

NAME OF WORK: CONSTRUCTION OF LIBRARY AT VANSDA.

TECHNICAL SPECIFICATION – POINT WIRING (LIGHT / BELL) – CAT III

1. Scope of Work

Providing and installing point wiring for light / bell point including supply, laying, connection, testing and commissioning complete with all accessories as per drawings and direction of Engineer-in-Charge.

2. Wiring System

- Wiring shall be carried out using:
 - **2 runs of 1.5 sq.mm + 1 run of 1.5 sq.mm (earth)**
 - Type of wire:
 - **ISI marked, FRLS (Flame Retardant Low Smoke), PVC insulated copper conductor**
 - **Multistrand flexible copper conductor**
 - Voltage grade:
 - **1100 Volts (1.1 KV)**
 - Conductor:
 - Electrolytic grade annealed copper
-

3. Conduit System

- Conduit type:
 - **Medium class rigid PVC conduit**
 - Conduit standard:
 - **As per IS: 9537 (Part III)**
 - Installation:
 - **Concealed wiring** in wall/ceiling
 - Accessories:
 - Bends, junction boxes, inspection boxes, couplers, saddles etc. as required
 - Conduit fixing:
 - Properly clamped and secured before plastering
-

4. Point Length

- Wiring length considered:
 - **Up to 10 meters** from switchboard to light/bell point
 - Measurement:
 - From switchboard to outlet point via shortest route
-

5. Switches & Accessories

- Switch:
 - **6A modular type switch / bell push**
 - Mounting:
 - **On PVC / Metallic / Wooden box**
 - Plate:
 - **Single mounting base frame with front plate**
 - **Finish: Textured / metallic / white**
 - Make:
 - **Anchor / Roma / Legrand / Schneider / Havells or approved equivalent**
-

6. Outlet Accessories

- Light point:
 - **Ceiling rose / lamp holder / batten holder**
- Bell point:
 - **Bell push switch with wiring up to bell**
- Connector:
 - **Heavy duty connector (H.D. connector)** where required

7. Earthing

- Earth wire:
 - **1.5 sq.mm green insulated copper wire**
 - Earth continuity:
 - Properly connected to main earth system
 - All metallic parts shall be effectively earthed
-

8. Installation

- Wiring shall be:
 - Drawn through conduit without joints
 - Proper ferruling at both ends
 - Colour coding:
 - Phase – Red / Yellow / Blue
 - Neutral – Black
 - Earth – Green
 - All terminations:
 - Tightened using proper lugs and terminals
-

9. Testing & Commissioning

- Continuity test
 - Insulation resistance test (as per IS standards)
 - Functional test of switch and load
-

10. Standards

Work shall comply with:

- **IS 694** – PVC insulated wires
 - **IS 9537** – Conduits
 - **IS 732** – Electrical wiring installation
 - **National Electrical Code (NEC) India**
 - Local authority regulations
-

11. Category

- **Category III** (as per SOR – includes complete wiring with conduit, accessories, switch, plate, and outlet)

(2) TECHNICAL SPECIFICATION – SECONDARY LIGHT POINT (TISSINO / MODULAR TYPE)

1. Scope of Work

Providing and installing **secondary light point wiring** derived from primary light point, including supply, laying, connection, testing and commissioning complete as per drawings and direction of Engineer-in-Charge.

2. Wiring System

- Wiring shall be carried out using:
 - **2 runs of 1.5 sq.mm copper wire (phase & neutral)**
 - **1 run of 1.5 sq.mm copper wire (earth – green)**
 - Wire type:
 - **ISI marked FRLS PVC insulated copper wire**
 - Multistrand flexible conductor
 - Voltage grade:
 - **1100 V (1.1 KV)**
 - Standard:
 - As per **IS 694**
-

3. Definition (Secondary Light Point)

- A **secondary light point** is a light outlet connected from an existing **primary light point** without independent control switch.
 - It operates simultaneously with the primary point.
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4. Conduit System

- Conduit:
 - **Medium class rigid PVC conduit**
 - Standard:
 - **IS 9537 (Part III)**
 - Installation:
 - **Concealed in wall / ceiling** (or open if specified)
 - Accessories:
 - Junction boxes, bends, tees, couplers, saddles etc.
 - Conduit shall be:
 - Properly aligned and securely fixed before plastering
-

5. Mounting Arrangement

- Mounting box:
 - **Metal / PVC / Wooden box**
 - Covering:
 - **3 mm thick Polycarbonate (PC) / Acrylic sheet**
 - Suitable for:
 - **Open or concealed wiring system**
-

6. Connection

- Supply derived from:
 - **Primary light point circuit**
 - Connection includes:
 - Looping of phase, neutral, and earth
 - Proper termination using connectors
 - Connector:
 - **Heavy Duty (H.D.) connector / terminal block**
-

7. Accessories

- Light outlet:
 - **Lamp holder / batten holder / ceiling rose**
 - No separate switch is provided (controlled by primary point)
 - All accessories shall be modular / Tissino compatible
-

8. Earthing

- Earth wire:
 - **1.5 sq.mm green insulated copper wire**
 - Earth continuity:
 - Maintained from primary point to secondary point
 - All metallic parts:
 - Properly earthed
-

9. Installation Requirements

- Wires shall be:
 - Drawn through conduit without damage
 - No joints in between
- Proper ferruling and termination at both ends
- Colour coding:
 - Phase – Red

- Neutral – Black
- Earth – Green

10. Testing & Commissioning

- Continuity test
- Insulation resistance test
- Functional test along with primary light point

11. Standards

Work shall comply with:

- **IS 694** – PVC insulated wires
- **IS 9537** – Conduits
- **IS 732** – Wiring installation
- **National Electrical Code (India)**

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TECHNICAL SPECIFICATION – FAN POINT WIRING (WITH ELECTRONIC REGULATOR) – CAT III

1. Scope of Work

Providing and installing complete **fan point wiring** including wiring, conduit, switch, electronic regulator, accessories, connection, testing and commissioning as per drawings and direction of Engineer-in-Charge.

2. Wiring System

- Wiring shall be carried out using:
 - **2 runs of 1.5 sq.mm (Phase & Neutral)**
 - **1 run of 1.5 sq.mm (Earth – Green)**
- Wire type:
 - **ISI marked FRLS PVC insulated copper wire**
 - Multistrand conductor
- Voltage grade:
 - **1100 Volts (1.1 KV)**
- Standard:
 - As per **IS 694**

3. Point Length

- Wiring length:
 - **Up to 10 meters** from switchboard to fan outlet
- Measurement:
 - Along actual routing through conduit

4. Conduit System

- Conduit:
 - **Medium class rigid PVC conduit**
- Standard:
 - **IS 9537 (Part III)**
- Installation:
 - **Concealed in wall / ceiling**
- Accessories:
 - Junction boxes, bends, couplers, inspection boxes etc.
- Conduit shall be:
 - Properly fixed and aligned before plastering

5. Switch & Regulator

- Switch:
 - **6A modular type switch**

- Regulator:
 - **Hum-free electronic fan regulator (step type)**
 - Suitable for ceiling fan control
 - Mounting:
 - **On PVC / Metallic / Wooden box**
 - Plate:
 - **Single mounting base frame with front plate**
 - Finish: textured / metallic / white
 - Make:
 - Anchor / Roma / Legrand / Schneider / Havells or approved equivalent
-

6. Fan Outlet

- Outlet provided with:
 - **Ceiling rose**
 - **Heavy Duty (H.D.) connector**
 - Suitable for connection of ceiling fan
 - Provision for fan hook/box shall be coordinated (by civil/other agency if not included)
-

7. Earthing

- Earth wire:
 - **1.5 sq.mm green insulated copper wire**
 - Earth continuity:
 - Maintained from DB to fan point
 - All metallic parts:
 - Properly earthed
-

8. Installation Requirements

- Wires shall be:
 - Drawn through conduit without joints
 - Properly ferruled at ends
 - Termination:
 - Done with proper lugs/connectors
 - Colour coding:
 - Phase – Red
 - Neutral – Black
 - Earth – Green
-

9. Testing & Commissioning

- Continuity test
 - Insulation resistance test
 - Functional testing of:
 - Switch
 - Regulator (smooth speed control, no humming)
 - Fan operation
-

10. Standards

Work shall comply with:

- **IS 694** – PVC insulated wires
 - **IS 9537** – Conduits
 - **IS 732** – Electrical wiring installation
 - **National Electrical Code (India)**
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11. Category

- **Category III** – Includes complete wiring with conduit, switch, regulator, accessories and outlet

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TECHNICAL SPECIFICATION – 6A INDIVIDUAL PLUG POINT WIRING – CAT III

1. Scope of Work

Providing and installing **individual 6A plug point wiring** from nearby switchboard / MCB DB, including supply, laying, connection, testing and commissioning complete with all accessories as per drawings and direction of Engineer-in-Charge.

2. Wiring System

- Wiring shall be carried out using:
 - **2 runs of 1.5 sq.mm copper wire (Phase & Neutral)**
 - **1 run of 1.5 sq.mm copper wire (Earth – Green)**
 - Wire type:
 - **ISI marked FRLS PVC insulated copper wire**
 - Multistrand conductor
 - Voltage grade:
 - **1100 Volts (1.1 KV)**
 - Standard:
 - As per IS 694
-

3. Point Length

- Wiring length:
 - **Up to 10 meters**
 - Supply taken from:
 - **Nearby switchboard / MCB distribution board**
 - Measurement:
 - Along conduit route
-

4. Conduit System

- Conduit:
 - **Medium class rigid PVC conduit**
 - Standard:
 - **IS 9537 (Part III)**
 - Installation:
 - **Concealed in wall / ceiling**
 - Accessories:
 - Junction boxes, bends, couplers, inspection boxes etc.
 - Conduit fixing:
 - Properly aligned and securely fixed before plastering
-

5. Switch & Socket

- Switch:
 - **6A modular type switch**
 - Socket:
 - **6A, 5-pin modular socket outlet**
 - Mounting:
 - **On PVC / Metallic / Wooden box**
 - Plate:
 - Modular front plate with base frame
 - Finish: **Textured / metallic / white**
 - Make:
 - Anchor / Roma / Legrand / Schneider / Havells or approved equivalent
-

6. Earthing

- Earth wire:
 - **1.5 sq.mm green insulated copper wire**

- Earth continuity:
 - Connected to main earthing system
 - Socket earthing:
 - Earth terminal of socket properly connected
-

7. Installation Requirements

- Wiring:
 - Drawn through conduit without joints
 - Termination:
 - Proper ferruling and tightening at terminals
 - Colour coding:
 - Phase – Red
 - Neutral – Black
 - Earth – Green
 - Socket shall be:
 - Firmly fixed and aligned properly
-

8. Testing & Commissioning

- Continuity test
 - Insulation resistance test
 - Polarity test
 - Functional test using load
-

9. Standards

Work shall comply with:

- **IS 694** – PVC insulated wires
 - **IS 9537** – Conduits
 - **IS 732** – Wiring installation
 - **National Electrical Code (India)**
-

10. Category

- **Category III** – Complete wiring with conduit, switch, socket, accessories and earthing

(5)

TECHNICAL SPECIFICATION – 16A INDIVIDUAL POWER PLUG POINT – CAT III

1. Scope of Work

Providing and installing **16A individual power plug point wiring** from MCB distribution board, including supply, laying, connection, testing and commissioning complete with all accessories as per drawings and direction of Engineer-in-Charge.

2. Wiring System

- Wiring shall be carried out using:
 - **2 runs of 4 sq.mm copper wire (Phase & Neutral)**
 - **1 run of 2.5 sq.mm copper wire (Earth – Green)**
 - Wire type:
 - **ISI marked FRLS PVC insulated copper wire**
 - Multistrand conductor
 - Voltage grade:
 - **1100 Volts (1.1 KV)**
 - Standard:
 - As per **IS 694**
-

3. Point Length

- Wiring length:
 - **Up to 10 meters**

- Supply taken from:
 - **MCB Distribution Board (DB)**
 - Measurement:
 - Along conduit route
-

4. Conduit System

- Conduit:
 - **Medium class rigid PVC conduit**
 - Standard:
 - **IS 9537 (Part III)**
 - Installation:
 - **Concealed in wall / ceiling**
 - Accessories:
 - Junction boxes, bends, couplers, inspection boxes etc.
 - Conduit fixing:
 - Properly secured before plastering
-

5. Switch & Socket

- Switch:
 - **16A modular type switch**
 - Socket:
 - **16A, 5-pin modular socket outlet**
 - Mounting:
 - On **PVC / Metallic / Wooden box**
 - Plate:
 - Modular base frame with front plate
 - Finish: textured / metallic / white
 - Make:
 - Anchor / Roma / Legrand / Schneider / Havells or approved equivalent
-

6. Earthing

- Earth wire:
 - **2.5 sq.mm green insulated copper wire**
 - Earth continuity:
 - Directly connected to DB earth bar
 - Socket earthing:
 - Properly terminated to earth terminal
-

7. Installation Requirements

- Wiring:
 - Drawn through conduit without joints
 - Termination:
 - Proper lugs/ferrules used for 4 sq.mm wires
 - Colour coding:
 - Phase – Red
 - Neutral – Black
 - Earth – Green
 - Proper tightening and safe termination at DB and socket
-

8. Testing & Commissioning

- Continuity test
 - Insulation resistance test
 - Polarity test
 - Load test for 16A operation
-

9. Standards

Work shall comply with:

- **IS 694** – PVC insulated wires
 - **IS 9537** – Conduits
 - **IS 732** – Electrical wiring installation
 - **National Electrical Code (India)**
-

10. Category

- **Category III** – Includes complete wiring with conduit, switch, socket, accessories and earthing

(6)

TECHNICAL SPECIFICATION – 16A INDIVIDUAL PLUG POINT (2.5 SQ.MM WIRING) – CAT III

1. Scope of Work

Providing and installing **16A individual plug point wiring** from MCB distribution board, including supply, laying, connection, testing and commissioning complete with all accessories as per drawings and direction of Engineer-in-Charge.

2. Wiring System

- Wiring shall be carried out using:
 - **2 runs of 2.5 sq.mm copper wire (Phase & Neutral)**
 - **1 run of 1.5 sq.mm copper wire (Earth – Green)** (*as specified*)
 - Wire type:
 - **ISI marked FRLS PVC insulated copper wire**
 - Multistrand conductor
 - Voltage grade:
 - **1100 Volts (1.1 KV)**
 - Standard:
 - As per **IS 694**
-

3. Point Length

- Wiring length:
 - **Up to 10 meters**
 - Supply taken from:
 - **MCB Distribution Board (DB)**
 - Measurement:
 - Along conduit route
-

4. Conduit System

- Conduit:
 - **Medium class rigid PVC conduit**
 - Standard:
 - **IS 9537 (Part III)**
 - Installation:
 - **Concealed in wall / ceiling**
 - Accessories:
 - Junction boxes, bends, couplers, inspection boxes etc.
 - Conduit fixing:
 - Properly secured before plastering
-

5. Switch & Socket

- Switch:
 - **16A modular type switch**
- Socket:
 - **16A, 5-pin modular socket outlet**

- Mounting:
 - On **PVC / Metallic / Wooden box**
 - Plate:
 - Modular base frame with front plate
 - Finish: textured / metallic / white
 - Make:
 - Anchor / Roma / Legrand / Schneider / Havells or approved equivalent
-

6. Earthing

- Earth wire:
 - **1.5 sq.mm green insulated copper wire**
- Earth continuity:
 - Connected to main earthing system
- Socket earthing:
 - Properly terminated to earth terminal

Note: For better safety in 16A circuits, 2.5 sq.mm earth wire is generally recommended, though 1.5 sq.mm is as per given specification.

7. Installation Requirements

- Wiring:
 - Drawn through conduit without joints
 - Termination:
 - Proper ferrules/lugs used
 - Colour coding:
 - Phase – Red
 - Neutral – Black
 - Earth – Green
 - All connections:
 - Properly tightened and tested
-

8. Testing & Commissioning

- Continuity test
 - Insulation resistance test
 - Polarity test
 - Functional/load test
-

9. Standards

Work shall comply with:

- **IS 694** – PVC insulated wires
 - **IS 9537** – Conduits
 - **IS 732** – Electrical wiring installation
 - **National Electrical Code (India)**
-

10. Category

- **Category III** – Complete wiring with conduit, switch, socket, accessories and earthing

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TECHNICAL SPECIFICATION – MODULAR BLANK PLATE (SINGLE) – CAT III

1. Scope of Work

Providing and fixing **single modular blank plate** on existing or new modular mounting box, including supply, installation and finishing complete as per site requirements and direction of Engineer-in-Charge.

2. Description

- Item:
 - **Single blank plate (dummy module)**

- Purpose:
 - To cover unused/extra module space in switchboard
 - Maintain safety and aesthetic appearance
-

3. Mounting Arrangement

- Box type:
 - **PVC / Metallic / Wooden box**
 - Mounting:
 - On **single mounting base frame**
 - Plate:
 - Modular front plate with:
 - **Textured / metallic / white finish**
 - Compatibility:
 - Suitable for standard modular systems (Tissino / Anchor / Roma / Legrand / Schneider / Havells etc.)
-

4. Material Specifications

- Blank module:
 - High quality **polycarbonate / FR grade plastic**
 - Heat resistant and non-flammable
 - Front plate:
 - Rigid, scratch-resistant, and durable finish
 - Base frame:
 - Strong and properly aligned for module fixing
-

5. Installation

- Blank plate shall be:
 - Properly fitted into modular frame
 - Flush with surrounding modules
 - No gaps or unevenness allowed
 - Firm fixing to avoid loosening over time
-

6. Electrical Considerations

- No electrical wiring required
 - Ensures:
 - **Protection against accidental contact**
 - Covers live/open points safely
-

7. Standards

- Conforming to:
 - Relevant **IS standards for modular accessories**
 - Fire-resistant and safe materials (FR grade)
-

8. Category

- **Category III** – Includes supply and fixing complete with frame and plate

(8)

TECHNICAL SPECIFICATION – CALL BELL INDICATOR WITH BUZZER & RED LIGHT

1. Scope of Work

Supplying, installing, testing and commissioning of **call bell indicator unit** complete with audible buzzer, visual indication (red lamp), and reset/acknowledgement push button, suitable for 240V AC supply, as per direction of Engineer-in-Charge.

2. Description of Item

- Type:

- **Call bell indicator unit (combined audio-visual type)**
 - Function:
 - Provides **buzzing sound** and **red light indication** when call is initiated
 - Includes **red push button** to acknowledge/reset the call
-

3. Electrical Specifications

- Rated voltage:
 - **240 Volts AC**
 - Frequency:
 - **50 Hz (c/s)**
 - Power consumption:
 - Low power (as per manufacturer standard)
 - Operation:
 - Suitable for continuous duty
-

4. Components

The unit shall consist of:

- **Buzzer**
 - Clear audible sound (minimum ~70–85 dB at 1 m)
 - **Indicator lamp**
 - **Red LED / lamp indication**
 - High visibility type
 - **Reset/Acknowledge Push Button**
 - **Red color push button**
 - For cancelling the call indication
 - **Housing**
 - Compact, robust enclosure
-

5. Construction

- Body:
 - High-quality **ABS / polycarbonate / metal enclosure**
 - Finish:
 - **White / off-white / metallic** as approved
 - Mounting:
 - Suitable for **wall mounting**
 - Protection:
 - Proper insulation and shock-proof design
-

6. Installation

- Installed at:
 - Nurse station / office / reception / control point
 - Mounting:
 - On wall with screws and suitable fasteners
 - Wiring:
 - Proper connection with call bell push system
 - All terminals:
 - Properly tightened and insulated
-

7. Operation

- On pressing call bell push:
 - **Buzzer sounds**
 - **Red light glows**
- On pressing reset button:
 - **Buzzer stops**
 - **Light turns OFF**

8. Standards

- Conforming to:
 - Relevant **IS standards for electrical accessories**
 - Safe insulation and low-voltage control compatibility (if used with bell transformer)
-

9. Testing & Commissioning

- Functional test:
 - Buzzer operation
 - Light indication
 - Reset button operation
 - Voltage and connection check
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10. Approved Makes

- Honeywell / OBO / Anchor / Legrand / Schneider / Havells / equivalent approved make

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TECHNICAL SPECIFICATION – ON-BOARD LOOPED 6A PLUG POINT – CAT III

1. Scope of Work

Providing and installing **on-board looped 6A plug point** on existing light circuit, including supply, connection, fixing, testing and commissioning complete with modular switch, socket and accessories as per direction of Engineer-in-Charge.

2. Definition (Looped Plug Point)

- A **looped plug point** is a socket outlet derived from an **existing light/fan point circuit** without independent wiring from DB.
 - It is controlled locally by a switch and shares the same circuit as the light point.
-

3. Wiring System

- Connection taken from:
 - **Existing light/fan point wiring (looping)**
 - Wire size:
 - Same as circuit wiring (generally **1.5 sq.mm copper**)
 - Earth continuity:
 - Extended from existing earth wire (1.5 sq.mm green)
 - Wire type:
 - **ISI marked FRLS PVC insulated copper conductor**
 - Voltage grade:
 - **1100 Volts (1.1 KV)**
-

4. Switch & Socket

- Switch:
 - **6A modular type switch**
 - Socket:
 - **6A, 5-pin modular socket outlet**
 - Mounting:
 - **On PVC / Metallic / Wooden box**
 - Plate:
 - Modular base frame with front plate
 - Finish: **Textured / metallic / white**
 - Make:
 - Anchor / Roma / Legrand / Schneider / Havells or approved equivalent
-

5. Mounting Arrangement

- Installed:

- On same board or nearby board of light point
 - Fixing:
 - Proper alignment and firm fixing
 - Flush mounting preferred for concealed system
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6. Earthing

- Earth wire:
 - **1.5 sq.mm green insulated copper wire**
 - Earth continuity:
 - Maintained from existing circuit
 - Socket earth terminal:
 - Properly connected
-

7. Installation Requirements

- Looping:
 - Proper phase loop through switch
 - Neutral looped directly to socket
 - Wiring:
 - No loose joints, proper connectors used
 - Colour coding:
 - Phase – Red
 - Neutral – Black
 - Earth – Green
-

8. Testing & Commissioning

- Continuity test
 - Insulation resistance test
 - Polarity test
 - Functional test with load
-

9. Standards

Work shall comply with:

- **IS 694** – PVC insulated wires
 - **IS 732** – Electrical wiring installation
 - **National Electrical Code (India)**
-

10. Category

- **Category III** – Includes modular switch, socket, plate, mounting and connections

(10)

TECHNICAL SPECIFICATION – CAT 6 LAN CABLE (IN EXISTING CONDUIT)

1. Scope of Work

Supplying, pulling, laying, terminating, testing and commissioning of **CAT-6 LAN cable** in existing conduit/pipe, complete as per site requirements and direction of Engineer-in-Charge.

2. Cable Specifications

- Type:
 - **Category 6 (CAT-6) LAN Cable**
- Conductor:
 - **Solid bare copper conductor**
- Size:
 - Typically **23 AWG**
- Pair:
 - **4 twisted pairs (8 conductors)**
- Insulation:

- High-quality **HDPE insulation**
 - Sheath:
 - **FRLS PVC outer sheath**
 - Cable type:
 - **UTP (Unshielded Twisted Pair)** *(or FTP if specified)*
-

3. Performance Standards

- Bandwidth:
 - **Up to 250 MHz**
 - Data support:
 - Suitable for **Gigabit Ethernet (10/100/1000 Mbps)**
 - Compliance:
 - **TIA/EIA-568-C.2 / ISO/IEC 11801**
 - Fire safety:
 - **FRLS (Flame Retardant Low Smoke)**
-

4. Installation

- Installation in:
 - **Existing PVC / metal conduit**
 - Method:
 - Cable shall be carefully **pulled without damage**
 - Bend radius:
 - Minimum as per manufacturer recommendation
 - Routing:
 - Avoid sharp bends, kinks, and electromagnetic interference (EMI)
-

5. Termination

- Termination at:
 - **RJ-45 I/O outlets / patch panels / switches**
 - Connector:
 - **RJ-45 (8P8C) modular jack**
 - Wiring scheme:
 - **T568A or T568B** (uniform throughout system)
 - Proper crimping and dressing required
-

6. Accessories

- RJ-45 connectors / I/O modules
 - Face plates (modular type)
 - Patch cords (if included in scope)
 - Cable ties, ferrules, markers
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7. Testing & Commissioning

- Continuity test
 - Wire mapping test
 - Fluke test (recommended for certification)
 - Performance verification (data transmission test)
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8. Approved Makes

- D-Link / Molex / Schneider / Legrand / AMP / Belden / Finolex or approved equivalent

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TECHNICAL SPECIFICATION – 20 MM DIA RIGID PVC CONDUIT – MEDIUM CLASS

1. Scope of Work

Providing and erecting **ISI marked medium class rigid PVC conduit (pipe)** of **20 mm diameter**, including all accessories, fixing, laying, jointing, and making complete installation in wall/ceiling as per drawings and direction of Engineer-in-Charge.

2. Material Specifications

- Conduit type:
 - **Rigid PVC conduit (medium class)**
 - Size:
 - **20 mm outer diameter**
 - Standard:
 - Conforming to **IS 9537 (Part III)**
 - Quality:
 - ISI marked
 - Smooth inner surface for easy wire pulling
 - Properties:
 - Non-corrosive, moisture resistant, durable
-

3. Accessories

The conduit system shall include:

- Couplers
- Bends (inspection bends where required)
- Junction boxes / inspection boxes
- Adapters, bush, locknuts
- Saddles / clamps
- Pull boxes (if required)

All accessories shall be:

- Compatible with conduit
 - Of same make/quality (ISI standard where applicable)
-

4. Installation

- Installation type:
 - **Concealed in wall / ceiling**
(or surface if specified)
 - Method:
 - Conduits shall be:
 - Laid in straight alignment
 - Fixed before plastering for concealed work
 - Fixing:
 - Using **clamps/saddles at regular intervals** (~600 mm or as per standard)
 - Jointing:
 - Using **approved adhesive solution (PVC solvent cement)**
 - Bends:
 - Smooth bends to maintain cable pulling capacity
-

5. Junction Boxes

- Material:
 - PVC / metal as specified
 - Installation:
 - Flush with wall/ceiling
 - Cover:
 - Properly closed with screws
 - Accessible for maintenance
-

6. Workmanship

- Conduits shall be:

- Free from cracks and defects
 - Properly aligned and securely fixed
 - No sharp edges inside pipe
 - Fish wire shall be provided for easy cable pulling
-

7. Testing

- Check for:
 - Continuity of conduit route
 - Proper alignment and fixing
 - Ease of wire pulling

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TECHNICAL SPECIFICATION – 25 MM DIA RIGID PVC CONDUIT – MEDIUM CLASS

1. Scope of Work

Providing and erecting **ISI marked medium class rigid PVC conduit of 25 mm diameter**, including supply, laying, jointing, fixing, and all accessories complete for installation in wall/ceiling as per drawings and direction of Engineer-in-Charge.

2. Material Specifications

- Conduit type:
 - **Rigid PVC conduit (medium class)**
 - Size:
 - **25 mm outer diameter**
 - Standard:
 - Conforming to **IS 9537 (Part III)**
 - Marking:
 - ISI marked
 - Properties:
 - Smooth internal surface
 - Non-corrosive, moisture resistant
 - High mechanical strength suitable for concealed wiring
-

3. Accessories

The conduit system shall include:

- Couplers
- Bends / inspection bends
- Junction boxes / inspection boxes
- Adapters, bushes, locknuts
- Saddles / clamps
- Pull boxes where required

All accessories shall be:

- Compatible with conduit size
 - Of approved make and quality
-

4. Installation

- Installation type:
 - **Concealed in wall / ceiling** *(or surface if specified)*
- Method:
 - Conduits shall be laid in proper alignment before plastering
- Fixing:
 - Using **clamps/saddles at intervals of approx. 600 mm**
- Jointing:
 - Using **approved PVC solvent adhesive**
- Bends:
 - Smooth radius bends to facilitate easy cable pulling

5. Junction Boxes

- Type:
 - PVC / metallic boxes
 - Installation:
 - Flush mounted with wall/ceiling
 - Covers:
 - Properly fitted and removable for maintenance
-

6. Workmanship

- Conduits shall be:
 - Free from cracks, bends, or deformities
 - Properly aligned and securely fixed
 - No sharp edges inside conduit
 - **Fish wire** shall be provided for wire pulling
-

7. Testing

- Visual inspection for:
 - Alignment and fixing
 - Proper jointing
- Ensure:
 - Smooth passage for wiring

(13)

TECHNICAL SPECIFICATION – 32 MM DIA RIGID PVC CONDUIT – MEDIUM CLASS

1. Scope of Work

Providing and erecting **ISI marked medium class rigid PVC conduit** of **32 mm diameter**, including supply, laying, jointing, fixing, and all necessary accessories complete for installation in wall/ceiling as per drawings and direction of Engineer-in-Charge.

2. Material Specifications

- Conduit type:
 - **Rigid PVC conduit (medium class)**
 - Size:
 - **32 mm outer diameter**
 - Standard:
 - Conforming to **IS 9537 (Part III)**
 - Marking:
 - ISI marked
 - Properties:
 - Smooth internal surface for easy cable pulling
 - Non-corrosive and moisture resistant
 - Adequate mechanical strength for heavy-duty wiring
-

3. Accessories

The conduit system shall include:

- Couplers
- Bends / inspection bends
- Junction boxes / inspection boxes
- Adapters, bushes, locknuts
- Saddles / clamps
- Pull boxes (where required)

All accessories shall be:

- Compatible with conduit size
- Of approved make and quality

4. Installation

- Installation type:
 - **Concealed in wall / ceiling** (*or surface if specified*)
 - Method:
 - Conduits shall be laid in straight alignment and proper routing before plastering
 - Fixing:
 - Using **clamps/saddles at intervals of approx. 600 mm**
 - Jointing:
 - Using **approved PVC solvent cement**
 - Bends:
 - Long radius bends to facilitate easy pulling of multiple/heavy cables
-

5. Junction Boxes

- Type:
 - PVC / metallic
 - Installation:
 - Flush with wall/ceiling surface
 - Cover:
 - Removable and properly secured for maintenance access
-

6. Workmanship

- Conduits shall be:
 - Free from cracks, dents, or deformation
 - Properly aligned and rigidly fixed
 - Internal surface:
 - Smooth, without sharp edges
 - **Fish wire (draw wire)** shall be provided for cable pulling
-

7. Testing

- Inspection for:
 - Alignment and secure fixing
 - Proper jointing and continuity
 - Ensure:
 - Easy and obstruction-free cable pulling
-

(14)

TECHNICAL SPECIFICATION – UNDERFLOOR CABLE TRUNKING (300 × 38 MM, 3 COMPARTMENTS) – CAT III

1. Scope of Work

Supplying, laying, fixing and commissioning of **underfloor pre-galvanised rectangular sheet steel cable trunking system** suitable for power and ELV services, complete with accessories, junction boxes, joints and all fittings as per OEM guidelines and direction of Engineer-in-Charge.

2. Material Specifications

- Type:
 - **Rectangular cable trunking (underfloor type)**
- Size:
 - **300 mm (Width) × 38 mm (Depth) × 1.6 mm (Thickness)**
- Material:
 - **Pre-galvanised sheet steel**
- Thickness:
 - **1.6 mm (uniform)**
- Finish:
 - Corrosion-resistant zinc coating (factory pre-galvanised)

3. Load Bearing Capacity

- Trunking shall:
 - Withstand **point load up to 1.33 Ton**
 - Suitable for:
 - Heavy-duty floor applications (commercial/office areas)
-

4. Construction Features

- Design:
 - Fully enclosed rectangular trunking
 - Compartments:
 - **Three (3) separate compartments**
 - For segregation of:
 - **Power cables**
 - **ELV/Data cables**
 - **Optional (voice/communication/UPS)**
 - Separation:
 - Metallic partitions between compartments
-

5. Waterproofing / Seepage Protection

- Trunking shall be:
 - **Leak-proof and resistant to seepage**
 - Prevent:
 - Entry of **concrete slurry / screed water**
 - Joints:
 - Properly sealed using gaskets/sealants as per OEM design
-

6. Accessories

The system shall include:

- Junction boxes
- Tee / cross junctions
- Couplers and jointing plates
- Covers and lids
- End caps
- Fixing brackets/supports
- Gaskets and sealing compounds

All accessories shall be:

- Of same material and finish
 - Compatible with trunking system
-

7. Installation

- Location:
 - **Underfloor (embedded in screed / flooring)**
 - Method:
 - Laid as per approved layout drawings
 - Alignment:
 - Proper straight routing with level control
 - Fixing:
 - Firmly supported and secured before concreting
 - Jointing:
 - Using bolts/screws with sealing arrangement
 - Coordination:
 - With civil works before screed laying
-

8. Cable Segregation

- Mandatory separation:
 - **Power and ELV cables in separate compartments**
- Prevents:
 - Electrical interference (EMI)
 - Safety hazards

(15)

TECHNICAL SPECIFICATION – PERFORATED C-TYPE CABLE TRAY (300 × 50 × 1.5 MM) – CAT III

1. Scope of Work

Providing, fixing, and erecting **perforated C-type cable tray** made from pre-galvanised steel sheet, including all accessories, jointing, and fixing on existing supports, complete as per specifications and direction of Engineer-in-Charge.

2. Material Specifications

- Type:
 - **Perforated C-type cable tray**
- Size:
 - **300 mm (Width) × 50 mm (Depth) × 1.5 mm Thickness**
- Material:
 - **Pre-galvanised sheet steel**
- Base material standard:
 - **IS 2062 / IS 1079**
- Finish:
 - Factory pre-galvanised (zinc coated) for corrosion protection

3. Perforation

- Perforation:
 - Uniformly distributed holes for ventilation and heat dissipation
- Maximum perforation:
 - **Up to 17.5% of tray surface area**
- Purpose:
 - Improves air circulation and reduces cable heating

4. Construction Features

- Tray edges:
 - Properly folded/rolled edges for:
 - Mechanical strength
 - Safety (no sharp edges)
- Structure:
 - Rigid and capable of handling specified cable load
- Fabrication:
 - Machine formed/bended as per standards

5. Accessories

The tray system shall include:

- **Coupler plates / Fish plates**
- GI nuts, bolts, washers
- Bends (horizontal/vertical)
- Tees / crosses (if required)
- Reducers
- End caps

All accessories shall be:

- Of same material and thickness
- Pre-galvanised / GI finished

6. Installation

- Installation location:
 - **Electrical duct / service shaft / ceiling / plant area**
 - Support:
 - Fixed on **existing support system**
 - Fixing:
 - Using GI nuts, bolts, and washers
 - Alignment:
 - Proper horizontal/vertical alignment maintained
 - Jointing:
 - Using coupler/fish plates with proper tightening
 - Earthing:
 - Tray shall be properly earthed at regular intervals
-

7. Application

Suitable for routing of:

- **ELV (Data, CCTV, IT cables)**
 - **Electrical (Power cables)**
 - **HVAC control cables**
 - **Fire alarm cables**
-

8. Load Consideration

- Tray shall be:
 - Designed to carry cable load with adequate safety margin
- Proper spacing of supports to avoid sagging

(16)

TECHNICAL SPECIFICATION – COMPUTER RJ-45 SOCKET (MODULAR TYPE) – CAT III

1. Scope of Work

Providing, fixing, terminating and testing of **RJ-45 computer data socket (I/O outlet)** in modular form, including mounting on box, faceplate, and necessary connections complete as per site requirements and direction of Engineer-in-Charge.

2. Description

- Item:
 - **RJ-45 Data Socket (Computer Outlet)**
 - Type:
 - **Modular type (snap-in module)**
 - Application:
 - For **LAN / Ethernet networking**
-

3. Technical Specifications

- Category:
 - **CAT-6 (or as specified in BOQ)**
 - Connector:
 - **RJ-45 (8P8C) female jack**
 - Compatibility:
 - Suitable for **CAT-6 UTP cable**
 - Bandwidth:
 - Up to **250 MHz**
 - Data support:
 - **10/100/1000 Mbps (Gigabit Ethernet)**
-

4. Mounting Arrangement

- Box:
 - **PVC / Metallic / Wooden box**
 - Mounting:
 - **On single modular base frame**
 - Plate:
 - Modular front plate with:
 - **Textured / metallic / white finish**
 - Installation:
 - Flush mounted in wall / surface mounted as required
-

5. Termination

- Cable termination:
 - Using **IDC (Insulation Displacement Connector)**
 - Wiring standard:
 - **T568A or T568B** (uniform throughout system)
 - Tool:
 - Proper punch-down tool shall be used
 - Labeling:
 - Both ends shall be properly identified
-

6. Accessories

- Modular face plate
 - Base frame
 - Mounting box
 - Cable manager (if required)
 - Identification labels
-

7. Installation

- Socket shall be:
 - Properly fixed and aligned
 - Cable routing:
 - Through conduit/trunking without damage
 - Maintain:
 - Minimum bend radius of LAN cable
 - Avoid:
 - EMI interference (separation from power cables)
-

8. Testing & Commissioning

- Continuity test
 - Wire mapping test
 - Fluke test (recommended for CAT-6 certification)
 - Data connectivity test
-

9. Approved Makes

- D-Link / Molex / Schneider / Legrand / AMP / Belden or approved equivalent

(17)

TECHNICAL SPECIFICATION – TELEPHONE SOCKET (RJ-11 / TWO PIN) – TWO GANG – CAT III

1. Scope of Work

Providing, fixing, terminating and testing of **telephone socket outlet (RJ-11 / two pin type)** in **two gang configuration**, including mounting, connections and accessories complete as per site requirements and direction of Engineer-in-Charge.

2. Description

- Item:
 - **Telephone socket outlet**
 - Type:
 - **RJ-11 (6P2C/6P4C) modular socket or 2-pin telephone socket**
 - Configuration:
 - **Two gang (double module)**
 - Application:
 - For **telephone / intercom / voice communication systems**
-

3. Technical Specifications

- Connector:
 - **RJ-11 female jack (6P type)** (*preferred modern system*)
(*or 2-pin connector as specified*)
 - Compatibility:
 - Suitable for **telephone cable (0.5 mm dia copper conductor / CAT3/CAT5 voice cable)**
 - Mounting type:
 - Modular snap-in type
-

4. Mounting Arrangement

- Box:
 - **PVC / Metallic / Wooden box**
 - Mounting:
 - On **modular base frame (two gang)**
 - Plate:
 - Modular front plate with:
 - **Textured / metallic / white finish**
 - Installation:
 - Flush mounted in wall / surface mounted as required
-

5. Termination

- Cable termination:
 - Through **screw terminals / IDC type**
 - Pair connection:
 - Proper polarity maintained (Tip & Ring)
 - Cable:
 - Telephone cable routed through conduit
 - Labeling:
 - Proper identification at both ends
-

6. Accessories

- Modular RJ-11 / 2-pin modules (2 Nos. for two gang)
 - Base frame (two module capacity)
 - Front plate
 - Mounting box
 - Fixing screws and connectors
-

7. Installation

- Socket shall be:
 - Firmly fixed and aligned
 - Wiring:
 - Neatly dressed and terminated
 - Routing:
 - Separate from power cables to avoid interference
-

8. Testing & Commissioning

- Continuity test
 - Line polarity check
 - Functional test with telephone instrument
-

9. Approved Makes

- Anchor / Legrand / Schneider / D-Link / Molex / Havells or approved equivalent

(18)

TECHNICAL SPECIFICATION – MODULAR SWITCH BOARD (COMPUTER / ELECTRICAL APPARATUS) – CAT III

1. Scope of Work

Providing, fixing, wiring, testing and commissioning of **modular switch board** for computer/electrical apparatus, complete with accessories, mounting box, faceplate and internal connections as per site requirements and direction of Engineer-in-Charge.

2. Description of Switch Board

The switch board shall consist of the following modular accessories:

- **1 No. 6A/16A Universal Plug with Switch (combined unit)**
- **3 Nos. 6A Modular Switches**
- **3 Nos. 6A, 5-pin Socket Outlets**

All modules shall be mounted on a **single base frame with front plate**.

3. Material Specifications

- Accessories:
 - Modular type switches and sockets
 - High quality **FR grade polycarbonate**
 - Switch rating:
 - **6A switches (240V AC)**
 - Socket rating:
 - **6A, 5-pin sockets**
 - Universal socket:
 - **6A/16A combined universal type with control switch**
 - Finish:
 - **Textured / metallic / white front plate**
-

4. Mounting Arrangement

- Box:
 - **PVC / Metallic (GI) / Wooden box**
 - Type:
 - **Concealed or surface mounted**
 - Mounting:
 - Modular base frame with front plate
 - Installation:
 - Flush with wall for concealed system
-

5. Wiring & Connections

- Internal wiring:
 - Using **FRLS copper wires (1.5 sq.mm or as required)**
- Looping:
 - Proper phase looping through switches
- Neutral:
 - Common neutral looped to sockets
- Earth:
 - Proper earth continuity provided to all sockets
- Termination:

- Proper ferruling and tightening

6. Earthing

- Earth wire:
 - Connected to all socket earth terminals
- Continuity:
 - Maintained from main earthing system
- All metallic parts:
 - Properly earthed

7. Installation Requirements

- Board shall be:
 - Properly aligned and firmly fixed
- Modules:
 - Neatly arranged and flush fitted
- Wiring:
 - Neatly dressed inside box
- No loose connections permitted

8. Testing & Commissioning

- Continuity test
- Insulation resistance test
- Polarity test
- Functional test of:
 - Switches
 - Sockets
 - Universal plug

9. Approved Makes

- Anchor / Roma / Legrand / Schneider / Havells or approved equivalent

(19)

TECHNICAL SPECIFICATION – LED MIRROR LIGHT (9W, WALL MOUNTED) – CAT III

1. Scope of Work

Supplying, installing, testing and commissioning of **LED mirror light fitting (wall mounted)** complete with LED module, driver, housing, diffuser and all accessories as per specifications and direction of Engineer-in-Charge.

2. Luminaire Description

- Type:
 - **LED Mirror Light (Linear type)**
- Mounting:
 - **Wall mounted above mirror**
- Length:
 - **Minimum 1 feet (≈ 300 mm)**
- Application:
 - **Toilet mirror / dressing mirror illumination**

3. Electrical Specifications

- Wattage:
 - **9 Watts**
- Input voltage:
 - **160V to 270V AC**
- Frequency:
 - **50 Hz**

- Power factor:
 - ≥ 0.95
 - Total Harmonic Distortion (THD):
 - $< 15\%$
 - Driver efficiency:
 - $\geq 85\%$
-

4. LED Specifications

- LED type:
 - LEDs of **0.2W to 0.5W** mounted on **single MCPCB**
 - Luminous efficacy:
 - ≥ 85 lumens/Watt
 - CCT (Colour Temperature):
 - **3000K to 6500K** (*as selected by Engineer-in-Charge*)
 - Light output:
 - Uniform, glare-free illumination suitable for mirrors
-

5. Housing & Construction

- Material:
 - **CRCA sheet steel (IS 513) / Aluminium pressure die-cast**
 - Finish:
 - **Powder coated**
 - **High UV & corrosion resistance**
 - Heat dissipation:
 - Housing acts as **heat sink**
 - Diffuser:
 - High quality **opal / frosted diffuser**
 - Ensures uniform light distribution
 - Marking:
 - Manufacturer's **name/logo** on luminaire body
-

6. Driver

- Type:
 - **Inbuilt LED driver**
 - Protection:
 - Short circuit / overload protection
 - Efficiency:
 - $\geq 85\%$
 - Mounting:
 - Integrated within fitting
-

7. Mounting & Installation

- Installation:
 - **Wall mounted above mirror**
 - Fixing:
 - Using screws/fasteners on wall surface
 - Wiring:
 - Connected to nearby light point
 - Alignment:
 - Proper horizontal alignment for uniform illumination
-

8. Certifications

- Mandatory:
 - **LM-79 (Photometric performance)**
 - **LM-80 (LED life performance)**

- Compliance:
 - BIS / relevant Indian standards
-

9. Testing & Commissioning

- Visual inspection
 - Electrical testing
 - Illumination check
 - Functional operation
-

10. Approved Makes

- Philips / Wipro / Havells / Crompton / Bajaj / Syska or approved equivalent

(20)

TECHNICAL SPECIFICATION – LED TUBE LIGHT (18–20W, 4 FT, INTEGRAL DRIVER) – CAT III

1. Scope of Work

Supplying, installing, testing and commissioning of **LED tube light fitting with integral driver**, complete with all accessories, mounting and electrical connections as per specifications and direction of Engineer-in-Charge.

2. Luminaire Description

- Type:
 - **LED Tube Light (Conventional 4 feet)**
 - Wattage:
 - **18 to 20 Watts**
 - Length:
 - **4 feet (approx. 1200 mm)**
 - Mounting:
 - **Surface mounted / batten type**
 - Driver:
 - **Integral (inbuilt) driver**
-

3. Electrical Specifications

- Input voltage:
 - **160V to 270V AC**
 - Frequency:
 - **50 Hz**
 - Power factor:
 - **≥ 0.95**
 - THD:
 - **< 15%**
 - Surge protection:
 - **Minimum 2 kV**
 - Driver efficiency:
 - **≥ 85%**
-

4. LED Specifications

- LED type:
 - **LEDs of 0.2W to 0.5W mounted on single MCPCB**
- Luminous efficacy:
 - **≥ 85 lumens/Watt**
- CCT:
 - **3000K to 6500K (as approved)**
- Light output:
 - **Uniform, glare-free illumination**

5. Housing & Construction

- Material:
 - **CRCA sheet steel (IS 513) / Aluminium die-cast / Extruded aluminium**
 - Finish:
 - **Powder coated**, corrosion-resistant
 - Heat dissipation:
 - Housing acts as **heat sink**
 - Diffuser:
 - **Opal / milky polycarbonate diffuser**
 - IP Rating:
 - **IP20 (Indoor use)**
 - Marking:
 - Manufacturer's **name/logo** on luminaire
-

6. Driver

- Type:
 - **Integral electronic LED driver**
 - Protection:
 - Over-voltage / short circuit protection
 - Efficiency:
 - **≥ 85%**
-

7. Mounting & Installation

- Installation:
 - **Direct on wall / ceiling (batten mounted)**
 - Fixing:
 - Using suitable screws and fasteners
 - Wiring:
 - Connected to light point via ceiling rose / connector
 - Alignment:
 - Properly leveled and secured
-

8. Certifications

- Mandatory:
 - **LM-79 (photometric performance)**
 - **LM-80 (LED life performance)**
 - Compliance:
 - BIS / relevant Indian standards
-

9. Testing & Commissioning

- Visual inspection
 - Electrical testing
 - Illumination check
 - Functional operation
-

10. Approved Makes

- Philips / Wipro / Havells / Crompton / Bajaj / Syska or approved equivalent
-

11. Category

- **Category III** – Includes supply, fixing, connection and testing complete

(21)

TECHNICAL SPECIFICATION – LED DOWNLIGHT (5–9W, SQUARE/CIRCULAR, SURFACE/RECESSED) – CAT III

1. Scope of Work

Supplying, installing, testing and commissioning of **LED downlight fitting** (square/circular, surface or recessed type), complete with LED module, driver, mounting accessories and connections as per specifications and direction of Engineer-in-Charge.

2. Luminaire Description

- Type:
 - **LED Downlight**
 - Shape:
 - **Square / Circular**
 - Mounting:
 - **Recessed (spring-loaded clips) / Surface mounted**
 - Wattage:
 - **5 to 9 Watts**
 - Application:
 - Indoor lighting for **residential, commercial, offices**
-

3. Electrical Specifications

- Input voltage:
 - **160V to 270V AC**
 - Frequency:
 - **50 Hz**
 - Power factor:
 - **≥ 0.90**
 - THD:
 - **< 15%**
 - Surge protection:
 - **Minimum 2 kV**
 - Driver efficiency:
 - **≥ 85%**
-

4. LED Specifications

- LED type:
 - LEDs of **0.2W to 0.5W mounted on single MCPCB**
 - Luminous efficacy:
 - **≥ 85 lumens/Watt**
 - CCT:
 - **3000K to 6500K** (*Warm / Neutral / Cool White as approved*)
 - Light quality:
 - Uniform, glare-controlled illumination
-

5. Housing & Construction

- Material:
 - **CRCA sheet steel (IS 513) / Aluminium pressure die-cast**
 - Finish:
 - **Powder coated**, UV & corrosion resistant
 - Heat management:
 - Housing acts as **heat sink**
 - Diffuser:
 - **Opal / frosted diffuser** for uniform light
 - Body:
 - Aluminium casted body with **manufacturer's name/logo**
 - IP Rating:
 - **IP20 (Indoor use)**
-

6. Driver

- Type:
 - **External / integral LED driver**
 - Protection:
 - Over-voltage, short circuit protection
 - Efficiency:
 - **≥ 85%**
-

7. Mounting & Installation

- Recessed mounting:
 - Using **spring-loaded clips**
 - Suitable cut-out as per fixture size
 - Surface mounting:
 - Using base plate and screws
 - Wiring:
 - Connected to light point via connector/ceiling rose
 - Alignment:
 - Properly centered and flush with ceiling
-

8. Certifications

- Mandatory:
 - **LM-79 (Photometric performance)**
 - **LM-80 (LED life performance)**
 - Compliance:
 - BIS / relevant Indian standards
-

9. Testing & Commissioning

- Visual inspection
 - Electrical testing
 - Illumination check
 - Functional operation
-

10. Approved Makes

- Philips / Wipro / Havells / Crompton / Bajaj / Syska or approved equivalent
-

11. Category

- **Category III** – Includes supply, fixing, connection and testing complete

(22)

TECHNICAL SPECIFICATION – LED DOWNLIGHT (11–15W, SQUARE/CIRCULAR, SURFACE/RECESSED) – CAT III

1. Scope of Work

Supplying, installing, testing and commissioning of **LED downlight fitting** (square/circular type, surface or recessed mounting), complete with LED module, driver, mounting accessories and electrical connections as per specifications and direction of Engineer-in-Charge.

2. Luminaire Description

- Type:
 - **LED Downlight**
- Shape:
 - **Square / Circular**
- Mounting:
 - **Recessed (spring-loaded clips) / Surface mounted**
- Wattage:
 - **11 to 15 Watts**

- Application:
 - Indoor lighting for **residential, commercial, office spaces**
-

3. Electrical Specifications

- Input voltage:
 - **160V to 270V AC**
 - Frequency:
 - **50 Hz**
 - Power factor:
 - **≥ 0.90**
 - THD:
 - **< 15%**
 - Surge protection:
 - **Minimum 2 kV**
 - Driver efficiency:
 - **≥ 85%**
-

4. LED Specifications

- LED type:
 - LEDs of **0.2W to 0.5W mounted on single MCPCB**
 - Luminous efficacy:
 - **≥ 85 lumens/Watt**
 - CCT:
 - **3000K to 6500K** (*Warm / Neutral / Cool White as approved*)
 - Light quality:
 - Uniform, glare-controlled illumination
-

5. Housing & Construction

- Material:
 - **CRCA sheet steel (IS 513) / Aluminium pressure die-cast**
 - Finish:
 - **Powder coated**, UV & corrosion resistant
 - Heat dissipation:
 - Housing acts as **heat sink**
 - Diffuser:
 - **Opal / frosted diffuser**
 - Body:
 - Aluminium casted body with **manufacturer's name/logo**
 - IP Rating:
 - **IP20 (Indoor use)**
-

6. Driver

- Type:
 - **External / integral LED driver**
 - Protection:
 - Over-voltage, short circuit protection
 - Efficiency:
 - **≥ 85%**
-

7. Mounting & Installation

- Recessed mounting:
 - Using **spring-loaded clips**
 - Proper ceiling cut-out as per fixture size
- Surface mounting:
 - Using base plate with screws

- Wiring:
 - Connected to light point via connector/ceiling rose
 - Alignment:
 - Properly centered and flush mounted
-

8. Certifications

- Mandatory:
 - **LM-79 (Photometric performance)**
 - **LM-80 (LED life performance)**
 - Compliance:
 - BIS / relevant Indian standards
-

9. Testing & Commissioning

- Visual inspection
 - Electrical testing
 - Illumination check
 - Functional operation
-

10. Approved Makes

- Philips / Wipro / Havells / Crompton / Bajaj / Syska or approved equivalent
-

11. Category

- **Category III** – Includes supply, fixing, connection and testing complete

(23)

TECHNICAL SPECIFICATION – LED DOWNLIGHT (22–24W, SQUARE/CIRCULAR, SURFACE/RECESSED) – CAT III

1. Scope of Work

Supplying, installing, testing and commissioning of **LED downlight fitting** (square/circular type, surface or recessed mounting), complete with LED module, driver, mounting accessories and electrical connections as per specifications and direction of Engineer-in-Charge.

2. Luminaire Description

- Type:
 - **LED Downlight**
 - Shape:
 - **Square / Circular**
 - Mounting:
 - **Recessed (spring-loaded clips) / Surface mounted**
 - Wattage:
 - **22 to 24 Watts**
 - Application:
 - Indoor lighting for **commercial spaces, halls, lobbies, offices**
-

3. Electrical Specifications

- Input voltage:
 - **160V to 270V AC**
- Frequency:
 - **50 Hz**
- Power factor:
 - **≥ 0.90**
- THD:
 - **< 15%**
- Surge protection:
 - **Minimum 2 kV**

- Driver efficiency:
 - $\geq 85\%$
-

4. LED Specifications

- LED type:
 - LEDs of **0.2W to 0.5W** mounted on single MCPCB
 - Luminous efficacy:
 - ≥ 85 lumens/Watt
 - CCT:
 - **3000K to 6500K** (*as approved: Warm / Neutral / Cool White*)
 - Light quality:
 - Uniform, glare-controlled illumination suitable for larger areas
-

5. Housing & Construction

- Material:
 - **CRCA sheet steel (IS 513) / Aluminium pressure die-cast**
 - Finish:
 - **Powder coated**, UV & corrosion resistant
 - Heat dissipation:
 - Housing acts as **heat sink**
 - Diffuser:
 - **Opal / frosted diffuser**
 - Body:
 - Aluminium casted body with **manufacturer's name/logo**
 - IP Rating:
 - **IP20 (Indoor use)**
-

6. Driver

- Type:
 - **External / integral LED driver**
 - Protection:
 - Over-voltage, short circuit protection
 - Efficiency:
 - $\geq 85\%$
-

7. Mounting & Installation

- Recessed mounting:
 - Using **spring-loaded clips**
 - Suitable ceiling cut-out as per fixture size
 - Surface mounting:
 - Using base plate with screws
 - Wiring:
 - Connected to light point via connector/ceiling rose
 - Alignment:
 - Properly centered and flush with ceiling
-

8. Certifications

- Mandatory:
 - **LM-79 (Photometric performance)**
 - **LM-80 (LED life performance)**
 - Compliance:
 - BIS / relevant Indian standards
-

9. Testing & Commissioning

- Visual inspection

- Electrical testing
 - Illumination check
 - Functional operation
-

10. Approved Makes

- Philips / Wipro / Havells / Crompton / Bajaj / Syska or approved equivalent
-

11. Category

- **Category III** – Includes supply, fixing, connection and testing complete

(24)

TECHNICAL SPECIFICATION – LED PANEL LIGHT (36W, 2'×2') – CAT III

1. Scope of Work

Supplying, installing, testing and commissioning of **LED panel light fitting** complete with LED module, driver, frame, diffuser and all accessories, as per specifications and direction of Engineer-in-Charge.

2. Luminaire Description

- Type:
 - **LED Panel Light (Flat type)**
 - Size:
 - **2 feet × 2 feet (600 mm × 600 mm)**
 - Wattage:
 - **36 Watts**
 - Mounting:
 - **Recessed in false ceiling (grid type)**
(surface/suspended mounting with accessories if required)
 - Application:
 - **Offices, commercial buildings, hospitals, classrooms**
-

3. Electrical Specifications

- Input voltage:
 - **160V to 270V AC**
 - Frequency:
 - **50 Hz**
 - Power factor:
 - **≥ 0.90**
 - THD:
 - **< 15%**
 - Surge protection:
 - **Minimum 2 kV**
 - Driver efficiency:
 - **≥ 85%**
-

4. LED Specifications

- LED type:
 - **LEDs of 0.2W to 0.5W mounted on single MCPCB**
 - Luminous efficacy:
 - **≥ 85 lumens/Watt**
 - CCT:
 - **3000K to 6500K** *(Warm / Neutral / Cool White as approved)*
 - Light distribution:
 - **Uniform, glare-free, wide beam output**
-

5. Housing & Construction

- Material:

- **CRCA sheet steel (IS 513) / Aluminium pressure die-cast / extruded aluminium frame**
 - Finish:
 - **Powder coated**, UV & corrosion resistant
 - Frame:
 - **Plane front frame (edge-lit/back-lit design)**
 - Diffuser:
 - **High-quality translucent (opal) diffuser**
 - Heat dissipation:
 - Housing acts as **heat sink**
 - Marking:
 - Manufacturer's **name/logo** on fitting
 - IP Rating:
 - **IP20 (Indoor use)**
-

6. Driver

- Type:
 - **External LED driver**
 - Protection:
 - Over-voltage / short circuit protection
 - Efficiency:
 - **≥ 85%**
 - Mounting:
 - Placed above ceiling or integrated as per design
-

7. Mounting & Installation

- Recessed mounting:
 - In **standard 600 × 600 mm false ceiling grid**
 - Surface mounting:
 - Using surface mounting frame (if required)
 - Suspension:
 - Using suspension kit (if required)
 - Wiring:
 - Connected via connector/ceiling rose
 - Alignment:
 - Flush and properly seated in grid
-

8. Certifications

- Mandatory:
 - **LM-79 (Photometric performance)**
 - **LM-80 (LED life performance)**
 - Compliance:
 - BIS / relevant Indian standards
-

9. Testing & Commissioning

- Visual inspection
 - Electrical testing
 - Illumination level check
 - Functional operation
-

10. Approved Makes

- Philips / Wipro / Havells / Crompton / Bajaj / Syska or approved equivalent
-

11. Category

- **Category III** – Includes supply, fixing, connection and testing complete

(25)

TECHNICAL SPECIFICATION – LED FLOOD LIGHT (20–30W, IP65) – CAT III

1. Scope of Work

Supplying, installing, testing and commissioning of **LED flood light fitting** complete with LED module, driver, optics, housing, mounting arrangement and accessories as per specifications and direction of Engineer-in-Charge.

2. Luminaire Description

- Type:
 - **LED Flood Light**
 - Wattage:
 - **Above 20W to 30W**
 - Application:
 - **Outdoor lighting, façade lighting, landscape, parking areas, signage illumination**
 - Mounting:
 - **Wall mounted / pole mounted / bracket mounted**
-

3. Electrical Specifications

- Input voltage:
 - **160V to 270V AC**
 - Frequency:
 - **50 Hz**
 - Power factor:
 - **≥ 0.95**
 - THD:
 - **< 10%**
 - Surge protection:
 - **Minimum 4 kV (integral)**
 - Over-voltage protection:
 - **Withstand up to 440V AC line supply**
 - Driver efficiency:
 - **≥ 85%**
-

4. LED Specifications

- LED type:
 - **High power white LEDs (≥ 3W each) mounted on single MCPCB**
 - LED efficacy:
 - **≥ 130 lumens/Watt**
 - Luminaire efficacy:
 - **≥ 100 lumens/Watt**
 - CCT:
 - **3000K to 5700K (Warm to Cool White as approved)**
 - Uniformity ratio:
 - **≥ 0.45**
 - Optics:
 - **Polycarbonate lenses / optics for beam control**
-

5. Housing & Construction

- Material:
 - **High pressure die-cast aluminium housing**
- Finish:
 - **Powder coated, corrosion-resistant**
- Heat sink:
 - **Extruded aluminium heat sink** for efficient heat dissipation
- Diffuser:

- Toughened glass / high-quality diffuser
 - Protection:
 - **IP65 (dustproof and water-resistant)**
 - Marking:
 - Manufacturer's name/logo engraved or embossed
-

6. Driver

- Type:
 - **Integral LED driver**
 - Protection:
 - Over-voltage, short circuit, surge protection
 - Efficiency:
 - **≥ 85%**
-

7. Mounting & Installation

- Mounting:
 - Using **adjustable bracket / clamp**
 - Installation:
 - Wall / pole / structure mounted
 - Alignment:
 - Adjustable tilt for required beam angle
 - Wiring:
 - Weatherproof cable entry with proper gland
-

8. Certifications

- Mandatory:
 - **LM-79 (Photometric performance)**
 - **LM-80 (LED life performance)**
 - Compliance:
 - BIS / relevant Indian standards
-

9. Testing & Commissioning

- Visual inspection
 - Electrical testing
 - Illumination and focusing check
 - Functional operation
-

10. Approved Makes

- Philips / Wipro / Havells / Crompton / Bajaj / GE / Syska or approved equivalent
-

11. Category

- **Category III** – Includes supply, fixing, connection and testing complete

(26)

TECHNICAL SPECIFICATION – DECORATIVE EXHAUST FAN (250 MM, LOW NOISE) – CAT II

1. Scope of Work

Supplying, installing, testing and commissioning of **decorative exhaust fan** complete with motor, louvers, frame, mounting arrangement and electrical connections as per specifications and direction of Engineer-in-Charge.

2. Description

- Type:
 - **Decorative Exhaust Fan**
- Size:

- **250 mm sweep (10 inch)**
 - Speed:
 - **Approx. 1350 RPM**
 - Application:
 - **Toilets, bathrooms, kitchens, utility areas**
-

3. Construction & Material

- Body:
 - **High quality ABS plastic (square frame)**
 - Finish:
 - Aesthetic decorative finish (white/ivory or as approved)
 - Frame:
 - **Square frame design**
 - Louvers:
 - **Inbuilt automatic louvers (shutters)**
 - Prevents entry of dust, insects, and backflow of air
-

4. Motor Specifications

- Type:
 - **Single phase AC motor**
 - Operation:
 - **Low noise / smooth running**
 - Speed:
 - **~1350 RPM**
 - Bearing:
 - **Sleeve bearing / ball bearing (as per make)**
 - Insulation:
 - Class B or better
-

5. Electrical Specifications

- Voltage:
 - **230V AC $\pm 10\%$**
 - Frequency:
 - **50 Hz**
 - Power consumption:
 - Typically **35–45 Watts** (*depending on make*)
 - Protection:
 - Overload protection (as per manufacturer design)
-

6. Performance

- Air delivery:
 - Approx. **700–900 CMH** (*typical for 250 mm fan*)
 - Noise level:
 - **Low noise operation** suitable for indoor use
-

7. Mounting & Installation

- Mounting:
 - **Wall mounted / window mounted**
- Fixing:
 - Using screws, clamps or brackets
- Opening:
 - Suitable cut-out provided in wall/window
- Alignment:
 - Properly fixed to avoid vibration
- Wiring:

- Connected to switch point with proper earthing

8. Accessories

- Mounting screws and fasteners
- Back shutter (inbuilt louvers)
- Protective grill (if provided)

9. Testing & Commissioning

- Rotation check
- Noise level verification
- Air flow direction check
- Functional operation

10. Approved Makes

- Crompton / Havells / Usha / Bajaj / Orient / Anchor or approved equivalent

11. Category

- **Category II** – Includes supply and erection (installation) complete

(27)

TECHNICAL SPECIFICATION – CEILING FAN (900 MM SWEEP, DOUBLE BALL BEARING)

1. Scope of Work

Providing, installing, testing and commissioning of **ceiling fan** complete with motor, blades, canopy, downrod, capacitor and all accessories as per specifications and direction of Engineer-in-Charge.

2. Description

- Type:
 - **Ceiling Fan**
- Sweep:
 - **900 mm (36 inch)**
- Blades:
 - **3 blades (Aluminium)**
- Application:
 - Suitable for **residential rooms, offices, cabins**

3. Construction & Material

- Blades:
 - **Aluminium blades**, aerodynamically designed
 - Powder coated / painted finish
- Motor housing:
 - Metallic body with corrosion-resistant finish
- Canopy:
 - Top and bottom canopy for aesthetic finish
- Downrod:
 - Suitable length with shackle assembly

4. Motor Specifications

- Type:
 - **Single phase induction motor**
- Bearing:
 - **Double ball bearing** for smooth and long-life operation
- Insulation:
 - Class B or higher
- Operation:
 - Low noise and vibration-free

5. Electrical Specifications

- Voltage:
 - **230V AC**
 - Frequency:
 - **50 Hz**
 - Capacitor:
 - Heavy duty **condenser (capacitor type)**
 - Power consumption:
 - Typically **50–70 Watts** (*depending on make*)
 - Speed:
 - Approx. **350–400 RPM**
-

6. Performance

- Air delivery:
 - Approx. **110–140 CMM**
 - Efficiency:
 - Energy efficient performance with smooth airflow
-

7. Mounting & Installation

- Mounting:
 - Suspended from ceiling using **downrod and shackle**
 - Fixing:
 - Proper anchoring with hook/bolt in ceiling
 - Wiring:
 - Connected through **ceiling rose / connector**
 - Regulator:
 - Compatible with **electronic fan regulator**
 - Earthing:
 - Proper earthing of fan body
-

8. Accessories Included

- Downrod
 - Shackle assembly
 - Canopy (top & bottom)
 - Capacitor
 - Mounting hardware
-

9. Testing & Commissioning

- Rotation direction check
 - Speed control check
 - Noise and vibration check
 - Functional operation
-

10. Approved Makes

- Crompton / Havells / Orient / Usha / Bajaj / Anchor or approved equivalent

(28)

TECHNICAL SPECIFICATION – POWER SAVING CEILING FAN (50W, 1200 MM SWEEP)

1. Scope of Work

Providing, installing, testing and commissioning of **power saving ceiling fan** complete with motor, blades, canopy, downrod, capacitor, earthing and all accessories as per specifications and direction of Engineer-in-Charge.

2. Description

- Type:
 - **Energy efficient ceiling fan**
 - Sweep:
 - **1200 mm (48 inch)**
 - Blades:
 - **3 aluminium blades**
 - Power consumption:
 - **50 Watts (power saving type)**
 - Application:
 - Suitable for **residential rooms, offices, halls**
-

3. Construction & Material

- Blades:
 - **Aluminium blades**, aerodynamically balanced
 - Powder coated / corrosion resistant finish
 - Motor housing:
 - Sturdy metallic body with aesthetic finish
 - Canopy:
 - Top and bottom canopy provided
 - Downrod:
 - **30 cm (300 mm) length**
 - With shackle assembly
-

4. Motor Specifications

- Type:
 - **Single phase induction motor**
 - Bearing:
 - **Double ball bearing**
 - Insulation:
 - Class B or better
 - Operation:
 - Smooth, low noise, long life
-

5. Electrical Specifications

- Voltage:
 - **230V AC**
 - Frequency:
 - **50 Hz**
 - Capacitor:
 - Heavy duty **condenser (capacitor type)**
 - Power consumption:
 - **50 Watts**
 - Speed:
 - Approx. **350–380 RPM**
-

6. Performance

- Air delivery:
 - Approx. **200–230 CMM**
 - Efficiency:
 - High air delivery with reduced power consumption
-

7. Mounting & Installation

- Mounting:
 - Suspended from ceiling using **30 cm downrod**
- Fixing:

- Proper hook/anchor bolt arrangement
 - Wiring:
 - Through ceiling rose / connector
 - Regulator:
 - Compatible with electronic fan regulator
 - Earthing:
 - **Proper earthing mandatory**
-

8. Accessories Included

- 30 cm downrod
 - Shackle assembly
 - Canopy (top & bottom)
 - Capacitor
 - Mounting hardware
-

9. Testing & Commissioning

- Rotation and balancing check
 - Speed regulation check
 - Noise and vibration check
 - Earthing continuity check
-

10. Standards

- **ISI marked (BIS certified)**
 - Conforming to relevant IS standards for ceiling fans
-

11. Approved Makes

- Crompton / Havells / Orient / Usha / Bajaj / Anchor or approved equivalent

(29)

TECHNICAL SPECIFICATION – FAN HOOK BOX (CONCEALED IN RCC CEILING)

1. Scope of Work

Providing and erecting **fan hook box assembly** including MS hook, box, fixing with RCC reinforcement, and finishing, complete as per specifications and direction of Engineer-in-Charge.

2. Description

- Item:
 - **Fan Hook Box**
 - Application:
 - For supporting **ceiling fan / light fixtures**
 - Installation:
 - **Concealed in RCC slab/ceiling**
-

3. Material Specifications

a) Hook

- Material:
 - **Mild Steel (M.S.) round bar**
 - Size:
 - **10 mm diameter**
 - Shape:
 - U-shaped / hook type suitable for fan suspension
 - Fixing:
 - Ends bent and tied with RCC reinforcement bars
-

b) Box

- Type:

- **MS box (16 Gauge) / Heavy Duty PVC box**
 - Thickness (MS box):
 - **16 Gauge (~1.6 mm)**
 - Size:
 - Suitable to accommodate hook and wiring connection
 - Features:
 - Provision for conduit entry
-

4. Installation

- Placement:
 - Positioned at required fan location before slab casting
 - Fixing:
 - **MS hook ends embedded and bound with RCC steel bars**
 - **Minimum 50 mm anchorage on both sides**
 - Alignment:
 - Hook shall be centered and vertically aligned
 - Box fixing:
 - Properly secured to reinforcement to avoid displacement during concreting
-

5. Concealing & Finishing

- Box shall be:
 - Fully **embedded in RCC slab**
 - Opening:
 - Proper opening maintained for fan mounting
 - Finishing:
 - Surface finished flush with ceiling
 - No visible cracks or gaps
-

6. Strength Requirements

- Hook arrangement shall:
 - Safely support **ceiling fan load and dynamic load**
 - Proper anchorage to avoid:
 - Loosening or vibration
-

7. Accessories

- Binding wire for fixing with reinforcement
 - Conduit entry provision
 - Protective covering during concreting
-

8. Workmanship

- Ensure:
 - Proper alignment and positioning
 - Firm fixing before concrete pouring
 - Prevent:
 - Movement or tilting during concreting
-

9. Testing & Inspection

- Visual inspection:
 - Position and alignment
 - Check:
 - Firm anchorage and rigidity
 - Load safety:
 - Must withstand fan load safely
-

10. Standards

Work shall comply with:

- **IS standards for MS materials**
- **IS 732** – Electrical installation practices
- Good engineering practices

(30)

TECHNICAL SPECIFICATION – ACRYLIC COVER FOR FAN HOOK / FAN BOX (2.5 MM THICK)

1. Scope of Work

Providing, cutting, fixing and finishing of **laminated acrylic sheet** to cover **fan hook / fan box opening**, complete in all respects as per specifications and direction of Engineer-in-Charge.

2. Description

- Item:
 - **Acrylic Sheet Cover**
- Application:
 - Covering exposed **fan hook box / ceiling opening**
- Location:
 - **Ceiling mounted (below fan canopy area)**

3. Material Specifications

- Material:
 - **Acrylic (PMMA) sheet**
- Thickness:
 - **2.5 mm**
- Type:
 - **Laminated / decorative finish**
- Finish:
 - **Transparent / milky / colored / laminated (as approved)**
- Properties:
 - Lightweight
 - Smooth surface finish
 - Crack-resistant and durable

4. Size & Shape

- Size:
 - As per **fan box / hook box opening**
- Shape:
 - **Square / circular / rectangular (as per site requirement)**
- Cutting:
 - Machine cut with smooth edges

5. Installation

- Fixing:
 - Using:
 - Screws with caps /
 - Adhesive /
 - Double-sided tape (*as approved*)
- Alignment:
 - Properly centered with fan hook location
- Fit:
 - Neatly covering opening without gaps

6. Workmanship

- Edges:

- Smooth and polished (no sharp edges)
 - Surface:
 - Free from scratches, bubbles or defects
 - Installation:
 - Firm and vibration-free fixing
-

7. Accessories

- Screws with decorative caps (if required)
 - Adhesive / fixing material
 - Edge finishing materials
-

8. Testing & Inspection

- Visual inspection:
 - Finish and alignment
 - Check:
 - Proper coverage of opening
 - Firm fixing
-

9. Standards

- As per:
 - Approved material quality standards
 - Good engineering and finishing practices

(31)

TECHNICAL SPECIFICATION – M.S. PIPE DOWN ROD FOR CEILING FAN (19/20 MM NB)

1. Scope of Work

Supplying, fabricating, painting, installing and commissioning of **MS pipe down rod** for ceiling fan, complete with insulation, earthing and all accessories as per specifications and direction of Engineer-in-Charge.

2. Description

- Item:
 - **Fan Down Rod**
 - Size:
 - **19 mm / 20 mm nominal bore (NB)**
 - Type:
 - **Medium Class M.S. Pipe**
 - Application:
 - Suspension of **ceiling fan from slab/ceiling**
-

3. Material Specifications

- Pipe:
 - **Mild Steel (M.S.) pipe – Medium Class**
 - Standard:
 - Conforming to **IS 1239 (Part 1)**
 - Diameter:
 - **19/20 mm NB**
 - Length:
 - As per requirement (*generally 300 mm to 600 mm or as directed*)
-

4. Fabrication

- Threading:
 - Proper threading at both ends (if required)
- Drilling:
 - Holes for **safety pin / bolt fixing**

- Finishing:
 - Smooth surface, free from burrs and sharp edges
-

5. Painting & Protection

- Surface preparation:
 - Cleaning and removal of rust
 - Coating:
 - **One coat primer + two coats synthetic enamel paint**
 - Finish:
 - Corrosion-resistant and aesthetically matching ceiling/fan
-

6. Insulation

- Insulating bush/sleeve:
 - Provided at fan connection point
 - Purpose:
 - Prevents **electrical leakage through rod**
 - Material:
 - PVC / bakelite / approved insulating material
-

7. Earthing

- Provision:
 - Proper **earthing continuity through down rod**
 - Connection:
 - Earth wire connected to fan body
 - Ensure:
 - No break in earthing path
-

8. Installation

- Mounting:
 - Connected between **fan hook and fan body**
 - Fixing:
 - Using **shackle / bolt / pin arrangement**
 - Alignment:
 - Vertical alignment ensured
 - Safety:
 - Secure locking with **split pin / nut bolt**
-

9. Accessories

- Shackle assembly
 - Nut, bolts, washers
 - Safety pin
 - Insulating bush
 - Earthing connection
-

10. Testing & Inspection

- Check:
 - Alignment and rigidity
- Ensure:
 - No wobbling or vibration
- Verify:
 - Earthing continuity
 - Insulation effectiveness

TECHNICAL SPECIFICATION – WATER COOLER (150 LPH, 150 LTR STORAGE) – STAINLESS STEEL BODY

1. Scope of Work

Supplying, installing, testing and commissioning of **storage type water cooler** complete with refrigeration system, storage tank, piping connections and all accessories as per specifications and direction of Engineer-in-Charge.

2. Description

- Type:
 - **Storage Water Cooler**
 - Cooling capacity:
 - **150 Litres per hour (LPH)**
 - Storage capacity:
 - **150 Litres**
 - Application:
 - **Schools, offices, public places, industrial areas**
-

3. Performance Requirements

- Ambient temperature:
 - **Up to 45°C**
 - Cooling performance:
 - Water temperature drop of **minimum 15°C within one hour**
 - Continuous cooling:
 - Capable of maintaining rated performance under specified conditions
-

4. Construction & Material

- Outer body:
 - **Stainless Steel (SS 202 / SS 304 as approved)**
 - Inner tank:
 - **Food-grade Stainless Steel**
 - Insulation:
 - **PUF insulation** to minimize heat loss
 - Finish:
 - Corrosion-resistant, hygienic and easy to clean
-

5. Refrigeration System

- Compressor:
 - **Hermetically sealed compressor**
 - Condenser:
 - Air-cooled condenser with fan motor
 - Evaporator:
 - Efficient evaporating coil wrapped around storage tank
 - Refrigerant:
 - Eco-friendly refrigerant (R134a or equivalent)
 - Controls:
 - Thermostat for temperature control
 - Relay and overload protection
-

6. Electrical Specifications

- Voltage:
 - **230V AC**
- Frequency:
 - **50 Hz**
- Power consumption:
 - As per manufacturer (approx. **1–1.5 kW**)

- Protection:
 - Overload and short circuit protection
-

7. Components & Features

- Fan motor for condenser cooling
 - Thermostat for temperature regulation
 - Water level indicator (if provided)
 - Drain arrangement for cleaning
 - Anti-corrosive components
-

8. Inlet & Outlet Connections

- Water inlet:
 - With float valve / control valve
 - Outlet:
 - Drinking taps (SS faucets)
 - Drain:
 - For cleaning and maintenance
 - Connections:
 - Suitable for standard plumbing lines
-

9. Mounting & Installation

- Installation:
 - Floor mounted on firm base
 - Leveling:
 - Proper leveling for smooth operation
 - Connections:
 - Electrical connection with proper earthing
 - Plumbing connections for inlet/outlet
 - Ventilation:
 - Adequate airflow space around unit
-

10. Testing & Commissioning

- Cooling performance test
 - Leak test of refrigeration system
 - Electrical safety test
 - Functional testing of thermostat and compressor
-

11. Approved Makes

- Blue Star / Voltas / Usha / Havells / Western / Rockwell or approved equivalent

(33)

TECHNICAL SPECIFICATION – REVERSE OSMOSIS (RO) WATER PURIFICATION SYSTEM (50 LPH) – CAT III

1. Scope of Work

Supplying, installing, testing and commissioning of **5-stage Reverse Osmosis (RO) water purification system**, complete with filtration stages, pumps, storage, piping connections and accessories as per specifications and direction of Engineer-in-Charge.

2. Description

- Type:
 - **5 Stage RO Water Purification System**
- Capacity:
 - **50 Litres per hour (LPH)**
- Application:

- Suitable for **offices, institutions, commercial use**
-

3. Filtration Stages

The system shall consist of the following stages:

1. **Pre-sediment Filter**
 - Removes suspended particles, dust, sand
 - With housing and **‘O’ ring sealing**
 2. **Granular Activated Carbon (GAC) Filter**
 - Removes chlorine, odor and organic impurities
 3. **Carbon Block Filter**
 - Fine filtration of chlorine and chemical contaminants
 4. **RO Membrane**
 - High pressure membrane for dissolved salts removal
 5. **Post Carbon Filter (Inline)**
 - Improves taste and odor of purified water
-

4. Pump & Pressure System

- Booster pumps:
 - **2 Nos. high pressure booster pumps**
 - Pump capacity:
 - **Up to 150 psi**
 - Inline pump:
 - Suitable **DC booster pump (80 psi / 40 psi operation range)**
 - Function:
 - Maintains required pressure for RO membrane
-

5. Control & Protection

- Low pressure switch:
 - Protects system from dry running
 - High pressure switch:
 - Prevents overpressure
 - Auto cut-off:
 - Stops system when tank is full
 - Solenoid valve:
 - Controls water flow
-

6. Construction & Material

- Frame:
 - **M.S. powder coated frame**
 - Filter housings:
 - Food grade plastic with **‘O’ ring sealing**
 - Piping:
 - Food grade tubing (HDPE/UPVC)
-

7. Storage Tank

- Type:
 - **Food grade storage tank**
 - Capacity:
 - As per system requirement (*generally 50–100 L or as specified*)
 - Features:
 - Covered and hygienic
-

8. Electrical Specifications

- Voltage:
 - **230V AC**

- Frequency:
 - **50 Hz**
- Power consumption:
 - Approx. **100–300 Watts** (*depending on pump*)
- Protection:
 - Overload and short circuit protection

9. Performance

- Output:
 - **50 LPH purified water**
- Recovery:
 - As per feed water quality (typically 40–60%)
- Water quality:
 - Removes **TDS, bacteria, dissolved salts, chemicals**

10. Installation

- Mounting:
 - Wall mounted / floor mounted on **MS frame**
- Connections:
 - Raw water inlet
 - Reject water outlet
 - Pure water outlet
- Drain:
 - Proper reject water disposal
- Electrical:
 - With proper earthing and plug point

11. Testing & Commissioning

- Leak test
- Pressure test
- Water quality test (TDS reduction)
- Functional testing of all stages and controls

12. Approved Makes

- Kent / Aquaguard / Pureit / Blue Star / Ion Exchange or approved equivalent

13. Category

- **Category III** – Includes supply, installation, connections and testing complete

(34)

TECHNICAL SPECIFICATION – MINIATURE CIRCUIT BREAKER (SP, 6A–25A, 10kA) – CAT III

1. Scope of Work

Providing, fixing, connecting, testing and commissioning of **single pole miniature circuit breaker (MCB)** in existing distribution board/box, complete in all respects as per specifications and direction of Engineer-in-Charge.

2. Description

- Type:
 - **Miniature Circuit Breaker (MCB)**
- पोल:
 - **Single Pole (SP)**
- Current rating:
 - **6A to 25A** (*as per circuit requirement*)
- Application:

- Protection of **lighting, socket and small power circuits**
-

3. Electrical Specifications

- Rated voltage:
 - **240V AC**
 - Frequency:
 - **50 Hz**
 - Breaking capacity:
 - **10 kA**
 - Tripping characteristics:
 - **B Curve / C Curve** (*as specified*)
 - Insulation voltage:
 - As per standard requirements
-

4. Standards

- Conforming to:
 - **IS 8828:1996**
 - Certification:
 - **ISI Marked**
-

5. Construction Features

- Housing:
 - **Flame retardant, heat resistant thermoplastic**
 - Contacts:
 - High conductivity **silver alloy contacts**
 - Mechanism:
 - Quick make & break, trip-free mechanism
 - Mounting:
 - **DIN rail mounting type**
-

6. Protection Features

- Overload protection
 - Short circuit protection
 - Trip-free operation (cannot be held ON during fault)
-

7. Installation

- Location:
 - **Existing DB / MCB box**
 - Mounting:
 - On DIN rail
 - Connections:
 - Proper termination of phase conductor
 - Tightening:
 - Using proper lugs/ferrules
 - Identification:
 - Circuit labeling to be provided
-

8. Testing & Commissioning

- Continuity test
 - Insulation resistance test
 - Functional tripping test
 - Proper ON/OFF operation check
-

9. Approved Makes

- Schneider / Legrand / Siemens / L&T / Havells / ABB or approved equivalent

10. Category

- **Category III** – Includes supply, fixing, connection and testing complete

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TECHNICAL SPECIFICATION – RCCB (25A, DOUBLE POLE, 30 mA, 10 kA) – CAT III

1. Scope of Work

Providing, fixing, connecting, testing and commissioning of **Residual Current Circuit Breaker (RCCB)** in distribution board, complete with all accessories as per specifications and direction of Engineer-in-Charge.

2. Description

- Type:
 - **Residual Current Circuit Breaker (RCCB)**
- Poles:
 - **Double Pole (DP)**
- Rated current:
 - **25 Amps**
- Application:
 - Protection against **earth leakage and electric shock**

3. Electrical Specifications

- Rated voltage:
 - **240V AC**
- Frequency:
 - **50 Hz**
- Sensitivity (tripping current):
 - **30 mA**
- Short circuit withstand capacity:
 - **10 kA**
- Operating mechanism:
 - **Electromechanical (non-electronic)**

4. Protection Features

- Protection against:
 - **Earth leakage currents**
 - **Indirect contact / shock protection**
- Trip characteristics:
 - **Quick action tripping**
- Trip-free mechanism:
 - Cannot be held ON during fault condition

5. Construction Features

- Housing:
 - **Flame retardant, high strength insulating material**
 - Contacts:
 - High quality **silver alloy contacts**
 - Mechanism:
 - Precision tripping mechanism
 - Mounting:
 - **DIN rail mounting type**
 - Indication:
 - ON/OFF position indicator
 - Test facility:
 - **Inbuilt test button**
-

6. Standards

- Conforming to:
 - **IS 12640**
 - Certification:
 - **ISI Marked**
-

7. Installation

- Location:
 - Installed in **distribution board (DB)**
 - Mounting:
 - On DIN rail
 - Connections:
 - Phase and neutral connected properly
 - Tightening:
 - Proper torque for terminals
 - Labeling:
 - Circuit identification to be provided
-

8. Testing & Commissioning

- Functional test using:
 - **Test button**
 - Leakage current tripping test
 - Continuity and insulation test
 - ON/OFF operation check
-

9. Approved Makes

- Schneider / Legrand / Siemens / ABB / L&T / Havells or approved equivalent
-

10. Category

- **Category III** – Includes supply, fixing, connection and testing complete

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TECHNICAL SPECIFICATION – MCB DOUBLE POLE (6–32A, B CURVE, 10kA) – CAT III

1. Scope of Work

Providing, fixing, connecting, testing and commissioning of **Double Pole (DP) Miniature Circuit Breaker (MCB)** for lighting load in existing distribution board/box, complete in all respects as per specifications and direction of Engineer-in-Charge.

2. Description

- Type:
 - **Miniature Circuit Breaker (MCB)**
 - Poles:
 - **Double Pole (DP)**
 - Current rating:
 - **6A to 32A**
 - Application:
 - **Lighting load circuits** (phase + neutral isolation)
-

3. Electrical Specifications

- Rated voltage:
 - **240V AC**
- Frequency:
 - **50 Hz**
- Breaking capacity:
 - **10 kA**

- Tripping curve:
 - **B Curve** (*suitable for lighting loads*)
 - Insulation voltage:
 - As per IS standards
-

4. Standards

- Conforming to:
 - **IS 8828**
 - Certification:
 - **ISI Marked**
-

5. Construction Features

- Housing:
 - **Flame retardant thermoplastic body**
 - Contacts:
 - **Silver alloy contacts** for better conductivity
 - Mechanism:
 - **Quick make & break, trip-free mechanism**
 - Mounting:
 - **DIN rail mounting type**
 - Indication:
 - ON/OFF position indicator
-

6. Protection Features

- Protection against:
 - **Overload**
 - **Short circuit**
 - Isolation:
 - Disconnects **both phase and neutral**
-

7. Installation

- Location:
 - Installed in **existing DB / MCB box**
 - Mounting:
 - On DIN rail
 - Connections:
 - Proper termination of **phase and neutral**
 - Tightening:
 - With suitable lugs/ferrules
 - Identification:
 - Circuit labeling to be provided
-

8. Testing & Commissioning

- Continuity test
 - Insulation resistance test
 - Tripping operation test
 - ON/OFF functionality check
-

9. Approved Makes

- Schneider / Legrand / Siemens / ABB / L&T / Havells or approved equivalent
-

10. Category

- **Category III** – Includes supply, fixing, connection and testing complete

TECHNICAL SPECIFICATION – MCB FOUR POLE (63A, C CURVE, 10kA, 415V) – CAT III

1. Scope of Work

Providing, fixing, connecting, testing and commissioning of **Four Pole (FP) Miniature Circuit Breaker (MCB)** for motor/inductive load in existing distribution board/panel, complete in all respects as per specifications and direction of Engineer-in-Charge.

2. Description

- Type:
 - **Miniature Circuit Breaker (MCB)**
 - Poles:
 - **Four Pole (TPN – 3 Phase + Neutral)**
 - Current rating:
 - **63 Amps**
 - Application:
 - **Motor loads, inductive loads, small power distribution**
-

3. Electrical Specifications

- Rated voltage:
 - **415V AC (3 Phase)**
 - Frequency:
 - **50 Hz**
 - Breaking capacity:
 - **10 kA**
 - Tripping curve:
 - **C Curve** (*suitable for inductive loads with moderate inrush current*)
 - Insulation voltage:
 - As per IS standards
-

4. Standards

- Conforming to:
 - **IS 8828**
 - Certification:
 - **ISI Marked**
-

5. Construction Features

- Housing:
 - **Flame retardant, heat resistant thermoplastic**
 - Contacts:
 - **Silver alloy contacts** for high conductivity
 - Mechanism:
 - **Quick make & break, trip-free mechanism**
 - Mounting:
 - **DIN rail mounting type**
 - Indication:
 - **ON/OFF position indicator**
-

6. Protection Features

- Protection against:
 - **Overload**
 - **Short circuit**
 - Suitable for:
 - **Inductive loads (motors, pumps, compressors)**
 - Isolation:
 - **Simultaneous disconnection of all phases and neutral**
-

7. Installation

- Location:
 - Installed in **existing panel / DB**
 - Mounting:
 - On DIN rail or panel base
 - Connections:
 - Proper termination of **R, Y, B phases and Neutral**
 - Tightening:
 - Using suitable lugs with proper torque
 - Identification:
 - Circuit labeling to be provided
-

8. Testing & Commissioning

- Continuity test
 - Insulation resistance test
 - Phase sequence verification
 - Tripping operation test
 - Functional ON/OFF check
-

9. Approved Makes

- Schneider / Siemens / ABB / L&T / Legrand / Havells or approved equivalent
-

10. Category

- **Category III** – Includes supply, fixing, connection and testing complete

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TECHNICAL SPECIFICATION – MCB DISTRIBUTION BOARD (12 WAY, SPN, DOUBLE DOOR, IP-43)

1. Scope of Work

Providing, fixing, connecting and commissioning of **sheet steel MCB distribution board (DB)** complete with busbar, neutral link, earth bar, DIN rail etc., suitable for housing MCBs, as per specifications and direction of Engineer-in-Charge.

2. Description

- Type:
 - **MCB Distribution Board (DB)**
 - Configuration:
 - **Single Phase Incoming & Single Phase Outgoing (SPN)**
 - Ways:
 - **12 Way**
 - Mounting:
 - **Flush / Surface mounted**
 - Door type:
 - **Double door**
 - Application:
 - **Residential / commercial power distribution**
-

3. Standards

- Conforming to:
 - **IS 8623 (Part 1 & 3)**
 - **IEC 61439 (Part 1 & 3)**
 - Enclosure protection:
 - **IP-43**
-

4. Construction & Material

- Enclosure:
 - **CRCA sheet steel**, powder coated
 - Thickness:
 - As per standard (generally **1.0–1.6 mm**)
 - Finish:
 - **Epoxy powder coated**, corrosion resistant
 - Door:
 - **Double door construction**
 - Outer door: Solid metal
 - Inner door: Transparent (for MCB visibility)
-

5. Internal Components

- Busbar:
 - **Electrolytic copper busbar**
 - Adequate current carrying capacity
 - Neutral link:
 - **Tinned copper neutral bar**
 - Earth bar:
 - **Separate earth bar**
 - DIN rail:
 - Standard **DIN rail for MCB mounting**
 - Wiring space:
 - Adequate space for cable termination
-

6. Configuration

- Incoming:
 - **Single phase (L + N)**
 - Outgoing:
 - **Horizontal arrangement of SP MCBs**
 - Compatibility:
 - DB shall be compatible with **same make MCB**
-

7. Mounting & Installation

- Mounting:
 - **Flush mounted inside wall** or surface mounted
 - Fixing:
 - Using screws/anchor fasteners
 - Cable entry:
 - Top/bottom knockouts
 - Wiring:
 - Proper dressing and ferruling
 - Earthing:
 - Proper earthing of DB body
-

8. Safety Features

- Proper insulation between live parts
 - Shrouded busbars
 - Door interlocking (if provided)
 - Safe accessibility for operation
-

9. Testing & Commissioning

- Visual inspection
- Insulation resistance test
- Continuity test
- Functional check after MCB installation

10. Approved Makes

- Schneider / Legrand / Siemens / ABB / L&T / Havells or approved equivalent
-

11. Category

- **Category III** – Includes supply, fixing and installation (excluding MCBs)

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TECHNICAL SPECIFICATION – MCB DISTRIBUTION BOARD (8 WAY, TPN, PPI TYPE, DOUBLE DOOR, IP-43)

1. Scope of Work

Providing, fixing, connecting and commissioning of **sheet steel powder coated MCB distribution board (DB)** suitable for **three phase incoming and single phase outgoing (Per Phase Isolation type)** complete with all internal components, as per specifications and direction of Engineer-in-Charge.

2. Description

- Type:
 - **MCB Distribution Board**
 - System:
 - **Three Phase + Neutral (TPN) incoming**
 - Outgoing:
 - **Single phase horizontal outgoing**
 - Type:
 - **Per Phase Isolation (PPI)**
 - Ways:
 - **8 Way**
 - Mounting:
 - **Flush / Surface mounted**
 - Door:
 - **Double door construction**
 - Application:
 - **Commercial / institutional load distribution**
-

3. Standards

- Conforming to:
 - **IS 8623 (Part 1 & 3)**
 - **IEC 61439 (Part 1 & 3)**
 - Degree of protection:
 - **IP-43**
-

4. Construction & Material

- Enclosure:
 - **CRCA sheet steel, powder coated**
 - Thickness:
 - **1.0 to 1.6 mm**
 - Finish:
 - **Epoxy powder coating for corrosion resistance**
 - Door:
 - **Double door type**
 - **Outer door: Solid metal**
 - **Inner door: Transparent (polycarbonate/acrylic)**
-

5. Internal Components

- Busbars:
 - **Electrolytic copper busbars (R, Y, B phases)**

- Properly insulated and color coded
 - Neutral link:
 - **Tinned copper neutral bar**
 - Earth bar:
 - **Separate copper earth bar**
 - DIN rail:
 - Standard **DIN rail mounting**
 - Termination:
 - Adequate space for cable termination and dressing
-

6. Configuration (PPI – Per Phase Isolation)

- Incoming:
 - **3 Phase + Neutral**
 - Outgoing:
 - **Single phase circuits distributed across phases**
 - Feature:
 - Each phase provided with **independent isolation**
 - Advantage:
 - Safer maintenance and **phase-wise control**
-

7. Mounting & Installation

- Mounting:
 - **Flush in wall / surface on wall**
 - Fixing:
 - Using anchor fasteners
 - Cable entry:
 - Top/bottom knockouts
 - Wiring:
 - Proper ferruling and dressing
 - Earthing:
 - Proper earthing of DB body and door
-

8. Safety Features

- Fully shrouded busbars
 - Phase segregation
 - Adequate insulation clearance
 - Door earthing provision
 - Safe accessibility for operation
-

9. Testing & Commissioning

- Visual inspection
 - Insulation resistance test
 - Phase sequence verification
 - Continuity test
-

10. Approved Makes

- Schneider / Siemens / ABB / Legrand / L&T / Havells or approved equivalent
-

11. Category

- **Category III** – Includes supply, fixing and installation (excluding MCBs)

(40)

TECHNICAL SPECIFICATION – FLOOR MOUNTED INDOOR CUBICAL PANEL BOARD (IP-42, 350 mm DEPTH)

1. Scope of Work

Providing, fabricating, assembling, erecting and commissioning of **floor mounted, front operated indoor cubical panel board**, complete with enclosure, internal structure, cable alley, earthing, painting and all accessories, as per specifications and direction of Engineer-in-Charge.

2. Description

- Type:
 - **Floor mounted cubical panel board**
 - Operation:
 - **Front operated**
 - Installation:
 - **Indoor**
 - Degree of protection:
 - **IP-42 or higher**
 - Depth:
 - **350 mm**
 - Application:
 - **Power distribution / control panels**
-

3. Standards & Compliance

- Conforming to:
 - **IEC 61439**
 - **Relevant IS standards**
 - Manufacturing:
 - **From CPRI approved manufacturer**
 - Switchgear:
 - **From standard approved makes**
-

4. Enclosure Construction

- Outer body & doors:
 - **14 SWG CRCA M.S. sheet (~2.0 mm thick)**
 - Internal partitions:
 - **16 SWG CRCA M.S. sheet (~1.6 mm thick)**
 - Structure:
 - **Rigid framework using angles / flats / channels**
 - Fabrication:
 - **Cutting, bending, drilling, welding, riveting as required**
-

5. Panel Features

- Type:
 - **Compartmentalized cubical design**
 - Cable alley:
 - **Provided as per requirement**
 - Accessibility:
 - **Front access for operation and maintenance**
 - Ventilation:
 - **Louvers / ventilation slots provided**
-

6. Doors & Hardware

- Doors:
 - **Hinged doors with adequate number**
- Locking:
 - **Handle with locking arrangement**
- Gasket:
 - **Rubber gasket for dust protection**
- Accessories:

- Name plates, labels

7. Internal Components (Provision)

(Note: Switchgears, busbars, etc. not included in cost)

- Mounting arrangement for:
 - Switchgear
 - Meters
 - Control devices
- Control wiring:
 - Provision for **PVC insulated copper wiring**
- Supports:
 - For busbars and equipment

8. Busbar & Wiring Provisions

- Busbars:
 - Space and supports provided (*not included in cost*)
- Interconnections:
 - Provision for **copper/aluminium strips or PVC copper wires**
- Insulation:
 - Using **rubber grommets, ribs, bakelite supports**

9. Earthing

- Earth bus:
 - **Continuous earth busbar inside panel**
- Earthing bolts:
 - Provided at suitable locations
- Body earthing:
 - Proper earthing of panel and doors

10. Foundation & Mounting

- Mounting:
 - **Floor mounted**
- Base:
 - With **foundation flange, base plate, anchor bolts**
- Alignment:
 - Proper leveling and alignment

11. Finishing & Painting

- Surface treatment:
 - Degreasing, derusting, phosphating
- Coating:
 - **Epoxy powder coating**
- Finish:
 - Smooth, corrosion resistant

12. Safety Features

- **Danger notice board** provided
- Proper insulation and segregation
- Safe cable entry with grommets
- Adequate clearances inside panel

13. Testing & Inspection

- Visual inspection
- Dimensional check (*excluding base frame*)
- Insulation resistance test

- Mechanical operation check
-

14. Approved Makes

- Panel manufacturer:
 - **CPRI approved panel builder**
 - Switchgear:
 - Schneider / Siemens / ABB / L&T / Legrand (*to be supplied separately*)
-

15. Category

- **Category III** – Includes supply, fabrication, erection (excluding switchgear, busbars, interconnections, meters, etc.)

(41)

TECHNICAL SPECIFICATION – MOULDED CASE CIRCUIT BREAKER (MCCB, 4 POLE, 25kA) – CAT III

1. Scope of Work

Providing, fixing, connecting, testing and commissioning of **Four Pole MCCB** complete with internal connections, spreaders, and accessories, installed in existing MS enclosure, as per specifications and direction of Engineer-in-Charge.

2. Description

- Type:
 - **Moulded Case Circuit Breaker (MCCB)**
 - Poles:
 - **Four Pole (4P – TPN)**
 - Current rating:
 - **25A to 100A**
 - Application:
 - **Power distribution, motor feeders, sub-main protection**
-

3. Electrical Specifications

- Rated voltage:
 - **415V AC (3 Phase)**
 - Frequency:
 - **50 Hz**
 - Breaking capacity (Icu):
 - **25 kA**
 - Service breaking capacity (Ics):
 - **100% of Icu (i.e., 25 kA)**
 - Tripping unit:
 - **Fixed Thermal & Magnetic (TM) release**
-

4. Protection Features

- Overload protection:
 - **Thermal trip**
 - Short circuit protection:
 - **Magnetic trip**
 - Trip characteristics:
 - **Fixed settings (non-adjustable)**
 - Isolation:
 - **Simultaneous disconnection of all poles**
-

5. Construction Features

- Housing:
 - **Moulded insulating body, flame retardant**

- Contacts:
 - High quality **silver alloy contacts**
 - Arc quenching:
 - Efficient arc chute system
 - Mechanism:
 - **Quick make & break, trip-free operation**
 - Indication:
 - ON / OFF / TRIP position indicator
-

6. Internal Connections

- Spreader:
 - **Tinned copper spreader links**
 - Connections:
 - Suitable for copper/aluminium conductors
 - Termination:
 - Proper lugs and tightening arrangement
-

7. Mounting & Installation

- Location:
 - Installed in **existing 16 Gauge MS enclosure**
 - Mounting:
 - Panel mounted
 - Connections:
 - Proper termination of **R, Y, B, N**
 - Tightening:
 - As per recommended torque
 - Earthing:
 - Proper earthing of enclosure
-

8. Standards

- Conforming to:
 - **IS / IEC 60947-2**
 - Certification:
 - **ISI marked (where applicable)**
-

9. Testing & Commissioning

- Insulation resistance test
 - Continuity test
 - Functional tripping test
 - Load trial (if required)
-

10. Approved Makes

- Schneider / Siemens / ABB / L&T / Legrand / Havells or approved equivalent
-

11. Category

- **Category III** – Includes supply, fixing, connection and testing complete

(42)

TECHNICAL SPECIFICATION – MOULDED CASE CIRCUIT BREAKER (MCCB, 4 POLE, 125A, 35kA) – CAT III

1. Scope of Work

Providing, fixing, connecting, testing and commissioning of **Four Pole MCCB** complete with internal connections, tinned copper spreaders and accessories, installed in existing MS enclosure, as per specifications and direction of Engineer-in-Charge.

2. Description

- Type:
 - **Moulded Case Circuit Breaker (MCCB)**
 - Poles:
 - **Four Pole (4P – TPN)**
 - Current rating:
 - **125 Amps**
 - Application:
 - **Main incomer / sub-main / motor feeder protection**
-

3. Electrical Specifications

- Rated voltage:
 - **415V AC (3 Phase)**
 - Frequency:
 - **50 Hz**
 - Breaking capacity (Icu):
 - **35 kA**
 - Service breaking capacity (Ics):
 - **100% of Icu (i.e., 35 kA)**
 - Tripping unit:
 - **Fixed Thermal & Magnetic (TM) release**
-

4. Protection Features

- Overload protection:
 - **Thermal trip**
 - Short circuit protection:
 - **Magnetic trip**
 - Trip characteristics:
 - Fixed (non-adjustable)
 - Isolation:
 - Simultaneous disconnection of **all poles including neutral**
-

5. Construction Features

- Housing:
 - **Moulded insulating enclosure, flame retardant**
 - Contacts:
 - High conductivity **silver alloy contacts**
 - Arc quenching:
 - Advanced arc chute system
 - Mechanism:
 - **Quick make & break, trip-free operation**
 - Indication:
 - ON / OFF / TRIP status indication
-

6. Internal Connections

- Spreader links:
 - **Tinned copper spreaders**
 - Terminals:
 - Suitable for **copper/aluminium conductors**
 - Termination:
 - With proper lugs and tightening arrangement
-

7. Mounting & Installation

- Location:
 - Installed in **existing 16 Gauge MS enclosure**

- Mounting:
 - Panel mounted
 - Connections:
 - Proper termination of **R, Y, B, N**
 - Tightening:
 - As per recommended torque values
 - Earthing:
 - Proper earthing of enclosure body
-

8. Standards

- Conforming to:
 - **IS / IEC 60947-2**
 - Certification:
 - As per applicable standards
-

9. Testing & Commissioning

- Insulation resistance test
 - Continuity test
 - Functional tripping test
 - Operational check
-

10. Approved Makes

- Schneider (NSX series) / Siemens / ABB (Tmax) / L&T / Legrand / Havells or approved equivalent
-

11. Category

- **Category III** – Includes supply, fixing, connection and testing complete

(43)

TECHNICAL SPECIFICATION – EARTH FAULT RELAY (EFR) WITH CT & SHUNT TRIP – CAT III

1. Scope of Work

Providing, fixing, connecting, testing and commissioning of **Earth Fault Relay (EFR)** complete with **current transformer (CT)**, **shunt trip coil (220V AC)** and all interconnections, suitable for MCCB protection, installed in existing MS enclosure as per specifications and direction of Engineer-in-Charge.

2. Description

- Type:
 - **Earth Fault Relay (EFR)**
 - Application:
 - Protection against **earth leakage / earth fault currents**
 - Suitable MCCB rating:
 - **125A to 200A**
-

3. System Configuration

- CT Ratio:
 - **1/200**
 - Sensing:
 - Residual current through **external CT**
 - Tripping:
 - Through **shunt trip coil of MCCB**
-

4. Electrical Specifications

- Auxiliary supply:
 - **220V AC**
- Frequency:

- **50 Hz**
 - Relay type:
 - **Electromechanical / static (non-microprocessor based unless specified)**
 - Sensitivity:
 - Adjustable as per application (*typical range 30 mA to several amps*)
-

5. Components Included

- Earth Fault Relay unit
 - Current Transformer (CT) – Ratio **1/200**
 - **Shunt Trip Coil (220V AC)** for MCCB
 - Interconnecting control wiring
 - Terminal blocks and connectors
-

6. Protection Features

- Detects:
 - **Earth leakage / ground fault current**
 - Operation:
 - Sends trip signal to MCCB via shunt trip
 - Time delay:
 - Adjustable (if provided)
 - Reset:
 - Manual reset facility
-

7. Construction Features

- Relay housing:
 - Panel mountable, robust construction
 - Indications:
 - Trip indication (LED/flag)
 - Controls:
 - Sensitivity and time setting knobs (if applicable)
 - Terminals:
 - Clearly marked for easy wiring
-

8. Mounting & Installation

- Location:
 - Installed in **existing MS panel**
 - Mounting:
 - Panel mounted (flush/door mounted)
 - CT installation:
 - Mounted on **phase conductors (core balance or individual as required)**
 - Wiring:
 - Proper interconnection between **CT → Relay → Shunt Trip**
 - Earthing:
 - Proper earthing of panel and components
-

9. Internal Connections

- Control wiring:
 - Using **PVC insulated copper wires**
 - Termination:
 - With lugs/ferrules
 - Routing:
 - Proper dressing and clamping
-

10. Standards

- Conforming to:

- Relevant **IS / IEC standards for protection relays**
 - Quality:
 - From approved manufacturers
-

11. Testing & Commissioning

- CT polarity and ratio check
 - Relay setting verification
 - Earth fault simulation test
 - Tripping operation of MCCB via shunt trip
 - Functional testing of complete scheme
-

12. Approved Makes

- Schneider / Siemens / ABB / L&T / Legrand / Havells or approved equivalent
-

13. Category

- **Category III** – Includes supply, fixing, wiring, interconnection and testing complete

(44)

TECHNICAL SPECIFICATION – TPN ALUMINIUM BUSBAR (100A, PANEL MOUNTED) – CAT III

1. Scope of Work

Supplying, fabricating, installing, connecting and testing of **Triple Pole & Neutral (TPN) Aluminium Busbars** complete with supports, insulation, terminations and accessories, erected in existing cubical panel as per specifications and direction of Engineer-in-Charge.

2. Description

- Type:
 - **TPN Busbar System (3 Phase + Neutral)**
 - Material:
 - **Aluminium busbars**
 - Application:
 - **Power distribution inside panel boards**
 - Rated capacity:
 - **100 Amps**
-

3. Electrical Specifications

- Rated voltage:
 - **440V / 500V AC**
 - Frequency:
 - **50 Hz**
 - Current density:
 - **Not more than 0.8 A/sq.mm**
-

4. Busbar Sizing

- Cross-section area:
 - Calculated based on current density
 - For 100A:
 - Minimum required area =
 $100 / 0.8 = 125 \text{ sq.mm}$
 - Typical size:
 - **25 mm × 5 mm Aluminium busbar (or equivalent)**
-

5. Configuration

- Number of bars:
 - **4 Nos. (R, Y, B, Neutral)**

- Arrangement:
 - Parallel/equal busbars for each phase
 - Phase identification:
 - Wrapped with **colour coded insulation tape**
 - R – Red
 - Y – Yellow
 - B – Blue
 - N – Black
-

6. Construction & Installation

- Mounting:
 - Installed inside **existing cubical panel**
 - Support:
 - Mounted on **busbar supports / insulators (SMC/DMC type)**
 - Spacing:
 - Adequate phase-to-phase and phase-to-earth clearance
 - Fixing:
 - Proper clamping and alignment
-

7. Insulation

- Insulation method:
 - **PVC colour insulating tape wrapping**
 - Protection:
 - Prevents accidental contact and short circuit
-

8. Termination

- Main connections:
 - Provided with **cable sockets / lugs**
 - Material:
 - Suitable for **Aluminium / Copper cable termination**
 - Hardware:
 - GI / zinc plated nuts, bolts, washers
 - Contact surface:
 - Properly cleaned and applied with **jointing compound (for Al)**
-

9. Accessories

- Busbar supports / insulators
 - Fasteners (nuts, bolts, washers)
 - Cable lugs/sockets
 - Identification markers
-

10. Earthing

- Panel earthing:
 - Proper earthing of panel body
 - Neutral:
 - Proper neutral continuity ensured
-

11. Testing & Commissioning

- Visual inspection
 - Tightness check
 - Continuity test
 - Insulation resistance test
-

12. Standards

- Conforming to:

- Relevant **IS standards for busbars and panel wiring**
 - Installation:
 - As per **good engineering practices**
-

13. Category

- **Category III** – Includes supply, fabrication, erection, connection and testing complete

(45)

TECHNICAL SPECIFICATION – TPN ALUMINIUM BUSBAR (200A, PANEL MOUNTED) – CAT III

1. Scope of Work

Supplying, fabricating, installing, connecting and commissioning of **Triple Pole & Neutral (TPN) Aluminium Busbars** complete with supports, insulation, terminations and accessories, erected in existing cubical panel as per specifications and direction of Engineer-in-Charge.

2. Description

- Type:
 - **TPN Busbar System (3 Phase + Neutral)**
 - Material:
 - **High conductivity Aluminium busbars (EC grade)**
 - Application:
 - **Power distribution within panel boards**
 - Rated capacity:
 - **200 Amps**
-

3. Electrical Specifications

- Rated voltage:
 - **440V / 500V AC**
 - Frequency:
 - **50 Hz**
 - Current density:
 - **≤ 0.8 A/sq.mm**
-

4. Busbar Sizing

- Required cross-sectional area:
 - **200 / 0.8 = 250 sq.mm (minimum)**
 - Typical standard sizes:
 - **50 mm × 5 mm Aluminium busbar (250 sq.mm)**
 - Or equivalent combination (e.g., 25×10 mm)
-

5. Configuration

- Number of busbars:
 - **4 Nos. (R, Y, B, Neutral)**
 - Arrangement:
 - Equal size bars for all phases and neutral
 - Phase identification:
 - Colour coded PVC insulation tape:
 - R – Red
 - Y – Yellow
 - B – Blue
 - N – Black
-

6. Mounting & Supports

- Installation:
 - Inside **existing cubical panel**

- Supports:
 - **SMC/DMC busbar supports (insulators)**
 - Spacing:
 - Adequate clearance between phases and earth
 - Fixing:
 - Rigid mounting with proper alignment
-

7. Insulation

- Method:
 - **PVC colour insulating tape wrapping**
 - Purpose:
 - Safety and phase identification
-

8. Termination

- Cable connections:
 - **Heavy duty cable sockets/lugs** provided for each busbar
 - Hardware:
 - GI / zinc plated nuts, bolts, washers
 - Jointing:
 - Application of **anti-oxidation compound** for aluminium joints
 - Compatibility:
 - Suitable for **Aluminium / Copper cables**
-

9. Accessories

- Busbar supports / insulators
 - Fasteners and hardware
 - Cable lugs/sockets
 - Identification markers
-

10. Earthing

- Panel:
 - Proper earthing of panel body
 - Neutral:
 - Proper neutral continuity maintained
-

11. Testing & Commissioning

- Visual inspection
 - Tightness check of joints
 - Continuity test
 - Insulation resistance test
-

12. Standards

- Conforming to:
 - Relevant **IS standards for busbars and panel construction**
 - Installation:
 - As per **good engineering practices**
-

13. Category

- **Category III** – Includes supply, fabrication, erection, connection and testing complete

(46)

TECHNICAL SPECIFICATION – MULTIFUNCTIONAL POWER MONITORING METER (MFM) – CAT III

1. Scope of Work

Providing, fixing, connecting, testing and commissioning of **Multifunctional Digital Power Meter (MFM)** suitable for comprehensive electrical parameter monitoring, complete with all accessories and interconnections, as per specifications and direction of Engineer-in-Charge.

2. Description

- Type:
 - **Multifunctional Digital Power Monitoring Meter**
 - Application:
 - **Electrical parameter measurement and energy monitoring**
 - System:
 - Suitable for **3 Phase (3P) network**
-

3. Electrical Specifications

- Rated supply voltage (Us):
 - **40 to 300 V AC (45–65 Hz)**
 - **40 to 300 V DC**
 - Network frequency:
 - **50 Hz**
 - Measurement type:
 - **True RMS measurement**
-

4. Measured Parameters

Voltage Parameters

- Line voltages:
 - **U21, U32, U13**
 - Phase voltages:
 - **V1, V2, V3**
 - Average voltage:
 - **Vavg**
-

Current Parameters

- Phase currents:
 - **I1, I2, I3**
 - Average current:
 - **Iavg**
 - Demand currents:
 - **I1, I2, I3 (Demand)**
 - Peak demand currents
 - Calculated neutral current
 - Unbalance current
-

Power Parameters

- Active power:
 - **P, P1, P2, P3**
 - Reactive power:
 - **Q, Q1, Q2, Q3**
 - Apparent power:
 - **S, S1, S2, S3**
 - Demand power:
 - **P, Q, S (Demand)**
 - Peak demand power:
 - **PM, QM, SM**
-

Energy Parameters

- Active energy:

- **kWh (four quadrant, signed)**
 - Reactive energy:
 - **kVARh (four quadrant, signed)**
 - Apparent energy:
 - **kVAh**
-

Power Factor & Frequency

- Power factor:
 - **Signed PF (four quadrant)**
 - Displacement power factor
 - Frequency
-

5. Display Features

- Display type:
 - **7 Segment LED**
 - Display colour:
 - **Red**
 - Display configuration:
 - **3 fields × 4 characters**
 - Total digits:
 - **12 digits**
 - Digit height:
 - **14.2 mm**
 - Clear visibility for panel mounting
-

6. Functional Features

- Four quadrant measurement capability
 - Peak demand recording
 - Load monitoring and analysis
 - Phase-wise and total parameter display
 - High accuracy measurement
-

7. Construction Features

- Housing:
 - **Panel mount type**
 - Front:
 - Dust resistant with clear display window
 - Terminals:
 - Screw type for secure connections
 - Compact and robust design
-

8. Installation

- Mounting:
 - **Panel mounted (flush type)**
 - Connections:
 - Voltage and current (via CTs if required)
 - Wiring:
 - Proper ferruling and dressing
 - Earthing:
 - As per standard practice
-

9. Communication (if applicable)

- Optional:
 - **RS-485 / Modbus (depending on model)**
-

10. Standards

- Conforming to:
 - Relevant **IS / IEC standards for energy meters**
 - Accuracy:
 - As per standard class (typically Class 1 or better)
-

11. Testing & Commissioning

- Functional testing of all parameters
 - Display verification
 - Voltage and current measurement check
 - Calibration verification
-

12. Approved Makes

- Schneider (PM series) / Siemens / ABB / L&T / Secure / Havells or approved equivalent
-

13. Category

- **Category III** – Includes supply, fixing, connection and testing complete

(47)

TECHNICAL SPECIFICATION – PANEL INDICATOR LED LAMP – CAT III

1. Scope of Work

Supplying, fixing, connecting, testing and commissioning of **LED type panel indicator lamps** complete with lens cover and accessories, mounted on panel/DB as per specifications and direction of Engineer-in-Charge.

2. Description

- Type:
 - **LED Panel Indicator Lamp**
 - Application:
 - Indication of **power ON/OFF status, phase indication, fault indication** in panels
-

3. Electrical Specifications

- Rated voltage:
 - **230V AC / 415V AC** (*as per application*)
 - Frequency:
 - **50 Hz**
 - Power consumption:
 - **Low power LED type (approx. 0.5W to 2W)**
-

4. Construction Features

- Body:
 - **High quality flame retardant plastic / polycarbonate**
 - Lens:
 - **Transparent / coloured lens cover**
 - LED:
 - Long life, high brightness LED
 - Mounting:
 - **Panel mounting type (flush)**
-

5. Colour Options

- Red – **Phase R / Trip / Fault indication**
- Yellow – **Phase Y indication**
- Blue – **Phase B indication**
- Green – **Power ON / Healthy indication**

(Colour selection as per panel scheme)

6. Mounting & Installation

- Mounting:
 - **Front panel mounting with locking nut**
 - Cut-out:
 - Standard **22.5 mm / 16 mm** (*as per make*)
 - Connections:
 - Proper termination with ferrules
 - Wiring:
 - Using PVC insulated copper wire
-

7. Accessories

- Lens cover
 - Fixing nut / locking arrangement
 - Terminal connectors
-

8. Safety Features

- Shock proof design
 - Flame retardant material
 - Proper insulation of terminals
-

9. Testing & Commissioning

- Illumination test
 - Voltage check
 - Proper functioning verification
-

10. Standards

- Conforming to:
 - Relevant **IS / IEC standards**
 - Quality:
 - Approved make only
-

11. Approved Makes

- Schneider / Siemens / ABB / L&T / Legrand / Havells / BCH or approved equivalent
-

12. Category

- **Category III** – Includes supply, fixing, connection and testing complete

(48)

TECHNICAL SPECIFICATION – AC-3 POWER CONTACTOR (3 POLE, 60/70A, WITH AUX CONTACTS) – CAT III

1. Scope of Work

Providing, fixing, connecting, testing and commissioning of **AC-3 duty 3 pole power contactor** complete with auxiliary contacts and operating coil, installed in panel as per specifications and direction of Engineer-in-Charge.

2. Description

- Type:
 - **Power Contactor**
- Duty category:
 - **AC-3** (*suitable for motor loads*)
- Poles:
 - **3 Pole**
- Current rating:
 - **60 / 70 Amps**

- Application:
 - **Motor control, inductive load switching**
-

3. Electrical Specifications

- Rated operational voltage:
 - **415V AC (3 Phase)**
 - Frequency:
 - **50 Hz**
 - Utilization category:
 - **AC-3 (motor starting and switching)**
 - Rated operational current:
 - **60–70A**
-

4. Coil Specifications

- Coil voltage:
 - **220V AC / 415V AC (*as specified*)**
 - Frequency:
 - **50 Hz**
 - Coil type:
 - **AC operated electromagnetic coil**
-

5. Auxiliary Contacts

- Configuration:
 - **2 NO (Normally Open) + 2 NC (Normally Closed)**
 - Usage:
 - **For interlocking, indication, control circuits**
-

6. Construction Features

- Housing:
 - **Flame retardant insulated body**
 - Contacts:
 - **Silver alloy contacts** for high durability
 - Arc suppression:
 - **Built-in arc chute**
 - Mechanism:
 - **Electromagnetic operation with quick make & break**
 - Mounting:
 - **DIN rail / panel mounting type**
-

7. Performance Features

- Suitable for:
 - **Frequent switching operations**
 - Electrical life:
 - High switching endurance
 - Mechanical life:
 - Long operational life
 - Low maintenance design
-

8. Installation

- Mounting:
 - Inside panel on **DIN rail / base plate**
- Connections:
 - Proper termination of **R, Y, B phases**
- Control wiring:
 - For coil and auxiliary contacts

- Tightening:
 - With proper torque and lugs
-

9. Standards

- Conforming to:
 - **IS / IEC 60947-4-1**
 - Certification:
 - As per approved make standards
-

10. Testing & Commissioning

- Coil energization test
 - Contact operation check
 - Auxiliary contact verification
 - Functional operation under load
-

11. Approved Makes

- **L&T / BCH / Siemens / C&S / TC (Teknic Controls)** or approved equivalent
-

12. Category

- **Category III** – Includes supply, fixing, connection and testing complete

(49)

TECHNICAL SPECIFICATION – FOUR POLE CHANGEOVER SWITCH (100–125A, AC-23 DUTY, 415V) – CAT III

1. Scope of Work

Supplying, fixing, connecting, testing and commissioning of **Four Pole Changeover Switch** complete with operating mechanism, mounted inside panel, as per specifications and direction of Engineer-in-Charge.

2. Description

- Type:
 - **Manual Changeover Switch**
 - Poles:
 - **Four Pole (4P – TPN)**
 - Rating:
 - **100A to 125A**
 - Application:
 - **Source changeover (e.g., Mains ↔ DG / UPS)**
-

3. Electrical Specifications

- Rated voltage:
 - **415V AC (3 Phase)**
 - Frequency:
 - **50 Hz**
 - Utilization category:
 - **AC-23 Duty** (*suitable for highly inductive loads*)
 - Rated current:
 - **100–125 Amps**
-

4. Standards

- Conforming to:
 - Relevant **IS / IEC standards (IS 13947 / IEC 60947-3)**
 - Certification:
 - Approved make
-

5. Construction Features

- Body:
 - **Heavy duty insulated housing**
 - Contacts:
 - **Silver alloy contacts** for high conductivity
 - Mechanism:
 - **Manual rotary / lever operated mechanism**
 - Arc quenching:
 - Efficient arc control system
 - Mounting:
 - **Panel mounting (interior type)**
-

6. Operating Mechanism

- Type:
 - **Manual operation with handle**
 - Positions:
 - **I – OFF – II** (Source 1 / OFF / Source 2)
 - Interlocking:
 - Mechanical interlock to prevent simultaneous connection
 - Indication:
 - Clear position marking
-

7. Installation

- Mounting:
 - Installed inside **panel (interior mounting)**
 - Operation:
 - Handle extended to panel door (if required)
 - Connections:
 - Proper termination of **R, Y, B, N**
 - Tightening:
 - With suitable lugs and torque
-

8. Safety Features

- Positive isolation of both sources
 - Mechanical interlocking
 - Safe switching under load (AC-23 duty)
 - Shock proof construction
-

9. Testing & Commissioning

- Mechanical operation test
 - Continuity test
 - Load transfer test
 - Position indication verification
-

10. Approved Makes

- L&T / Siemens / Schneider / ABB / C&S / BCH or approved equivalent
-

11. Category

- **Category III** – Includes supply, fixing, connection and testing complete

(50)

TECHNICAL SPECIFICATION – METALLIC VITRIFIED DANGER NOTICE BOARD (MV) – CAT III

1. Scope of Work

Supply, fabrication, and installation of **metallic vitrified danger notice board** suitable for medium voltage (MV) electrical installations, complete with fixing, lettering, and finishing, as per IS 2551 and instructions of Engineer-in-Charge.

2. Description

- Type:
 - **Metallic Vitrified Danger Notice Board**
 - Application:
 - **Warning / safety signage for medium voltage installations**
 - Mounting:
 - Wall, enclosure, or panel mounting as required
-

3. Material & Construction

- Base material:
 - **Mild Steel / Stainless Steel sheet (minimum 1.6 mm thick)**
 - Surface:
 - **Vitrified enamel / powder coated** for corrosion resistance
 - Finish:
 - Smooth, durable, scratch-resistant
 - Lettering:
 - **Raised / screen-printed / enamel lettering**
 - Colour: Contrasting for visibility (e.g., **Red letters on White/Yellow background**)
 - Language:
 - As per **Engineer-in-Charge** (typically bilingual: English + Local language)
-

4. Dimensions

- Typical size:
 - **300 mm × 200 mm** (customizable as per site requirement)
 - Thickness:
 - **≥1.6 mm metallic sheet with vitrified coating**
 - Mounting holes:
 - Pre-drilled at corners for bolts/screws
-

5. Standards

- Conforming to:
 - **IS 2551: “Safety Signs for Electrical Installations”**
 - Safety requirements:
 - Resistant to fading, heat, moisture, and corrosion
-

6. Installation

- Fixing:
 - Screwed / Bolted to wall, panel, or enclosure
 - Orientation:
 - Clearly visible at approach of MV equipment
 - Height:
 - As per Engineer-in-Charge recommendation for visibility
-

7. Safety & Durability

- Vitrified coating:
 - **Protects against corrosion and scratching**
 - Material:
 - **Non-flammable metallic sheet**
 - Clear lettering:
 - Visible from a distance of **3–5 meters** for safety compliance
-

8. Accessories

- Fixing bolts/screws
 - Washers / spacers (if required)
 - Optional: Protective transparent cover
-

9. Testing & Verification

- Visual inspection for:
 - Surface finish
 - Lettering clarity
 - Mounting holes and dimensions
 - Compliance check with **IS 2551**
-

10. Approved Makes

- Godrej, Signify, Schneider, ABB, or other ISI approved manufacturer with proven MV signage quality
-

11. Category

- **Category III** – Includes supply, fabrication, fixing, and finishing complete

(51)

TECHNICAL SPECIFICATION – METALLIC VITRIFIED DANGER NOTICE BOARD (MV) – CAT III

1. Scope of Work

Supply, fabrication, and installation of **metallic vitrified danger notice board** suitable for **medium voltage (MV) electrical installations**, complete with fixing, lettering, and finishing, as per **IS 2551** and instructions of the Engineer-in-Charge.

2. Description

- **Type:** Metallic Vitrified Danger Notice Board
 - **Application:** Warning / safety signage for medium voltage installations
 - **Mounting:** Wall, panel, or enclosure mounting as required
-

3. Material & Construction

- **Base Material:** Mild Steel / Stainless Steel sheet, minimum 1.6 mm thick
 - **Surface Finish:** Vitrified enamel / powder coated for corrosion resistance
 - **Durability:** Smooth, durable, scratch-resistant
 - **Lettering:** Raised / screen-printed / enamel lettering
 - **Colour:** Contrasting for visibility (e.g., Red letters on White/Yellow background)
 - **Language:** As per Engineer-in-Charge (typically bilingual: English + Local language)
-

4. Dimensions

- **Typical Size:** 300 mm × 200 mm (customizable as per site requirements)
 - **Thickness:** ≥1.6 mm metallic sheet with vitrified coating
 - **Mounting Holes:** Pre-drilled at corners for bolts/screws
-

5. Standards

- **Compliance:** IS 2551 – “Safety Signs for Electrical Installations”
 - **Requirements:** Resistant to fading, heat, moisture, and corrosion
-

6. Installation

- **Fixing:** Screwed / bolted to wall, panel, or enclosure
 - **Orientation:** Clearly visible from approach to MV equipment
 - **Height:** As per Engineer-in-Charge recommendations for visibility
-

7. Safety & Durability

- **Vitrified Coating:** Protects against corrosion and scratching
 - **Material:** Non-flammable metallic sheet
 - **Lettering Visibility:** Clearly readable from a distance of 3–5 meters
-

8. Accessories

- Fixing bolts / screws
 - Washers / spacers (if required)
 - Optional: Protective transparent cover
-

9. Testing & Verification

- Visual inspection for surface finish
 - Lettering clarity
 - Verification of mounting holes and dimensions
 - Compliance check with **IS 2551**
-

10. Approved Makes

- **Godrej, Signify, Schneider, ABB** or other ISI-approved manufacturers with proven MV signage quality
-

11. Category

- **Category III** – Includes supply, fabrication, fixing, and finishing complete

(52)

TECHNICAL SPECIFICATION – STREET LIGHT SINGLE ARM BRACKET (1.5 M) – CAT III

1. Scope of Work

Supply, fabrication, and erection of **single-arm street light pole brackets** complete with all structural components, fasteners, welding, and painting, suitable for mounting street lighting luminaries as per specifications and directions of the Engineer-in-Charge.

2. Description

- **Type:** Single Arm Street Light Bracket
 - **Length:** 1.5 meters
 - **Application:** Mounting street light fixtures on poles for roadway, outdoor, or commercial area lighting.
 - **Orientation:** 110° spread in vertical plane
 - **Structure:** Includes main arm, sleeve, welded stays, and reducer for pole top fitting
-

3. Material & Construction

- **Main Arm Pipe:**
 - B-Class MS (Mild Steel) pipe
 - Outer diameter: 42 mm (4.2 cm) or as required
 - **Sleeve Tubing:**
 - B-Class MS sleeve, approx. 45 cm length
 - To fit pole top diameter: 76.5 mm / 80 mm / as required
 - **Stays / Braces:**
 - MS welded stays for structural stability
 - **Reducer:**
 - MS reducer for smooth attachment to pole top
 - **Fasteners:**
 - Suitable bolts, nuts, washers, and check nuts for assembly
-

4. Structural & Mechanical Specifications

- **Arm Spread:** 1.5 m with 110° tilt in vertical plane
- **Strength:** Designed to withstand wind load as per relevant IS standards for street lighting
- **Finish:** Welded joints inspected for integrity

5. Surface Treatment & Painting

- **Primer:** One coat of Red Oxide / PU primer
 - **Top Coat:** Two coats of Aluminium / PU paint
 - **Purpose:** Protection against corrosion, weather, and UV degradation
-

6. Installation

- **Mounting:** Fixed to top of street light pole with sleeve tubing and fasteners
 - **Alignment:** Arm levelled horizontally with correct vertical tilt
 - **Verification:** Proper tightening of nuts and visual check for alignment
-

7. Standards & Codes

- **Material:** IS 1239 / IS 2062 (B-Class MS pipe)
 - **Design:** IS 875 (Wind Load for outdoor structures)
 - **Corrosion Protection:** As per IS 1477 (Paints & coatings for steel)
-

8. Accessories Included

- MS welded stays
 - Reducer for pole top
 - Check nuts and bolts
 - Painting and surface treatment
-

9. Approved Makes / Manufacturers

- Tata Steel / Jindal / SAIL / Local ISI-approved B-Class MS pipes and fabrication shops approved by Engineer-in-Charge
-

10. Category

- **Category III** – Includes supply, fabrication, welding, painting, erection, and testing

(53)

TECHNICAL SPECIFICATION – STREET LIGHT SINGLE ARM BRACKET (1.5 M) – CAT III

1. Scope of Work

Supply, fabrication, and erection of **single-arm street light pole brackets**, complete with all structural components, fasteners, welding, and painting. Brackets shall be suitable for mounting street lighting luminaires as per specifications and directions of the Engineer-in-Charge.

2. Description

- **Type:** Single Arm Street Light Bracket
 - **Length:** 1.5 meters
 - **Application:** Mounting street light fixtures on poles for roadway, outdoor, or commercial area lighting
 - **Orientation:** 110° spread in vertical plane
 - **Structure:** Includes main arm, sleeve, welded stays, and reducer for pole-top fitting
-

3. Material & Construction

- **Main Arm Pipe:** B-Class MS (Mild Steel) pipe, Outer diameter 42 mm (or as required)
 - **Sleeve Tubing:** B-Class MS sleeve, approx. 45 cm length, suitable for pole-top diameter 76.5 mm / 80 mm / as required
 - **Stays / Braces:** MS welded stays for structural stability
 - **Reducer:** MS reducer for smooth attachment to pole top
 - **Fasteners:** Suitable bolts, nuts, washers, and check nuts for assembly
-

4. Structural & Mechanical Specifications

- **Arm Spread:** 1.5 m with 110° tilt in vertical plane
- **Strength:** Designed to withstand wind load as per relevant IS standards for street lighting

- **Finish:** Welded joints inspected for integrity
-

5. Surface Treatment & Painting

- **Primer:** One coat of Red Oxide / PU primer
 - **Top Coat:** Two coats of Aluminium / PU paint
 - **Purpose:** Protection against corrosion, weather, and UV degradation
-

6. Installation

- **Mounting:** Fixed to top of street light pole with sleeve tubing and fasteners
 - **Alignment:** Arm leveled horizontally with correct vertical tilt
 - **Verification:** Proper tightening of nuts and visual check for alignment
-

7. Standards & Codes

- **Material:** IS 1239 / IS 2062 (B-Class MS pipe)
 - **Design:** IS 875 (Wind Load for outdoor structures)
 - **Corrosion Protection:** As per IS 1477 (Paints & coatings for steel)
-

8. Accessories Included

- MS welded stays
 - Reducer for pole top
 - Check nuts and bolts
 - Painting and surface treatment
-

9. Approved Makes / Manufacturers

- Tata Steel / Jindal / SAIL / Local ISI-approved B-Class MS pipes and fabrication shops approved by Engineer-in-Charge
-

10. Category

- **Category III** – Includes supply, fabrication, welding, painting, erection, and testing

(54)

TECHNICAL SPECIFICATION – LED STREET LIGHT / FLOOD LIGHT (48–60 W) – CAT III

1. Scope of Work

Supply, fabrication, and erection of **LED street light / flood light fittings** complete with high-power LEDs, driver, housing, optics, heat sink, and mounting accessories as per specifications and directions of the Engineer-in-Charge.

2. Description

- **Type:** LED Street Light / Flood Light
- **Ingress Protection:** IP-65 (dust-tight and protected against water jets)
- **Power Rating:** 48–60 W (Engineer-in-Charge may select within range)
- **Voltage Range:** 120–300 V AC (suitable for standard line supply)
- **Line Protection:**
 - Surge protection integral: 4 kV
 - Surge protection non-integral: 10 kV
 - Light must withstand **440 VAC line supply for 48 hours**

- **Light Source:** High-power White LEDs, ≥ 1 W each, assembled on single MCPCB
-

3. Electrical & Photometric Specifications

- **Power Factor:** > 0.95
 - **Total Harmonic Distortion (THD):** $< 10\%$
 - **CCT (Correlated Colour Temperature):** 3000 K to 5700 K (Neutral / Cool White)
 - **Luminaire Efficacy:** > 100 lumens/W
 - **LED Efficiency:** ≥ 130 lm/W
 - **Driver Efficiency:** $> 85\%$
 - **Uniformity Ratio:** > 0.45
-

4. Mechanical & Housing Specifications

- **Housing Material:** High-pressure die-cast aluminum
 - **Finish:** Smooth powder-coated corrosion-resistant finish
 - **Heat Dissipation:** Extruded aluminum heat sink integrated with housing
 - **Optics:** Polycarbonate lenses / diffuser for uniform light distribution
 - **Marking:** Company mark/name engraved or embossed
-

5. LED Source / Manufacturer

- Approved LED makes: **CREE, OSRAM, Philips Lumileds, NICHIA, SEOUL, BridgeLux (U.S.A.)**
 - LED must be **LM-79 & LM-80 certified** for performance and reliability
-

6. Standards & Certifications

- **Electrical Safety:** IEC / IS standards for LED luminaires
 - **Surge Protection:** As per IEC 61000-4-5
 - **Ingress Protection:** IP-65
 - **LED Photometry:** LM-79 & LM-80 certified
-

7. Installation

- **Mounting:** Pole-mounted with suitable brackets (as per site requirement)
 - **Orientation:** Adjusted to provide optimal lighting coverage
 - **Verification:** Testing for electrical continuity, luminaire operation, and light output
-

8. Accessories / Included Items

- Pole mounting bracket (if specified)
 - Fasteners, washers, and bolts for installation
 - Driver and surge protection components
-

9. Approved Makes / Manufacturers

- **CREE, OSRAM, Philips Lumileds, NICHIA, SEOUL, BridgeLux (U.S.A.)**
-

10. Category

- **Category III** – Includes supply, fabrication, assembly, mounting, testing, and commissioning

(55)

TECHNICAL SPECIFICATION – IP-55 GRADE SECTION PILLAR – CAT III

1. Scope of Work

Supply, fabrication, and erection of **IP-55 grade section pillars**, complete with jointless MS sheet construction, angle iron supports, doors, internal fittings, cable clamps, foundation, and painting. The pillars shall be suitable for housing electrical equipment and wiring, and shall comply with IP-55 protection standards.

2. Description

- **Type:** IP-55 Grade Section Pillar (Dust and Water Resistant)
 - **Dimensions:** 75 × 60 × 45 cm (L × W × H)
 - **Application:** Housing electrical equipment, switches, or junctions for outdoor installation
 - **Mounting:** Buried with cement concrete foundation and brick work finishing (45 cm high), as required
 - **Door:** Hinged double door, internally supported, with external lockable arrangement and keys in duplicate
-

3. Material & Construction

- **Sheet Material:** 16-gauge MS sheet (for main body)
 - **Angle Iron Legs:** 35 × 35 × 5 mm MS angles, 45 cm long, jointless construction
 - **Internal Support:** Hinged double door supported on both sides
 - **Bakelite Sheet:** Mounted using two 35 × 35 × 5 mm MS angles, one welded, one bolted with nut & bolt
 - **Cable Clamps:** Suitable clamps provided for cable entry and support
-

4. Structural & Mechanical Specifications

- **Pillar Body:** Jointless construction, roof without joints, tested for water tightness
 - **Protection Standard:** IP-55 (Dust-tight and protected against water jets)
 - **Testing:** As per **IS 2147:1962**
 - **Door & Locking:** External locks with duplicate keys, internal reinforcement for stability
 - **Foundation:** Cement concrete with brickwork finishing for proper erection and stability
-

5. Surface Treatment & Painting

- **Paint Type:** Three coats of powder-coated paint (inside and outside)
 - **Purpose:** Protection against corrosion, weather, and UV degradation
-

6. Standards & Codes

- **Ingress Protection:** IP-55 (Dust and water resistant)
 - **Material Standards:** IS 2147:1962 (Sheet steel fabrication)
 - **Construction Standards:** IS 1239 / IS 2062 for MS angles
 - **Painting Standards:** IS 1477 (Paints and coatings for steel)
-

7. Accessories Included

- Hinged double door with lock & keys
 - Bakelite sheet mounting arrangement
 - Cable clamps inside pillar
 - Fasteners for internal fittings
 - Powder-coated finish
-

8. Installation

- Pillar to be erected on **cement concrete foundation** with **brickwork finishing (45 cm high)**
 - Proper leveling, alignment, and stability to be ensured
 - Water leakage and IP-55 compliance tested after installation
-

9. Approved Makes / Manufacturers

- Schneider, ABB, Siemens, L&T, or other ISI-approved manufacturers for IP-55 grade outdoor electrical enclosures
-

10. Category

- **Category III** – Includes supply, fabrication, painting, foundation, installation, testing, and commissioning

(56)

TECHNICAL SPECIFICATION – IP-55 GRADE SECTION PILLAR – CAT III

1. Scope of Work

Supply, fabrication, and erection of **IP-55 grade section pillars**, including:

- Jointless MS sheet construction
- Angle iron supports
- Hinged double doors
- Internal fittings and cable clamps
- Cement concrete foundation with brickwork finishing
- Surface painting and powder coating

The pillar shall be suitable for housing **electrical equipment and wiring** for outdoor installation and comply with **IP-55 protection standards**.

2. Description

- **Type:** IP-55 Grade Section Pillar (Dust and Water Resistant)
 - **Dimensions:** 75 × 60 × 45 cm (L × W × H)
 - **Application:** Housing electrical equipment, switches, or junctions
 - **Mounting:** Buried in ground with cement concrete foundation and 45 cm high brickwork finishing
 - **Door:** Hinged double door, internally supported, externally lockable with duplicate keys
-

3. Material & Construction

- **Sheet Material:** 16-gauge MS sheet (main body)
 - **Angle Iron Legs:** 35 × 35 × 5 mm MS angles, 45 cm long, jointless
 - **Internal Support:** Hinged double door with reinforcement on both sides
 - **Bakelite Sheet:** Mounted using two 35 × 35 × 5 mm MS angles, one welded and one bolted with nut & bolt
 - **Cable Clamps:** Provided inside pillar for cable entry and support
-

4. Structural & Mechanical Specifications

- **Pillar Body:** Jointless construction; roof without joints; water tight
- **Protection Standard:** IP-55 (dust-tight and protected against water jets)
- **Testing:** As per **IS 2147:1962**

- **Door & Locking:** External locks with duplicate keys; internal reinforcement for stability
 - **Foundation:** Cement concrete with brickwork finishing to ensure stability
-

5. Surface Treatment & Painting

- **Paint Type:** Three coats of powder-coated paint (inside and outside)
 - **Purpose:** Corrosion protection and durability against weather and UV
-

6. Standards & Codes

- **Ingress Protection:** IP-55 (Dust and water resistant)
 - **Material Standards:** IS 2147:1962 (Sheet steel fabrication)
 - **Construction Standards:** IS 1239 / IS 2062 (MS angles)
 - **Painting Standards:** IS 1477
-

7. Accessories Included

- Hinged double door with lock & keys
 - Bakelite sheet mounting arrangement
 - Cable clamps
 - Fasteners for internal fittings
 - Powder-coated finish
-

8. Installation

- Erected on cement concrete foundation with 45 cm high brickwork
 - Ensure proper leveling, alignment, and stability
 - Verify **water leakage** and **IP-55 compliance** after installation
-

9. Approved Makes / Manufacturers

- Schneider, ABB, Siemens, L&T, or other ISI-approved manufacturers for IP-55 grade outdoor electrical enclosures
-

10. Category

- **Category III** – Includes supply, fabrication, painting, foundation, installation, testing, and commissioning

TECHNICAL SPECIFICATION – IP-55 GRADE SECTION PILLAR – CAT III

1. Scope of Work

Supply, fabrication, and erection of **IP-55 grade section pillars**, including:

- Jointless MS sheet construction
- Angle iron supports
- Hinged double doors
- Internal fittings and cable clamps
- Cement concrete foundation with brickwork finishing
- Surface painting and powder coating

The pillar shall be suitable for housing **electrical equipment and wiring** for outdoor installations and comply with **IP-55 protection standards**.

2. Description

- **Type:** IP-55 Grade Section Pillar (Dust and Water Resistant)
 - **Dimensions:** 75 × 60 × 45 cm (L × W × H)
 - **Application:** Housing electrical equipment, switches, or junctions
 - **Mounting:** Buried in ground with cement concrete foundation and 45 cm high brickwork finishing
 - **Door:** Hinged double door, internally supported, externally lockable with duplicate keys
-

3. Material & Construction

- **Sheet Material:** 16-gauge MS sheet (main body)
 - **Angle Iron Legs:** 35 × 35 × 5 mm MS angles, 45 cm long, jointless
 - **Internal Support:** Hinged double door reinforced on both sides
 - **Bakelite Sheet:** Mounted using two 35 × 35 × 5 mm MS angles; one welded, one bolted with nut & bolt
 - **Cable Clamps:** Provided inside for cable entry and support
-

4. Structural & Mechanical Specifications

- **Pillar Body:** Jointless construction; roof without joints; water tight
 - **Protection Standard:** IP-55 (Dust-tight and protected against water jets)
 - **Testing:** As per **IS 2147:1962**
 - **Door & Locking:** External locks with duplicate keys; internal reinforcement for stability
 - **Foundation:** Cement concrete with brickwork finishing to ensure stability
-

5. Surface Treatment & Painting

- **Paint Type:** Three coats of powder-coated paint (inside and outside)
 - **Purpose:** Corrosion protection and durability against weather and UV
-

6. Standards & Codes

- **Ingress Protection:** IP-55 (Dust and water resistant)
 - **Material Standards:** IS 2147:1962 (Sheet steel fabrication)
 - **Construction Standards:** IS 1239 / IS 2062 (MS angles)
 - **Painting Standards:** IS 1477
-

7. Accessories Included

- Hinged double door with lock & keys
 - Bakelite sheet mounting arrangement
 - Cable clamps
 - Fasteners for internal fittings
 - Powder-coated finish
-

8. Installation

- Erect on cement concrete foundation with 45 cm high brickwork
 - Ensure proper leveling, alignment, and stability
 - Verify water leakage and **IP-55 compliance** after installation
-

9. Approved Makes / Manufacturers

- Schneider, ABB, Siemens, L&T, or other ISI-approved manufacturers for IP-55 grade outdoor electrical enclosures
-

10. Category

- **Category III** – Includes supply, fabrication, painting, foundation, installation, testing, and commissioning

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TECHNICAL SPECIFICATION – IP-55 GRADE SECTION PILLAR – CAT III

1. Scope of Work

Supply, fabrication, and erection of **IP-55 grade section pillars**, including:

- Jointless MS sheet construction
- Angle iron supports
- Hinged double doors
- Internal fittings and cable clamps
- Cement concrete foundation with brickwork finishing
- Surface painting and powder coating

The pillar shall be suitable for housing **electrical equipment and wiring** for outdoor installations and comply with **IP-55 protection standards**.

2. Description

- **Type:** IP-55 Grade Section Pillar (Dust and Water Resistant)
 - **Dimensions:** $75 \times 60 \times 45$ cm (L \times W \times H)
 - **Application:** Housing electrical equipment, switches, or junctions
 - **Mounting:** Buried in ground with cement concrete foundation and 45 cm high brickwork finishing
 - **Door:** Hinged double door, internally supported, externally lockable with duplicate keys
-

3. Material & Construction

- **Sheet Material:** 16-gauge MS sheet (main body)
 - **Angle Iron Legs:** $35 \times 35 \times 5$ mm MS angles, 45 cm long, jointless
 - **Internal Support:** Hinged double door reinforced on both sides
 - **Bakelite Sheet:** Mounted using two $35 \times 35 \times 5$ mm MS angles; one welded, one bolted with nut & bolt
 - **Cable Clamps:** Provided inside for cable entry and support
-

4. Structural & Mechanical Specifications

- **Pillar Body:** Jointless construction; roof without joints; water tight
 - **Protection Standard:** IP-55 (dust-tight and protected against water jets)
 - **Testing:** As per **IS 2147:1962**
 - **Door & Locking:** External locks with duplicate keys; internal reinforcement for stability
 - **Foundation:** Cement concrete with brickwork finishing to ensure stability
-

5. Surface Treatment & Painting

- **Paint Type:** Three coats of powder-coated paint (inside and outside)
- **Purpose:** Corrosion protection and durability against weather and UV

6. Standards & Codes

- **Ingress Protection:** IP-55 (Dust and water resistant)
 - **Material Standards:** IS 2147:1962 (Sheet steel fabrication)
 - **Construction Standards:** IS 1239 / IS 2062 (MS angles)
 - **Painting Standards:** IS 1477
-

7. Accessories Included

- Hinged double door with lock & keys
 - Bakelite sheet mounting arrangement
 - Cable clamps
 - Fasteners for internal fittings
 - Powder-coated finish
-

8. Installation

- Erect on cement concrete foundation with 45 cm high brickwork
 - Ensure proper leveling, alignment, and stability
 - Verify water leakage and **IP-55 compliance** after installation
-

9. Approved Makes / Manufacturers

- Schneider, ABB, Siemens, L&T, or other ISI-approved manufacturers for IP-55 grade outdoor electrical enclosures
-

10. Category

- **Category III** – Includes supply, fabrication, painting, foundation, installation, testing, and commissioning

(59)

TECHNICAL SPECIFICATION – MAINS WIRING IN PVC PIPE – CAT III

1. Scope of Work

Supply and erection of mains wiring using **1.1 kV grade FRLS PVC insulated, ISI marked stranded copper conductors**, laid in **medium class rigid PVC pipes** along walls or ceilings, complete with earth continuity using green-coloured copper conductor. The work shall include all necessary connections, fixing, supports, and accessories, as per site requirement and direction of the Engineer-in-Charge.

2. Description

- **Voltage Rating:** 1.1 kV
 - **Conductor Type:** Stranded copper, FRLS PVC insulated, ISI marked
 - **Earth Continuity:** Green-coloured 2.5 sq.mm stranded copper wire
 - **Installation:** Concealed or surface-mounted in medium class rigid PVC pipes
 - **Pipe Accessories:** Bends, junctions, clamps, couplers as required
 - **Application:** Electrical mains for general power distribution in buildings
-

3. Material & Construction

- **Phase Wires:**
 - 2 wires × 4 sq.mm stranded copper conductor
 - 1.1 kV FRLS PVC insulated, ISI marked
 - **Earth Wire:**
 - 2.5 sq.mm stranded copper, FRLS PVC insulated, green
 - **Pipe Material:** Medium class rigid PVC pipe as per IS 12818 / IS 9537
 - **Pipe Fittings & Accessories:**
 - Elbows, junction boxes, couplers, clamps
 - Fixed with suitable adhesive solution and / or screws
 - **Conductor Color Code:**
 - Phase: Red / Yellow / Blue (as per site standard)
 - Earth: Green
-

4. Installation & Erection

- Conduit to be fixed on walls or ceiling using appropriate clamps
 - Wires to be pulled inside PVC conduit without damage
 - Earth continuity to be maintained throughout the run
 - All joints, bends, and terminations to be properly insulated and secured
 - Conduit alignment to be neat and parallel to walls / ceiling as per site standards
-

5. Standards & Codes

- **Conductor:** IS 694 / IS 8130, Copper stranded
- **PVC Insulation:** IS 5831, FRLS PVC
- **Pipe:** IS 12818 / IS 9537 (Medium Class)
- **Installation:** As per IE rules and Indian Electricity Act

- **Earth Continuity:** IS 3043
-

6. Accessories Included

- PVC bends, junction boxes, couplers
 - Conduit clamps and fasteners
 - Identification markers (phase & earth)
 - End terminations and H.D. connectors as required
-

7. Category

- **Category III** – Includes supply of copper wires, PVC pipes & accessories, erection, earth continuity, and commissioning.

(60)

TECHNICAL SPECIFICATION – XLPE ARMoured CABLE (4C × 6 SQ.MM) – CAT III

1. Scope of Work

Supply, laying, and erection of **XLPE (IS:7098 Part I – 1988) ISI marked armoured copper cables**, 1.1 kV grade, either **wall-mounted with clamps, in existing conduit/pipe, or trench/road crossing/floor duct**, as per site requirement and Engineer-in-Charge directions. Includes all terminations, fixing, and necessary accessories.

2. Description

- **Cable Type:** XLPE insulated, ISI marked, armoured, copper conductor
 - **Voltage Rating:** 1.1 kV AC
 - **Number of Cores:** 4
 - **Conductor Size:** 6 sq.mm
 - **Conductor Type:** Multistrand or solid copper
 - **Application:** Power distribution, lighting circuits, or feeder wiring for commercial/residential/industrial buildings
-

3. Material & Construction

- **Conductor:**
 - Copper, stranded or solid
 - ISI marked, as per IS 8130
- **Insulation:**
 - XLPE (Cross-Linked Polyethylene), 1.1 kV rated, IS:7098 Part I – 1988

- Colour-coded cores for phase identification
 - **Armouring:**
 - Galvanized steel wire armoured (GSWA) for mechanical protection
 - Optional: Aluminum wire armour (if approved)
 - **Sheath:**
 - PVC outer sheath, FRLS (Flame Retardant Low Smoke)
 - Black/grey as per standard
-

4. Electrical & Mechanical Specifications

- **Rated Voltage:** 1.1 kV
 - **Test Voltage:** 3.5 kV AC for 5 minutes
 - **Temperature Ratings:**
 - Operating conductor temperature: 90°C
 - Short circuit conductor temperature: 250°C (for 5 sec)
 - **Mechanical Strength:**
 - Suitable for wall, floor, duct, or trench laying
 - Resistant to mechanical stress, rodents, and moisture ingress
 - **Current Carrying Capacity:** As per IS 3961, depends on installation method
-

5. Installation & Laying

- **Wall Mounting:** With approved cable clamps at standard spacing (e.g., 0.5 m)
 - **Trench Laying / Road Crossing:**
 - Sand bedding / warning tape as per local standards
 - Minimum cover depth as per IE rules
 - **Conduit / Pipe Laying:** Existing PVC/HDPE / RCC conduits
 - **Termination:** Suitable gland / lugs for connections at panels, switchboards, or MCB/DB
 - **Bending Radius:** Minimum $12 \times$ overall diameter of cable
-

6. Standards & Codes

- **Conductor:** IS 8130
- **Insulation:** IS:7098 Part I – 1988 (XLPE, 1.1 kV)
- **Armouring:** IS 3975 / IS 1554
- **Sheath:** IS 5831 (PVC, FRLS)
- **Installation:** Indian Electricity Rules (IER), IEC 60502-1 reference

- **Marking:** Cable to be marked with manufacturer, size, voltage, ISI mark, and year of manufacture
-

7. Accessories Included

- Cable glands / lugs for termination
 - Cable clamps, saddles, supports
 - Insulation tape for joints if required
-

8. Category

- **Category III** – Includes supply, laying, fixing, clamping, terminations, and testing of XLPE armoured copper cable.

(61)

TECHNICAL SPECIFICATION – XLPE ARMOURED CABLE (4C × 10 SQ.MM) – CAT III

1. Scope of Work

Supply, laying, and erection of XLPE (IS:7098 Part I – 1988) ISI marked armoured copper cables, 1.1 kV grade, either **wall-mounted with clamps, in existing conduit/pipe, or trench/road crossing/floor duct**, as per site requirement and Engineer-in-Charge directions. Includes all terminations, fixing, and necessary accessories.

2. Description

- **Cable Type:** XLPE insulated, ISI marked, armoured, copper conductor
 - **Voltage Rating:** 1.1 kV AC
 - **Number of Cores:** 4
 - **Conductor Size:** 10 sq.mm
 - **Conductor Type:** Multistrand copper
 - **Application:** Power distribution, lighting circuits, or feeder wiring for commercial/residential/industrial buildings
-

3. Material & Construction

- **Conductor:**
 - Multistrand copper, ISI marked (IS 8130)
- **Insulation:**
 - XLPE (Cross-Linked Polyethylene), 1.1 kV rated, IS:7098 Part I – 1988
 - Colour-coded cores for phase identification
- **Armouring:**

- Galvanized steel wire armoured (GSWA) for mechanical protection
 - **Sheath:**
 - FRLS PVC outer sheath
 - Colour: Black / Grey (as per standard)
-

4. Electrical & Mechanical Specifications

- **Rated Voltage:** 1.1 kV
 - **Test Voltage:** 3.5 kV AC for 5 minutes
 - **Temperature Ratings:**
 - Operating conductor temperature: 90°C
 - Short circuit conductor temperature: 250°C (for 5 sec)
 - **Mechanical Strength:**
 - Suitable for wall, floor, duct, or trench laying
 - Resistant to mechanical stress, rodents, and moisture ingress
 - **Current Carrying Capacity:** As per IS 3961, depends on installation method
-

5. Installation & Laying

- **Wall Mounting:** With approved cable clamps at standard spacing (~0.5 m)
 - **Trench / Road Crossing:**
 - Sand bedding / warning tape as per local standards
 - Minimum cover depth as per IE rules
 - **Conduit / Pipe Laying:** Existing PVC/HDPE / RCC conduits
 - **Termination:** Suitable gland / lugs for connections at panels, switchboards, or MCB/DB
 - **Bending Radius:** Minimum 12 × overall diameter of cable
-

6. Standards & Codes

- **Conductor:** IS 8130
 - **Insulation:** IS:7098 Part I – 1988 (XLPE, 1.1 kV)
 - **Armouring:** IS 3975 / IS 1554
 - **Sheath:** IS 5831 (PVC, FRLS)
 - **Installation:** Indian Electricity Rules (IER), IEC 60502-1 reference
 - **Marking:** Manufacturer, size, voltage, ISI mark, and year of manufacture
-

7. Accessories Included

- Cable glands / lugs for termination
 - Cable clamps, saddles, supports
 - Insulation tape for joints if required
-

8. Category

- **Category III** – Includes supply, laying, fixing, clamping, terminations, and testing of XLPE armoured copper cable.

(62)

TECHNICAL SPECIFICATION – XLPE ARMoured ALUMINIUM CABLE (3½C × 70 / 35 SQ.MM) – CAT III

1. Scope of Work

Supply, laying, and erection of XLPE (IS:7098 Part I – 1988) ISI marked armoured aluminium cables, 1.1 kV grade, to be **wall-mounted with clamps, in existing conduits/pipes, or trenches/floor ducts/road crossings**, including all terminations, supports, and accessories as directed by Engineer-in-Charge.

2. Description

- **Cable Type:** XLPE insulated, ISI marked, armoured aluminium conductor
 - **Voltage Rating:** 1.1 kV AC
 - **Number of Cores:** 3½ (3 full + 1 half)
 - **Conductor Size:** 70 sq.mm for main cores, 35 sq.mm for half core
 - **Conductor Type:** Multistrand aluminium
 - **Application:** Power distribution for main feeders in buildings, industries, or utility networks
-

3. Material & Construction

- **Conductor:**
 - Multistrand aluminium, ISI marked (IS 8130)
 - **Insulation:**
 - XLPE (Cross-Linked Polyethylene) insulation rated for 1.1 kV, IS:7098 Part I – 1988
 - Colour-coded cores for phase identification
 - **Armouring:**
 - Galvanized steel wire armoured (GSWA) for mechanical protection
 - **Sheath:**
 - FRLS PVC outer sheath
 - Colour: Black / Grey (as per standard)
-

4. Electrical & Mechanical Specifications

- **Rated Voltage:** 1.1 kV
 - **Test Voltage:** 3.5 kV AC for 5 minutes
 - **Temperature Ratings:**
 - Operating: 90°C conductor temperature
 - Short circuit: 250°C (for 5 seconds)
 - **Mechanical Strength:**
 - Suitable for wall, floor, duct, or trench installation
 - Resistant to mechanical stress, moisture, and minor impact
 - **Current Carrying Capacity:** As per IS 3961 depending on installation method
-

5. Installation & Laying

- **Wall Mounting:** With approved cable clamps at standard spacing (~0.5 m)
 - **Trench / Road Crossing / Floor Duct:**
 - Sand bedding / warning tape as per site standard
 - Minimum cover depth as per IE rules
 - **Conduit / Pipe Laying:** In existing medium-class PVC/HDPE/RCC conduits
 - **Termination:** Suitable cable glands/lugs at panels, switchboards, or DBs
 - **Bending Radius:** Minimum 12 × overall cable diameter
-

6. Standards & Codes

- **Conductor:** IS 8130
 - **Insulation:** IS:7098 Part I – 1988 (XLPE, 1.1 kV)
 - **Armouring:** IS 3975 / IS 1554
 - **Sheath:** IS 5831 (PVC, FRLS)
 - **Installation:** Indian Electricity Rules (IER), IEC 60502-1 reference
 - **Marking:** Manufacturer, size, voltage, ISI mark, and year of manufacture
-

7. Accessories Included

- Cable glands / lugs for termination
 - Cable clamps, saddles, supports
 - Insulation tape for joints if required
-

8. Category

Category III – Includes supply, laying, fixing, clamping, terminations, and testing of XLPE armoured aluminium cable.

(63)

TECHNICAL SPECIFICATION – XLPE ARMOURED ALUMINIUM CABLE (3½C × 50 / 25 SQ.MM) – CAT III

1. Scope of Work

Supply, laying, and erection of **XLPE (IS:7098 Part I – 1988) ISI marked armoured aluminium cables**, 1.1 kV grade, to be **wall-mounted with clamps, in existing conduits/pipes, or trenches/floor ducts**, including all terminations, supports, and accessories as directed by Engineer-in-Charge.

2. Description

- **Cable Type:** XLPE insulated, ISI marked, armoured aluminium conductor
- **Voltage Rating:** 1.1 kV AC
- **Number of Cores:** 3½ (3 full + 1 half)
- **Conductor Size:** 50 sq.mm for main cores, 25 sq.mm for half core
- **Conductor Type:** Multistrand aluminium
- **Application:** Power distribution for main feeders in buildings, industries, or utility networks

3. Material & Construction

- **Conductor:**
 - Multistrand aluminium, ISI marked (IS 8130)
- **Insulation:**
 - XLPE (Cross-Linked Polyethylene) insulation rated for 1.1 kV, IS:7098 Part I – 1988
 - Colour-coded cores for phase identification
- **Armouring:**
 - Galvanized steel wire armoured (GSWA) for mechanical protection
- **Sheath:**
 - FRLS PVC outer sheath
 - Colour: Black / Grey (as per standard)

4. Electrical & Mechanical Specifications

- **Rated Voltage:** 1.1 kV
- **Test Voltage:** 3.5 kV AC for 5 minutes
- **Temperature Ratings:**

- Operating: 90°C conductor temperature
 - Short circuit: 250°C (for 5 seconds)
 - **Mechanical Strength:**
 - Suitable for wall, floor, duct, or trench installation
 - Resistant to mechanical stress, moisture, and minor impact
 - **Current Carrying Capacity:** As per IS 3961 depending on installation method
-

5. Installation & Laying

- **Wall Mounting:** With approved cable clamps at standard spacing (~0.5 m)
 - **Trench / Floor Duct / Pipe:**
 - Sand bedding / warning tape as per site standard
 - Minimum cover depth as per IE rules
 - **Conduit / Pipe Laying:** In existing medium-class PVC/HDPE/RCC conduits
 - **Termination:** Suitable cable glands/lugs at panels, switchboards, or DBs
 - **Bending Radius:** Minimum 12 × overall cable diameter
-

6. Standards & Codes

- **Conductor:** IS 8130
 - **Insulation:** IS:7098 Part I – 1988 (XLPE, 1.1 kV)
 - **Armouring:** IS 3975 / IS 1554
 - **Sheath:** IS 5831 (PVC, FRLS)
 - **Installation:** Indian Electricity Rules (IER), IEC 60502-1 reference
 - **Marking:** Manufacturer, size, voltage, ISI mark, and year of manufacture
-

7. Accessories Included

- Cable glands / lugs for termination
 - Cable clamps, saddles, supports
 - Insulation tape for joints if required
-

8. Category

Category III – Includes supply, laying, fixing, clamping, terminations, and testing of XLPE armoured aluminium cable.

TECHNICAL SPECIFICATION – XLPE ARMoured COPPER CABLE (4C × 16 SQ.MM) – CAT III

1. Scope of Work

Supply, laying, and erection of **XLPE (IS:7098 Part I – 1988) ISI marked armoured copper cables**, 1.1 kV grade, to be **wall-mounted with clamps, in existing conduits/pipes, or trenches/floor ducts**, including all terminations, supports, and accessories as directed by Engineer-in-Charge.

2. Description

- **Cable Type:** XLPE insulated, ISI marked, armoured copper conductor
 - **Voltage Rating:** 1.1 kV AC
 - **Number of Cores:** 4 cores
 - **Conductor Size:** 16 sq.mm per core
 - **Conductor Type:** Multistrand copper
 - **Application:** Power distribution for lighting, small motor loads, or sub-main feeders in buildings, industries, or utility networks
-

3. Material & Construction

- **Conductor:**
 - Multistrand copper, ISI marked (IS 8130)
 - **Insulation:**
 - XLPE (Cross-Linked Polyethylene) insulation rated for 1.1 kV, IS:7098 Part I – 1988
 - Colour-coded cores for phase identification
 - **Armouring:**
 - Galvanized steel wire armoured (GSWA) for mechanical protection
 - **Sheath:**
 - FRLS PVC outer sheath
 - Colour: Black / Grey (as per standard)
-

4. Electrical & Mechanical Specifications

- **Rated Voltage:** 1.1 kV
- **Test Voltage:** 3.5 kV AC for 5 minutes
- **Temperature Ratings:**
 - Operating: 90°C conductor temperature
 - Short circuit: 250°C (for 5 seconds)
- **Mechanical Strength:**

- Suitable for wall, floor, duct, trench, or road crossing installation
 - Resistant to mechanical stress, moisture, and minor impact
 - **Current Carrying Capacity:** As per IS 3961 depending on installation method
-

5. Installation & Laying

- **Wall Mounting:** With approved cable clamps at standard spacing (~0.5 m)
 - **Trench / Floor Duct / Pipe:**
 - Sand bedding / warning tape as per site standard
 - Minimum cover depth as per Indian Electricity Rules (IER)
 - **Conduit / Pipe Laying:** In existing medium-class PVC/HDPE/RCC conduits
 - **Termination:** Suitable cable glands/lugs at panels, switchboards, or DBs
 - **Bending Radius:** Minimum $12 \times$ overall cable diameter
-

6. Standards & Codes

- **Conductor:** IS 8130
 - **Insulation:** IS:7098 Part I – 1988 (XLPE, 1.1 kV)
 - **Armouring:** IS 3975 / IS 1554
 - **Sheath:** IS 5831 (PVC, FRLS)
 - **Installation:** Indian Electricity Rules (IER), IEC 60502-1 reference
 - **Marking:** Manufacturer, size, voltage, ISI mark, and year of manufacture
-

7. Accessories Included

- Cable glands / lugs for termination
 - Cable clamps, saddles, supports
 - Insulation tape for joints if required
-

8. Category

Category III – Includes supply, laying, fixing, clamping, terminations, and testing of XLPE armoured copper cable.

(65)

TECHNICAL SPECIFICATION – XLPE ARMoured ALUMINIUM CABLE (4C × 10 SQ.MM) – CAT III

1. Scope of Work

Supply, laying, and erection of **XLPE (IS:7098 Part I – 1988) ISI marked armoured aluminium cables**, 1.1 kV grade, to be **wall-mounted with clamps, in existing conduits/pipes, or trenches/floor ducts**, including all terminations, supports, and accessories as directed by Engineer-in-Charge.

2. Description

- **Cable Type:** XLPE insulated, ISI marked, armoured aluminium conductor
 - **Voltage Rating:** 1.1 kV AC
 - **Number of Cores:** 4 cores
 - **Conductor Size:** 10 sq.mm per core
 - **Conductor Type:** Multistrand or solid aluminium
 - **Application:** Power distribution for sub-main feeders, lighting, or small motor circuits in residential, commercial, or industrial installations
-

3. Material & Construction

- **Conductor:**
 - Multistrand or solid aluminium, ISI marked (IS 8130)
 - **Insulation:**
 - XLPE (Cross-Linked Polyethylene) insulation rated for 1.1 kV, IS:7098 Part I – 1988
 - Colour-coded cores for phase identification
 - **Armouring:**
 - Galvanized steel wire armoured (GSWA) for mechanical protection
 - **Sheath:**
 - FRLS PVC outer sheath
 - Colour: Black / Grey (as per standard)
-

4. Electrical & Mechanical Specifications

- **Rated Voltage:** 1.1 kV
- **Test Voltage:** 3.5 kV AC for 5 minutes
- **Temperature Ratings:**
 - Operating: 90°C conductor temperature
 - Short circuit: 250°C (for 5 seconds)
- **Mechanical Strength:**
 - Suitable for wall, floor, duct, trench, or road crossing installation
 - Resistant to mechanical stress, moisture, and minor impact
- **Current Carrying Capacity:** As per IS 3961 depending on installation method

5. Installation & Laying

- **Wall Mounting:** With approved cable clamps at standard spacing (~0.5 m)
 - **Trench / Floor Duct / Pipe:**
 - Sand bedding / warning tape as per site standard
 - Minimum cover depth as per Indian Electricity Rules (IER)
 - **Conduit / Pipe Laying:** In existing medium-class PVC/HDPE/RCC conduits
 - **Termination:** Suitable cable glands/lugs at panels, switchboards, or DBs
 - **Bending Radius:** Minimum $12 \times$ overall cable diameter
-

6. Standards & Codes

- **Conductor:** IS 8130
 - **Insulation:** IS:7098 Part I – 1988 (XLPE, 1.1 kV)
 - **Armouring:** IS 3975 / IS 1554
 - **Sheath:** IS 5831 (PVC, FRLS)
 - **Installation:** Indian Electricity Rules (IER), IEC 60502-1 reference
 - **Marking:** Manufacturer, size, voltage, ISI mark, and year of manufacture
-

7. Accessories Included

- Cable glands / lugs for termination
 - Cable clamps, saddles, supports
 - Insulation tape for joints if required
-

8. Category

Category III – Includes supply, laying, fixing, clamping, terminations, and testing of XLPE armoured aluminium cable.

(66)

TECHNICAL SPECIFICATION – XLPE ARMoured ALUMINIUM CABLE (4C × 10 SQ.MM) – CAT III

1. Scope of Work

Supply, laying, and erection of **XLPE (IS:7098 Part I – 1988) ISI marked armoured aluminium cables**, 1.1 kV grade, to be **wall-mounted with clamps**, in existing conduits/pipes, or trenches/floor ducts, including all **terminations, supports, and accessories** as directed by the Engineer-in-Charge.

2. Description

- **Cable Type:** XLPE insulated, ISI marked, armoured aluminium conductor
 - **Voltage Rating:** 1.1 kV AC
 - **Number of Cores:** 4 cores
 - **Conductor Size:** 10 sq.mm per core
 - **Conductor Type:** Multistrand or solid aluminium
 - **Application:** Power distribution for sub-main feeders, lighting, or small motor circuits in residential, commercial, or industrial installations
-

3. Material & Construction

- **Conductor:** Multistrand or solid aluminium, ISI marked (IS 8130)
 - **Insulation:** XLPE (Cross-Linked Polyethylene) rated for 1.1 kV (IS:7098 Part I – 1988)
 - Colour-coded cores for phase identification
 - **Armouring:** Galvanized steel wire armoured (GSWA) for mechanical protection
 - **Sheath:** FRLS PVC outer sheath
 - Colour: Black / Grey (as per standard)
-

4. Electrical & Mechanical Specifications

- **Rated Voltage:** 1.1 kV
 - **Test Voltage:** 3.5 kV AC for 5 minutes
 - **Temperature Ratings:**
 - Operating: 90°C conductor temperature
 - Short circuit: 250°C (for 5 seconds)
 - **Mechanical Strength:** Suitable for wall, floor, duct, trench, or road crossing installation; resistant to mechanical stress, moisture, and minor impact
 - **Current Carrying Capacity:** As per IS 3961 depending on installation method
-

5. Installation & Laying

- **Wall Mounting:** With approved cable clamps at standard spacing (~0.5 m)
 - **Trench / Floor Duct / Pipe:** Sand bedding and warning tape as per site standard; minimum cover depth as per Indian Electricity Rules (IER)
 - **Conduit / Pipe Laying:** In existing medium-class PVC/HDPE/RCC conduits
 - **Termination:** Suitable cable glands/lugs at panels, switchboards, or DBs
 - **Bending Radius:** Minimum 12 × overall cable diameter
-

6. Standards & Codes

- **Conductor:** IS 8130
 - **Insulation:** IS:7098 Part I – 1988
 - **Armouring:** IS 3975 / IS 1554
 - **Sheath:** IS 5831 (PVC, FRLS)
 - **Installation:** Indian Electricity Rules (IER), IEC 60502-1 reference
 - **Marking:** Manufacturer, size, voltage, ISI mark, and year of manufacture
-

7. Accessories Included

- Cable glands / lugs for termination
 - Cable clamps, saddles, supports
 - Insulation tape for joints if required
-

8. Category

Category III – Includes supply, laying, fixing, clamping, terminations, and testing of XLPE armoured aluminium cable.

(67)

TECHNICAL SPECIFICATION – HEAVY DUTY FLANGE TYPE BRASS CABLE GLAND (2–4C × 16 SQ.MM) – CAT III

1. Scope of Work

Supply, fixing, and termination of **heavy-duty flange type brass cable glands** with rubber sealing rings for PVC insulated armoured cables, including outgoing tails, insulating tape, and all necessary accessories as directed by the Engineer-in-Charge.

2. Description

- **Type:** Heavy-duty flange type cable gland
 - **Material:** Brass (for body and flange), corrosion resistant
 - **Sealing:** Rubber ring for proper insulation and water/dust resistance
 - **Application:** For terminating PVC insulated, armoured power cables
 - **Cable Size Compatibility:** 2 to 4 cores, 16 sq.mm
-

3. Material & Construction

- **Body:** Brass, high mechanical strength, corrosion resistant
- **Seal:** Rubber ring to provide insulation and mechanical grip

- **Cable Entry:** Suitable for 2–4 core armoured cable of 16 sq.mm size
 - **Accessories:** Includes outgoing tails, insulating tape, and necessary fasteners for termination
-

4. Electrical & Mechanical Specifications

- **Voltage Rating:** Suitable for 1.1 kV PVC armoured cables
 - **Ingress Protection:** IP54 or better
 - **Temperature Rating:** As per cable specification
 - **Mechanical Strength:** Designed for heavy-duty industrial / commercial cable termination
-

5. Installation & Laying

- Fit gland on cable entry point of panel, switchgear, or enclosure
 - Ensure proper crimping / clamping of cable armour inside gland
 - Outgoing conductor tails insulated with tape as per site standard
 - Tightening torque as per manufacturer's recommendation
 - Ensure no mechanical stress or damage to cable insulation
-

6. Standards & Codes

- **Material & Dimensions:** IS 6291 / IEC 62444 (Brass cable glands)
 - **Installation:** Indian Electricity Rules (IER) and manufacturer instructions
 - **Marking:** Manufacturer name, cable size, and IP rating
-

7. Accessories Included

- Rubber sealing ring
 - Outgoing tails
 - Insulating tape
 - Fasteners / nuts / bolts for gland fixing
-

8. Category

Category III – Includes supply, fitting, sealing, tailing, and testing of heavy-duty brass cable gland for PVC armoured cables.

(68)

**TECHNICAL SPECIFICATION – HEAVY DUTY FLANGE TYPE DOUBLE COMPRESSION
BRASS CABLE GLAND (3½C × 70 SQ.MM) – CAT III**

1. Scope of Work

Supply, fixing, and termination of **heavy-duty flange type double compression brass cable glands** with rubber sealing rings for PVC insulated armoured cables, including outgoing tails, insulating tape, and all necessary accessories as directed by the Engineer-in-Charge.

2. Description

- **Type:** Heavy-duty flange type, **double compression** cable gland
 - **Material:** Brass (body and flange), corrosion-resistant
 - **Sealing:** Rubber ring for proper insulation, mechanical grip, and water/dust resistance
 - **Application:** For terminating large-size PVC insulated, armoured power cables
 - **Cable Size Compatibility:** 3½ cores, 70 sq.mm
-

3. Material & Construction

- **Body:** Brass with high mechanical strength and corrosion resistance
 - **Seal:** Rubber ring to provide electrical insulation and water-tightness
 - **Double Compression:** Ensures both armour and insulation of cable are securely clamped
 - **Accessories:** Includes outgoing conductor tails, insulating tape, and necessary fasteners for termination
-

4. Electrical & Mechanical Specifications

- **Voltage Rating:** Suitable for 1.1 kV PVC armoured cables
 - **Ingress Protection:** IP54 or better (dust and water resistant)
 - **Temperature Rating:** As per cable manufacturer specification
 - **Mechanical Strength:** Heavy-duty design for industrial/commercial large cable termination
-

5. Installation & Laying

- Gland to be installed at cable entry points of panel, switchgear, or enclosure
 - Armour clamped securely in the double compression gland
 - Outgoing conductor tails insulated with approved insulating tape
 - Follow recommended torque values for bolts/nuts
 - Ensure no damage to cable insulation during installation
-

6. Standards & Codes

- **Material & Dimensions:** IS 6291 / IEC 62444 (Brass cable glands)
- **Installation:** Indian Electricity Rules (IER) and manufacturer instructions

- **Marking:** Manufacturer name, cable size, type, and IP rating
-

7. Accessories Included

- Rubber sealing ring
 - Outgoing tails
 - Insulating tape
 - Fasteners / nuts / bolts for gland fixing
-

8. Category

Category III – Includes supply, fixing, sealing, tailing, and testing of heavy-duty brass double compression cable gland for PVC armoured cables.

(69)

TECHNICAL SPECIFICATION – HEAVY DUTY FLANGE TYPE DOUBLE COMPRESSION BRASS CABLE GLAND (3½C × 35/50 SQ.MM) – CAT III

1. Scope of Work

Supply, fixing, and termination of **heavy-duty flange type double compression brass cable glands** with rubber sealing rings for PVC insulated armoured cables, including outgoing tails, insulating tape, and all necessary accessories as directed by the Engineer-in-Charge.

2. Description

- **Type:** Heavy-duty flange type, **double compression** cable gland
 - **Material:** Brass (body and flange), corrosion-resistant
 - **Sealing:** Rubber ring for proper insulation, mechanical grip, and water/dust resistance
 - **Application:** For terminating medium to large-size PVC insulated, armoured power cables
 - **Cable Size Compatibility:** 3½ cores, 35/50 sq.mm
-

3. Material & Construction

- **Body:** Brass with high mechanical strength and corrosion resistance
 - **Seal:** Rubber ring to provide electrical insulation and water-tightness
 - **Double Compression:** Ensures both armour and insulation of cable are securely clamped
 - **Accessories:** Includes outgoing conductor tails, insulating tape, and necessary fasteners for termination
-

4. Electrical & Mechanical Specifications

- **Voltage Rating:** Suitable for 1.1 kV PVC armoured cables
 - **Ingress Protection:** IP54 or better (dust and water resistant)
 - **Temperature Rating:** As per cable manufacturer specification
 - **Mechanical Strength:** Heavy-duty design for industrial/commercial medium-to-large cable termination
-

5. Installation & Laying

- Gland to be installed at cable entry points of panel, switchgear, or enclosure
 - Armour clamped securely in the double compression gland
 - Outgoing conductor tails insulated with approved insulating tape
 - Follow recommended torque values for bolts/nuts
 - Ensure no damage to cable insulation during installation
-

6. Standards & Codes

- **Material & Dimensions:** IS 6291 / IEC 62444 (Brass cable glands)
 - **Installation:** Indian Electricity Rules (IER) and manufacturer instructions
 - **Marking:** Manufacturer name, cable size, type, and IP rating
-

7. Accessories Included

- Rubber sealing ring
 - Outgoing tails
 - Insulating tape
 - Fasteners / nuts / bolts for gland fixing
-

8. Category

Category III – Includes supply, fixing, sealing, tailing, and testing of heavy-duty brass double compression cable gland for PVC armoured cables.

(70)

TECHNICAL SPECIFICATION – HEAVY DUTY FLANGE TYPE DOUBLE COMPRESSION BRASS CABLE GLAND (3½C × 35/50 SQ.MM) – CAT III

1. Scope of Work

Supply, fixing, and termination of **heavy-duty flange type double compression brass cable glands** with rubber sealing rings for PVC insulated armoured cables. This includes outgoing tails, insulating tape, and all necessary accessories as directed by the Engineer-in-Charge.

2. Description

- **Type:** Heavy-duty flange type, double compression cable gland
 - **Material:** Brass (body and flange), corrosion-resistant
 - **Sealing:** Rubber ring for proper insulation, mechanical grip, and dust/water resistance
 - **Application:** Termination of medium to large-size PVC insulated, armoured power cables
 - **Cable Size Compatibility:** 3½ cores, 35/50 sq.mm
-

3. Material & Construction

- **Body:** Brass with high mechanical strength and corrosion resistance
 - **Seal:** Rubber ring providing electrical insulation and water-tightness
 - **Double Compression:** Ensures secure clamping of both armour and insulation
 - **Accessories:** Outgoing conductor tails, insulating tape, and necessary fastening hardware
-

4. Electrical & Mechanical Specifications

- **Voltage Rating:** Suitable for 1.1 kV PVC armoured cables
 - **Ingress Protection:** IP54 or better (dust and water resistant)
 - **Temperature Rating:** As per cable manufacturer specifications
 - **Mechanical Strength:** Heavy-duty design for industrial/commercial medium-to-large cable termination
-

5. Installation & Laying

- Installed at cable entry points of panels, switchgear, or enclosures
 - Armour clamped securely in the double compression gland
 - Outgoing conductor tails insulated with approved insulating tape
 - Recommended torque values to be followed for bolts/nuts
 - Ensure no damage to cable insulation during installation
-

6. Standards & Codes

- **Material & Dimensions:** IS 6291 / IEC 62444 (Brass cable glands)
 - **Installation:** Indian Electricity Rules (IER) and manufacturer's instructions
 - **Marking:** Manufacturer name, cable size, gland type, and IP rating
-

7. Accessories Included

- Rubber sealing ring
 - Outgoing tails
 - Insulating tape
 - Fasteners (nuts, bolts) for gland fixing
-

8. Category

Category III – Includes supply, fixing, sealing, tailing, and testing of heavy-duty brass double compression cable glands for PVC armoured cables.

(71)

TECHNICAL SPECIFICATION – SOLDERLESS CRIMPING TYPE ALUMINIUM LUG (10 SQ.MM) – CAT III

1. Scope of Work

Supply and termination of **solderless crimping type aluminium lugs** suitable for 1.1 kV XLPE / PVC insulated armoured or unarmoured cables, including crimping with high-pressure tools and connection to switchgear terminals using brass/cadmium-plated nuts and bolts as approved by the Engineer-in-Charge.

2. Description

- **Type:** Solderless crimping aluminium lug
 - **Material:** High-conductivity aluminium, corrosion-resistant
 - **Cable Size Compatibility:** 10 sq.mm
 - **Termination:** Suitable for connection to switchgear terminals with brass/cadmium-plated nuts and bolts
-

3. Material & Construction

- **Body:** Aluminium, designed for even current distribution
 - **Crimping:** Solderless, evenly crimped using high-pressure crimping tool
 - **Connection Hardware:** Brass/cadmium-plated nuts and bolts for secure mounting
 - **Finish:** Smooth, free from burrs or sharp edges
-

4. Electrical & Mechanical Specifications

- **Voltage Rating:** 1.1 kV AC
- **Current Carrying Capacity:** As per IS 5561 / IS 1839 guidelines for 10 sq.mm conductor
- **Mechanical Strength:** Designed to withstand cable pull-out and terminal torque
- **Temperature Rating:** Compatible with conductor operating temperature

5. Installation & Laying

- Crimp aluminium lug to cable using high-pressure crimping tool
 - Connect lug to switchgear terminal using approved brass/cadmium-plated nuts and bolts
 - Ensure proper torque tightening and electrical continuity
 - Check for secure mechanical and electrical connection
-

6. Standards & Codes

- **Lug:** IS 5561 / IS 1839 (Solderless aluminium terminals)
 - **Fasteners:** IS 1363 / IS 3094 (Brass / cadmium-plated)
 - **Installation:** As per Indian Electricity Rules (IER) and manufacturer instructions
-

7. Accessories Included

- Brass / cadmium-plated nuts and bolts
 - Crimping sleeves if required
 - Insulation protection or heat shrink (if applicable)
-

8. Category

Category III – Includes supply, crimping, connection, and testing of solderless aluminium lugs for 10 sq.mm cables.

(72)

TECHNICAL SPECIFICATION – SOLDERLESS CRIMPING TYPE ALUMINIUM LUG (35/50 SQ.MM) – CAT III

1. Scope of Work

Supply, crimping, and termination of **solderless aluminium lugs** suitable for XLPE / PVC insulated armoured or unarmoured cables. Lugs to be evenly crimped using a **high-pressure crimping tool** and securely connected to switchgear terminals using **brass/cadmium-plated nuts and bolts**, as per Engineer-in-Charge approval.

2. Description

- **Type:** Solderless crimping aluminium lug
- **Material:** High-conductivity aluminium, corrosion-resistant
- **Cable Size Compatibility:** 35 sq.mm and 50 sq.mm (depending on conductor)
- **Termination:** For secure connection to switchgear terminals using brass/cadmium-plated fasteners

3. Material & Construction

- **Body:** Aluminium, smooth, durable, and designed for uniform current flow
 - **Crimping:** Solderless, evenly crimped with high-pressure tool
 - **Fasteners:** Brass / cadmium-plated nuts and bolts for mechanical and electrical connection
 - **Finish:** Free from burrs or sharp edges, corrosion-resistant
-

4. Electrical & Mechanical Specifications

- **Voltage Rating:** 1.1 kV AC
 - **Current Carrying Capacity:** As per IS 5561 / IS 1839 guidelines for 35/50 sq.mm conductor
 - **Mechanical Strength:** Resistant to pull-out forces and rated terminal torque
 - **Temperature Rating:** Suitable for conductor operating temperatures
-

5. Installation & Laying

- Crimp aluminium lug to cable with a **high-pressure crimping tool**
 - Connect lug to switchgear terminal using **approved brass/cadmium-plated nuts and bolts**
 - Apply correct torque for secure mechanical and electrical contact
 - Ensure continuity and verify insulation integrity
-

6. Standards & Codes

- **Lug:** IS 5561 / IS 1839 (Solderless aluminium terminals)
 - **Fasteners:** IS 1363 / IS 3094 (Brass / cadmium-plated)
 - **Installation:** Indian Electricity Rules (IER) and manufacturer's recommendations
-

7. Accessories Included

- Brass / cadmium-plated nuts and bolts
 - Optional: Crimping sleeves or heat-shrink protection if required
-

8. Category

Category III – Includes supply, crimping, connection, and testing of solderless aluminium lugs for 35/50 sq.mm cables.

TECHNICAL SPECIFICATION – SOLDERLESS CRIMPING TYPE ALUMINIUM LUG (35/50 SQ.MM) – CAT III

1. Scope of Work

Supply, crimping, and termination of **solderless aluminium lugs** suitable for XLPE / PVC insulated armoured or unarmoured cables. Lugs to be evenly crimped using a **high-pressure crimping tool** and securely connected to switchgear terminals using **brass/cadmium-plated nuts and bolts**, as per Engineer-in-Charge approval.

2. Description

- **Type:** Solderless crimping aluminium lug
 - **Material:** High-conductivity aluminium, corrosion-resistant
 - **Cable Size Compatibility:** 35 sq.mm and 50 sq.mm (depending on conductor)
 - **Termination:** For secure connection to switchgear terminals using **brass/cadmium-plated fasteners**
-

3. Material & Construction

- **Body:** Aluminium, smooth, durable, and designed for uniform current flow
 - **Crimping:** Solderless, evenly crimped with a high-pressure tool
 - **Fasteners:** Brass / cadmium-plated nuts and bolts for mechanical and electrical connection
 - **Finish:** Free from burrs or sharp edges, corrosion-resistant
-

4. Electrical & Mechanical Specifications

- **Voltage Rating:** 1.1 kV AC
 - **Current Carrying Capacity:** As per IS 5561 / IS 1839 guidelines for 35/50 sq.mm conductor
 - **Mechanical Strength:** Resistant to pull-out forces and rated terminal torque
 - **Temperature Rating:** Suitable for conductor operating temperatures
-

5. Installation & Laying

- Crimp aluminium lug to cable using a **high-pressure crimping tool**
 - Connect lug to switchgear terminal using **approved brass/cadmium-plated nuts and bolts**
 - Apply correct torque for secure mechanical and electrical contact
 - Ensure continuity and verify insulation integrity
-

6. Standards & Codes

- **Lug:** IS 5561 / IS 1839 (Solderless aluminium terminals)
- **Fasteners:** IS 1363 / IS 3094 (Brass / cadmium-plated)

- **Installation:** Indian Electricity Rules (IER) and manufacturer's recommendations
-

7. Accessories Included

- Brass / cadmium-plated nuts and bolts
 - Optional: Crimping sleeves or heat-shrink protection if required
-

8. Category

Category III – Includes supply, crimping, connection, and testing of solderless aluminium lugs for 35/50 sq.mm cables.

(74)

TECHNICAL SPECIFICATION – 1.5 SQ.MM, 1.5 KV GRADE PVC INSULATED COPPER CONDUCTOR – CAT III

1. Scope of Work

Supply, laying, and erection of **ISI marked, 1.5 kV grade, multi-stranded, annealed copper conductor wires** with heat-resistant PVC insulation, suitable for control panels, relays, power switchgears, motor starters, and control wiring. The work includes all terminations using **copper lugs, nuts, and bolts** as required, and installation in **existing conduits/pipes** as directed by the Engineer-in-Charge.

2. Description

- **Type:** Single core, multi-stranded copper conductor wire
 - **Conductor Material:** Electrolytic annealed copper, ISI marked
 - **Insulation:** Heat-resistant PVC, suitable for 1.5 kV grade
 - **Wire Size:** 1.5 sq.mm
 - **Application:** Control panels, relays, power switchgears, motor starters, control circuits
 - **Installation Location:** Inside existing PVC/rigid conduits, cable trays, or pipes
-

3. Material & Construction

- **Conductor:** Multi-stranded copper for flexibility and durability, conforming to **IS 694 / IEC 227**
 - **Insulation:** Heat-resistant PVC, rated for 1.5 kV, with colour coding as per standard
 - **Flexibility:** Multi-strand design allows easy bending for panel wiring and conduit installations
 - **Termination Accessories:** Copper lugs, brass/cadmium-plated nuts and bolts for secure electrical connections
-

4. Electrical & Mechanical Specifications

- **Voltage Rating:** 1.5 kV AC

- **Current Carrying Capacity:** As per IS 694 guidelines for 1.5 sq.mm conductor
 - **Temperature Rating:** PVC insulation suitable for normal operating temperatures of control wiring
 - **Mechanical Strength:** Resistant to abrasion, bending, and mechanical stress during installation
 - **Fire & Safety:** FRLS / Heat-resistant PVC insulation reduces flame propagation and smoke emission
-

5. Installation & Laying

- Pull cable through existing conduit, pipe, or tray as per site conditions
 - Use approved copper lugs for termination at panels, relays, switchgear, or control devices
 - Secure connections with brass/cadmium-plated nuts and bolts
 - Verify insulation continuity and ensure proper torque application at terminals
 - Follow standard bending radius recommendations to avoid conductor damage
-

6. Standards & Codes

- **Conductor:** IS 694 / IEC 227
 - **Termination:** IS 5561 (copper lugs), IS 1363 / IS 3094 (nuts/bolts)
 - **Installation:** Indian Electricity Rules (IER)
 - **Marking:** Manufacturer name, wire size, voltage grade, ISI mark, year of manufacture
-

7. Accessories Included

- Copper lugs for termination
 - Nuts and bolts for secure connections
 - Insulating tape for finishing
 - Cable markers if required
-

8. Category

Category III – Includes supply, laying, termination, clamping, and testing of 1.5 sq.mm, 1.5 kV grade copper conductor wiring for control and power circuits.

(75)

TECHNICAL SPECIFICATION – 2.5 SQ.MM, 1.5 KV GRADE PVC INSULATED COPPER CONDUCTOR – CAT III

1. Scope of Work

Supply, laying, and erection of **ISI marked, 1.5 kV grade, multi-stranded, annealed copper conductor wires** with heat-resistant PVC insulation, suitable for control panels, relays, power switchgears, motor

starters, and control wiring. The work includes all terminations using **copper lugs, nuts, and bolts** as required, and installation in **existing conduits/pipes** as directed by the Engineer-in-Charge.

2. Description

- **Type:** Single core, multi-stranded copper conductor wire
 - **Conductor Material:** Electrolytic annealed copper, ISI marked
 - **Insulation:** Heat-resistant PVC, suitable for 1.5 kV grade
 - **Wire Size:** 2.5 sq.mm
 - **Application:** Control panels, relays, power switchgears, motor starters, control circuits
 - **Installation Location:** Inside existing PVC/rigid conduits, cable trays, or pipes
-

3. Material & Construction

- **Conductor:** Multi-stranded copper for flexibility and durability, conforming to **IS 694 / IEC 227**
 - **Insulation:** Heat-resistant PVC, rated for 1.5 kV, with colour coding as per standard
 - **Flexibility:** Multi-strand design allows easy bending for panel wiring and conduit installations
 - **Termination Accessories:** Copper lugs, brass/cadmium-plated nuts and bolts for secure electrical connections
-

4. Electrical & Mechanical Specifications

- **Voltage Rating:** 1.5 kV AC
 - **Current Carrying Capacity:** As per IS 694 guidelines for 2.5 sq.mm conductor
 - **Temperature Rating:** PVC insulation suitable for normal operating temperatures of control wiring
 - **Mechanical Strength:** Resistant to abrasion, bending, and mechanical stress during installation
 - **Fire & Safety:** FRLS / Heat-resistant PVC insulation reduces flame propagation and smoke emission
-

5. Installation & Laying

- Pull cable through existing conduit, pipe, or tray as per site conditions
 - Use approved copper lugs for termination at panels, relays, switchgear, or control devices
 - Secure connections with brass/cadmium-plated nuts and bolts
 - Verify insulation continuity and ensure proper torque application at terminals
 - Follow standard bending radius recommendations to avoid conductor damage
-

6. Standards & Codes

- **Conductor:** IS 694 / IEC 227

- **Termination:** IS 5561 (copper lugs), IS 1363 / IS 3094 (nuts/bolts)
 - **Installation:** Indian Electricity Rules (IER)
 - **Marking:** Manufacturer name, wire size, voltage grade, ISI mark, year of manufacture
-

7. Accessories Included

- Copper lugs for termination
 - Nuts and bolts for secure connections
 - Insulating tape for finishing
 - Cable markers if required
-

8. Category

Category III – Includes supply, laying, termination, clamping, and testing of 2.5 sq.mm, 1.5 kV grade copper conductor wiring for control and power circuits.

(76)

TECHNICAL SPECIFICATION – 2.5 SQ.MM, 1.5 KV GRADE PVC INSULATED COPPER CONDUCTOR – CAT III

1. Scope of Work

Supply, laying, and erection of **ISI marked, 1.5 kV grade, multi-stranded annealed copper conductor wires** with heat-resistant PVC insulation. The cables are suitable for control panels, relays, power switchgears, motor starters, and other control wiring. The work includes all terminations using **copper lugs, nuts, and bolts**, as required, and installation in **existing conduits/pipes**, as directed by the Engineer-in-Charge.

2. Description

- **Type:** Single core, multi-stranded copper conductor
 - **Conductor Material:** Electrolytic annealed copper, ISI marked
 - **Insulation:** Heat-resistant PVC, rated for 1.5 kV
 - **Wire Size:** 2.5 sq.mm
 - **Application:** Control panels, relays, motor starters, switchgears, and control circuits
 - **Installation Location:** Existing PVC/rigid conduits, cable trays, or pipes
-

3. Material & Construction

- **Conductor:** Multi-stranded copper for flexibility and durability; conforms to IS 694 / IEC 227
- **Insulation:** Heat-resistant PVC, colour-coded as per standard
- **Flexibility:** Multi-strand design allows easy bending and conduit installations

- **Termination Accessories:** Copper lugs with brass/cadmium-plated nuts and bolts for secure electrical connections
-

4. Electrical & Mechanical Specifications

- **Voltage Rating:** 1.5 kV AC
 - **Current Carrying Capacity:** As per IS 694 guidelines for 2.5 sq.mm conductor
 - **Temperature Rating:** Suitable for normal operating conditions of control wiring
 - **Mechanical Strength:** Resistant to abrasion, bending, and mechanical stress
 - **Fire & Safety:** FRLS / heat-resistant PVC insulation reduces flame propagation and smoke emission
-

5. Installation & Laying

- Pull cable through existing conduit, pipe, or tray as per site conditions
 - Terminate with approved copper lugs at panels, relays, switchgear, or control devices
 - Secure connections using brass/cadmium-plated nuts and bolts
 - Verify insulation continuity and ensure proper torque application at terminals
 - Follow standard bending radius to avoid conductor damage
-

6. Standards & Codes

- **Conductor:** IS 694 / IEC 227
 - **Termination:** IS 5561 (copper lugs), IS 1363 / IS 3094 (nuts/bolts)
 - **Installation:** Indian Electricity Rules (IER)
 - **Marking:** Manufacturer name, wire size, voltage grade, ISI mark, year of manufacture
-

7. Accessories Included

- Copper lugs for termination
 - Brass/cadmium-plated nuts and bolts for secure connections
 - Insulating tape for finishing
 - Cable markers, if required
-

8. Category

Category III – Includes supply, laying, termination, clamping, and testing of 2.5 sq.mm, 1.5 kV grade copper conductor wiring for control and power circuits.

TECHNICAL SPECIFICATION – 10 SQ.MM, 1.5 KV GRADE PVC INSULATED COPPER CONDUCTOR – CAT III

1. Scope of Work

Supply, laying, and erection of **ISI marked, 1.5 kV grade, multi-stranded annealed copper conductor wires** with heat-resistant PVC insulation, suitable for control panels, relays, power switchgears, motor starters, and control wiring. The work includes all terminations using **copper lugs, nuts, and bolts** as required, and installation in **existing conduits/pipes**, as directed by the Engineer-in-Charge.

2. Description

- **Type:** Single core, multi-stranded copper conductor
 - **Conductor Material:** Electrolytic annealed copper, ISI marked
 - **Insulation:** Heat-resistant PVC, rated for 1.5 kV
 - **Wire Size:** 10 sq.mm
 - **Application:** Control panels, relays, motor starters, switchgears, and control circuits
 - **Installation Location:** Existing PVC/rigid conduits, cable trays, or pipes
-

3. Material & Construction

- **Conductor:** Multi-stranded copper for flexibility and durability; conforms to IS 694 / IEC 227
 - **Insulation:** Heat-resistant PVC, colour-coded as per standard
 - **Flexibility:** Multi-strand design allows easy bending and conduit installations
 - **Termination Accessories:** Copper lugs with brass/cadmium-plated nuts and bolts for secure electrical connections
-

4. Electrical & Mechanical Specifications

- **Voltage Rating:** 1.5 kV AC
 - **Current Carrying Capacity:** As per IS 694 guidelines for 10 sq.mm conductor
 - **Temperature Rating:** Suitable for normal operating conditions of control wiring
 - **Mechanical Strength:** Resistant to abrasion, bending, and mechanical stress
 - **Fire & Safety:** FRLS / heat-resistant PVC insulation reduces flame propagation and smoke emission
-

5. Installation & Laying

- Pull cable through existing conduit, pipe, or tray as per site conditions
- Terminate with approved copper lugs at panels, relays, switchgear, or control devices
- Secure connections using brass/cadmium-plated nuts and bolts
- Verify insulation continuity and ensure proper torque application at terminals

- Follow standard bending radius to avoid conductor damage
-

6. Standards & Codes

- **Conductor:** IS 694 / IEC 227
 - **Termination:** IS 5561 (copper lugs), IS 1363 / IS 3094 (nuts/bolts)
 - **Installation:** Indian Electricity Rules (IER)
 - **Marking:** Manufacturer name, wire size, voltage grade, ISI mark, year of manufacture
-

7. Accessories Included

- Copper lugs for termination
 - Brass/cadmium-plated nuts and bolts for secure connections
 - Insulating tape for finishing
 - Cable markers, if required
-

8. Category

Category III – Includes supply, laying, termination, clamping, and testing of 10 sq.mm, 1.5 kV grade copper conductor wiring for control and power circuits.

(78)

TECHNICAL SPECIFICATION – TRENCH EXCAVATION FOR CABLE LAYING – CAT III

1. Scope of Work

Supply of labor, excavation of trench in soft soil, laying of cables or locating faults along the run, backfilling, and restoring the surface to original condition as per Engineer-in-Charge directions.

2. Description

- **Purpose:** Cable laying or fault location in existing electrical distribution network.
- **Location:** Outdoor / ground level, in soft soil.
- **Trench Width & Depth:** Suitable width to accommodate cables and associated conduits; typical depth: 90 cm (or as per cable manufacturer/site requirement).

3. Material & Construction

- Soil type: Soft soil (loose to medium compacted earth)
- Bedding: If required, provide sand bedding for cable protection.
- Supports: Maintain side walls vertical/stable to avoid collapse during excavation.

4. Structural & Mechanical Specifications

- Trench alignment: As per cable route layout approved by Engineer-in-Charge.

- **Safety:** Ensure trench edges are marked, and excavation is carried out with proper shoring if necessary.

5. Backfilling & Restoration

- Backfill with excavated soil in layers, compacted adequately to avoid future settlement.
- Restore surface to original level and finish (natural ground, turf, or paved surface as per site).

6. Standards & Codes

- Follow Indian Electricity Rules (IER) and relevant civil excavation safety standards.
- Minimum cover: Maintain depth of 90 cm or as required by cable specifications.

7. Accessories / Requirements

- Sand bedding (if required for cable protection)
- Warning tape over cables before final backfilling
- Temporary safety barriers during excavation

8. Installation / Execution

- Excavate trench along planned route with required width and depth.
- Lay cable(s) or locate faults as directed.
- Backfill in layers with proper compaction.
- Restore surface to normal ground level.
- Verify alignment, depth, and compaction by Engineer-in-Charge.

9. Category

Category III – Includes excavation, cable laying / fault location, backfilling, and restoration of surface.

(79)

TECHNICAL SPECIFICATION – DWC (DOUBLE WALLED CORRUGATED) PE PIPE FOR CABLE LAYING – CAT III

1. Scope of Work

Supply, laying, and connection of approved double-walled corrugated (DWC) polyethylene (PE) pipes with all necessary accessories in existing trench at specified depth for enclosing electrical cables, including handling, jointing, and alignment as directed by Engineer-in-Charge.

2. Description

- **Type:** Double-walled corrugated (DWC) polyethylene (PE) pipe
- **Material Standard:** IS 14930 Part II
- **Application:** Enclosure and protection of electrical cables below ground or under road surfaces
- **Pipe Size:** 50 mm outer diameter
- **Trench:** Existing trench excavated as per cable requirements

3. Material & Construction

- **Pipe Material:** High-density polyethylene (HDPE), double-walled corrugated for mechanical strength and flexibility
- **Inner Wall:** Smooth to allow easy cable pulling
- **Outer Wall:** Corrugated for strength and resistance to soil pressure
- **Accessories:** Connectors, couplers, elbows, end caps of same material for secure joining
- **Colour:** Standard (usually black or as approved by Engineer-in-Charge)

4. Mechanical & Structural Specifications

- **Load Resistance:** Suitable to withstand soil load and vehicular passage (if under road)
- **Bending Radius:** Minimum radius as per manufacturer recommendation
- **Joining:** Solvent welded / push-fit couplers as per approved method
- **Alignment:** Continuous run without kinks or sharp bends
- **Depth of Laying:** As per site and cable protection requirements

5. Installation & Laying

- Place DWC pipe in existing trench at correct alignment and slope
- Join sections using approved couplers / accessories
- Ensure proper positioning to avoid cable stress during pulling
- Backfill with soft soil or sand as per site specification, avoiding sharp stones
- Verify continuity and alignment before cable installation

6. Standards & Codes

- Pipe: IS 14930 Part II
- Installation: Indian Electricity Rules (IER) and manufacturer instructions
- Safety: Maintain minimum cover and follow civil safety codes for trenching

7. Accessories Included

- Couplers / joints / elbows / end caps
- Sand bedding or warning tape if required by Engineer-in-Charge
- Pipe supports (if needed in long horizontal runs)

8. Category

Category III – Includes supply, laying, jointing, alignment, backfilling, and preparation for cable installation of 50 mm DWC PE pipe.

(80)

TECHNICAL SPECIFICATION – DWC (DOUBLE WALLED CORRUGATED) PE PIPE FOR CABLE LAYING (90 MM OD) – CAT III

1. Scope of Work

Supply, laying, and connection of approved double-walled corrugated (DWC) polyethylene (PE) pipes with

all necessary accessories in existing trench at specified depth for enclosing electrical cables, including handling, jointing, and alignment as directed by Engineer-in-Charge.

2. Description

- **Type:** Double-walled corrugated (DWC) polyethylene (PE) pipe
- **Material Standard:** IS 14930 Part II
- **Application:** Enclosure and protection of electrical cables below ground or under road surfaces
- **Pipe Size:** 90 mm outer diameter
- **Trench:** Existing trench excavated as per cable requirements

3. Material & Construction

- **Pipe Material:** High-density polyethylene (HDPE), double-walled corrugated for mechanical strength and flexibility
- **Inner Wall:** Smooth to allow easy cable pulling
- **Outer Wall:** Corrugated for strength and resistance to soil pressure
- **Accessories:** Connectors, couplers, elbows, end caps of same material for secure joining
- **Colour:** Standard (usually black or as approved by Engineer-in-Charge)

4. Mechanical & Structural Specifications

- **Load Resistance:** Suitable to withstand soil load and vehicular passage (if under road)
- **Bending Radius:** Minimum radius as per manufacturer recommendation
- **Joining:** Solvent welded / push-fit couplers as per approved method
- **Alignment:** Continuous run without kinks or sharp bends
- **Depth of Laying:** As per site and cable protection requirements

5. Installation & Laying

- Place DWC pipe in existing trench at correct alignment and slope
- Join sections using approved couplers / accessories
- Ensure proper positioning to avoid cable stress during pulling
- Backfill with soft soil or sand as per site specification, avoiding sharp stones
- Verify continuity and alignment before cable installation

6. Standards & Codes

- Pipe: IS 14930 Part II
- Installation: Indian Electricity Rules (IER) and manufacturer instructions
- Safety: Maintain minimum cover and follow civil safety codes for trenching

7. Accessories Included

- Couplers / joints / elbows / end caps
- Sand bedding or warning tape if required by Engineer-in-Charge

- Pipe supports (if needed in long horizontal runs)

8. Category

Category III – Includes supply, laying, jointing, alignment, backfilling, and preparation for cable installation of 90 mm DWC PE pipe.

(81)

Technical Specification and Scope of Work – 3 Core x 2.5 Sq. mm PVC Insulated Submersible Cable

The work includes **supplying and erecting ISI marked PVC insulated and PVC sheathed flat flexible submersible copper cable** of approved make, **3 Core x 2.5 Sq. mm**, suitable for submersible pump applications. The cable shall conform to **relevant IS standards**, ensuring high-quality copper conductors with **flexible multi-strand construction** to allow easy bending and installation in submersible pump connections. The PVC insulation shall provide excellent electrical insulation, mechanical strength, and resistance to heat, moisture, and chemical corrosion, while the outer PVC sheath shall offer protection against abrasion, water ingress, and other environmental stresses encountered in submersible applications.

The scope of work includes: **laying the cable from the power source to the submersible pump**, ensuring proper handling to prevent damage to insulation and conductors. The cable shall be connected to the pump starter or control panel using appropriate cable glands and terminations as per manufacturer recommendations. All joints and terminations shall be made following IS standards, with proper insulation and mechanical protection. The installation shall ensure that the cable is free from tension, kinking, or sharp bends, and is adequately supported along its entire length. The work also includes testing the continuity, insulation resistance, and functional performance of the cable after installation to ensure compliance with safety and operational requirements.

Applicable Standards: IS 694 / IS 1554 / IS 8130 for copper conductors, ISI marking, and IS: 398 (as applicable for flexible submersible cables).

(82)

Technical Specification and Scope of Work – Earth Pit with Pipe-in-Pipe Earthing Electrode

The work includes **supplying and erecting an earth pit** of minimum bore diameter **150 mm**, using **approved make earthing electrode with Pipe-in-Pipe technology**, conforming to **IS 3043:1987**. The electrode shall be constructed of **corrosion-free hot-dipped galvanized iron (G.I.) pipes**, with an **outer pipe diameter of 50 mm** having **galvanization thickness of 80–200 microns**, and an **inner pipe diameter of 25 mm** with **galvanization of 200–250 microns**. The connection terminal shall be of **12 mm diameter**, maintaining a **constant low ohmic value**, and the assembly shall be surrounded by a **highly conductive compound with superior charge dissipation properties**.

The earth pit shall include a **chamber with heavy-duty cover**, and the **back-filling compound** shall consist of:

- **Inner chemical (CCM Compound)** with **resistivity $0.2 \Omega \cdot m$** , tested as per **IEC 62561:2017**, voltage drop **<1 V at no load in dry form**, and sulphur content **<2%**.
- **Earthing backfill compound** capable of **retaining moisture over long periods**, ensuring consistent performance.

The earth pit shall be suitable for **sensitive electrical installations**, including **transformer neutrals, lightning arrester earthing, A.C. plants, and computer/automation systems (SCADA)**. It is also

applicable for **electrical installations up to 11 kV in normal soil conditions**. The standard **length of the pipe shall be 2.0 meters**, and the backfilling shall include **1 bag (25 kg) of compound** per pit.

The scope of work includes **excavation of the earth pit, installation of the electrode, proper connection to the system, filling with chemical compound, and testing**. The contractor shall ensure that the earth resistance is within the desired limit, submit all **manufacturer test certificates**, and verify **ohmic value, voltage drop, and moisture retention**. The installation shall comply with **all relevant standards and safety practices** to provide long-term, reliable earthing.

(83)

Technical Specification and Scope of Work – Earth Pit with Pipe-in-Pipe Earthing Electrode

The work includes **supplying and erecting an earth pit** of minimum bore diameter **150 mm** using an **approved make earthing electrode with Pipe-in-Pipe technology**, as per **IS 3043:1987**. The electrode shall be constructed of **corrosion-free hot-dipped G.I. pipes**, with an **outer pipe diameter of 50 mm** having **80–200 microns galvanization**, and an **inner pipe diameter of 25 mm** with **200–250 microns galvanization**. The **connection terminal** shall be of **12 mm diameter** ensuring a **constant low ohmic value**. The inner pipe shall be surrounded by a **highly conductive chemical compound** with **high charge dissipation**, and the entire assembly shall be housed in a **chamber with a heavy-duty cover**. **OEM test certificates** must be submitted for approval.

The **back-filling** shall include:

- **Inner chemical (CCM Compound):** Resistivity **0.2 $\Omega \cdot m$** , tested as per **IEC 62561-2017**, voltage drop **<1 V at no load in dry form**, and sulphur content **<2%**.
- **Backfill compound:** Earthing compound capable of **retaining moisture for extended periods**, ensuring reliable long-term earthing.

The earth pit shall be suitable for **electrical installations covering transformer neutrals, lightning arrester earthing, A.C. plants, and sensitive computer/automation systems (SCADA)**, i.e., for **independent earthing in normal soil conditions**. The pipe length shall be **3.0 meters**, and **2 bags (25 kg each) of backfilling compound** shall be used per pit.

The scope of work includes **excavation, installation of the electrode, proper connection to the system, backfilling with chemical compounds, and testing**. The contractor shall ensure that **earth resistance is within required limits**, and all **test reports and certificates** are submitted. Installation shall comply with **relevant IS standards and safety practices**, providing **reliable, long-term, low-resistance earthing** for all critical electrical and automation systems.

(84)

Providing and erecting of required size hot-dip galvanised (HDG) iron strip for earthing system shall be carried out in accordance with relevant standards such as **IS 3043 (Code of Practice for Earthing)** and applicable electrical safety regulations. The earthing strip shall be made of mild steel, hot-dip galvanised with a uniform zinc coating of minimum **80–100 microns** to ensure high corrosion resistance and long service life under outdoor and industrial conditions. The size of the strip shall be selected based on equipment rating and fault current capacity, typically not less than **25 mm × 3 mm** for general applications and higher sizes such as **50 mm × 6 mm** or as specified for HT equipment, transformers, ACB/OCB panels, and motors. The strip shall be straight, free from bends, cracks, or surface defects, and shall have smooth edges.

The installation shall include laying, fixing, and routing of the HDG strip from equipment body to the earth electrode/grid through the shortest and safest path. The strip shall be securely fixed on walls, ceilings, trenches, or cable trays using suitable heavy-duty galvanised clamps, saddles, spacers, and fasteners at regular intervals not exceeding 1 meter or as per site conditions. Proper spacing from building surfaces shall be maintained to avoid corrosion and facilitate inspection. Wherever the strip passes through walls or floors, suitable PVC sleeves or GI pipes shall be provided for mechanical protection. All bends shall be made with appropriate radius to avoid damage to galvanisation.

All joints in the earthing strip shall be made by bolting or welding as required. For welded joints, the overlap shall be minimum 50 mm and the joint shall be properly cleaned and coated with anti-corrosive paint and zinc-rich compound to restore galvanisation. For bolted connections, GI bolts, nuts, spring washers, and plain washers shall be used with at least two bolts per joint. The connection of earthing strip to equipment such as HT panels, LT panels, transformers, motors, ACB/OCB, etc., shall be done using suitable lugs, thimbles, and double earthing points wherever required. The contact surfaces shall be properly cleaned to ensure low resistance electrical continuity.

The earthing system shall ensure that the overall earth resistance is within permissible limits as per standards (generally less than 1 ohm for substations and as specified for the system). Necessary testing shall be carried out using approved earth resistance testers after installation and results shall be documented. The contractor shall also ensure proper identification of earthing strips using green colour coding or painting as per standard practice.

Scope of work shall include supply of HDG iron strips of required size, all necessary clamps, fasteners, hardware, jointing materials, protective sleeves, and accessories; complete installation, laying, fixing, jointing, and connection to equipment and earth electrodes; excavation and backfilling if required for underground routing; making good of civil works; testing and commissioning of the earthing system; and submission of test reports and as-built drawings. The work shall be executed in a neat, workmanlike manner ensuring safety, durability, and compliance with all applicable standards and specifications.

(85)

Providing and erecting hot-dip galvanised (HDG) iron strip wire of size ranging from 8 SWG to 16 SWG shall be carried out as per relevant standards such as IS 3043 (Code of Practice for Earthing) and good engineering practices. The wire shall be manufactured from high-quality mild steel and shall be uniformly hot-dip galvanised with a minimum zinc coating of 80 microns to ensure excellent مقاومت against corrosion, oxidation, and harsh environmental conditions. The selected wire gauge (8 SWG to 16 SWG) shall be based on the specific application, fault current requirements, and equipment rating, with thicker gauges (lower SWG number) used for higher current carrying capacity and critical earthing applications.

The installation work shall include laying, routing, and fixing of the HDG iron wire for earthing continuity of electrical systems such as LT panels, distribution boards, lighting poles, motors, small equipment, and auxiliary systems. The wire shall be run along the shortest practical path from equipment body to the earthing strip or earth electrode, ensuring minimum bends and avoiding sharp turns. It shall be securely fixed on walls, ceilings, cable trays, or structural members using suitable galvanised saddles, clips, or clamps at regular intervals not exceeding 600 mm to maintain proper alignment and mechanical strength.

All joints in the GI wire shall be made either by twisting, crimping, or using suitable connectors, followed by soldering or brazing where required to ensure proper electrical continuity. Each joint shall be mechanically strong and electrically sound, and shall be protected against corrosion by applying anti-corrosive compound or zinc-rich paint. Connections to equipment shall be made using appropriate lugs, thimbles, or eyelets, firmly bolted to designated earthing terminals after proper surface cleaning to ensure low resistance contact. Double earthing shall be provided wherever specified for safety and redundancy.

Wherever the wire passes through walls, floors, or exposed areas prone to damage, it shall be enclosed in suitable PVC conduit or GI pipe sleeves for mechanical protection. Proper identification of earthing wire shall be done by green colour insulation, painting, or tagging as per standard practice. Care shall be taken to maintain continuity throughout the system without any loose connections or breaks.

The complete earthing arrangement shall be tested after installation to verify continuity and earth resistance values using standard testing instruments. The measured values shall comply with permissible limits as per IS standards or project specifications.

Scope of work shall include supply of HDG GI wire (8 to 16 SWG), all necessary fixing accessories such as saddles, clamps, connectors, lugs, protective conduits, and hardware; complete laying, fixing, jointing, and connection to equipment and earthing system; providing mechanical protection where required; testing and commissioning; and submission of test reports. The work shall be executed in a safe, durable, and workmanlike manner ensuring reliable earthing performance and long service life.

(86)

Providing and erecting of open well horizontal monoblock pump set shall be carried out complete in all respects, conforming to relevant IS standards and good engineering practices. The pump set shall be of horizontal, centrifugal, close-coupled monoblock construction with a rigidly coupled motor and pump mounted on a common shaft. The casing shall be made of high-grade cast iron, robust in design to withstand continuous operation under varying load conditions. The impeller shall be of bronze or high-quality engineering material, dynamically balanced for smooth and vibration-free operation, and keyed to the shaft to prevent slippage.

The pump shall be driven by a 3 HP, 415V $\pm 10\%$, 50 Hz, three-phase squirrel cage induction motor, suitable for continuous duty (S1 rating). The motor shall be TEFC (Totally Enclosed Fan Cooled) type with IP55 protection, Class B or higher insulation, and capable of operating efficiently under site conditions. The shaft shall be made of stainless steel or EN series steel, supported on heavy-duty antifriction bearings with adequate lubrication for long service life. The pump performance shall comply with Category II requirements, delivering discharge in the range of 85 LPM to 270 LPM against a head range of 11 meters to 33 meters, suitable for connection with 50 mm to 65 mm diameter delivery pipe.

The pump set shall be suitable for installation in open well conditions and shall be capable of handling clear water with minor suspended particles. It shall have a self-priming or manually primed arrangement as required. The suction and delivery nozzles shall be flanged or threaded as per standard design, ensuring leak-proof connections. Mechanical seal or gland packing arrangement shall be provided to prevent leakage along the shaft.

Installation work shall include proper alignment, mounting on a suitable base frame or foundation, grouting, and fixing with foundation bolts. The suction pipe shall be provided with foot valve and strainer of appropriate size, and the delivery pipe shall be connected with necessary NRV (Non-Return Valve), sluice valve, and pressure gauge as required. Flexible couplings or anti-vibration pads shall be used wherever necessary to reduce vibration and noise.

Electrical connection shall include proper termination of motor with suitable size cable, cable glands, lugs, earthing, and connection to starter panel (DOL/Star-Delta as applicable). The earthing of motor body shall be done using GI strip or wire as per standard practice. Adequate protection such as overload relay, short circuit protection, and dry run protection (if specified) shall be ensured.

Testing and commissioning shall include checking insulation resistance, direction of rotation, vibration levels, discharge and head performance, and overall operational stability. The pump shall be tested under actual working conditions to ensure it meets specified discharge (85–270 LPM) and head (11–33 m) requirements.

Scope of work shall include supply of pump set, motor, base frame, all accessories such as foot valve, strainers, valves, gauges, foundation hardware, electrical connections, earthing materials; complete installation, alignment, testing, and commissioning; and submission of performance test reports. The entire work shall be executed in a safe, workmanlike manner ensuring reliable operation, efficiency, and long service life.

(87)

Supply, Installation, Testing and Commissioning (S.I.T.C.) of submersible pump set shall be carried out complete in all respects, conforming to relevant IS standards such as IS 8034 (submersible pump sets) and IS 9283 (motors), and as per good engineering practices. The pump set shall be suitable for installation in bore wells of 100 mm diameter or larger and shall be of multistage centrifugal type, directly coupled with a submersible motor.

The pump shall be of 16-stage construction, designed to deliver discharge in the range of 140 to 180 litres per minute at a head varying from 96 meters to 69 meters respectively, complying with Category III performance requirements. The pump housing, stage bowls, and impellers shall be made of high-grade corrosion-resistant materials such as stainless steel or engineering thermoplastic, ensuring durability and efficient hydraulic performance. The shaft shall be of stainless steel, properly aligned and supported on water-lubricated bearings.

The motor shall be a 3-phase, 415V $\pm 10\%$, 50 Hz, squirrel cage induction type, with power rating not exceeding 5 HP. It shall be water-filled or oil-filled type, rewindable, designed for continuous duty (S1), with Class B or higher insulation and suitable for submerged operation. The motor shall be hermetically sealed and provided with a thrust bearing to withstand axial loads from the pump stages. A built-in non-return valve (NRV) shall be provided at the pump outlet to prevent backflow.

The pump set shall be suitable for connection to 50 mm diameter delivery pipe (GI/HDPE as specified). The installation shall include lowering of the pump set into the bore well (lifting and lowering shall be measured and paid separately as specified), along with column pipe, cable, and safety arrangements. The pump shall be suspended using suitable clamps and supported properly to avoid stress on the cable.

The submersible flat cable shall be of adequate size (as per motor rating and depth), PVC insulated and sheathed, suitable for submersible application, and properly jointed using heat shrink or epoxy resin cable jointing kits to ensure waterproof and reliable connections. The cable shall be clamped with column pipes at regular intervals.

Electrical installation shall include connection to suitable starter panel (DOL or Star-Delta depending on design), with necessary protections such as overload relay, single phasing preventer, dry run protection, and short circuit protection. Proper earthing shall be provided using GI wire/strip as per IS standards.

Testing and commissioning shall include insulation resistance test, continuity check, verification of phase sequence and rotation, and performance testing to confirm discharge (140–180 LPM) and head (96–69 m). The pump shall be run under actual operating conditions and all parameters such as current, voltage, and flow rate shall be recorded.

Scope of work shall include supply of submersible pump set, motor, column pipes (if included), submersible cable, NRV, clamps, jointing materials, accessories; complete installation including lowering (if in scope), cable jointing, electrical connections, earthing; testing and commissioning; and submission of test certificates and performance reports. Lifting and lowering of pump set shall be measured and paid separately as per BOQ conditions. The entire work shall be executed ensuring safe operation, high efficiency, and long service life.

(88)

Providing and erecting of approved make 3-phase motor control cubicle panel (Star–Delta starter) suitable for motors up to 7.5 HP shall be carried out in accordance with relevant IS standards such as IS 8623 / IEC 61439 for LT panels and IS 60947 for switchgear components. The panel shall be fabricated from 16 gauge CRCA (Cold Rolled Close Annealed) steel sheet, with proper cutting, bending, welding, and reinforcement to ensure rigidity and durability. The enclosure shall be dust and vermin proof, treated with a seven-tank anti-corrosive process, and finished with epoxy powder coating (minimum 60–80 microns thickness) both inside and outside for long-term corrosion protection. The panel shall be provided with hinged doors, neoprene gaskets, and lockable arrangements for safe operation.

The panel shall be floor/wall mounted on a suitably designed angle iron frame, which shall be properly grouted or anchored to the wall/floor as directed at site. Adequate space shall be provided for cable entry (top/bottom), gland plates, and ventilation louvers where required. The internal wiring shall be neatly dressed using PVC channels, properly ferruled, and terminated with crimped lugs.

The panel shall be complete with the following components of approved makes such as L&T, Siemens, or Cutler Hammer (Eatons):

- **Main Incomer:** TP isolator switch of suitable rating with AC-23 duty, complete with HRC fuse units for short circuit protection.
- **Star–Delta Starter Assembly:**
 - Three contactors (Main, Star, Delta) with mechanical and electrical interlocking
 - Thermal or electronic Star–Delta timer for automatic changeover
- **Protection System:**
 - Thermal overload relay (adjustable type) for motor protection
 - Single Phasing Preventer cum Water Level Guard (SPP + WLG) unit to protect against dry run and phase failure
 - Toggle switch for bypassing SPP + WLG when required
- **Control & Indication:**
 - Start and Stop push buttons (industrial heavy duty)
 - Indicating lamps for R, Y, B phases (LED type)
 - Ammeter with selector switch (to read all phases)
 - Voltmeter with selector switch (to monitor line voltages)
 - Automatic water level controller for tank/borewell operation

All incoming and outgoing terminals shall be provided with suitable copper busbars of adequate rating, properly insulated and supported. All wiring shall be done with FRLS copper conductors with proper color coding. Earthing terminals shall be provided inside and outside the panel for effective grounding.

Installation shall include erection of panel on angle iron frame, proper alignment, grouting, and tightening. Cable termination shall be done using double compression glands, crimped lugs, and proper identification ferrules. The panel body shall be effectively earthed using GI strip or wire as per IS 3043.

Testing and commissioning shall include insulation resistance test, continuity check, functional testing of Star–Delta operation, timer setting, overload relay calibration, verification of phase sequence, and operation of all protective devices including SPP and WLG. The panel shall be tested under actual load conditions to ensure smooth starting and running of the motor.

Scope of work shall include supply of complete cubicle panel with all internal components, angle iron frame, mounting hardware, wiring, termination accessories, earthing arrangement, erection, testing, and commissioning. The work shall also include submission of wiring diagrams, GA drawings, and test certificates. The entire system shall be handed over in complete working condition ensuring safety, reliability, and compliance with specifications.

(89)

Providing and erecting of approved make Automatic Liquid Level Controller (ALLC) rated for 6 Amps shall be carried out as per site requirements and instructions of the Engineer-in-Charge, conforming to relevant IS standards and good engineering practices. The controller shall be suitable for automatic operation of water pumps based on upper and lower tank levels, ensuring prevention of dry run and overflow conditions. The unit shall be compact, wall-mountable type, housed in a robust, fire-retardant, and shock-proof enclosure with proper terminal connections and clear indication for power, pump ON/OFF, and tank status.

The system shall operate using conductive probes or float sensors installed in the sump (lower tank) and overhead tank (upper tank). The controller shall automatically start the pump when the water level in the overhead tank falls below the preset low level and stop the pump when the tank reaches full level. It shall also incorporate dry run protection by sensing the water level in the lower tank to prevent pump operation when water is insufficient.

The installation shall include wiring connections from the pump to both upper and lower tanks using copper conductor wires of minimum 1.5 sq. mm cross-section. The wires shall be of FR/FRLS grade, with proper color coding, and shall be drawn through ISI-marked rigid PVC conduit pipes of suitable diameter. The conduit shall be properly fixed on walls/ceilings using saddles and clamps at regular intervals, ensuring neat routing and adequate mechanical protection. All bends shall be made using standard accessories without damaging the conduit.

The sensor wires shall be terminated properly at probe points using corrosion-resistant electrodes (typically stainless steel) or float switches, securely fixed at required levels inside the tanks. All joints and terminations shall be properly insulated using suitable connectors, lugs, and insulating sleeves to prevent moisture ingress and ensure long-term reliability.

The controller shall be integrated with the existing pump wiring system, ensuring compatibility with the starter panel (DOL/Star-Delta). Proper interlocking shall be provided so that the controller can safely start/stop the pump without affecting existing protections. Manual override provision may be included as per requirement.

Testing and commissioning shall include checking continuity of wiring, proper functioning of sensors, automatic start/stop operation, dry run protection, and overall system reliability. The system shall be demonstrated under actual working conditions to verify correct operation.

Scope of work shall include supply of 6A automatic liquid level controller, copper conductor wiring (minimum 1.5 sq. mm), ISI-marked rigid PVC conduits and accessories, sensors/probes, fixing hardware, and all required materials; complete installation, wiring, connection with existing system, testing, and commissioning. The work shall be executed in a neat, safe, and workmanlike manner ensuring efficient and trouble-free automatic water level control.

(90)

Providing, erecting, testing and commissioning of Diesel Generating (DG) set of **50 kVA continuous rating** shall be carried out in accordance with IS: 4722:1968 and BS: 5514 standards. The DG set shall be designed for 3-phase, 415 volts, 50 Hz AC supply and shall consist of a totally enclosed, air/water-cooled, multi-

cylinder diesel engine directly coupled to an alternator, both mounted on a common fabricated steel base frame with anti-vibration mountings.

The diesel engine shall be capable of developing **not less than 65.8 BHP at 1500 RPM**, with provision for **10% overload for one hour in every 24 hours**. The engine shall be equipped with standard accessories including flywheel, lubricating oil cooler, "A" class mechanical/electronic governor, heavy-duty fuel and lubricating oil filters, oil bath air filter, lubricating oil pressure gauge, exhaust manifold, and complete tool kit. The engine shall have **12/24V DC electric starting system** comprising heavy-duty batteries, dynamo/alternator, cut-outs, ammeter, starter motor, and all necessary wiring.

The exhaust system shall include a **residential type silencer** with required exhaust piping of adequate length, properly insulated using asbestos-free rope or equivalent modern insulation. Oil drip trays shall be provided to prevent spillage. A standard wall/floor-mounted fuel tank with level indicator, fuel piping, and necessary valves shall be included.

The alternator shall be **self-excited, self-regulated, screen-protected, drip-proof type**, suitable for continuous duty, delivering rated output at **415V, 3-phase, 0.8 power factor, 50 Hz, 4-wire system at 1500 RPM**. The voltage regulation shall be within **±5% from no load to full load**. The alternator shall be directly coupled to the engine through a flexible flange coupling.

The DG set shall be provided with a **floor/wall-mounted control panel** comprising voltmeter, ammeter, selector switches, ACB/MCCB/MCB of suitable rating, indicating lamps for phase indication, and HRC fuses for protection. The panel shall be fully wired and tested, and connected to the alternator using suitable capacity armoured cables with proper gland termination.

The complete DG set shall be enclosed in an **acoustic canopy** fabricated from **16 SWG CRCA sheet**, treated and powder coated for corrosion resistance. The canopy shall be internally lined with **resin-bonded rockwool of 64 kg/m³ density and 100 mm thickness conforming to IS: 8183**, or PU foam of minimum 40 density and 40 mm thickness. The insulation shall be covered with perforated sheets (3–4 mm holes) for protection. The canopy shall ensure **noise level not exceeding 75 dB(A) at 1 meter distance**, as per CPCB/PVCT norms.

Installation shall include proper placement on foundation, alignment, vibration isolation, exhaust routing, fuel system setup, and electrical connections. All cables shall be properly glanded, terminated, and earthed as per IS standards.

Testing and commissioning shall include checking insulation resistance, voltage regulation, load testing, fuel system operation, safety interlocks, and overall performance under load conditions. Initial filling of fuel, lubricating oil, and coolant shall be included.

Scope of work shall include supply of complete DG set with engine, alternator, control panel, acoustic enclosure, fuel system, exhaust system, batteries, cables, and all accessories; complete erection, wiring, testing, and commissioning; first fill of consumables; obtaining necessary approvals from Electrical Inspector; and providing **minimum 2-year guarantee/warranty** for the complete system. The DG set shall be handed over in fully operational condition ensuring reliability, safety, and compliance with all applicable standards.

(91)

Providing and erecting of approved make **Automatic Mains Failure (AMF) Control Panel** suitable for **50 / 62.5 kVA, 3-phase, 415V, 50 Hz diesel generating set** shall be carried out in accordance with relevant IS/IEC standards (IS 8623 / IEC 61439 for LT panels and IS 60947 for switchgear). The AMF panel shall be designed for automatic changeover between mains supply and DG set, ensuring uninterrupted power supply during mains failure and safe restoration when mains power resumes.

The panel shall be fabricated from **CRCA sheet steel (minimum 16 SWG)**, with rigid construction, dust and vermin proof design, and finished with epoxy powder coating (minimum 60–80 microns) after proper surface treatment. The enclosure shall be provided with hinged doors, locking arrangement, gasket sealing, and suitable cable entry provisions with gland plates. The panel shall be floor/wall mounted on a sturdy angle iron frame or base with proper earthing studs.

1) Power Module

The AMF panel shall be equipped with a **pair of electrically and mechanically interlocked contactors** (one for mains and one for DG supply) to prevent parallel operation. The contactors shall be of suitable AC-3 duty rating. An **overload relay** shall be provided for generator protection. Separate **neutral contactors** for mains and DG shall be included to ensure proper switching of neutral. Adequate **power terminals/socket arrangements** shall be provided for safe and reliable cable connections.

2) Control & Metering Module

The control section shall include:

- **Line voltage monitor** for sensing mains failure, phase sequence, and under/over voltage conditions
- **Generator voltage monitor** for output supervision
- **Ammeter** with selector switch for phase current indication
- **Voltmeter** (if applicable) with selector switch for voltage measurement
- **Frequency meter** for generator frequency monitoring
- **Engine hour meter** for recording DG running hours
- **Auto/Manual selector switch** for operational mode selection
- **Attempt start facility (minimum 3 attempts)** with automatic cranking sequence
- **Manual start push button**
- **Emergency stop push button** (mushroom type, latching)
- Suitable **ACB/MCCB/MCB** of required rating for incoming/outgoing feeders and protection

3) Protection Module

The panel shall incorporate automatic engine shutdown protections in case of:

- **Low lubricating oil pressure**
- **High engine/cylinder head temperature**
- **V-belt failure / alternator charging failure**

These protections shall be wired through engine sensors and relays to ensure immediate shutdown and alarm in abnormal conditions.

4) Indications & Alarm System

The panel shall be provided with LED indications and audible alarm for:

- **Load on generator**
- **Load on mains**
- **Engine fail to start**
- **Emergency stop activated**

- **Battery charging status**

All indication circuits shall be protected through HRC fuses or MCBs.

5) Battery Charger

An inbuilt **automatic battery charger** shall be provided for maintaining DG starting batteries in fully charged condition, with protections against overcharging and reverse polarity.

Installation & Wiring

The panel shall be completely wired using FRLS copper conductors with proper ferruling and identification. All terminations shall be done using crimped lugs and cable glands. The panel shall be connected to DG set and mains supply using suitable capacity **armoured cables**. Two distinct **earthing studs** shall be provided for body and neutral grounding, connected as per IS 3043.

Operation

In **Auto Mode**, the AMF panel shall automatically start the DG set upon mains failure, transfer load to DG after voltage stabilization, and retransfer load to mains once supply is restored, followed by DG shutdown after a preset cooling period. In **Manual Mode**, complete control shall be available to the operator.

Testing & Commissioning

Testing shall include insulation resistance test, functional checks of auto-start/stop sequence, interlocking verification, protection checks, alarm simulation, and load transfer operation. The system shall be commissioned under actual conditions to ensure reliable performance.

Scope of Work

The scope shall include **supply of complete AMF panel**, all switchgear components, meters, relays, battery charger, wiring, mounting structure, and accessories; complete erection, cable termination, earthing, testing, and commissioning. The work shall also include integration with DG set and mains supply, submission of drawings and test certificates, and handing over in fully operational condition ensuring safety, reliability, and compliance with specifications.

(92)

Providing, Installation, Testing and Commissioning (S.I.T.C.) of **Grid Tied Solar Power Plant of capacity 26–50 kW (3-phase)** shall be executed in accordance with MNRE guidelines, ALMM compliance, and relevant IS/IEC standards. The complete system shall include solar PV modules, grid-tied inverter, module mounting structure, balance of system (BoS), protection system, cabling, earthing, and all associated works required for safe and efficient operation.

The **solar PV modules** shall be ALMM approved, manufactured with anodized aluminum alloy frame having twin wall profile for enhanced strength and durability. The front cover shall be high transmission, low-iron tempered glass with anti-reflective (AR) coating to ensure maximum solar absorption. The modules shall have high efficiency in the range of **18% to 21%**, with positive power tolerance of **0 to +5 W**. The junction box shall be IP67 rated, weatherproof, and equipped with MC4 compatible connectors and bypass diodes to prevent hotspot formation. Each module shall undergo **100% electroluminescence (EL) testing** to ensure defect-free performance. The temperature coefficient shall be $\leq -0.45\%/^{\circ}\text{C}$, and the module fill factor shall not be less than 75%. The system shall deliver an average generation of **4 to 5 units per kW per day** annually. The modules shall be backed by **10-year product warranty** and **25-year linear performance warranty**.

The **grid-tied solar inverter** shall be of high efficiency (97.5% to 98.9%) with MPPT voltage range of **80V to 1000V**, suitable for Indian grid conditions. It shall provide output at **415V, 3-phase, 50/60 Hz** with near

unity power factor (~1) and THDi less than 3%. The inverter shall be capable of operating in ambient temperature range of **-25°C to +60°C** and at altitudes up to 4000 meters. It shall include **anti-islanding protection** and integrated protections such as reverse polarity protection, insulation resistance detection, residual current monitoring, overcurrent, short circuit, and overvoltage protections. The inverter shall have **IP65 protection**, LCD display, and remote monitoring capability through **GPRS/Wi-Fi datalogger and mobile application**.

The **module mounting structure (MMS)** shall be fabricated from hot-dip galvanized steel (HDG) using seamless box sections or C-channels of adequate size, designed to withstand wind loads and dead loads of modules and accessories. The structure shall be installed on rooftop or ground with proper base plates, J-bolts, anchor fasteners, and civil supports as required. All nuts and bolts used shall be of **SS 304 grade** to ensure corrosion resistance and long service life. The structure shall be designed to accommodate proper tilt angle and spacing for optimal solar generation.

The **Balance of System (BoS)** shall include AC Distribution Board (ACDB) and DC Distribution Board (DCDB) with suitable protection devices such as MCCB/MCB, isolators, surge protection devices (SPD), and proper cable management. All interconnecting cables shall be UV resistant, FRLS copper/aluminum cables of appropriate size, laid through conduits/trays with proper termination using glands and lugs.

A comprehensive **earthing system** shall be provided, including separate earthing for DC side, AC side, and lightning protection system. Suitable **lightning arresters** shall be installed as per IS standards to protect the plant from surges and lightning strikes.

The installation shall include complete mechanical erection, module mounting, inverter installation, cabling, termination, and integration with existing electrical system. Necessary **liaisoning work with government authorities** such as State Nodal Agency, DISCOM, and CEIG shall be included for approvals, inspection, and grid connectivity (excluding statutory fees such as GEDA application fees, meter charges, etc.).

Testing and commissioning shall include insulation resistance testing, string testing, inverter functional checks, synchronization with grid, performance verification, and generation monitoring. The system shall be commissioned ensuring safe grid synchronization and optimal performance.

Scope of work shall include supply of all equipment (modules, inverter, MMS, ACDB/DCDB, cables, earthing, lightning protection), complete installation, testing, commissioning, documentation, and approvals. The plant shall be handed over in fully operational condition with performance guarantee, ensuring reliability, safety, and compliance with all applicable standards.

(93)

Providing and erecting of approved make **Inverter-based Split Air Conditioning Unit of 1.5 Ton capacity** shall be carried out as per site requirements and instructions of the Engineer-in-Charge, conforming to relevant IS standards and energy efficiency norms. The unit shall be designed for operation on **230V, single phase, 50 Hz AC supply**, and shall have an **ISEER rating in the range of 3.1 to 3.99**, ensuring moderate energy efficiency performance.

The system shall consist of an **outdoor condensing unit** and an **indoor evaporating unit**. The outdoor unit shall be equipped with a **variable speed fan motor** and an **inverter-driven hermetically sealed rotary compressor**, designed for energy-efficient and low-noise operation. The compressor shall modulate speed based on cooling load, thereby reducing power consumption and maintaining consistent room temperature. The unit shall use **eco-friendly refrigerant (green gas such as R32/R410A)** with factory-charged or site-charged provision as required.

The indoor unit shall be a **wall-mounted evaporator** comprising a high-efficiency cooling coil, air filter, and **blower motor** for uniform air distribution. It shall be complete with a cordless **remote control unit** for

operation, including temperature setting, fan speed control, swing operation, and timer functions. The indoor unit shall have a compact aesthetic design with low noise levels.

Installation shall include proper mounting of indoor and outdoor units using **MS stand (powder coated/painted)** for outdoor unit placement. The interconnection between indoor and outdoor units shall be done using **properly insulated copper refrigerant tubing** of appropriate diameter, along with control wiring. The copper pipes shall be insulated with nitrile rubber insulation to prevent condensation and energy loss. Necessary **core cutting** through walls shall be carried out for routing piping and cables, and the same shall be finished neatly.

A **PVC drain pipe** of suitable size shall be provided and connected to the indoor unit for condensate water disposal, ensuring proper slope for gravity flow and leak-proof joints. Electrical connection shall include **15A plug top**, socket, and necessary wiring from the nearest power source. Proper earthing shall be ensured for safe operation.

The complete system shall be tested for gas leakage, proper cooling performance, airflow, and electrical safety. Vacuuming of refrigerant lines, gas charging (if required), and commissioning shall be carried out as per manufacturer recommendations.

Scope of work shall include supply of 1.5 Ton inverter split AC unit, indoor and outdoor units, MS stand, insulated copper piping, drain piping, electrical accessories (15A plug), remote control, refrigerant gas charging, core cutting, installation, testing, and commissioning. The unit shall be handed over in fully operational condition ensuring efficient cooling performance, energy savings, and long service life.

(94)

Supply, Installation, Testing and Commissioning (SITC) of **48-port 10/100/1000Base-T managed network switch** with **4 Gigabit SFP combo uplink ports** shall be carried out as per industry standards and approval of the competent authority (not below the rank of Executive Engineer). The switch shall be enterprise-grade, rack-mountable type, designed for high-performance LAN applications, surveillance systems, and IT network infrastructure.

The switch shall provide **48 auto-negotiating RJ45 ports (10/100/1000 Mbps)** supporting full/half duplex operation, along with **4 Gigabit SFP combo ports** for fiber uplink connectivity. It shall support **advanced Layer 2 (L2) switching features** including VLAN (IEEE 802.1Q), port-based VLAN, MAC address filtering, IGMP snooping, port mirroring, link aggregation (LACP), QoS (Quality of Service), storm control, and loop prevention protocols such as STP/RSTP/MSTP.

The switch shall also support **Layer 2+ (L2+) static routing features**, enabling basic inter-VLAN routing for efficient network segmentation and traffic management. Security features shall include **port security, access control lists (ACL), DHCP snooping, IP-MAC binding**, and protection against network attacks such as ARP spoofing and broadcast storms.

The unit shall have **dual management interface modes**, including:

- **Standard Mode** for general enterprise networking
- **Surveillance Mode** optimized for CCTV/IP camera networks with enhanced multicast handling and bandwidth optimization

The switch shall support multiple management options such as **Web GUI, CLI (console/telnet/SSH), and SNMP** for remote monitoring and configuration. It shall include LED indicators for link/activity, speed, and power status. The enclosure shall be **19-inch rack mountable**, made of sturdy metal housing with adequate ventilation and internal cooling system.

Power supply shall be **230V AC, 50 Hz**, with built-in SMPS and protection against voltage fluctuations. The switch shall support continuous operation in typical indoor conditions.

Installation shall include proper mounting in standard network rack, connection with patch panel using CAT6 cables, fiber termination for SFP ports (if applicable), and labeling for all ports. Proper earthing shall be ensured for equipment safety.

Testing and commissioning shall include verification of all ports, VLAN configuration, uplink connectivity, routing functionality, security features, and network performance under load conditions.

Scope of work shall include supply of 48-port managed switch with SFP modules (if specified), power cord, mounting accessories, configuration, installation in rack, interconnection with existing network, testing, commissioning, and documentation. The system shall be handed over in fully operational condition with necessary approvals from competent authority ensuring reliability, scalability, and secure network operation.

(95)

Supply, Installation, Testing and Commissioning (S.I.T.C.) of **Cat 6 UTP Patch Panel, 24 Port, Keystone Type (Fully Loaded)** shall be carried out as per TIA/EIA-568 and ISO/IEC 11801 standards, duly approved by the competent authority (not below the rank of Executive Engineer). The patch panel shall be suitable for structured cabling systems and designed for mounting in standard **19-inch network racks**.

The patch panel shall be of **modular keystone type**, fully loaded with **24 Nos. Cat 6 UTP keystone jacks**, supporting data transmission up to **1 Gbps (Gigabit Ethernet)** and bandwidth up to **250 MHz**. The panel shall be constructed from high-quality cold-rolled steel with powder-coated finish for durability and corrosion resistance. The front side shall have clearly numbered ports (1 to 24) with provision for labeling, while the rear side shall support **IDC (Insulation Displacement Contact) termination** with standard color coding (T568A/T568B).

Each keystone jack shall be of high गुणवत्ता thermoplastic housing with phosphor bronze contacts and gold plating to ensure low contact resistance and reliable connectivity. The panel shall be designed to minimize crosstalk (NEXT/FEXT) and support high-performance data transmission.

Installation shall include proper mounting of the patch panel in the rack using suitable hardware. All incoming LAN cables (Cat 6 UTP) shall be neatly terminated on the rear side using punch-down tools, ensuring adherence to proper color coding standards. Adequate cable management shall be provided using horizontal/vertical cable managers, and all cables shall be properly dressed, bundled, and labeled for easy identification and maintenance.

Testing shall be carried out using standard cable testers to verify continuity, wire mapping, attenuation, and performance parameters as per Cat 6 standards. Each port shall be tested for proper connectivity and compliance with Gigabit Ethernet requirements.

Scope of work shall include supply of 24-port Cat 6 patch panel (fully loaded with keystone jacks), mounting accessories, labeling strips, cable ties, and termination hardware; complete installation in rack, termination of cables, dressing, testing, and commissioning. The system shall be handed over in a fully operational condition with proper documentation and approval from the competent authority, ensuring structured, reliable, and high-speed network connectivity.

(96)

Supply, Installation, Testing and Commissioning (S.I.T.C.) of **Dual Port Face Plate (Keystone Type, Square)** shall be carried out as per TIA/EIA-568 and ISO/IEC 11801 standards, and duly approved by the

competent authority (not below the rank of Executive Engineer). The face plate shall be suitable for structured cabling systems for voice/data applications in commercial and institutional buildings.

The face plate shall be of **modular keystone type**, designed to accommodate **two numbers of keystone jacks (Cat 6 UTP or as specified)**. It shall be of square profile, made from high-quality, fire-retardant, UV-stabilized thermoplastic material with smooth finish, ensuring durability and aesthetic appearance. The plate shall be compatible with standard electrical modular boxes (metal or PVC flush boxes) and shall be provided with **shuttered ports (if specified)** to protect against dust ingress.

The face plate shall include **labeling provision** for identification of ports and shall support easy snap-fit installation of keystone jacks. The design shall ensure firm holding of jacks without loosening during usage. The outlet shall support high-speed data transmission up to Cat 6 standards when used with compatible keystone modules.

Installation shall include fixing of face plate on concealed or surface-mounted box, proper insertion of keystone jacks, and termination of incoming LAN cables using standard punch-down method at the jack end. The wiring shall follow T568A/T568B color coding standards. All cables shall be neatly dressed inside the box without excessive bending to maintain performance integrity.

Testing shall be carried out for each outlet point to verify continuity, proper termination, and network performance using cable tester. Each port shall be labeled and mapped with corresponding patch panel ports for easy identification and maintenance.

Scope of work shall include supply of dual port face plate, keystone jack mounting, fixing screws, labeling accessories; complete installation, termination (if in scope), testing, and commissioning. The system shall be handed over in fully functional condition ensuring reliable, organized, and high-performance network connectivity.

(97)

Supply, Installation, Testing and Commissioning (S.I.T.C.) of **Cat 6 UTP Patch Cord, 2 meter length, 24 AWG, snagless type** shall be carried out as per TIA/EIA-568 and ISO/IEC 11801 standards, duly approved by the competent authority (not below the rank of Executive Engineer). The patch cord shall be factory assembled, tested, and certified for high-speed data transmission applications.

The patch cord shall be constructed using **24 AWG stranded copper conductors**, ensuring flexibility and durability for frequent handling. It shall be **unshielded twisted pair (UTP)** type, supporting data transmission up to **1 Gbps (Gigabit Ethernet)** and bandwidth up to **250 MHz**, compliant with Cat 6 performance standards. The outer sheath shall be made of high-quality PVC or LSZH material, flame retardant, and resistant to abrasion.

Both ends of the patch cord shall be terminated with **RJ45 connectors** featuring **minimum 30 microns (30μ") gold-plated contacts**, ensuring low contact resistance, high conductivity, and long service life. The connectors shall be provided with **snagless molded boots**, preventing damage to locking clips during installation and removal, especially in dense rack environments.

The patch cords shall be suitable for interconnection between **patch panel to switch, I/O outlet to workstation**, or other network devices. They shall be available in standard color coding (as specified) for easy identification and cable management.

Installation shall include proper routing and dressing of patch cords within racks or workstations, ensuring no sharp bends or **तनाव** on connectors. Cable management accessories such as horizontal/vertical organizers shall be used to maintain neat and structured cabling layout.

Testing shall be performed for continuity, pin configuration, and performance parameters using standard LAN cable testers to ensure compliance with Cat 6 specifications.

Scope of work shall include supply of 2-meter Cat 6 patch cords, installation/patching between network devices, testing, and commissioning. The system shall be handed over in fully operational condition with proper labeling and documentation, ensuring reliable and high-speed network connectivity.

(98)

Supply, Installation, Testing and Commissioning (S.I.T.C.) of **5 MP IP Dome Camera (Indoor/Outdoor type)** shall be carried out as per relevant industry standards and project requirements. The camera shall be suitable for high-resolution surveillance applications in commercial, industrial, and institutional environments.

The camera shall be equipped with a **1/2.8" Progressive CMOS sensor**, capable of delivering high-quality video output at **30 fps with resolution up to 2048 × 1536 pixels (5 MP)**. It shall feature a **manual varifocal lens (f = 3–9 mm)**, providing a flexible **field of view ranging from 40° to 80° (horizontal) and 30° to 60° (vertical)**, allowing adjustment as per site coverage requirements.

The camera shall have **infrared (IR) illumination up to 30 meters** with **Smart IR technology**, ensuring clear night vision without overexposure. Minimum illumination shall be **0.1 Lux (color) and 0.01 Lux (B/W) at F1.4**, enabling operation in low-light conditions. It shall support **Wide Dynamic Range (WDR) of 110 dB** for handling high contrast lighting environments and **3D Noise Reduction (3D DNR)** for improved image clarity.

The camera shall support advanced **video compression technologies including H.265, H.264, and MJPEG**, with capability for **three simultaneous video streams**, optimizing bandwidth and storage usage. The **signal-to-noise ratio (S/N)** shall be minimum **51.5 dB**, ensuring clear image output.

The unit shall include **two-way audio functionality** with built-in or external microphone/speaker support, and an **onboard SD/SDHC/SDXC card slot** for local storage. It shall be equipped with **P-Iris lens** for precise exposure control and **Digital Image Stabilization (DIS)** for reducing motion blur.

The camera shall be **ONVIF compliant**, ensuring interoperability with various NVRs and VMS platforms. It shall comply with international certifications such as **IP43 (or higher for outdoor use), CE, FCC Class A, and UL listing**. The housing shall be vandal-resistant and weatherproof, suitable for both indoor and outdoor installations.

Installation shall include proper mounting on wall/ceiling using suitable brackets, alignment for desired coverage, and connection through Cat 6 cable to network switch/NVR. Power shall be supplied via **PoE (Power over Ethernet)** or external DC supply as required. Necessary accessories such as mounting brackets, junction boxes, connectors, and fasteners shall be included.

Testing and commissioning shall include configuration of IP address, integration with NVR/VMS, focus and zoom adjustment, verification of video quality, IR performance, audio functionality, recording, and network connectivity.

Scope of work shall include supply of 5 MP IP dome camera, mounting accessories, cabling (if specified), installation, configuration, testing, and commissioning. The system shall be handed over in fully operational condition ensuring high-quality surveillance, reliability, and compliance with specifications.

(99)

Supply, Installation, Testing and Commissioning (S.I.T.C.) of **5 MP IP Bullet Camera (Indoor/Outdoor type)** shall be carried out as per industry standards and project specifications. The camera shall be suitable for perimeter security, outdoor surveillance, and long-range monitoring applications.

The camera shall be equipped with a **1/2.8" Progressive CMOS sensor**, capable of delivering high-definition video at **30 fps with resolution up to 2048 × 1536 (5 MP)**. It shall be provided with a **manual varifocal lens (f = 3–9 mm)** offering adjustable **field of view from 40° to 80° (horizontal) and 30° to 60° (vertical)**, enabling flexible coverage depending on installation location.

The camera shall have **integrated infrared (IR) illumination with Smart IR technology**, providing night vision range up to **30 to 50 meters**, ensuring clear image capture in complete darkness. The minimum illumination shall be **0.1 Lux (color) and 0.01 Lux (B/W) at F1.4**, suitable for low-light conditions. The camera shall support **Wide Dynamic Range (WDR) of 110 dB** and **3D Noise Reduction (3D DNR)** for enhanced image clarity in varying lighting environments.

The camera shall support advanced **video compression formats H.265, H.264, and MJPEG**, with capability for **three simultaneous video streams**, optimizing bandwidth and storage. The **signal-to-noise ratio (S/N)** shall be minimum **51.5 dB**.

The unit shall include **two-way audio support**, and an **onboard SD/SDHC/SDXC card slot** for local storage. It shall feature a **P-Iris lens** for precise exposure control and **Digital Image Stabilization (DIS)** to minimize motion blur and vibrations.

The camera shall be **ONVIF compliant** for interoperability with third-party NVR/VMS systems. The housing shall be rugged, **weatherproof (IP66 rated)** and **vandal-resistant (IK10 rated)**, suitable for harsh outdoor environments. It shall comply with certifications such as **CE, FCC Class A, and UL**.

Installation shall include mounting of the camera on wall/pole using suitable brackets, proper alignment for required coverage, and connection via **Cat 6 cable** to network switch/NVR. Power shall be provided through **PoE (Power over Ethernet)** or external DC supply as required. All accessories such as mounting brackets, junction boxes, and connectors shall be included.

Testing and commissioning shall include IP configuration, integration with NVR/VMS, adjustment of focus and zoom, verification of IR performance, audio testing, recording functionality, and network connectivity checks.

Scope of work shall include supply of 5 MP IP bullet camera, all mounting and installation accessories, cabling (if specified), installation, configuration, testing, and commissioning. The system shall be handed over in fully operational condition ensuring reliable, high-resolution surveillance and long service life.

(100)

Supply, Installation, Testing and Commissioning (S.I.T.C.) of **64 Channel Network Video Recorder (NVR)** shall be carried out as per industry standards and project specifications for centralized IP-based surveillance systems. The NVR shall be enterprise-grade, rack-mountable type, designed for high-capacity video recording, storage, and playback.

The NVR shall support **64 IP camera channels**, with recording capability of minimum **16 channels at 2 MP resolution simultaneously**, using advanced **H.265 / H.264 video compression technologies** for efficient storage and bandwidth utilization. The system shall have a **dual operating system (Dual OS) design** to ensure high reliability and fail-safe operation in case of system faults.

The unit shall support **hot-swappable HDD bays** with **RAID configuration (RAID 0/1/5/6/10)** for data redundancy and security. It shall be equipped with **up to 8 SATA interfaces**, each supporting hard disks up

to **10 TB capacity**, along with **1 eSATA port** for external storage expansion. The NVR shall support **N+1 hot spare configuration**, allowing standby NVR takeover in case of primary system failure.

The NVR shall provide **simultaneous playback of up to 16 channels at 1080p resolution**, ensuring smooth review of recorded footage. Video output interfaces shall include **HDMI and VGA ports** for connection to display monitors with high-definition output.

The system shall have **Gigabit Ethernet interface(s)** with minimum **320 Mbps incoming bandwidth**, ensuring seamless handling of multiple high-resolution video streams. It shall support network protocols and be compatible with ONVIF standards for integration with various IP cameras.

The NVR shall include **USB ports and serial interfaces** for peripheral connectivity such as mouse, keyboard, backup devices, and control systems. It shall be designed to operate in ambient temperature range of **-10°C to +50°C**, suitable for control room environments.

The unit shall comply with relevant certifications such as **CE, FCC, and BIS**, ensuring quality, safety, and regulatory compliance.

Installation shall include mounting of NVR in rack, connection to network switch, camera integration, and display setup. Required hard disks (if in scope) shall be installed and configured in RAID mode. Proper earthing and power supply connections shall be ensured.

Testing and commissioning shall include configuration of channels, recording parameters, RAID setup, live view, playback, backup functionality, network performance, and failover (N+1) verification.

Scope of work shall include supply of 64-channel NVR, installation in rack, HDD installation (if included), RAID configuration, integration with IP cameras, connection to display system, testing, commissioning, and documentation. The system shall be handed over in fully operational condition ensuring reliable, secure, and high-performance video surveillance management.

(101)

Supply, Installation, Testing and Commissioning (S.I.T.C.) of **8 TB enterprise-class hard disk drive (HDD)** suitable for continuous **24×7 surveillance recording** shall be carried out as per industry standards and project requirements. The HDD shall be specifically designed for use in **NVR/DVR/RAID-based storage systems**, ensuring high reliability, durability, and optimized performance for video recording applications.

The hard disk shall have **8 TB storage capacity**, with **SATA III (6 Gb/s) interface**, rotational speed of **7200 RPM**, and **minimum 256 MB cache memory** for high-speed data access and smooth recording of multiple high-definition video streams. The drive shall be designed for **low power consumption** and efficient thermal management, making it suitable for continuous operation in surveillance environments.

The HDD shall support **vibration tolerance and rotational vibration (RV) sensors**, ensuring stable performance in multi-drive environments such as rack-mounted NVRs. It shall be compatible with **RAID configurations** and capable of handling high workload rates typical of surveillance systems. The drive shall include features like error recovery control, optimized firmware for streaming workloads, and enhanced data integrity.

Installation shall include proper mounting of the HDD in NVR/DVR/server storage bays using suitable brackets and screws. Necessary **data (SATA) and power connections** shall be made securely. The HDD shall be configured within the system, including formatting, partitioning, and integration into RAID setup (if applicable).

Testing and commissioning shall include verification of HDD detection, read/write performance, error-free operation, and integration with the recording system. The drive shall be tested under actual recording conditions to ensure stable and continuous operation.

Scope of work shall include supply of 8 TB enterprise surveillance HDD, mounting hardware, cabling, installation in NVR/DVR system, configuration (including RAID if required), testing, and commissioning. The HDD shall be provided with **manufacturer warranty** (typically 3 to 5 years) and handed over in fully operational condition ensuring reliable long-term storage performance for surveillance applications.

(102)

Supply, Delivery, Installation, Testing and Commissioning (S.I.T.C.) of **55-inch LED/LCD display** shall be carried out as per project requirements for use in **conference halls, classrooms, meeting rooms, or similar applications**. The display shall be of reputed make, designed for high-quality visual output, reliability, and ease of integration with AV systems.

The display shall have a **screen size of 55 inches** with **Full HD resolution (1920 × 1080 pixels)**, capable of delivering clear, sharp, and high-contrast images suitable for presentations, video conferencing, and multimedia applications. The panel shall support standard refresh rates (minimum 50/60 Hz) with wide viewing angles and adequate brightness levels for indoor environments.

The unit shall be equipped with **minimum 2 HDMI ports and 1 VGA port**, along with additional standard input interfaces such as USB, audio input/output, and AV ports as available. It shall support connection with laptops, desktops, media players, and other AV devices. The display shall include built-in speakers for basic audio output.

Installation shall include **wall mounting or floor stand mounting** as per site requirement. A heavy-duty wall mount bracket or MS floor stand shall be provided, ensuring proper alignment, stability, and सुरक्षित installation. All required accessories such as mounting hardware, screws, anchor fasteners, and supports shall be included.

The work shall include **power and signal cabling**, including HDMI/VGA cables of appropriate length, routing through conduits/trays where required, and proper dressing of cables for neat appearance. Necessary electrical connection shall be made through a suitable power socket with proper earthing.

Configuration shall include setting up of display parameters such as brightness, contrast, input selection, and audio settings. All input ports shall be tested to ensure proper functionality and compatibility with connected devices.

Testing and commissioning shall include verification of display quality, resolution, input/output functionality, sound performance, and overall operation under actual usage conditions. The system shall be demonstrated to the user for satisfactory performance.

Scope of work shall include supply of 55" LED/LCD display, wall mount or floor stand, cables, accessories, installation, mounting, wiring, configuration, testing, and commissioning. The display shall be provided with **manufacturer warranty** (typically 1–3 years) and handed over in fully operational condition ensuring reliable performance and long service life.

(103)

Supply, Installation, Testing and Commissioning (S.I.T.C.) of **Cat 6 UTP Keystone Jack** shall be carried out in accordance with TIA/EIA-568 and ISO/IEC 11801 standards for structured cabling systems, duly approved by the competent authority (not below the rank of Executive Engineer). The keystone jack shall be

suitable for high-speed data and voice communication applications in commercial and institutional networks.

The keystone jack shall be of **unshielded twisted pair (UTP), Category 6**, supporting data transmission up to **1 Gbps** and bandwidth up to **250 MHz**. It shall be designed with **RJ45 female connector** on the front side and **IDC (Insulation Displacement Contact) terminals** at the rear for cable termination. The housing shall be made of high-quality, fire-retardant thermoplastic material ensuring durability and safety.

The contact pins shall be made of **phosphor bronze with minimum 50 microns gold plating** to ensure excellent conductivity, low contact resistance, and long service life. The jack shall be compatible with standard modular face plates and patch panels (keystone type), allowing easy snap-fit installation. It shall be designed to minimize insertion loss, return loss, and crosstalk (NEXT/FEXT), ensuring reliable high-speed performance.

Installation shall include proper termination of **Cat 6 UTP cable (solid conductor)** using standard punch-down tool, following **T568A or T568B wiring standards**. The cable pairs shall be maintained up to the point of termination to preserve performance characteristics. The keystone jack shall be securely fixed into face plate or patch panel module.

Testing shall be carried out using LAN cable tester or certifier to verify continuity, wire mapping, and compliance with Cat 6 performance parameters. Each installed jack shall be checked for proper connectivity and signal integrity.

Scope of work shall include supply of Cat 6 UTP keystone jack, installation in face plate/patch panel, cable termination, labeling, testing, and commissioning. The system shall be handed over in fully operational condition ensuring structured, reliable, and high-speed network connectivity.

(104)

Supply, Installation, Testing and Commissioning (S.I.T.C.) of **12U Network Rack** suitable for housing network equipment such as switches, patch panels, and associated accessories shall be carried out as per industry standards and site requirements, duly approved by the competent authority (not below the rank of Executive Engineer).

The rack shall be of **standard 19-inch configuration**, constructed from high-quality CRCA steel with powder-coated finish for durability and corrosion resistance. It shall be of **12U height**, suitable for wall-mounted or floor-mounted installation as per site conditions. The rack shall be provided with **front toughened glass door** with lock and key arrangement, and rear/side panels (removable type) for easy access and maintenance.

The rack shall include the following accessories:

- **Mains Power Distribution Unit (PDU):** With multiple 5A/15A sockets, ON/OFF switch, and proper earthing provision
- **Fan Tray:** Minimum 2/4 cooling fans mounted at top/bottom for ventilation and heat dissipation
- **Cable Management System:** Horizontal/vertical cable organizers, cable channels, and routing space for structured wiring
- **Mounting Hardware:** Adjustable mounting rails, cage nuts, bolts, and screws for fixing network equipment
- **Ventilation:** Adequate perforations for airflow to maintain internal temperature

The rack shall have proper **cable entry provisions** from top and bottom with gland plates. It shall be designed to accommodate equipment such as **24-port patch panel, network switch, NVR, and other rack-mounted devices**.

Installation shall include fixing of the rack on wall/floor using suitable anchor fasteners, ensuring proper alignment and load-bearing support. All equipment inside the rack shall be mounted securely using standard rack accessories. Proper cable dressing shall be carried out using cable managers to maintain neat and organized wiring.

Electrical connection shall include wiring of PDU to nearby power source with proper earthing. Fan tray shall be connected and tested for proper operation.

Testing and commissioning shall include verification of rack stability, proper functioning of fans, power distribution, accessibility of equipment, and cable management. All installed components shall be checked for secure mounting and proper operation.

Scope of work shall include supply of 12U rack, PDU, fan tray, cable management accessories, mounting hardware; complete installation, equipment mounting, cabling arrangement, testing, and commissioning. The rack shall be handed over in fully operational condition ensuring safe, organized, and efficient housing of network infrastructure.

(105)

Providing and erecting of approved make **Online Uninterruptible Power Supply (UPS) System of 20 kVA capacity, 3-phase input/output with 1-hour backup** shall be carried out in accordance with relevant IS/IEC standards and as per site requirements. The UPS shall be of **true online double conversion type**, ensuring uninterrupted and regulated power supply to critical loads.

The UPS system shall consist of an **IGBT-based rectifier (charger), inverter, static bypass, and battery bank**. The rectifier/charger shall be capable of operating within an input voltage range of **160–270V AC**, converting AC input to DC to charge the batteries and supply the inverter. The inverter shall convert DC back to **230V, 50 Hz AC output** (or 415V for 3-phase system as applicable), maintaining stable voltage and frequency with output power factor of **0.8 or better**.

The UPS shall be equipped with **sealed maintenance-free (SMF) batteries** of suitable capacity to provide **minimum 1-hour backup** at full load. The battery bank shall be mounted on a **heavy-duty MS (mild steel) battery stand**, properly painted and treated for corrosion resistance. Inter-cell connectors, battery cables, and proper termination shall be included.

The system shall incorporate comprehensive protection features including:

- **Over-voltage and under-voltage protection (input/output)**
- **Overload protection (with minimum 10% overload capacity for short duration)**
- **Short circuit protection**
- **Battery deep discharge protection**
- **Automatic bypass facility for fault conditions**

The UPS enclosure shall be fabricated from **CRCA sheet steel**, powder coated for durability, and designed for floor mounting. It shall include a user-friendly interface with LED/LCD display for monitoring parameters such as input/output voltage, frequency, load, battery status, and fault indications.

Installation shall include proper placement of UPS and battery bank in a well-ventilated area, interconnection of batteries, earthing, and connection to input supply and output load distribution panel. All cables shall be of appropriate size with proper lugs, glands, and terminations.

Testing and commissioning shall include checking of input/output parameters, battery charging and discharging, load test, changeover to battery mode during power failure, and verification of all protection features. The system shall be tested under actual load conditions to ensure reliable performance.

Scope of work shall include supply of 20 kVA online UPS, SMF batteries, MS battery stand, interconnecting cables, accessories; complete installation, wiring, earthing, testing, and commissioning. The system shall be handed over in fully operational condition ensuring uninterrupted power supply, reliability, and compliance with specifications.

(106)

Power Connection & Statutory Approvals (Liaisoning for 1 No. 3-Phase Meter)

Providing services for **liaisoning work with power utility (GEB/DISCOM)** for obtaining a **new 3-phase electrical connection** for the premises shall be carried out in full compliance with statutory regulations, local electrical rules, and as per instructions of the Engineer-in-Charge (E.I.C.) and competent authorities.

The contractor shall be responsible for **complete coordination with all concerned authorities**, including the Electricity Distribution Company (DISCOM/GEB), Electrical Inspectorate, and any other statutory bodies required for approval of the electrical installation. The work shall include preparation, submission, and follow-up of all necessary applications, documents, and approvals required for energization of the electrical system.

All **technical documentation** required for approvals shall be prepared and submitted by the contractor. This shall include **electrical drawings (SLD, layout, load schedules), design calculations (load calculations, cable sizing, earthing calculations, voltage drop), test certificates, equipment datasheets, and compliance reports** as per applicable standards and authority requirements. The drawings shall be based on the **designs provided by the architect/consultant** and shall be modified if required to meet statutory norms.

The contractor shall also arrange for **inspection by the Electrical Inspector** and ensure compliance with all safety and regulatory requirements. Any **modifications, rectifications, or additional works** pointed out by the Electrical Inspector or DISCOM authorities during inspection shall be carried out by the contractor without delay, to obtain final approval.

The scope shall include:

- Application for **new 3-phase meter connection** with DISCOM/GEB
- Submission of all **required documents, drawings, and test reports**
- **Coordination and follow-up** with authorities until final approval
- Facilitation of **site inspections** by Electrical Inspector/Authorities
- Execution of **corrections/modifications** as per authority remarks
- Assistance in **meter installation, testing, and final energization**

All work shall be executed **as per approved drawings, design intent, and instructions from the Architect and Engineer-in-Charge (E.I.C.)**, ensuring compliance with statutory regulations and timely completion of approvals.

Note: Government fees, meter charges, and statutory payments (if not included in BOQ) shall be paid separately by the client unless otherwise specified. The contractor's responsibility is limited to liaisoning,

documentation, coordination, and execution support to obtain final electrical clearance and power connection.

(107)

Supply, Installation, Testing and Commissioning (S.I.T.C.) of **high-performance portable Bluetooth-enabled Public Address (PA) system** shall be carried out as per project requirements for use in **open halls, seminar rooms, classrooms, and social gatherings**. The system shall be designed for portability, high sound clarity, and reliable wireless operation.

The PA system shall deliver a **minimum output power of 150W to 240W RMS**, ensuring adequate sound coverage and uniform distribution in medium to large spaces without distortion. The speaker shall be equipped with a **multi-driver configuration**, consisting of **high-efficiency woofers for deep bass response** and **dedicated tweeters for clear high-frequency and vocal reproduction**, making it suitable for speeches, lectures, and music playback.

The unit shall support **Bluetooth version 5.0 or higher**, enabling seamless wireless audio streaming from smartphones, laptops, and other compatible devices. In addition, it shall provide multiple input options including:

- **USB port** for media playback
- **AUX (3.5 mm) input** for external audio sources
- **SD card slot** for direct audio playback

For seminar and presentation use, the system shall include **minimum two professional-grade UHF wireless microphones**, ensuring stable transmission, minimal interference, and clear voice pickup. Each microphone channel shall have **independent volume control and echo adjustment**, allowing customization of audio output. The system shall also feature a **“Mic Priority” function**, which automatically reduces background music volume when the microphone is in use, ensuring speech clarity.

The PA system shall be housed in a **rugged, portable enclosure**, preferably with trolley wheels and handle for easy movement. It shall include a **built-in amplifier**, control panel with knobs/buttons for volume, bass, treble, echo, and input selection. LED display or indicators for mode/status shall be provided.

Power supply shall be **AC 230V, 50 Hz**, with provision for **inbuilt rechargeable battery backup** (if specified) for portable use. Necessary accessories such as remote control, charging cable, microphones, and connecting leads shall be included.

Installation shall include positioning of the unit, initial setup, pairing of wireless microphones, and connection with input devices. Testing and commissioning shall include verification of Bluetooth connectivity, microphone performance, audio clarity, input/output functionality, and mic priority operation.

Scope of work shall include supply of PA system, wireless microphones, accessories, installation, configuration, testing, and commissioning. The system shall be handed over in fully operational condition ensuring clear sound output, ease of use, and reliable performance for public address applications.

(108)

Supply, Delivery, Installation, Testing and Commissioning (S.I.T.C.) of **75-inch LED/LCD display** shall be carried out as per project requirements for use in **conference halls, meeting rooms, classrooms, and presentation areas**. The display shall be of reputed make, designed for large-format viewing with high clarity and reliable performance.

The display shall have a **screen size of 75 inches** with **Full HD resolution (1920 × 1080 pixels)**, capable of delivering sharp, bright, and high-contrast visuals suitable for presentations, videos, and multimedia applications. The panel shall support standard refresh rates (minimum 50/60 Hz) with wide viewing angles and sufficient brightness for indoor environments, ensuring distortion-free viewing even from a distance.

The unit shall be equipped with **minimum 2 HDMI ports and 1 VGA port**, along with additional standard connectivity options such as USB, audio input/output, and AV interfaces for compatibility with laptops, desktops, and media devices. The display shall support seamless switching between input sources.

Installation shall include provision and fixing of a **heavy-duty wall mount stand**, ensuring proper alignment, सुरक्षित mounting, and load-bearing stability. All required mounting accessories such as brackets, anchor fasteners, screws, and supports shall be included. The work shall also include **power cabling and signal cabling (HDMI/VGA)** of suitable length, properly routed through conduits or casing to maintain a neat installation.

The display shall provide **clear audio output through built-in speakers** (or provision for external audio system if required). Configuration shall include setting of display parameters such as brightness, contrast, color mode, input selection, and audio settings.

Testing and commissioning shall include verification of:

- Display quality (resolution, brightness, clarity)
- Functionality of HDMI and VGA inputs
- Audio output performance
- Compatibility with connected devices (laptop/PC/media player)

The system shall be demonstrated under actual operating conditions to ensure satisfactory performance.

Scope of work shall include supply of 75" display, wall mount stand, cables, accessories, installation, mounting, wiring, configuration, testing, and commissioning. The display shall be provided with **manufacturer warranty (typically 1–3 years)** and handed over in fully operational condition ensuring reliable performance, ease of use, and long service life.

(109)

Supply, Installation, Testing and Commissioning (S.I.T.C.) of **heavy-duty monochrome multi-function laser printer (MFP)** shall be carried out as per office/industrial requirements for printing, scanning, and photocopying applications. The unit shall be of reputed make and designed for reliable, high-volume usage in office environments.

The printer shall utilize **dry toner-based laser technology**, ensuring **smudge-proof, high-quality, and archival-grade output**. It shall support a **minimum print and copy resolution of 600 × 600 dpi**, producing sharp text and clear graphics suitable for official documentation. The device shall deliver a **print speed of 18 to 30 pages per minute (ppm)** on A4 size media, ensuring efficient handling of routine office workloads.

The machine shall be capable of **standalone photocopying (Xerox function)** without the need for a computer, with features such as multiple copies, zoom, and basic copy adjustments. It shall be designed for a **monthly duty cycle of 8,000 to 10,000 pages**, ensuring durability and consistent performance under regular usage conditions.

The integrated **flatbed scanner** shall support **color scanning** with an **optical resolution of minimum 600 dpi**, suitable for digitizing documents and images. The scanner shall support output formats such as **PDF and JPEG**, enabling easy storage and sharing of scanned files.

Connectivity shall be provided through **USB 2.0 interface**, ensuring compatibility with desktop and laptop systems. The unit shall support standard operating systems and shall include necessary drivers and software utilities for installation and operation.

The printer shall include a **user-friendly control panel** with display and function keys for easy operation of print, scan, and copy functions. It shall be equipped with standard input/output paper trays, toner cartridge, and power cable.

Installation shall include unpacking, placement at designated location, connection to power supply, USB interfacing with computer system, driver installation, and configuration. Testing and commissioning shall include verification of print quality, scanning functionality, copy operation, and overall performance.

Scope of work shall include supply of multi-function laser printer, toner cartridge, power and USB cables, installation, driver setup, testing, and commissioning. The unit shall be handed over in fully operational condition with **manufacturer warranty (typically 1 year or as specified)** ensuring reliable and efficient office performance.

(110)

Supply, Installation, Testing and Commissioning (S.I.T.C.) of **Desktop Personal Computer (PC)** with latest **AI-integrated processor** shall be carried out as per office/enterprise requirements. The system shall be of reputed OEM make and designed for high performance, reliability, and future-ready AI workloads.

The desktop shall be powered by an **AI-enabled processor such as Intel Core Ultra 5 or AMD Ryzen 5 (or equivalent)** with integrated **Neural Processing Unit (NPU)** to support AI-based applications, enhanced productivity tools, and efficient multitasking. The system shall be equipped with **minimum 16 GB DDR5 RAM**, expandable as per OEM design, and **512 GB Gen4 NVMe SSD**, ensuring high-speed booting, data access, and application performance.

The system shall be housed in a **compact Small Form Factor (SFF) chassis** with **tool-less design**, allowing easy maintenance and component upgrades without specialized tools. The cabinet shall be robust, well-ventilated, and space-saving, suitable for modern office environments. It shall be powered by an **80 Plus Gold certified power supply unit (PSU)**, ensuring high energy efficiency and stable operation.

The desktop shall support advanced connectivity features including:

- **Wi-Fi 6E** for high-speed wireless networking
- **Bluetooth 5.3** for peripheral connectivity
- **USB Type-C with Thunderbolt 4 support** for high-speed data transfer and display connectivity
- Multiple USB ports, HDMI/DisplayPort outputs, Ethernet port, and audio interfaces

The system shall be supplied with a **24-inch IPS monitor** featuring:

- **Full HD resolution (1920 × 1080 or higher)**
- **Height-adjustable stand** for ergonomic usage
- **TÜV-certified eye protection** (low blue light & flicker-free technology) for reduced eye strain during extended usage
- Wide viewing angles and accurate color reproduction

Installation shall include placement of CPU and monitor, connection of peripherals (keyboard, mouse, monitor cables), power supply connection, and network setup (LAN/Wi-Fi). Necessary cables such as power cords, HDMI/DisplayPort cable, and accessories shall be included.

Configuration shall include OS setup (if specified), driver installation, BIOS configuration, network setup, and system optimization for performance. All ports and connectivity features shall be tested.

Testing and commissioning shall include verification of:

- System boot and performance
- RAM and storage functionality
- Monitor display quality and adjustments
- Wi-Fi, Bluetooth, and USB connectivity
- Peripheral operation (keyboard, mouse, ports)

Scope of work shall include supply of desktop PC, monitor, accessories, installation, configuration, testing, and commissioning. The system shall be provided with **minimum 3-year onsite OEM warranty**, covering parts and labor, and handed over in fully operational condition ensuring high performance, reliability, and compliance with specifications.