ANNEXURE-D-1

Documents, duly approved by Metro Authorities, required for record for traction (OHE) and Power Supply System at appropriate stage -

1. **Details of General Arrangement of OHE duly approved by Metro Authorities.**

General arrangement Drawing pertaining to the followings:

a) Catenary Wire, Contact Wire, Aerial Earth Wire, Buried Conductor, Buried Rail, Booster Transformer, Return Conductor, High Voltage Cable used on OHE, Cross-feeder, along track feeder.
b) Cantilever Assemblies, Droppers, Schedule, Jumpers.
c) Insulated Overlaps, Un-insulated Overlaps.
d) Turnouts & Crossover arrangements.
e) Anti-Creep Arrangement. Termination, Anchoring Arrangement (along with AutoTensioning Device).
f) Feeding and Sectioning Arrangement including Traction Feeding Diagram, Gantry arrangement for cross feeder.
g) Position and details of Neutral Section.

Note: General arrangement drawing shall incorporate details of Material, Tension, size, permissible continuous current carrying capacity, short time rating, thermal time constant of contact wire, catenary wire, cross track feeder & along track feeder, permissible maximum temperature for continuous & short time rating, relevant standard references, permissible tensile stress, Breaking load & factor of safety for conductors & fittings , allowable wear of contact wire, permissible condemning diameter of the contact wire.

2. Basic Design Data approved by Metro Authorities related to followings.

a) Pre-sag of Contact Wire at mid-point.
b) Gradient of Contact Wire (Relative and Absolute).
c) Tension length, Spans, Stagger.
d) Height of Contact Wires in Tunnels Bridges and in Open Routes.
e) Wind Load & Seismic zones.
f) Electrical Clearances (Longitudinal/ Lateral & Vertical - Static & Dynamic).
g) Sweep zone of Pantographs & Panto pressures.
h) Basic design data as per EN50119 clause 4 Page 15 & 16 (attached) or any other relevant international standard followed in a project.
i) Temperature rise in all type of bare conductors, insulated conductors (Cables), for permanent, up to 30 min, up to 1 sec.
j) Electrical clearances of pantograph from adjacent structures, in dynamic condition of trainunder design wind conditions.
k) Wind speed and wind pressure as per the Indian Standard **IS:875(Part-3)-2015 or its latest version** for the Zone of electrification.
l) Wind speed and wind pressure considered for the design of OHE structure, contact wire sway

under operating condition, under stationary condition.

m) Clearances between adjacent live A.C. contact lines of different voltage phases.

n) OHE elasticity at the support, mid span and elasticity variation along with formula and parameters used.

o) Push up under dynamic condition.

p) Wave propagation velocity of waves caused by the pantograph forces on the contact wire.

q) Design quality of current collection-loss of contact.

r) Permissible range of pantograph contact force (maximum & minimum).

s) Permissible tensile stress, factor of safety, permissible wears of all type of conductors.

t) Efficiency of tensioning device.

u) Horizontal deflection of contact wire under design environmental conditions.

v) Tolerances and limit of construction and operation as per clause 5.14 of EN 50119.

w) Minimum Dropper length, Dropper spacing, dropper type (current carrying /non current carrying), dropper current carrying capacity.

3. Design Details approved by Metro Authorities related to following:

a) Typical Drawing of OHE at Support i.e. at Mast, Portal etc.

b) Earthing Drawings for Viaduct/Tunnel (Typical).

c) Earthing Design for Receiving/Auxiliary Sub-stations (RSS & ASS) (Typical).

d) Typical Drawing of Cantilever Arrangement for Single Bracket, Multiple Bracket and Fittings.

e) Make wise Drawing of Stay Insulator, Bracket Insulator, Tensioning Insulator, Disc Insulator, Section/ Core Insulator, Post Insulator, Operating Rod Insulator. (These are one time design and are not repeated for every project/section. Specifications showing Electro-mechanical characteristics can be submitted once for every Project).

f) Conceptual Drawing for traction Return Current including longitudinal continuity and integral transfer links.

g) Design Calculations, Simulation, Drawings for Earthing and Bonding (including Earth Conductors and connection).

h) Simulation report of Electromagnetic Interference current including the effect of Booster Transformer and Return Conductors.

i) Detail of Feeder Protection

   I. Protection of Phase Gaps/Neutral Sections, Traction power transformer protection, power quality compensation equipment protection (if provided).

   II. Extension of Power in case of emergency

j) Calculations of permissible tensile loading of various conductors (refer 5.4.1 of EN 50119)

k) Calculation of Automatic Tensioning device horizontal and vertical movement, calculation of factorof safety of steel wire ropes.

l) Calculation of Horizontal deflection of contact wire as per international standard with respect toproposed Pantographs configuration.

m) Calculation of condemning diameter of contact wire.

n) Calculation of spans on tangent and curved track.

o) Calculation of dropper schedule

p) Simulation report of OHE and Pantograph interaction.

q) Calculation of touch and step potential and its Permissible values

r) Calculation for OHE structure safety, stability.

s) Bracket safety calculation.

4. Details of Power Supply Arrangement duly approved by Metro Authorities related to followings:

a) EIG application with following:
   i. Details of Power Drawl from the Power Grid.
   ii. General Arrangement Details of Sub-stations
   iii. Protection Philosophy and relay setting calculations.
   iv. Earthing Arrangement for the Power Supply Installations (Traction/ Non-Traction Power Transformer, Switching Posts).
   v. Equipment details.

b) Power supply simulation with electric loads for peak traffic and under extended feed conditions by validated simulation software.

c) Sizing of Transformers, Conductors, Bus-bars, Instrument Transformers. batteries, battery charger at traction sub-station (TSS), Sub-Sectioning andparalleling post(SSP), sectioning and paralleling post (SP), Circuit Breaker, Interrupter, Isolator.

d) Details of Insulating Oils along with their class and technical details.

e) References for proven-ness of various Assemblies/ Sub-assemblies/ Equipments usedin Overhead Traction Equipment.

f) Details of CT and PT used for protection and metering.

g) Details of Lightning arrestor.

h) Alternating current distribution board and direct current distribution board.

i) Details of power quality compensation equipment and calculation for it rating (if provided).

j) Philosophy of OHE fault localization scheme.

k) Technical details of Relay used for protection of OHE, Traction power transformer, power quality compensation equipment (if provided).

l) Details of Circuit Breaker, interrupter & isolator.

m) Insulation coordination of traction power & OHE system.

5. EIG Report and pointwise compliance (Duly signed by Head of the Electrical Engineering) of EIG observations.

6. Conceptual scheme and design details of Supervisory Control and Data Acquisition System (SCADA).

7. Safety Circulars, Procedures for grant and cancellation of Permit to Work.

8. Submission of test Certificates of Equipments:-

a) Type Test of Insulators,

b) Type Test of Contact & Catenary Wire,

c) Type test of Booster Transformer, if any.

d) Type Test of Traction Transformer,

e) Type Test of Protection Relays,

f) Type Tests Reports of SCADA and related equipments

g) Type Tests Reports of Mast, Portals (if different from RDSO Design)

h) Type test report of OHE fittings, Auto tensioning devices , dropper, CT, PT, Lightning Arrestor, power compensation equipment (if provided), Circuit Breaker, Interrupter, Isolator,

i) Type Tests Reports of battery and battery charger

Sr. No.	Doc. No.	Description	Doc. Type
1.	D1.1	Summary Sheet	PDF
2.	D1.2	Description of Traction & Power Supply System	PDF
3.	D1.3	Details of General Arrangement of OHE and General arrangement Drawing pertaining to Catenary Wire, Contact wire, Aerial Earth Wire, Buried Conductor, Buried Rail, Booster Transformer, Return Conductor. ➢ General arrangement drawings of OHE conductors should have material specification, test specification, breaking load and factor of safety. ➢ details of conductors calculation of condemning diameter of contact wire, continuous and short time rating of OHE	PDF
4.	D1.4	General arrangement Drawing pertaining to Cantilever Assemblies, Droppers Schedule, Jumpers. ➢ Design details of cantilever assembly ➢ Details of different design of cantilevers used in Metro project at different locations along with loads on cantilever and Bracket safety calculation ➢ design details of permissible uplift, clearance of bracket component from the pantograph pan in static and dynamic condition ➢ The part drawings of cantilever components should be provided with material & test specification for cantilever components. Breaking load and factor of safety should also be specified. ➢ design details of droppers - dropper type whether current carrying or non-current carrying, dropper specification, dropper calculation and drawing for current distribution through current carrying droppers in a span ➢ design details of jumpers, Specification of various types of Jumpers, Jumper locations, jumper applications, general arrangement drawing of jumpers with Fitting details ➢ General arrangement drawing of feeding and sectioning arrangement including traction feeding diagram and general arrangement drawing of position and details of neutral section and section insulator	PDF

Sr. No.	Doc. No.	Description	Doc. Type
5.	D1.5	General arrangement Drawing pertaining to Insulated Overlaps, Un-insulated Overlaps, Turnouts & Crossover arrangements, Anticreep arrangements, Termination, Anchoring ➢ Drawing of turnout and overlap should incorporate Design Data like encumbrance, spans, overlapping distance, clearances, stagger, contact wire uplift, jumper, & permissible speed. ➢ Design data of Auto tensioning devices like maximum temperature range, maximum tension, X-Y chart and maximum tension length upto which it can be used.	PDF
6.	D1.6	Basic Design Data and Calculation of Pre-sag of Contact Wire at mid-point, Gradient of Contact Wire (Relative and Absolute), Tension length, Maximum Span length with calculation, Stagger, Height of Contact Wires in Tunnels Bridges, Height of Contact Wires in Open Routes, Wind Load Calculation, Seismic zones as per IS: 875 (Part-3), Electrical Clearances (Longitudinal/ Lateral & Vertical - Static &Dynamic), Sweep zone of Pantographs & Panto-pressures. ➢ Criteria/Standard for Static and Dynamic Electrical Clearances ➢ Anti-creep wire specification , Suspension clamp drawing and calculation of tension in anti-creep wire ➢ Technical specification of pantograph and Clearance Diagram showing kinetic envelope and rollingstock height on straight as well as curved track	PDF
7.	D1.7	Design Details approved by Metro Authorities related to Typical Drawing of OHE at Support i.e. at Mast, at Portal , safety load calculation of portal, Safety calculation of the Mast against the Axial load (Axial stress in compression) as well as Bending moment (Bending stress in compression, Calculation for mast deflection etc.	PDF
8.	D1.8	Design Details and Drawings of Earthing approved by Metro Authorities for Viaduct/Tunnel (Typical), Receiving Sub-stations (RSS), Auxiliary Sub-stations (ASS), Size of earth strips at TSS, GSS and ASS.	PDF

Sr. No.	Doc. No.	Description	Doc. Type
9.	D1.9	Design Details approved by Metro Authorities related to Typical Drawing of Cantilever Arrangement for Single Bracket, Multiple Bracket and Fittings.	PDF
10.	D1.10	Design Details approved by Metro Authorities related to Make wise Drawing having Guaranteed Technical Parameters and referred standards for Insulators and their fittings (These are one time design and are not repeated for every project/ section. Specifications showing Electro-mechanical characteristics can be submitted once for every Project).	PDF
11.	D1.11	Design Details approved by Metro Authorities related to Conceptual Drawing for traction Return Current including longitudinal continuity and integral transfer links, Design Calculation_s of Earthing of 25 kV AC Traction System, Simulation Report of Earthing of 25 kV AC Traction System, Drawings for Earthing and Bonding (including Earth Conductors and connection). ➢ Calculation of touch and step potential and its Permissible values	PDF
12.	D1.12	Simulation report of Electromagnetic Interference current including the effect of Booster Transformer and Return Conductors.	PDF
13.	D1.13	Detail of Feeder Protection, protection of phase gaps/Neutral Sections, Plan for Extension of power in case of emergency ➢ Traction power transformer protection, power quality compensation equipment protection (if provided)	PDF
14.	D1.13.1	Protection of Phase Gaps/Neutral Sections	PDF
15.	D1.13.2	Extension of Power in case of emergency	PDF
16.	D1.14	Details of Power Supply Arrangement duly approved by Metro Authorities related to EIG application with Power Drawl from the Power Grid, General Arrangement Details of Substations, Protection Philosophy, Relay setting calculations, Earthing Arrangement for the Power Supply Installations (Traction/ Non Traction Power Transformer), Switching Posts, Equipment details. Insulation coordination of traction power & OHE system	PDF
17.	D1.15	Power Supply Simulation Report with Electric Loads for peak traffic and under extended feed conditions with validated	PDF

Sr. No.	Doc. No.	Description	Doc. Type
		simulation software	
18.	D1.16	Guaranteed Technical Parameters, General Arrangement, Sizing Calculations & Drawings for Traction Transformer and Auxiliary Transformer, batteries, battery charger, Circuit Breaker, Interrupter, Isolator, Lightning arrestor, Protection relays, CT, PT, AC & DC distribution board, power compensation equipment (if provided).	PDF
19.	D1.17	Details of Power Supply Arrangement duly approved by Metro Authorities related to Sizing of Conductors, Bus-bars and Instrument Transformers, Insulating Oils along with their class and technical details.	PDF
20.	D1.18	Approved by Metro Authorities related to References for proven-ness of various Assemblies/ Sub-assemblies/ Equipment's used in Overhead Traction Equipment.	PDF
21.	D1.19	EIG Report	PDF
22.	D1.20	Conceptual scheme of Supervisory Control and Data Acquisition System	PDF
23.	D1.21	Safety Circulars, Procedures for grant and cancellation of Permit to Work.	PDF
24.	D1.22	Submission of test Certificates of Type Test of Composite Insulators, Porcelain Insulators, Disc Insulator, Section Insulator assembly	PDF
25.	D1.23	Submission of test Certificates of Type Test of Contact Wire, Un insulated Catenary Wire, Insulated Catenary Wire. Type Test reports of ATD and Jumpers	PDF
26.	D1.24	Submission of test Certificates of Type test of Booster Transformer.	PDF
27.	D1.25	Submission of test Certificates of Type Test of Traction Transformer.	PDF
28.	D1.26	Submission of test Certificates of Type Test of Protection Relays, Control and relay Panel, Panto Flash-Over Protection Relay, SCADA.	PDF
29.	D1.27	Isolation schemes and interlocking at Maintenance Depot and	PDF

Sr. No.	Doc. No.	Description	Doc. Type
		substations as proposed by Metro Authority.	
30.	D1.28	GTP with reference Specification/standards, Type Tests Reports of Overhead equipments of ROCS and design details of ROCS (Rigid Over Head Catenary System) if used.	PDF
31.	D1.29	Test certificate of CT, PT, Lightning Arrestor, power quality compensation equipment (if provided), Circuit Breaker, Interrupter, Isolators, battery and batterycharger.	
32.	D1.30	Approved copy of Schedule of Dimensions	PDF

ANNEXURE-D-2

Details of general arrangement of Third rail traction system and power supply system at appropriate stage duly approved by Metro Authority.

1. Details of General Arrangement of Third Rail Traction System duly approved by Metro Authorities. General arrangement drawing pertaining to the following:

a) Third Rail,
b) Bridgeable & Non-Bridgeable Gaps,
c) Third Rail Ramps at Turnouts,
d) Mid Point Anchor,
e) Expansion Joints,
f) Insulated Joints (IJ),
g) Third Rail Brackets,
h) Power Feed Assemblies,
i) Splice Assemblies,
j) Vertical & horizontal clearances of Third Rail,
k) Feeding and Sectioning Arrangement including Traction Feeding Diagram.

Note: General arrangement drawing shall incorporate details of permissible continuous current carrying capacity, short time rating (30min, 1sec.), permissible maximum temperature for continuous & short time rating, size, relevant standard references, permissible tensile stress, Breaking load, factor of safety, allowable wear.

2. Basic Design Data approved by Metro Authorities for the followings:

a) Third Rail Characteristics, Material & Electrical Properties,
b) Third Rail current carrying capacity & Temperature Rise,
c) Electrical resistance,
d) Peak Current Temperature Rise,
e) Short Circuit Level,
f) Third Rail Bracket Spacing,
g) Horizontal & Vertical Clearances of Third Rail,
h) Shroud for Third Rail,
i) Third Rail mounting insulator.
j) Specification of Third Rail System and its components
k) Basic design data as per EN50119 clause 4 Page 15 & 16 (attached) or any other relevantinternational standard followed in a project.
l) Temperature rise in all type of Rail, bare conductors, insulated conductors (Cables), forpermanent, up to 30 min, up to 1 sec.
m) Electrical clearances of pantograph/Current collector and third rail from adjacent structures, in static and dynamic condition of train. Relevant National/International standard for Electrical clearance.
n) Wind speed and wind pressure as per the Indian Standard **IS:875 (Part-3)-2015 or its latest version** for the Zone of electrification. Wind speed and wind pressure

considered for the design of structure, under operating condition, under stationary condition.

o) Design quality of current collection-loss of contact.
p) Permissible range of pantograph contact force (maximum & minimum).
q) Permissible tensile stress, factor of safety, permissible wears of all type of Rail, conductors.
r) Tolerances and limit of construction and operation as per clause 5.14 of EN 50119.
s) Third Rail System Installation and maintenance procedure, checks before & after installation
t) Details of the Acceptance test and commissioning after installation of Third Rail system.
u) Precautions and protections for Human safety.
v) List of standards used for designing and testing of Third Rail System.

3. Design Details for Third Rail System approved by Metro authorities should also be given for records as under:

a) Design calculations of Third Rail, Bracket, Insulated Joints, Expansion Joints, Ramps, Third Rail current carrying capacity & Temperature Rise
b) Thermal Expansion,
c) Conductor Rail Deflection,
d) Bracket Loading Calculations,
e) Bracket mechanical Validation,
f) Bracket Welding Validation,
g) Design Calculations for traction Return Current,
h) Design Calculations for Earthing and Bonding for Receiving Substation, Traction Substation and Auxiliary Substation Calculations of Electromagnetic Interference / Electro Magnetic Compatibility,
i) Bridgeable & Non-Bridgeable Gaps,
j) Extension of power in case of emergency.
k) Calculation for safety, stability of structures supporting Third rail system.
l) Touch potential calculation, Stray current calculation.

4. Details of Power Supply Arrangement duly approved by Metro Authorities for the following:

a) Details of Power Drawl from the Power Grid.
b) General Arrangement Details of Sub-stations. Documents shall adhere to latest Indian Electricity Rules & Statutes in force.
c) Protection Philosophy, Engineering Details along with calculations for High Voltage Circuits, Low Voltage Circuits and Transformers which shall include Traction and non-Traction loads.
d) Power Supply Redundancy for all loads (Traction and Non-Traction Loads)
e) Earthing Arrangement for the Power Supply Installations (Traction/ Non- TractionPower Transformer, Switching Posts.)
f) Earthing, Bonding and Stray current mitigation, monitoring and control
g) Philosophy, Stray Current Control, EMC Validation Arrangement for Power Supply Installations (Traction/Non Traction Power Transformation, Switching Posts.)Power supply Simulation with Electric Loads for peak traffic and under extended/diverted

Feed by validated simulation software.

h) Power supply Simulation/Calculations with Electric Loads for peak traffic and under extended/diverted Feed as case to case basis.

i) Short Circuit Levels unbalance, Voltage Drop Calculations.

j) Sizing of Transformers, Conductors, Bus-bars, Instrument Transformers, Surge Protection, batteries, battery charger .

k) Details of Insulating Oils along with class and technical details.

l) Details of Auxiliary Power Distribution including transformation details from grid to point of consumption, layout of Auxiliary Power Lines, Redundancy and Protection.

m) References for proven-ness of various Assemblies/ Sub-assemblies/ Equipments usedin Third Rail System.

n) Details of CT and PT used for protection and metering.

o) Alternating current distribution board and direct current distribution board.

p) Technical details of Relay used for protection of feeder, Traction power transformer, rectifier.

q) Insulation coordination of traction power & OHE system.

5. EIG Report.

6. Details of Supervisory Control and Data Acquisition System.

7. Declaration of Safety Policy, Procedures for grant and cancellation of permit to work.

8. Submission of Type test certificates applicable to Third Rail system as under:

a) Third Rail including assembly and accessories,

b) Power Cable, DC Cable, Control Cable & Optical Fibre Cables,

c) Rectifier Traction Transformer,

d) Auxiliary Transformer,

e) DC Equipments (Rectifier, HSCB Panel, BY Pass Panel, Dis-connector Switch, ShortCircuit Device at Sub Stations, Negative Return Panel),

f) Sandwich Bus-duct,

g) C&R Panels,

h) Switchgear Panels,

i) SCADA & Related Equipments,

j) Battery, Battery Charger, UPS,

k) Alternating Current Distribution Board and Direct Current Distribution.

l) Type test report of CT, PT, Circuit Breaker, Isolators, protection relay

Sr. No.	Doc. No.	Description	Doc. type
1.	D2.1	Summary Sheet	PDF
2.	D2.2	Brief Description of Project and Third Rail Traction & Power Supply System	PDF
3.	D2.3	Details of General Arrangement of Third Rail Traction System and General arrangement Drawing pertaining to Third Rail, Bridgeable & Non-Bridgeable Gaps, Third Rail Ramps at Turnouts, Mid Point Anchor, Expansion Joints, Insulated Joints (IJ), Third Rail Brackets, Power Feed Assemblies, Splice Assemblies, Vertical & horizontal clearances of Third Rail, Feeding and Sectioning Arrangement including Traction Feeding Diagram.	PDF
4.	D2.4	Basic Design Data for Third Rail Characteristics, Material & Electrical Properties, Basic Design Data and Calculations for Third Rail current carrying capacity & Temperature Rise, Electrical resistance, Peak Current Temperature Rise, Short Circuit Level, Third Rail Bracket Spacing, Horizontal & Vertical Clearances of Third Rail, Shroud for Third Rail, Third Rail mounting insulator.	PDF
5.	D2.5	Design Details for Third Rail System for records of Design calculations of Third Rail, Bracket, Insulated Joints, Expansion Joints, Ramps, Third Rail current carrying capacity & Temperature Rise, Thermal Expansion, Conductor Rail Deflection, Bracket Loading Calculations, Bracket mechanical Validation, Bracket Welding Validation, Design Calculations for traction Return Current, Design Calculations for Earthing and Bonding for Receiving Substation, Traction Substation and Auxiliary Substation Calculations of Electromagnetic Interference / Electro Magnetic Compatibility, Bridgeable & Non-Bridgeable Gaps, Extension of power in case of emergency.	PDF
6.	D2.6	Details & Drawings of Power Supply Arrangement for Power Drawl from the Power Grid, General Arrangement Details of Sub-stations. Documents shall adhere to latest Indian Electricity Rules & Statutes in force.	PDF
7.	D2.7	Protection Philosophy, Engineering Details along with calculations for High Voltage Circuits, Low Voltage Circuits and Transformers which shall include Traction and non-Traction loads.	PDF
8.	D2.8	Power Supply Redundancy for Traction load and Power Supply Redundancy for Non-Traction Loads, provisions of fire protection for traction and auxiliary transformers, fire protection system in tunnel.	PDF
9.	D2.9	Earthing Arrangement for the Power Supply Installations for Traction Power Transformer, Earthing Arrangement for the Power Supply Installations for non-Traction Power Transformer, Earthing	PDF

Sr. No.	Doc. No.	Description	Doc. type
		Arrangement for the Power Supply Installations for Switching Posts.	
10.	**D2.10**	Design Calculations of Earthing of Third rail Traction System, Simulation Report of Earthing of Third rail Traction System, Drawings for Earthing and Bonding (including Earth Conductors and connection). Earthing& Bonding and Stray current mitigation, monitoring and control Scheme, Earthing of tunnel and piers., isolation of DC traction system in tunnel, stray current mitigation with calculation, monitoring and control system for stray current mitigation, Insulation coordination of traction power & OHE system	PDF
11.	**D2.11**	Protection Philosophy, Stray Current Control, EMC Validation Arrangement for Power Supply Installations (Traction/Non Traction Power Transformation, Switching Posts.), Power supply Simulation with Electric Loads for peak traffic and under extended/diverted Feed condition, with validated simulation software.	PDF
12.	**D2.12**	Power supply Simulation/Calculations with Electric Loads for peak traffic and under extended/diverted Feed as case to case basis.	PDF
13.	**D2.13**	Short Circuit Levels unbalance and Voltage Drop Calculations	PDF
14.	**D2.14**	Guaranteed Technical Parameters, General Arrangement, Sizing Calculations & Drawings for Traction Transformer and Auxiliary Transformer, Conductors, Bus-bars, Instrument Transformers, Surge Protection, and Details of Insulating Oils along with class and technical details, rectifiers, batteries, battery charger, Circuit Breaker, Isolator, Protection relays, CT,PT, AC & DC distribution board	PDF
15.	**D2.15**	Details of Auxiliary Power Distribution including transformation details from grid to point of consumption, layout of Auxiliary Power Lines, Redundancy and Protection.	PDF
16.	**D2.16**	References for proven-ness of various Assemblies/ Sub-assemblies/ Equipments used in Third Rail System.	PDF
17.	**D2.17**	Details of Power Supply Arrangement duly approved by Metro Authorities related to Sizing of Conductors, Bus-bars and Instrument Transformers.	PDF
18.	**D2.18**	Details of Power Supply Arrangement duly approved by Metro Authorities related to various assemblies References for proven-ness of various Assemblies/ Sub-assemblies/ Equipments used in third rail traction system.	PDF
19.	**D2.19**	EIG Report	PDF

Sr. No.	Doc. No.	Description	Doc. type
20.	**D2.20**	Conceptual scheme of Supervisory Control and Data Acquisition System	PDF
21.	**D2.21**	Safety Circulars, Procedures for grant and cancellation of Permit to Work.	PDF
22.	**D2.22**	Submission of test Certificates of Type Test of Third Rail including assembly and accessories, Power Cable, DC Cable, Control Cable & Optical Fiber Cables.	PDF
23.	**D2.23**	Submission of test Certificates of Type Test of Rectifier Traction Transformer, Auxiliary Transformer	PDF
24.	**D2.24**	Submission of test Certificates of Type Test of DC Equipments (Rectifier, HSCB Panel, BY Pass Panel, Dis-connector Switch, Short Circuit Device at Sub Stations, Negative Return Panel).	PDF
25.	**D2.25**	Submission of test Certificates of Type Test of Sandwich Bus-duct, Control & Relay Panels, Switchgear Panels, Battery, Battery Charger, UPS.	PDF
26.	**D2.26**	Submission of test Certificates of Type Test of SCADA & Related Equipment.	PDF
27.	**D2.27**	Submission of test Certificates of Type Test of Alternating Current Distribution Board and Direct Current Distribution, CT, PT, Circuit Breaker, Isolator and relay.	PDF
28.	**D2.28**	Isolation schemes at Maintenance Depot as proposed by Metro Authority.	PDF
29.	D1.29	Approved copy of Schedule of Dimensions	PDF

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