,790.0 × 1.35	**3,767 m**	NirmanShastra assumption
Conduit: total in the report			**696 m**	The total at the top of the report (sections 3, 5 and 9)
Conduit: low end	low = total × low factor	696.0 × 0.8	**557 m**	NirmanShastra assumption
Conduit: high end	high = total × high factor	696.0 × 1.3	**905 m**	NirmanShastra assumption
Circuits: total in the report			**28 circuits**	The total at the top of the report (sections 3, 5 and 9)
Circuits: low end	low = total × low factor	28.0 × 0.8	**22 circuits**	NirmanShastra assumption
Circuits: high end	high = total × high factor	28.0 × 1.25	**35 circuits**	NirmanShastra assumption

12.3 The factors

KIND OF FIGURE	LOW FACTOR	HIGH FACTOR	APPLIES TO
Points and sockets	0.7	1.4	The "Points and sockets" total
Copper wire	0.75	1.35	The "Copper wire" total
Conduit	0.8	1.3	The "Conduit" total
Circuits and boards	0.8	1.25	The "Circuits" total
Switches, boxes and fittings	0.75	1.35	The counts of switches, boxes and fittings (section 11.2)

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Reconciliation: the report against this sheet

The totals printed in the report, rebuilt from the working above. Every row must read the same on both sides. This shows that the report and this sheet agree with each other, which is a check of the arithmetic; it does not show that either one is right against a standard or against your site.

ITEM	IN THE REPORT	FROM THIS SHEET	MATCH
Homes in the building	1 home	1 home	Yes
Air conditioners in the building	1 no.	1 no.	Yes
Rooms counted	13 rooms	13 rooms	Yes
Distribution boards in the building	2 boards	2 boards	Yes
Points table, all rooms: lights	47 nos	47 nos	Yes
Points table, all rooms: ceiling fans	6 nos	6 nos	Yes
Points table, all rooms: exhaust fans	4 nos	4 nos	Yes
Points table, all rooms: call bells	2 nos	2 nos	Yes
Points table, all rooms: 6 A sockets	53 nos	53 nos	Yes
Points table, all rooms: 6/16 A sockets	9 nos	9 nos	Yes
Points table, all rooms: TV and data points	8 nos	8 nos	Yes
Points and sockets (total under "What to order")	124 points and sockets	124 points and sockets	Yes
Outlets with a circuit of their own: air conditioner outlets, 20/25 A	1 no.	1 no.	Yes
Outlets with a circuit of their own: water heater outlets, 6/16 A	3 nos	3 nos	Yes
Outlets with a circuit of their own: washing machine and dishwasher outlets, 6/16 A	2 nos	2 nos	Yes
Outlets with a circuit of their own: pump outlets	1 no.	1 no.	Yes
Connected load, total	29.5 kW	29.5 kW	Yes
Design load shown in the report	10.5 kW	10.5 kW	Yes
Supply shown in the report	Three-phase	Three-phase	Yes
Circuits, all boards	28 circuits	28 circuits	Yes
Circuits (total under "What to order")	28 circuits	28 circuits	Yes
RCCBs (one on every board)	2 nos	2 nos	Yes
Meter boards	1 no.	1 no.	Yes
Wire needed, all sizes, before waste	1,818 m	1,818 m	Yes
Conduit run, all sizes, before waste	657 m	657 m	Yes
Earth strip	20 m	20 m	Yes
Earthing shown in the report	2 electrodes	2 electrodes	Yes
Buy list: Copper wire 1.5 mm², red	270 m	270 m	Yes
Buy list: Copper wire 1.5 mm², black	270 m	270 m	Yes
Buy list: Copper wire 1.5 mm², green-yellow	180 m	180 m	Yes
Buy list: Copper wire 2.5 mm², red	450 m	450 m	Yes
Buy list: Copper wire 2.5 mm², black	450 m	450 m	Yes
Buy list: Copper wire 2.5 mm², green-yellow	450 m	450 m	Yes

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Buy list: Copper wire 4 mm², red	90 m	90 m	Yes
Buy list: Copper wire 4 mm², black	90 m	90 m	Yes
Buy list: Copper wire 4 mm², green-yellow	90 m	90 m	Yes
Buy list: Copper wire 6 mm², red	90 m	90 m	Yes
Buy list: Copper wire 6 mm², yellow	90 m	90 m	Yes
Buy list: Copper wire 6 mm², blue	90 m	90 m	Yes
Buy list: Copper wire 6 mm², black	90 m	90 m	Yes
Buy list: Copper wire 6 mm², green-yellow	90 m	90 m	Yes
Buy list: PVC conduit 20 mm	675 m	675 m	Yes
Buy list: PVC conduit 25 mm	9 m	9 m	Yes
Buy list: PVC conduit 32 mm	12 m	12 m	Yes
Buy list: MCB 6 A	9 nos	9 nos	Yes
Buy list: MCB 10 A	7 nos	7 nos	Yes
Buy list: MCB 16 A	11 nos	11 nos	Yes
Buy list: MCB 20 A	1 no.	1 no.	Yes
Buy list: Incomer MCB 4-pole 32 A	1 no.	1 no.	Yes
Buy list: Incomer MCB 2-pole 32 A	1 no.	1 no.	Yes
Buy list: RCCB 30 mA	2 nos	2 nos	Yes
Buy list: Distribution board 24 way, three-phase (ground floor)	1 no.	1 no.	Yes
Buy list: Distribution board 8 way, single-phase (first floor)	1 no.	1 no.	Yes
Buy list: Light, fan, exhaust and bell points	59 nos	59 nos	Yes
Buy list: Socket outlets (6 A, 6/16 A, 20/25 A)	65 nos	65 nos	Yes
Buy list: Earth electrode with pit	2 nos	2 nos	Yes
Buy list: Modular switch, 6 A, one-way (lights, fans, exhaust fans)	57 nos	57 nos	Yes
Buy list: Electronic fan regulator, step type	6 nos	6 nos	Yes
Buy list: Modular socket with switch, 6 A, 3-pin	53 nos	53 nos	Yes
Buy list: Modular socket with switch, 6/16 A	11 nos	11 nos	Yes
Buy list: Socket, 20/25 A, for an air conditioner	1 no.	1 no.	Yes
Buy list: Isolator switch, double-pole, 32 A, with indicator (air conditioner, water heater)	4 nos	4 nos	Yes
Buy list: Call bell push	2 nos	2 nos	Yes
Buy list: Call bell	2 nos	2 nos	Yes
Buy list: TV outlet	4 nos	4 nos	Yes
Buy list: Data outlet (RJ45)	4 nos	4 nos	Yes
Buy list: Media box (TV and data cables meet here)	2 nos	2 nos	Yes
Buy list: Ceiling rose or connector	55 nos	55 nos	Yes
Buy list: Fan hook and box	6 nos	6 nos	Yes
Buy list: Junction box or ceiling box, 20 mm	102 nos	102 nos	Yes
Buy list: Switch box (GI or PVC) with cover plate, about 4 modules each	35 nos	35 nos	Yes
Range shown beside "Points and sockets"	87 to 174	87 to 174	Yes
Range shown beside "Copper wire"	2,093 to 3,767 m	2,093 to 3,767 m	Yes
Range shown beside "Conduit"	557 to 905 m	557 to 905 m	Yes

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Range shown beside "Circuits"	22 to 35 circuits	22 to 35 circuits	Yes
Copper wire to buy, total at the top of the report	2,790 m	2,790 m	Yes
Conduit to buy, total at the top of the report	696 m	696 m	Yes
Low and high factors for points and sockets	Points and sockets, 0.7 to 1.4	Points and sockets, 0.7 to 1.4	Yes
Low and high factors for copper wire	Copper wire, 0.75 to 1.35	Copper wire, 0.75 to 1.35	Yes
Low and high factors for conduit	Conduit, 0.8 to 1.3	Conduit, 0.8 to 1.3	Yes
Low and high factors for circuits and boards	Circuits and boards, 0.8 to 1.25	Circuits and boards, 0.8 to 1.25	Yes
Low and high factors for switches, boxes and fittings	Switches, boxes and fittings, 0.75 to 1.35	Switches, boxes and fittings, 0.75 to 1.35	Yes
Table "Points and sockets, room by room": every row and the foot	12 rows	12 rows	Yes
Table "Outlets with a circuit of their own": every row	4 rows	4 rows	Yes
Table "Circuits and breakers": every row and the foot	8 rows	8 rows	Yes
Table "Distribution boards": every row	2 rows	2 rows	Yes
Table "Mains, rising mains and sub-mains": every row	2 rows	2 rows	Yes
Table "Copper wire to buy": every row and the foot	14 rows	14 rows	Yes
Table "Conduit to buy": every row and the foot	3 rows	3 rows	Yes
Table "Switches, sockets, boxes and fittings": every row	20 rows	20 rows	Yes
Table "Breakers, shock protection and earthing": every row	11 rows	11 rows	Yes
Table "Connected load": every row and the foot	8 rows	8 rows	Yes
Wiring level shown in the report	Standard	Standard	Yes

Standards and references used in this sheet

DOCUMENT	TITLE	USED FOR
BIS draft of IS 4648 (first revision), ETD 20, September 2024	Guide for electrical layout in residential buildings	Room-wise points (Tables 2 and 3), circuit limits (cl 6.2.1 and 6.2.2), breaker ratings (cl 6.2.8), the 30 mA residual current device (cl 6.2.9), wire sizes (Table 4), loads (Tables 5 and 6), design load (cl 7) and the earth conductor (cl 8). These were re-read against the draft text. It is not yet published; some columns were read by position.
IS 4648:1968	Guide for electrical layout in residential buildings	The Basic level: the socket schedule (cl 9.8) and the limit on points on a lighting circuit (cl 7.2). Clause numbers as given in the tool's research notes; not re-read against the published text.
IS 732:2019	Code of practice for electrical wiring installations	Named by the BIS draft (its Annex C lists IS 732:2019) as the code for the current ratings of cables (its Annex T, in the note under Table 4), for the type of residual current device (its cl 6.2.9 points to cl 4.2 of IS 732:2019) and for surge protection (its cl 6.2.10 points to cl 5.3.5). The tool applies none of its rules, and no line of this sheet is worked from it. The text of IS 732:2019 was not read: the clause and annex numbers are the draft's and have not been checked against the standard.
IS 3043:2018	Code of practice for earthing	Named as the code for earthing. Not read in full: the number of electrodes is an assumption. Clause numbers as given in the tool's research notes; not re-read against the published text.
CPWD General Specifications for Electrical Works Part I (Internal), 2013	Sections 2 and 3	What a point is (GS 3.4), the load of a 16 A socket (GS 3.9), circuits (GS 3.10) and wire sizes (GS 3.12). Where CPWD is stricter than the draft IS 4648 (GS 3.12(ii) asks for 4 mm² on power wiring; GS 3.10(i) allows 10 points or 800 W on a lighting circuit), the tool follows the draft. Clause numbers as given in the tool's research notes; not re-read against the published text.

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CPWD Delhi Analysis of Rates for Electrical Works (E&M), 2016	Items 1.1 to 1.17	Wire, conduit, couplers and saddles in a point (items 1.1 and 1.7), fittings per metre of conduit (items 1.5 and 1.7), and the conductor allowed for each metre of route. Clause numbers as given in the tool's research notes; not re-read against the published text.
NIMI Electrician trade theory	Wiring of a dwelling	The area yardstick for lights and fans at the Basic level (Table 1). A yardstick, not a standard.
Tender distribution-board schedules	A secondary source, not a standard	The ratings of the incoming breakers for homes and for three-phase supply.

This sheet shows the method and the arithmetic behind a planning-level quantity estimate. It lets a qualified person check the formulas and the working. It is not a structural design, a drawing or a certificate, and it does not replace the drawings and calculations that a licensed professional signs for your building.

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