

b) Casing

Casing shall be of 2mm thick MS for impeller dia up to 600mm and 2.5mm thick MS for impeller dia above 600mm. Casing shall have flanged connection on both ends for ducted application. It shall be provided with suitable supports. Access door shall be provided in the casing for easy access to motor and impeller. Suitable arrangement for mounting of motor shall be provided.

c) Guide Vanes

In case of vane axial fans guide vane shall be provided on the discharge side.

d) Guards

Suitably designed guards shall be supplied. The fan motor construction should be of class H type. The fan shall be hanged from slab accordingly suspension rod are to be designed to take care of fan dynamic load as well as fire retardant flexible connection has be provided along with necessary fittings and accessories.

All the axial fans shall be AMCA (Air Movement and Control Associates Incorporation of USA) certified for air performance.

Accessories: The following accessories shall be provided with propeller fans:

- i. Wire guard on inlet side and bird screen at the outlet.
- ii. Fixed or gravity louvers built into a steel frame at the outlet.
- iii. Regulator for controlling fan speed for single phase fan motor.
- iv. Single phase preventors for 3 phase fans.
- v. Provision to provide digital input signal to SCADA system

8.10 BALANCING

The air distribution system shall be tested/ balanced so that the requisite temperature and air flow are maintained throughout the space to be air-conditioned/ ventilated.

Branch duct adjustments shall be permanently marked after air balancing is completed so that these can be restored to their correct position if disturbed at any time.

During startup phase, Contractor shall make all arrangement for drilling and plugging of all test openings/holes, adjustment of volume dampers, adjusting of fan speed to obtain specified flows, obtaining actual motor ampere readings, and all related functions to ensure the proper operation of all HVAC systems.

Test holes for plant system commissioning shall be minimum 20 mm dia. to accept a standard pitot tube of 8 mm dia. and each hole shall be fitted with an effective removable type seal. Location of test holes shall be decided by Contractor in consultation with Engineer-in-Charge.

All instruments required for testing / balancing the air distribution system shall be provided by Contractor.

Complete air balance report shall be submitted for and scrutiny and approval four copies of the approved balance report shall be provided with completion documents.

8.11 ACCEPTANCE REQUIREMENTS

Before acceptance, Air conditioning system shall be completely adjusted, properly balanced and indoor units placed in such a way to provide specified uniform space temperatures without any hot spots as per given design conditions.

Proper damper settings shall be indicated clearly in a manner permanent for operations as required.

Room Condition for air conditioned space will be $24^{\circ}\pm 1^{\circ}\text{C}$ and RH $50\pm 5\%$. Equipment and parts shall be guaranteed against defective material, poor workmanship, improper mechanical design, and failure from normal usage for a minimum of 1 year after placement in service or 18 months after date of shipment, whichever date is earlier. Parts found defective within specified guarantee period shall be repaired or replaced without charge. Capacities and performance requirements stated in this specification shall be guaranteed.

8.12 CODES AND STANDARDS

The system, design, materials, equipment and installation shall comply with all other applicable codes & standards and issued by:-

Table: Codes for HVAC Works

Codes	Description
	National Building Code 2005
	Energy Conservation Building Code 2008
ASHRAE 90.1-2009	ANSI/ ASHRAE/ IESNA standard 90.1-2009: Energy standard for buildings except low rise residential buildings.
	AMCA : Air Movement and Control Association
	ARI - American Refrigeration Institute
AHRI 410-2001 with Addenda 1, 2 and 3	Forced-Circulation Air-Cooling and Air-Heating Coils
ANSI/AHRI 430-2009	Central Station Air Handling Units
ANSI/AHRI 440-2008	Performance Rating of Room Fan-Coils
AHRI 550	Standard for centrifugal or rotary screw water chilling packages.
AHRI 575	Standard for method of measuring machinery sound within equipment room.
ASME: Section VIII Div.1	Code for Unfired Pressure Vessels Section VIII (Design; construction, testing and certification of pressure vessels) with 'U' stamping
ANSI B31.5	Code for Refrigeration piping
ASME B31.1	Code for Process piping
	Cooling Technology Institute, CTI
ATC-105-00	Acceptance Test Code for Water-cooling Towers (CTI Std-103)

Codes	Description
	Code Tower Standard Specifications).
ATC-201-96	Standard for Certification of Water Cooling Tower Performance (CTI Code Tower Standard Specifications).
ISO 2858, 5199	Specifications for pumps
ASHRAE 52.1-1992	Air Filters
ASHRAE 62-1-2007	Indoor Air Quality
	Duct Fabrication as per SMACNA
IS : 277 – 1977	GI Sheets
IS : 737	Aluminum Sheets
IS : 325	Three-phase induction motors
IS : 659	Safety code for air conditioning,
IS : 660	Safety code for mechanical refrigeration
IS : 4671	Expanded polystyrene for thermal insulation purposes
IS : 4894	Centrifugal Fans
IS : 1239 & IS 3589	Pipe & Pipe Fitting
	Fire Damper UL555, CBRI approved
IS : 659 – 1964 (Reaffirmed 1991)	Air conditioning (Safety Code)
IS : 660 – 1963 (Reaffirmed 1991)	Mechanical Refrigeration (Safety Code)
BS : EN:779 – 1993	Filters
ASHRAE Hand Books	American Society of Heating Refrigeration & Airconditioning Application 2007. Fundamentals 2005. Refrigeration 2006. Systems & Equipment 2008. ASHRAE Indoor air quality Standard 62.1-2007. ASHRAE 90.1-2007 ASHRAE 55-2004 ASHRAE 52.1 and 52.2
IEC	Relevant Sections.

9.0 FIRE FIGHTING WORKS REQUIREMENTS

The design shall comply with rules of the local fire service department / authorities.

The Fire Protection System design shall be based on the following codes & Standards :

Table 6: Codes for Fire Fighting Requirements

Codes / Specifications	Description
National Building Code 2005	Part 4, Fire & Life Safety
Tariff Advisory Committee (TAC)-12th Edition-1998	Fire Protection Manual
Tariff Advisory Committee (TAC)-1998 Edition	Rules for automatic Sprinkler Installations
Tariff Advisory Committee (TAC)	Rules for Water Spray System

IS:3844-1989 (1995)	Fire Protection Manual
IS:13039:1991	Fire Protection Manual
IS 15105: 2002	Design and Installation of Fixed Automatic Sprinkler Fire Extinguishing System-Code of Practice
IS 12459: 1988	Code of Practice For Fire Safety In Cable Runs
IS 12469: 1988	Fire Fighting Pumps
IS 5120: 1977	Technical requirement for Rotodynamic Special Purpose Pumps
IS 325: 1996	Three-Phase Induction Motor
IS 3042: 2003	Specification For Single Faced Sluice Gates
IS 2190: 2010	Selection, Installation and Maintenance of First-Aid Fire Extinguishers- Code of Practice
IS 15683:2006	Potable Fire Extinguishers - Performance and Construction Specification
IS 5: 1994	Colours for Ready Mixed Paints and Enamels (Fourth Revision)
IS 1239 (part-I): 1990	Mild Steel Tubes, Tubulars and Other Wrought Steel Fittings: Part-I Mild Steel Tubes (Fifth Revision)
IS 1239: (Part-II): 1992	Mild Steel Tubes, Tubulars and Other Wrought Steel Fittings: Part-II Mild Steel Tubulars and Other Wrought Steel Pipe Fittings (Fourth Revision)
IS 3589: 2001	Steel Pipes for Water and Sewage (168.3 to 2540 mm Outside Diameter) – Specification (Third Revision)
IS 6392: 1999	Specification for Steel Pipe Flanges (Seventh Reprint)
IS 12835: Part I: 1989	Code of practice for design and installation of fixed fire extinguishing system Part 1 Low expansion foam
IS:10221:1982	Code of Practice for Coating & Wrapping of underground Mild Steel Pipe Lines
IS: 5290:1983	Specification for Valve Landing (Second Revision)
IS:8442:1977	Specification for stand post type water monitor for fire fighting
IS:636:1988	Non-percolating flexible fire fighting delivery hose
IS:8423:1977	Specification for Controlled percolating hose for fire fighting
IS:4927:1968	Specification for unlined flax canvas hose for fire fighting (Amendment Nos. 1 & 2)
IS:903:1984	Specification for Fire Hose Delivery Couplings, Branch Pipe, Nozzles and Nozzle Spanner (Third Revision)
IS:906:1988	Specification for branch with revolving head for fire fighting purposes
IS 907: 1984	Specification for suction strainers, cylindrical type for fire fighting purposes(second revision)
IS:2871:1983	Specification for branch pipe, universal for fire fighting purposes (First revision)

IS: 884:1985	Specification for First Aid Hose Reel for fire fighting (First Revision) (Amendment No.1)
IS:940:1989	Specification for Portable Fire Extinguisher (Gas Pressure)
IS:2171:1985	Specification of Portable Fire Extinguisher, Dry Powder (Cartridge Type) (third Revision)
IS:2878:1986	Portable & Trolley Mounted CO2 type fire extinguisher (Third Revision)
IS:4947:1985	Specification for Gas Cartridges for use in fire Extinguishers-CO2 type (Second Revision) (Amendment Nos. 1 and 3)
IS:944:1979	Functional requirements for 1800 L/min. Trailer pump for Fire brigade use.(Second Revision) (Amendment No. 1)
IS:946:1977	Functional requirements for Engines for Motor Fire Engines (First Revision)
IS:947:1985	Functional requirements for towing tender for trailer fire pump for Fire brigade use (First Revision)
IS:10001, IS:10002	Diesel Engine-General Purpose
IS:13095: 1991	Butterfly valves
IS: 14846	Sluice Valves for Water Works 50-1200mm
IS: 9890	Ball Valves for General Purposes
IS 3624: 1987	Pressure and Vacuumed Gauge (Second Revision)
IS 2097: 1983	Specification for foam making branch pipe (first revision)
IS: 5312	Specification for Swing Check Valve
ASME B 36.10	Welded and Seamless Wrought Steel Pipe
BS:5150	C.I. Gate Valves/ Rising Stem types PN 16
BS:5153	C.I. Reflux Valves/Check Valves (Swing Type) PN16
BS:1414	Steel Wedge Gate Valves
BS:1868	Steel Check Valves
NFPA 1	NFPA Fire Prevention Code
NFPA 10	Standard for Portable Fire Extinguishers 1998 Edition
NFPA-11	Standard for installation of Low expansion Foam system
NFPA-13	Standard for installation of Sprinkler System
NFPA-15	Standard for Water Spray fixed system for the fire protection system
NFPA-20	Standard for the Installation of Stationary Pumps for Fire Protection
NFPA-2001	Standard on clean agent fire extinguishing system
NFPA-25	Standard for the Inspection, Testing, and Maintenance of. Water-Based Fire Protection Systems
NFA-16	Standard for installation of Foam water sprinkler system or Foam water spray system

NEMA	National Electricity Manufacturers Association
IEEE	Institute of Electrical and Electronic Engineers
ISA	Instrumentation, Systems and Automation society
ANSI	American National Standards Institute
DIN	Deutsche Industries Norman
IEC	International Electrochemical Commission
VDE	Verin Deutschar Eisechhuttenleutte
ISI	Indian Standard Institute
BS 5839	Code of practice for installation of fire alarm system
IS 2189	Code of practice for installation of automatic fire alarm system
IS:817/2008	Welded joints
UL / FM	Underwriters Laboratory / Factory Manual

10.0 PLUMBING WORKS SYSTEM

10.1 WATER SUPPLY SYSTEM

CODES AND STANDARADS

Unless specifically mentioned otherwise, all the applicable codes and standards published by the Bureau of Indian Standards and their subsequent revision shall govern in respect of design, workmanship, quality and properties of materials and method of testing.

The material supplied shall comply with the latest applicable Indian and / or British Standards. Other National Standards are acceptable, if they are established to be equal or superior.

Following codes and standards are made part of this specification:

Table 7: Codes for Plumbing Works

IS 10446 – 1983	Glossary of terms relating to water supply and sanitation.
IS 7558-1974	Code of practice for domestic hot water piping installations
IS 2692-1989	Specification for Ferrules For Water Services.
IS 1239	Mild steel tubular and other wrought steel pipes and fittings (Part-I)
IS 1239	Mild steel tubular and other wrought steel pipes and fittings (Part-II)
IS 779 -1978	Specifications for Water Meters - Domestic Type
IS 2104 – 1981	Specification for water meter boxes (Domestic type).
IS 2401–1973	Code of practice for selection, installation, and maintenance of domestic water meters.
IS 7413-1981	Insulation Material
IS 2065 –1983	Code of practice for Water Supply In Buildings (Second Revision)

IS 778- 1984	Specifications for copper alloy Gate, Globe And Check Valves for water supply purposes.
IS 1703 – 1977	Specification for ball valves (horizontal plunger type)including floats for water supply purposes.
IS 3004 – 1979	Specification for plug cocks for water supply purposes.
IS 3950 – 1979	Specifications for surface boxes for sluice valves.
IS 9338 – 1984	Specification for cast iron screw-down stop valves and stop and check valves for water works.
IS 4346 – 1982	Specification for washers for use with fittings for water services.
IS 5219 – Part 1	Specification for cast copper alloy traps – Part1 1982
IS 5312 – part 1	Specification for swing check type reflux (Non-return) 1969 valve for water works purposes part 1 single door pattern
IS 13049 – 1919	Diaphragm type (plastic body) float operated valve for cold water services – specification.
IS 13114 – 1991	Forged brass gate, globe and check valves for water works purposes – specification.
IS 14399 – part 1	Hot press moulded thermosetting glass fibre reinforced & Part 1 – 1996 polyester (GRP) resin sectional water storage tanks.
IS 310 –1965	Code of Practice for Water Supply
SP –35	Handbook of water supply and drainage (with special emphasis on plumbing)
IS 1172-1983	Code of Basic Requirement For Water Supply, Drainage & Sanitation (Third Revision)
IS 12183	Code of practice for Plumbing In Multi- Storey buildings Part I) – 1987 (Part 1 water supply)
IS 1200 - 1992	Method of Measurement Of Building And Civil Engg. Works.(Part 1 earthwork)
IS 2379 –1963	Specification of colour code for the identification of pipes.
SP 7 – 1983	National building code of India (Part IX – Plumbing services)
IS 2401 – 1973	Code of practice for selection, Installation and maintenance of domestic water meters.
IS 780-1984	Specification for Sluice valves for water works purposes (50 to 300mm size) (Sixth Revision)
	The Contractor shall comply with the water requirement, water supply lines and sewer lines as per the following manuals and Standards.
CPHEEO	Manual on water supply and treatment
CPHEEO	Manual on sewerage and sewage treatment

All the requirements must be in accordance with the statutory / authorities requirements.

10.2 SANITARY AND SEWERAGE SYSTEMS

CODES AND STANDARDS

Unless specifically mentioned otherwise, all the applicable codes and standards published by the Bureau of Indian Standards and their subsequent revision shall govern in respect of design, workmanship, quality and properties of materials and method of testing.

Following [Table 8] are the standards and codes are made part of these specifications.

Table 8: Codes for Sanitary and Sewerage System

Codes	Description
IS 10446 – 1983	Glossary of terms relating to water supply and sanitation.
IS 11208 –1985	Guidelines for registration of Plumbers
IS 5382 – 1985	Specification for rubber sealing rings for gas mains, water mains and sewers.
SP – 35	Handbooks of water supply and drainage (with special emphasis on plumbing)
IS 1172-1983	Code of Basic Requirement For Water Supply, Drainage & Sanitation (Third Revision)
IS 1200 - 1992	Method of Measurement Of Building and Civil Engg. Works.(Part 1 earthwork)
IS 2379 –1963	Specification of colour code for the identification of pipes.
SP 7 – 1983	National building code of India (Part IX – Plumbing services)
IS 1742 – 1983	Code Of Practice For Building Drainage (Second Revision)
IS 301 – 1971	Code of practice for Building Drainage
IS12251- 1987	Code Of Practice For Drainage In Basement
BS 5572 -1978 (Amendment No.2)	Sanitary pipe Works
BS 4660- 1973 (Amendment No.1)	PVC Underground Drain Pipes & Fittings.
IS 5329 – 1983	Code of practice for sanitary pipe work above ground for buildings (First Revision)
IS 2527 – 1984	Code of practice for fixing rain water gutters and down take pipes for roof drainage. (First Revision) I
IS 5961 – 1970	Specification for cast iron gratings for drainage purposes.
IS 2527 – 1984	Code of practice for fixing rain water gutters and down take pipes for roof drainage. (First Revision)
CPHEEO	Manual on sewerage and sewage treatment
IS 1626 (Part 1)	Specification for asbestos cement building pipes and pipe –1980 fittings, gutter and gutter fittings, and roof fittings

11.0 ROAD WORKS

11.1 Roads and Parking Areas:

Standards and Specifications for Roads and Parking Areas are given in this section;

11.2 The Codes, Standards and Technical Specifications applicable for the design and construction are as given under;

- i. Indian Roads Congress (IRC) Specifications, Standards, Design Codes
- ii. IRC Special Publications
- iii. Ministry of Surface Transport Publications (Now Ministry of Shipping, Road Transport & Highways) – Part A
- iv. Policy circular/Advisory letters issued to all states/UTs on the matter pertaining to urban transport April 2008 – October 2014

Latest version of the Codes, Standards, Specifications, etc., notified/published at least 60 days before the last date of bid submission shall be considered applicable.

11.3 Where the Contractor intends to use an alternative to these Standards/Guidelines for delivering an equal or better product, he shall be permitted to use such alternative subject to the following conditions:

He shall demonstrate that the proposed alternative conforms to any of the following international Standards, Codes of Practice, Specifications, Guidelines, etc.

- I. American Association of State Highway and Transportation Officials (AASHTO)
- II. American Society for Testing of Materials (ASTM)
- III. Euro Codes
- IV. National Standards of any of the following countries: United States of America (USA), Canada, United Kingdom (UK), France, Germany, Sweden, Denmark, Norway, Netherlands, Spain, Australia, New Zealand, Japan and South Africa

In case the Contractor intends to use any alternative material/technology/method, whether patented or otherwise, that is not specifically covered in the Indian or International Standards as listed above, but the use of which has been permitted on similar projects (similar in category of road, traffic and climatic conditions) as the Project Road, he would be permitted, its use on certification by the owners of such similar projects regarding the continued successful performance of such materials, technologies, methods, procedures or processes for at-least 5 years of the service life of the project. Such a certification shall be supported with details of critical performance parameters.

11.4 Standards and Specifications for Construction

The Contractor shall comply with the Standards and Specifications for Construction of Roads and Parking Areas as given below.

All materials, works and construction operations shall conform to the Specifications for Road and Bridge Works (Fifth Revision, April 2013), issued by the Ministry of Road Transport & Highways (MoRT&H). Where the Standards and Specifications for a work are not given, Good Industry Practice shall be adopted to the satisfaction of the Employer's Engineer.

11.5 List of Standards: List of Standards is given in Table: 12

Table 12

Code/Document No.	Description
1. IRC: 3-1983	Dimensions and weights of Road Design Vehicles
2. IRC: 32-1969	Standard for vertical and horizontal clearances of Overhead electric power and telecommunication lines as related to roads
3. IRC: 35-1997	Code of Practice for Road Markings (with Paints) (First Revision)
4. IRC: 37 -2012	Tentative Guidelines for the Design of Flexible Pavements
5. IRC: 38-1988	Guidelines for the design of curves for Highways & Design tables (First Revision)
6. IRC: 56-2011	Recommended Practices for Treatment of Embankment and Roadside Slopes for Erosion Control (First Revision)
7. IRC: 67-2012	Code of Practice for Road Signs (Third Revision)
8. IRC: 69-1977	Space Standards for Roads in Urban Areas
9. IRC: 86-1983	Geometric Design Standards for Urban Roads in Plains
10. IRC: 93-1985	Guidelines on Design and Installation of Road Traffic Signals
11. IRC: 98-2011	Guidelines on Accommodation of Underground Utility Services Along and Across Roads in Urban Areas (Second Revision)
12. IRC: 99-1988	Tentative Guidelines on the Provision of Speed Breakers for Control of Vehicular Speeds on Minor Roads
13. IRC: 103-2012	Guidelines for Pedestrian Facilities
14. IRC: SP: 23-1983	Vertical Curves for Highways
15. IRC: SP: 31-1992	New Traffic Signs
16. IRC: SP: 41-1994	Guidelines on Design of At-Grade Intersections in Rural & Urban Areas
17. IRC: SP: 44-1996	Highway Safety Code
18. IRC: SP: 50-2013	Guidelines on Urban Drainage
19. IRC: SP: 62-2004	Guidelines for the Design and Construction of Cement Concrete Pavement for Rural Roads
20. IRC: SP: 63-2004	Guidelines for the Use of Interlocking Concrete Block Pavement

12.0 Deleted

13.0 SOLID WASTE MANAGEMENT SYSTEM

The following standards and codes and statutory requirements to be followed for design and implementation of the Solid Waste Management:

Table 16

Codes / Manuals	Description
CPHEEO	Manual on Municipal Solid Waste Management, Ministry of Urban Development, Government of India, 2000.
Guidelines by Supreme Court of India, 1999.	Solid waste management in class-I cities in India
[20/7/1998], S.O.630 (E), 1998.	Bio-medical waste (management and handling) rules
S.O. 2400(E), 1999.	Recycled plastic (manufacture and usage) rules
[25.9.2000], S.O. 908(E), 2000 and the amendment 2013.	Municipal waste (Management and Handling Rules),
	Batteries (Management and handling) Rules, 2001.
1999, S. O.705 (E), 2003.	Amendment to the Recycled Plastic Manufacturing and Usage Rules,
[17.9.2003], S.O.1069 (E), 2003.	Bio-Medical Waste (Management and Handling) (Amendment) Rules,
	Hazardous waste management and handling rule, 1989.
S.O.2265 (E), 2008	Hazardous Wastes (Management, Handling and Trans boundary Movements) Rules,.
S.O. 2400(E), 2009.	Plastics (Manufacture, Usage and Waste Management) Rules, [17.09.2009],
	E waste (Management and handling) Rules, 2011.
	DSIR bye-laws.

Schedule E - Maintenance Requirements

(See Clauses 2.1 and 14.2)

1.0 Maintenance Requirements

- 1.1 The Contractor shall, at all times maintain the Project Components (Service area plots including buildings) in accordance with the provisions of this Agreement, Applicable Laws and Applicable Permits.
- 1.2 The Contractor shall repair or rectify any Defect or deficiency set forth in Paragraph 2 of this Schedule-E within the time limit specified therein and any failure in this behalf shall constitute non-fulfilment of the Maintenance obligations by the Contractor. Upon occurrence of any breach hereunder, the Employer shall be entitled to effect reduction in monthly lump sum payment as set forth in Clause 14.6 of this Agreement, without prejudice to the rights of the Employer under this Agreement, including Termination thereof.
- 1.3 All materials and works for operations and maintenance of roads and pavements shall conform to the Specifications for Road and Bridge Works (Fifth Revision, April 2013), issued by the Ministry of Road Transport & Highways (MoRT&H) and the relevant IRC publications.
- 1.4 All materials and works for operations and maintenance of Potable water supply system and distribution networks including valves, flow meters etc. shall conform to CPHEEO Manual and NBC on Operation and Maintenance of water supply systems, 2005, MoUD, GOI
- 1.5 Where the Standards and Specifications for any of the above work are not given, Good Industry Practice shall be adopted to the satisfaction of the Employer's Engineer.

2.0 Repair/Rectification of Defects and Deficiencies

The obligations of the Contractor in respect of Maintenance Requirements shall include repair and rectification of the Defects and deficiencies specified in Appendix E-I of this Schedule-E within the time limit set forth therein.

3.0 Other Defects and Deficiencies

In respect of any Defect or deficiency not specified in Appendix E-I of this Schedule-E, the Employer's Engineer may, in conformity with Good Industry Practice, specify the permissible limit of deviation or deterioration with reference to the Standards and Specifications, and any deviation or deterioration beyond the permissible limit shall be repaired or rectified by the Contractor within the time limit specified by the Employer's Engineer.

4.0 Extension of Time Limit

Notwithstanding anything to the contrary specified in this Schedule-E, if the nature and extent of any Defect or deficiency justifies more time for its repair or rectification than the time specified in Schedule M, the Contractor shall be entitled to additional time in conformity with Good Industry Practice. Such additional time shall be determined by the Employer's Engineer and conveyed to the Contractor and the Employer with reasons thereof.

5.0 Emergency Repairs/Restoration

Notwithstanding anything to the contrary contained in this Schedule-E, if any Defect, deficiency or deterioration in the Project Components poses a hazard to safety or risk of damage to property, the Contractor shall promptly take all reasonable measures for eliminating or minimizing such danger.

6.0 Daily Inspection by the Contractor

The Contractor shall, through its engineer, undertake a daily visual inspection of the Project Components (Service Area Plots including Buildings) and maintain a record thereof in a register to be kept in such form and manner as the Employer's Engineer may specify. Such record shall be kept in safe custody of the Contractor and shall be open to inspection by the Employer and the Employer's Engineer at any time during office hours.

7.0 Repairs On Account Of Natural Calamities

All damages occurring to the Project Components (Service Area Plots including Buildings) on account of a Force Majeure Event or default or neglect of the Employer shall be undertaken by the Employer at its own cost. The Employer may instruct the Contractor to undertake the repairs at the rates agreed between the Parties.

Appendix E-I – Repair / Rectification of Defects and Deficiencies

(Schedule-E)

The Contractor shall repair and rectify the Defects and deficiencies specified in this **Appendix E-I** of Schedule-E.

1. Architectural , Civil maintenance

- 1.1. Any break down of door / window / hatch accessories should be replaced / rectified within 24 hours
- 1.2. Any breakage of flooring/false flooring, dado, ceiling/false ceiling, peeling of paint, waterproofing, SS Railing, Electrical & ICT Shafts and trenches, etc should be rectified in 48 hours
- 1.3. Any damage to External-stone cladding, flooring, paving, hardscape, façade, glazing, fair finish concrete, mural, Fencing, Compound wall, Gates, Electrical & ICT Shaft and trenches, etc. shall be rectified within 48 hours.
- 1.4. Any crack / peeling of Plaster shall be repaired within 48 hrs
- 1.5. Any water leak in building shall be stopped within 2 hrs and suitable rectification process undertaken.
- 1.6. Housekeeping services for entire service area plot including building and connecting & approach road/street/corridor/trenches/shafts
- 1.7. Hardscape Any Hardscape / signage damage shall be repaired within 24 hrs

2. Electrical

- 2.1. Any LT Electrical equipment / instrument/ cables/ Accessories, ICT equipment / instrument/ cables/ Accessories & Electronic equipment / instrument/ cables/ Accessories, etc. shall be restored within two hours in case of minor faults and within eight hours in case of major faults
- 2.2. Faulty lighting fixtures should be rectified within six hours.
- 2.3. Essential spares to be available for immediate repairs

3. HVAC, Fire Fighting and Plumbing

- 3.1. Outdoor and Indoor equipment of DX units / VRV/VRF units - Minor repair shall be rectified within 4 hrs. and major repair (motor failure) shall be rectified within 24 hours.
- 3.2. Fans - Minor repair shall be rectified within 4 hrs. and major repair (motor/bearing failure) shall be rectified within 8 hours.
- 3.3. Piping/valve/ traps/ Sprinklers/ Hose Reel/ Fire Hydrant/ fittings / Taps leakages - Shall be rectified/replaced within 2 hrs.
- 3.4. Instruments like gauges/sensors - Shall be rectified / replaced within 2 hrs.
- 3.5. Pumps - Minor repair shall be rectified within 4 hrs. and major repair (motor/bearing failure)

shall be rectified within 8 hours.

3.6. Underground and Overhead Tanks - Minor repair shall be rectified within 4 hrs. and major repair shall be rectified within 8 hours.

3.7. Any damage to sanitary ceramic fixtures or CP fittings shall be replaced or rectified within 24 hours.

3.8. Essential spares to be available for immediate repair

4. Fire detection , alarm system ,access control, Network System, Visitor Management System, IBMS and CCTV surveillance

4.1. Any damage breakage of any instrument, equipment, accessories, sensors and system in general should not remain nonfunctional for more than two hour.

4.2. Essential spares to be available for immediate repair.

5. Roads and Parking Areas

Nature of Defect or Deficiency		Time Limit For Repair/Rectification
(a)	Carriageway and Paved Areas	
(i)	Breach or blockade	Temporary restoration of traffic within 24 hours; permanent restoration within 15 (fifteen) days
(ii)	Roughness value exceeding 2000 mm in a stretch of 1 km (as measured by a calibrated bump integrator)	120 (one hundred and twenty) days
(iii)	Pot holes	24 hours
(iv)	Any cracks in road / pavement surface	15 (fifteen) days
(v)	Any depressions, rutting exceeding 10 mm in road / pavement surface	30 (thirty) days
(vi)	Bleeding/skidding	7 (seven) days
(vii)	Any other defect/distress on the road / pavement	15 (fifteen) days
(viii)	Damage to pavement edges	15 (fifteen) days
(ix)	Removal of debris, dead animals	6 hours
(b)	Earthen Shoulders, Side Slopes, Drains and Culverts	
(i)	Variation by more than 1 % in the prescribed slope of camber/cross fall (shall not be less than the camber on the main carriageway)	7 (seven) days
(ii)	Edge drop at shoulders exceeding 40 mm	7 (seven) days
(iii)	Variation by more than 15% in the prescribed side (embankment) slopes	30 (thirty) days
(iv)	Rain cuts/gullies in slope	7 (seven) days
(v)	Damage to or silting of culverts and side drains	7 (seven) days
(vi)	De-silting of drains	24 hours
(vii)	Railing, parapets, crash barriers	7 (seven) days (Restore immediately if causing safety hazard)
(c)	External Lighting	
(i)	Any major failure of the system	24 hours

Nature of Defect or Deficiency		Time Limit For Repair/Rectification
(ii)	Faults and minor failures	8 hours
(f)	Other Project Facilities and Approach Roads	
(i)	5.1. Damage or breakage of merging/connecting the Service area plot entry with external road/approach road network	1 (One) day
(ii)	Damaged vehicles or debris on the road	4 (four) hours

6. Solid Waste Management (SWM) :

6.1. The bins should not be allowed to overflow at any point of time and should be emptied irrespective of pre-determined frequency of lifting the bins

Schedule F - Applicable Permits

(See Clause 3.1.7(a))

Applicable Permits

The Contractor shall obtain, as required under the Applicable Laws, the following Applicable Permits:

- (a) Development Permission from the Government/Concerned Authority
- (b) Permission of the State Government for extraction of boulders from quarry;
- (c) Permission of Village Panchayat and Pollution Control Board for installation of crushers;
- (d) License for use of explosives;
- (e) Permission of the State Government for drawing water from river/reservoir;
- (f) License from inspector of factories or other competent Authority for setting up batching plant;
- (g) Clearance of Pollution Control Board for setting up batching plant;
- (h) Clearance of Village Panchayats and Pollution Control Board for setting up asphalt plant;
- (i) Permission of Village Panchayats and State Government for borrow earth; and
- (j) Any other permits, clearances or approvals required under Applicable Laws.

Applicable permits, as required, relating to environmental protection and conservation shall have been procured by the EMPLOYER in accordance with the provisions of this Agreement.

Architecture

Commencement Certificate, Intermediate Certificates, Occupancy Certificate and Completion Certificate from local municipal body or designated authority for the buildings

Town Planning Department remarks for applicable norms / zones / uses

Civil & Structures

Forest department Clearance for clearing of site of trees and shrubs if required

Water Connection from Public Health Engineering Department (State)

Provision and permit for connection to proposed municipal sewage collection system at directed location from local municipal body.

Project Clearance From General Inspectorate For Emergency Situations

Project Clearance From The Solid Waste Management Authority

Electrical

Incoming Power Supply (Main and temporary): State electricity board or power supply authority.

Substation & Elevators & Solar PV system: CEIG (chief electrical inspector to government) / local statutory authority / PWD

License to Operate the Elevators from Ministry of Labour or relevant authority.

DG Set Fuel Tank approval from CCOE (chief controllers of Explosive) India

Fire Fighting

Preliminary approval from Chief Fire Officer prior to construction and final approval on completion of project.

ELV

- Fire Detection & Alarm System - Compliance with NFPA 72, NBC 2016, IS: 2189:1988, BIS: 15908 standards and certification from the Regional Fire Officer / Chief Fire Officer.
- Necessary approval from respective authorities for, Aspiration Smoke Detection System and Gas based Suppression System.
- Any other approval/permits required to complete the entire ELV works and equipment's.

FDA Access Control & Security

Fire Detection & Alarm System - Compliance with IS:2189:1988, BIS: 15908 standards and certification from the Regional Fire Officer / Chief Fire Officer

Roads

Concern PWD Clearance for connecting to the existing road.

Solid Waste Management

Permit from the municipal corporation for disposal of inert in the land fill site

Schedule G – Form of Bank Guarantee

(See Clause 7.1.1, 7.5.3 and 19.2)

Annexure I – Performance Security

(See Clause 7.1.1)

.....
Employer.....,
Gandhinagar, Gujarat

WHEREAS:

- (A) _____ [name and address of contractor] (hereinafter called “the Contractor”) and [name and address of the EMPLOYER], (“**the EMPLOYER**”) have entered into an agreement (the “**Agreement**”) for “Design and Construction of Service Area Buildings” on Engineering, Procurement and Construction (“EPC”) basis, subject to and in accordance with the provisions of the Agreement.
- (B) The Agreement requires the Contractor to furnish a Performance Security for due and faithful performance of its obligations, under and in accordance with the Agreement, during the Construction Period and Defects Liability Period (as defined in the Agreement) in a sum of Rs. Crore (Rupees Crore) (the “Guarantee Amount”).
- (C) We,through our branch at (the “Bank”) have agreed to furnish this bank guarantee (hereinafter called the “Guarantee”) by way of Performance Security.

NOW, THEREFORE, the Bank hereby, unconditionally and irrevocably, guarantees and affirms as follows:

1. The Bank hereby unconditionally and irrevocably guarantees the due and faithful performance of the Contractor’s obligations during and under and in accordance with the Agreement, and agrees and undertakes to pay to the Employer, upon its mere first written demand, and without any demur, reservation, recourse, contest or protest, and without any reference to the Contractor, such sum or sums up to an aggregate sum of the guarantee amount as the EMPLOYER shall claim, without the EMPLOYER being required to prove or to show grounds or reasons for its demand and/or for the sum specified therein.
2. A letter from the EMPLOYER, under the hand of an officer not below the rank of [.....of EMPLOYER], that the Contractor has committed default in the due and faithful performance of all or any of its obligations under and in accordance with the Agreement shall be conclusive, final and binding on the Bank. The Bank further agrees that the EMPLOYER shall be the sole judge as to whether the Contractor is in default in due and faithful performance of its obligations during and under the Agreement and its decision that the Contractor is in default shall be final, and binding on the Bank, notwithstanding any difference between the EMPLOYER and the Contractor, or any dispute between them pending before any court, tribunal, arbitrators or any other authority or body, or by the discharge of the Contractor for any reason whatsoever.

3. In order to give effect to this Guarantee, the EMPLOYER shall be entitled to act as if the Bank were the principal debtor and any change in the constitution of the Contractor and/or the Bank, whether by their absorption with any other body or corporation or otherwise, shall not in any way or manner affect the liability or obligation of the Bank under this Guarantee.
4. It shall not be necessary, and the Bank hereby waives any necessity, for the EMPLOYER to proceed against the Contractor before presenting to the Bank its demand under this Guarantee.
5. The EMPLOYER shall have the liberty, without affecting in any manner the liability of the Bank under this Guarantee, to vary at any time, the terms and conditions of the Agreement or to extend the time or period for the compliance with, fulfillment and/or performance of all or any of the obligations of the Contractor contained in the Agreement or to postpone for any time, and from time to time, any of the rights and powers exercisable by the EMPLOYER against the Contractor, and either to enforce or forbear from enforcing any of the terms and conditions contained in the Agreement and/or the securities available to the EMPLOYER, and the Bank shall not be released from its liability and obligation under these presents by any exercise by the EMPLOYER of the liberty with reference to the matters aforesaid or by reason of time being given to the Contractor or any other forbearance, indulgence, act or omission on the part of the EMPLOYER or of any other matter or thing whatsoever which under any law relating to sureties and guarantors would but for this provision have the effect of releasing the Bank from its liability and obligation under this Guarantee and the Bank hereby waives all of its rights under any such law.
6. This Guarantee is in addition to and not in substitution of any other guarantee or security now or which may hereafter be held by the EMPLOYER in respect of or relating to the Agreement or for the fulfillment, compliance and/or performance of all or any of the obligations of the Contractor under the Agreement.
7. Notwithstanding anything contained herein before, the liability of the Bank under this Guarantee is restricted to the Guarantee amount and this Guarantee will remain in force for the period specified in paragraph 8 below and unless a demand or claim in writing is made by the EMPLOYER on the Bank under this Guarantee all rights of the EMPLOYER under this Guarantee shall be forfeited and the Bank shall be relieved from its liabilities hereunder.
8. The Performance Security shall cease to be in force and effect 60 (sixty) days after the end of the Defects Liability Period as set forth in Clauses 7.1
9. The Bank undertakes not to revoke this Guarantee during its currency, except with the previous express consent of the EMPLOYER in writing, and declares and warrants that it has the power to issue this Guarantee and the undersigned has full powers to do so on behalf of the Bank.
10. Any notice by way of request, demand or otherwise hereunder may be sent by post addressed to the Bank at its above referred branch, which shall be deemed to have been duly authorized to receive such notice and to effect payment thereof forthwith, and if sent by post it shall be deemed to have been given at the time when it ought to have been delivered in due course of post and in proving such notice, when given by post, it shall be sufficient to prove that the envelope containing the notice was posted and a certificate signed by an officer of the EMPLOYER that the envelope was so posted shall be conclusive.
11. This Guarantee shall come into force with immediate effect and shall remain in force and effect for up to the end **** month in the year ***** or until it is released earlier by the EMPLOYER pursuant to the provisions of the Agreement.

Signed and sealed this day of 20..... at

SIGNED, SEALED AND DELIVERED

For and on behalf of the Bank by:

(Signature)

(Name)

(Designation)

(Code Number)

(Address)

NOTES:

- (i) The bank guarantee should contain the name, designation and code number of the officer(s) signing the guarantee.
- (ii) The address, telephone number and other details of the head office of the Bank as well as of issuing branch should be mentioned on the covering letter of issuing branch.

Annexure II – Form for Guarantee for Withdrawal of Retention Money

(Schedule-G)

(See Clause 7.5.3)

.....,
EMPLOYER,
Gandhinagar, Gujarat

WHEREAS:

[Name and address of contractor] (hereinafter called “the Contractor”) has executed an agreement (hereinafter called the “Agreement”) with the [name and address of the EMPLOYER], (hereinafter called “the EMPLOYER”) for the “Design and Construction of Service Area Buildings” on Engineering, Procurement and Construction (the “EPC”) basis, subject to and in accordance with the provisions of the Agreement.

- a. in accordance with the Clause 19.18 of the Agreement, whenever the amount of the retention money (hereinafter called “Retention Money”) held by the EMPLOYER exceeds 1% (one per cent) of the Contract Price, the Contractor may, at its option, withdraw the Retention Money after furnishing to the EMPLOYER a bank guarantee for an amount equal to the proposed withdrawal.
- b. We,through our branch at (the “Bank”) have agreed to furnish this bank guarantee (hereinafter called the “Guarantee”) for the amount of Rs. (..... in words) (the “**Guarantee Amount**”).

NOW, THEREFORE, the Bank hereby, unconditionally and irrevocably, guarantees and affirms as follows:

1. The Bank hereby unconditionally and irrevocably undertakes to pay to the EMPLOYER, upon its mere first written demand, and without any demur, reservation, recourse, contest or protest, and without any reference to the Contractor, such sum or sums up to an aggregate sum of the Guarantee Amount as the EMPLOYER shall claim, without the EMPLOYER being required to prove or to show grounds or reasons for its demand and/or for the sum specified therein.
2. A letter from the EMPLOYER, under the hand of an officer not below the rank of [.....of EMPLOYER], that the Contractor has committed default in the due and faithful performance of all or any of its obligations under and in accordance with the Agreement shall be conclusive, final and binding on the Bank. The Bank further agrees that the EMPLOYER shall be the sole judge as to whether the Contractor is in default in due and faithful performance of its obligations during and under the Agreement and its decision that the Contractor is in default shall be final, and binding on the Bank, notwithstanding any difference between the EMPLOYER and the Contractor, or any dispute between them pending before any court, tribunal, arbitrators or any other authority or body, or by the discharge of the Contractor for any reason whatsoever.
3. In order to give effect to this Guarantee, the EMPLOYER shall be entitled to act as if the Bank were the principal debtor and any change in the constitution of the Contractor and/or the Bank, whether by their absorption with any other body or corporation or otherwise, shall not in any way or manner affect the liability or obligation of the Bank under this Guarantee.

4. It shall not be necessary, and the Bank hereby waives any necessity, for the EMPLOYER to proceed against the Contractor before presenting to the Bank its demand under this Guarantee.
5. The EMPLOYER shall have the liberty, without affecting in any manner the liability of the Bank under this Guarantee, to vary at any time, the terms and conditions of the Retention Money and any of the rights and powers exercisable by the EMPLOYER against the Contractor, and either to enforce or forbear from enforcing any of the terms and conditions contained in the Agreement and/or the securities available to the EMPLOYER, and the Bank shall not be released from its liability and obligation under these presents by any exercise by the EMPLOYER of the liberty with reference to the matters aforesaid or by reason of time being given to the Contractor or any other forbearance, indulgence, act or omission on the part of the EMPLOYER or of any other matter or thing whatsoever which under any law relating to sureties and guarantors would but for this provision have the effect of releasing the Bank from its liability and obligation under this Guarantee and the Bank hereby waives all of its rights under any such law.
6. This Guarantee is in addition to and not in substitution of any other guarantee or security now or which may hereafter be held by the EMPLOYER in respect of or relating to the Retention Money.
7. Notwithstanding anything contained hereinbefore, the liability of the Bank under this Guarantee is restricted to the Guarantee amount and this Guarantee will remain in force for the period specified in paragraph 8 below and unless a demand or claim in writing is made by the EMPLOYER on the Bank under this Guarantee all rights of the EMPLOYER under this Guarantee shall be forfeited and the Bank shall be relieved from its liabilities hereunder.
8. The guarantee shall cease to be in force and effect 90 (ninety) days after the end of the Completion Period specified in Clauses 17.1 of the Agreement.
9. The Bank undertakes not to revoke this Guarantee during its currency, except with the previous express consent of the EMPLOYER in writing, and declares and warrants that it has the power to issue this Guarantee and the undersigned has full powers to do so on behalf of the Bank.
10. Any notice by way of request, demand or otherwise hereunder may be sent by post addressed to the Bank at its above referred branch, which shall be deemed to have been duly authorized to receive such notice and to effect payment thereof forthwith, and if sent by post it shall be deemed to have been given at the time when it ought to have been delivered in due course of post and in proving such notice, when given by post, it shall be sufficient to prove that the envelope containing the notice was posted and a certificate signed by an officer of the EMPLOYER that the envelope was so posted shall be conclusive.
11. This Guarantee shall come into force with immediate effect and shall remain in force and effect up to the end **** month in the year ***** or until it is released earlier by the EMPLOYER pursuant to the provisions of the Agreement.

Signed and sealed this day of 20..... at

SIGNED, SEALED AND DELIVERED

For and on behalf of the Bank by:

(Signature)

(Name)

(Designation)

(Code Number)

(Address)

NOTES:

- (i) The bank guarantee should contain the name, designation and code number of the officer(s) signing the guarantee.
- (ii) The address, telephone number and other details of the head office of the Bank as well as of issuing branch should be mentioned on the covering letter of issuing branch.

Annexure III – Form for Guarantee for Advance Payment

(Schedule-G)

(See Clause 19.2)

.....
.....EMPLOYER,
Gandhinagar, Gujarat

WHEREAS:

- (A) [name and address of contractor] (hereinafter called “the Contractor”) has executed an agreement (hereinafter called the “Agreement”) with the [name and address of the EMPLOYER], (hereinafter called “the EMPLOYER”) for the “Design and Construction of Service Area Buildings” on Engineering, Procurement and Construction (the “EPC”) basis, subject to and in accordance with the provisions of the Agreement.
- (B) in accordance with the Clause 19.2 of the Agreement the EMPLOYER shall make to the Contractor an interest bearing advance payment (hereinafter called “Advance Payment”) equal to 10% (ten per cent) of the contract price for mobilization expenses and acquisition of equipment; and that the Advance Payment shall be made in three installments subject to the Contractor furnishing an irrevocable and unconditional guarantee by a scheduled bank for an amount equal to the 110% amount of each installment to remain effective till the complete and full repayment of the installment of the Advance Payment as security for compliance with its obligations in accordance with the Agreement; and the amount of (first/second/third) installment of the Advance Payment is Rs. **** cr. (Rupees ***** crore) (the “Guarantee Amount”).
- (C) We,through our branch at (the “Bank”) have agreed to furnish this bank guarantee (hereinafter called the “Guarantee”) for the Guarantee Amount.

NOW, THEREFORE, the Bank hereby, unconditionally and irrevocably, guarantees and affirms as follows:

1. The Bank hereby unconditionally and irrevocably guarantees the due and faithful repayment on time of the aforesaid installment of the Advance Payment under and in accordance with the Agreement, and agrees and undertakes to pay to the EMPLOYER, upon its mere first written demand, and without any demur, reservation, recourse, contest or protest, and without any reference to the Contractor, such sum or sums up to an aggregate sum of the guarantee amount as the EMPLOYER shall claim, without the EMPLOYER being required to prove or to show grounds or reasons for its demand and/or for the sum specified therein.
2. A letter from the EMPLOYER, under the hand of an officer not below the rank of [.....of EMPLOYER], that the Contractor has committed default in the due and faithful performance of all or any of its obligations for the repayment of the installment of the Advance Payment under and in accordance with the Agreement shall be conclusive, final and binding on the Bank. The Bank further agrees that the EMPLOYER shall be the sole judge as to whether the Contractor is in default in due and faithful performance of its obligations during and under the Agreement and its decision that the Contractor is in default shall be final, and binding on the Bank, notwithstanding any difference between the EMPLOYER and the Contractor, or any dispute between them pending before any court, tribunal, arbitrators or any other authority or body, or by the discharge of the Contractor for any reason whatsoever.

3. In order to give effect to this Guarantee, the EMPLOYER shall be entitled to act as if the Bank were the principal debtor and any change in the constitution of the Contractor and/or the Bank, whether by their absorption with any other body or corporation or otherwise, shall not in any way or manner affect the liability or obligation of the Bank under this Guarantee.
4. It shall not be necessary, and the Bank hereby waives any necessity, for the EMPLOYER to proceed against the Contractor before presenting to the Bank its demand under this Guarantee.
5. The EMPLOYER shall have the liberty, without affecting in any manner the liability of the Bank under this Guarantee, to vary at any time, the terms and conditions of the Advance Payment or to extend the time or period of its repayment or to postpone for any time, and from time to time, any of the rights and powers exercisable by the EMPLOYER against the Contractor, and either to enforce or forbear from enforcing any of the terms and conditions contained in the Agreement and/or the securities available to the EMPLOYER, and the Bank shall not be released from its liability and obligation under these presents by any exercise by the EMPLOYER of the liberty with reference to the matters aforesaid or by reason of time being given to the Contractor or any other forbearance, indulgence, act or omission on the part of the EMPLOYER or of any other matter or thing whatsoever which under any law relating to sureties and guarantors would but for this provision have the effect of releasing the Bank from its liability and obligation under this Guarantee and the Bank hereby waives all of its rights under any such law.
6. This Guarantee is in addition to and not in substitution of any other guarantee or security now or which may hereafter be held by the EMPLOYER in respect of or relating to the Advance Payment.
7. Notwithstanding anything contained hereinbefore, the liability of the Bank under this Guarantee is restricted to the Guarantee amount and this Guarantee will remain in force for the period specified in paragraph 8 below and unless a demand or claim in writing is made by the EMPLOYER on the Bank under this Guarantee all rights of the EMPLOYER under this Guarantee shall be forfeited and the Bank shall be relieved from its liabilities hereunder.
8. The guarantee shall cease to be in force and effect 90 (ninety) days after the end of the one year from the date of payment of the installment of the Advance Payment, as set forth in Clause 19.2 of the Agreement.
9. The Bank undertakes not to revoke this Guarantee during its currency, except with the previous express consent of the EMPLOYER in writing, and declares and warrants that it has the power to issue this Guarantee and the undersigned has full powers to do so on behalf of the Bank.
10. Any notice by way of request, demand or otherwise hereunder may be sent by post addressed to the Bank at its above referred branch, which shall be deemed to have been duly authorized to receive such notice and to effect payment thereof forthwith, and if sent by post it shall be deemed to have been given at the time when it ought to have been delivered in due course of post and in proving such notice, when given by post, it shall be sufficient to prove that the envelope containing the notice was posted and a certificate signed by an officer of the EMPLOYER that the envelope was so posted shall be conclusive.
11. This Guarantee shall come into force with immediate effect and shall remain in force and effect for up to the end **** month in the year ***** or until it is released earlier by the EMPLOYER pursuant to the provisions of the Agreement.

Signed and sealed this day of 20..... at

SIGNED, SEALED AND DELIVERED

For and on behalf of the Bank by:

(Signature)

(Name)

(Designation)

(Code Number)

(Address)

NOTES:

- (i) The bank guarantee should contain the name, designation and code number of the officer(s) signing the guarantee.
- (ii) The address, telephone number and other details of the head office of the Bank as well as of issuing branch should be mentioned on the covering letter of issuing branch.

Schedule H - Contract Price Weightages

(See Clauses 10.1.4 and 19.3)

1.0 The Contract Price for This Agreement is Rs.....

2.0 Proportions of the Contract Price for different stages of Construction of Service Area Building and plot shall be as specified below;

Table 1 (Service Area Building)

Item	Weightage in percentage to the Contract Price	Stage for Payment	Percentage weightage
1	2	3	4
Civil and Structural Work			
Site Filling and Grading	2.5%	Site Filling and Grading	
		Site Filling & Grading from existing ground level to plinth-1.2 level	40
		Site Filling & Grading from plinth to plinth-1.2 level	40
		Final Site Grading	20
External Development	9.1%	External Development	
		Compound Wall along with Fencing and Gate	100
Substructure	6.3%	Pile foundation upto plinth level	
		Service Area Building	80
		Ancillary Structures like underground tanks, Pedestrian / Paved Street connecting Service area plot, Main gate pillars, Boundary wall colonnade, DG set base	20
Superstructure (RCC work)	11.2%	Superstructure (RCC work)	
		Service Area Bldg Ground floor	30
		Service Area Bldg 1 st floor	15
		Service Area Bldg 2 nd floor	15
		Service Area Bldg 3 rd floor	15
		Service Area Bldg terrace floor (as specified)	20
		Ancillary Structures like underground tanks, Pedestrian / Paved Street, Main gate pillars, Boundary wall	5
Superstructure (Building Work)	3.9%	Masonry, Internal & External Plaster of buildings	
		Service Area full building	100

Item	Weightage in percentage to the Contract Price	Stage for Payment	Percentage weightage
Architecture			
Facade, Glazing, windows, louvers, doors and skylights	4.9%	Facade, Glazing, windows, louvers, doors and skylights	
		Service Area full building	100
Finishing works	2.2%	Finishing works like Flooring, skirting, toilet tiling, dado, mud plaster, false ceiling, painting (int & ext), railing, GRC works, stone cladding	
		Service Area full building	70
		Ancillary Structures like underground tanks, Pedestrian / Paved Street, Main gate pillars	20
		Compound Wall and Fencing	10
MEPF for Building including ICT (FDA, Access Control, Security, PA system, BMS)	55.7%	MEPF works	
		Electrical, Plumbing, Firefighting & HVAC for Service Area full building	80
		Site Infrastructure connections including water, waste water, underground electrical cables, ICT, piping etc	15
		FDA, Access Control, Security, PA system, Network Management, Visitor Management, IBMS	5
Roads, Pavement, Service Ducts/RCC Trench & Drain	0.9%	Merging with External Roads, External Service Ducts/RCC Trench, Internal Driveways, Pavements and Storm Water Drains	
“Data, drawings and analysis of Surveys & Investigations” and “Designs, drawings and reports”	3.3%	Data, drawings and analysis of Surveys & Investigations	15
		Designs, drawings and reports of SA Building	35
		Designs, drawings and reports of External Ancillary Structure	10
		Designs, drawings and reports of External Roads, Internal Driveways, Pavements, Parking	5
		Designs, drawings and reports of project facilities	10
		Designs, drawings and reports of miscellaneous works	5
		As built drawings	10
		BIM model of all project components	10

3.0 Procedure of Estimating the Value of Work Done

3.1 Civil and Structural Work – Site Filling and Grading

Procedure for estimating the value of Site Grading works shall be as follows;

Table 2: Site Filling and Grading

Stage for Payment	Percentage weightage	Payment Procedure
Site Filling and Grading		
1) Site Filling & Grading from existing ground level to plinth-1.2 level	40	Payment shall be made on completion of a stage
2) Site Filling & Grading from plinth to plinth-1.2 level	40	Payment shall be made on completion of a stage
3) Final Site Grading	20	Payment shall be made on completion of a stage

Contractor is allowed to raise the invoice for each of the stage on prorated basis for each service area

3.2 Civil and Structural Work – External Development

Procedure for estimating the value of External development works shall be as follows;

Table 3: External Development

Stage for Payment	Percentage weightage	Payment Procedure
External Development		
1) Compound wall along with fencing and Gate	100	Payment shall be made on completion of a stage

Contractor is allowed to raise the invoice for each of the stage on prorated basis for each service area

3.3 Civil and Structural Work – Substructure

Procedure for estimating the value of Substructure (RCC works) shall be as follows;

Table 4: Pile foundation upto plinth level

Stage for Payment	Percentage weightage	Payment Procedure
Pile foundation upto plinth level		
1) Service Area Building	80	Payment shall be made on completion of a stage
2) Ancillary Structures like underground tanks, Pedestrian / Paved Street connecting Service area plot, Main gate pillars, Boundary wall colonnade, DG set base	20	Payment shall be made on completion of a stage

Contractor is allowed to raise the invoice for each of the stage on prorated basis for each service area

3.4 Civil and Structural Work – Superstructure (RCC work)

Procedure for estimating the value of Superstructure (Internal Building) works shall be as follows;

Table 5: Superstructure (RCC work)

Stage for Payment	Percentage weightage	Payment Procedure
Superstructure (RCC work)		
Service Area Bldg Ground floor	30	Payment shall be made on completion of a stage
Service Area Bldg 1 st floor	15	Payment shall be made on completion of a stage
Service Area Bldg 2 nd floor	15	Payment shall be made on completion of a stage
Service Area Bldg 3 rd floor	15	Payment shall be made on completion of a stage
Service Area Bldg terrace floor (as specified)	20	Payment shall be made on completion of a stage
Ancillary Structures like underground tanks, Pedestrian / Paved Street, Main gate pillars, Boundary wall	5	Payment shall be made on completion of a stage

Contractor is allowed to raise the invoice for each of the stage on prorated basis for each service area

3.5 Civil and Structural Work – Superstructure (Building Work)

Procedure for estimating the value of Superstructure (External Building) works shall be as follows;

Table 6: Masonry, Internal and External Plaster of buildings

Stage for Payment	Percentage weightage	Payment Procedure
Masonry, Internal & External Plaster, water proofing of buildings, expansion joint		
Service Area full building	100	Payment shall be made on completion of a stage

Contractor is allowed to raise the invoice for each of the stage on prorated basis for each service area

3.6 Architecture – Facade, Glazing, windows, louvers, doors and skylights

Procedure for estimating the value of façade, windows, door and glazing works shall be as follows;

Table 7: Facade, Glazing, windows, louvers, doors and skylights

Stage for Payment	Percentage weightage	Payment Procedure
Facade, Glazing, windows, louvers, doors and skylights		
Service Area full building	100	Payment shall be made on completion of a stage

Contractor is allowed to raise the invoice for each of the stage on prorated basis for each service area

3.7 Architecture – Finishing works

Procedure for estimating the value of finishing works shall be as follows;

Table 8: Finishing works like Flooring, skirting, toilet tiling, dado, mud plaster, false ceiling, painting (int & ext), railing, GRC works, stone cladding

Stage for Payment	Percentage weightage	Payment Procedure
Finishing works like Flooring, skirting, toilet tiling, dado, mud plaster, ceiling, painting (int & ext), railing, GRC works, stone cladding		
Service Area full building	70	Payment shall be made on completion of a stage
Ancillary Structures like underground tanks, Pedestrian / Paved Street, Main gate pillars	20	Payment shall be made on completion of a stage
Compound Wall and Fencing	10	Payment shall be made on completion of a stage

Contractor is allowed to raise the invoice for each of the stage on prorated basis for each service area

3.8 MEPF for Building including ICT (FDA, Access Control, Security, PA system, BMS)

Procedure for estimating the value of MEPF works shall be as follows;

Table 9: MEPF works

Stage for Payment	Percentage weightage	Payment Procedure
Electrical, Plumbing, Firefighting & HVAC for Service Area full building	80*	Payment shall be made on completion of a stage
Site Infrastructure connections including water, waste water, underground electrical cables, ICT, piping etc	15	Payment shall be made on completion of a stage
FDA, Access Control, Security, PA system, Network Management, Visitor Management, IBMS	5	Payment shall be made on completion of a stage

Contractor is allowed to raise the invoice for each of the stage on prorated basis for each service area

*** The contractor shall, after approval of his detailed engineering design, furnish to the**

Employer/Employer Engineer a Bill of Quantities of all the major items under MEPF , along with percentage breakdown in commensurate with value of respective equipment to facilitate progressive payments for approval

3.9 Roads, Pavement, Service Ducts/RCC Trench & Drain

Procedure for estimating the value of Road works shall be as follows;

Table 10: Merging with External Roads, External Service Ducts/RCC Trench, Internal Driveways, Pavements and Storm Water Drains

Stage for Payment	Percentage weightage	Payment Procedure
Merging with External Roads, External Service Ducts/RCC Trench, Internal Driveways, Pavements and Storm Water Drains	100	Payment shall be made on completion of a stage

Contractor is allowed to raise the invoice for each of the stage on prorated basis for each service area

4.0 Procedure for estimating the value of Submission and approval of “Data, drawings and analysis of Surveys & Investigations” and “Designs, drawings and reports” works done shall be as stated in Table: 13.

Table 11: Data, Drawings and analysis of surveys & investigations” and “Designs, Drawings and Reports”

Stage of Payment	Percentage weightage	Payment Procedure	
		% Payment on Complete Submission	% Payment on Approval by Engineer
Data, drawings and analysis of Surveys & Investigations	15%	9%	6%
Designs, drawings and reports of SA Building	35%	23%	12%
Designs, drawings and reports of External Ancillary Structure	10%	6%	4%
Designs, drawings and reports of External Roads, Internal Driveways, Pavements, Parking	5%	3%	2%
Designs, drawings and reports of project facilities	10%	6%	4%
Designs, drawings and reports of miscellaneous works	5%	3%	2%
As built drawings	10%	6%	4%

Stage of Payment	Percentage weightage	Payment Procedure	
		% Payment on Complete Submission	% Payment on Approval by Engineer
BIM model of all project components	10%	6%	4%

5.0 Procedure for payment for Maintenance

5.1 The cost for maintenance shall be as stated in Clause 14.1.1

5.2 Payment for Maintenance shall be made in quarterly instalments in accordance with the provisions of Clause 19.7

Schedule I - Drawings

(See Clauses 10.2.4)

1.0 Drawings

In compliance of the obligations set forth in Clause 10.2 of this Agreement, the Contractor shall furnish to the Employer's Engineer, free of cost, all Drawings listed in **Appendix I-I** of this Schedule-I.

2.0 Additional Drawings

If the Employer's Engineer determines that for discharging its duties and functions under this Agreement, it requires any drawings other than those listed in **Appendix I-I**, it may by notice require the Contractor to prepare and furnish such drawings forthwith. Upon receiving a requisition to this effect, the Contractor shall promptly prepare and furnish such drawings to the Employer's Engineer, as if such drawings formed part of **Appendix I-I** of this Schedule-I.

Appendix I-I - List of Drawings

(Schedule - I)

List of drawings is given in table below;

Table 1: List of drawings

S. No.	Description
1	SAB Site Layout Plan
2	SAB - Layout Plan (Ground Floor)
3	Structure Drawings (Foundation, Slab, Coloumn, Beam)
4	Fabrication Details
5	Layout Plan (First Floor)
6	Layout Plan (Second Floor)
7	Layout Plan (Third Floor)
8	Layout Plan (Terrace Floor)
9	ELEVATIONS
10	SECTIONS
11	ELECTRICAL Layout Plan & Details
12	FIRE FIGHTING Layout Plan & Details
13	HVAC Layout Plan & Details
14	PLUMBING Layout Plan & Details (Water Supply, Drainage, Storm Water & Tanks)
15	Single Line Diagram-Electrical
16	Single Line Diagram-Plumbing
17	Single Line Diagram-HVAC
18	Single Line Diagram-Fire Fighting
19	Earthing & Lightning Protection Drawings
20	Point Wiring Electrical (Power & Lighting)
21	Door Window Layout & Details
22	Toilet Layout & Details
23	Staircase & Ramp Layout & Details
24	Furniture Layout & Details
25	False Ceiling Layout & Details
26	Reflected Ceiling Plan

S. No.	Description
27	Flooring, False Flooring & Dado Layout & Details
28	Waterproofing Layout & Details
29	Façade Layout & Details
30	Service Duct, Trench, Shaft, Raceway & Cable Tray Layout & Details
31	External Development Details including Compound Wall along with Fencing, Gate & Hardscape Layout & Details
32	Extra Low Voltage Layout & Details including Fire Alarm & Detection, CCTV Surveillance, CCTV Surveillance, Access Control, Network Diagrams including Ethernet and its port routing, Visitor management details
33	GA Drawings of all Vendor related Equipment
34	Coordinated Services (MEPF) Layouts & Details

Schedule J - Project Completion Schedule

(See Clauses 10.3.2)

1.0 Project Completion Schedule

During Construction period, the Contractor shall comply with the requirements set forth in this Schedule-J for each of the Project Milestones and the **Scheduled Completion Date**. Within 15 (fifteen) days of the date of each Project Milestone, the Contractor shall notify the Employer of such compliance along with necessary particulars thereof.

2.0 Project Milestone-I

2.1 Project Milestone-I shall occur on the date falling on the 180th (one hundred and eightieth) day from the Appointed Date (the “**Project Milestone-I**”).

2.2 Prior to the occurrence of Project Milestone-I, the Contractor shall have commenced construction of the project components and submitted to the Employer duly and validly prepared Stage Payment Statements for an amount not less than 4% (Four per cent) of the Contract Price. Prior to the occurrence of Project Milestone-I, the Contractor shall also have Completed the foundation of service area building for eight numbers of service areas.

3.0 Project Milestone-II

3.1 Project Milestone-II shall occur on the date falling on the 270th (two hundred and seventieth) day from the Appointed Date (the “**Project Milestone-II**”).

3.2 Prior to the occurrence of Project Milestone-II, the Contractor shall have continued with construction of the project components (and submitted to the Employer duly and validly prepared Stage Payment Statements for an amount not less than 20% (Twenty per cent) of the Contract Price. Prior to the occurrence of Project Milestone-II, the Contractor shall have Completed the structure for eight numbers of service area building along with completion of ground floor in all aspects for eight numbers of service areas.

4.0 Project Milestone-III

4.1 Project Milestone-II shall occur on the date falling on the 425th (Four Hundred Twenty fifth) day from the Appointed Date (the “**Project Milestone-III**”).

4.2 Prior to the occurrence of Project Milestone-III, the Contractor shall have continued with construction of the project components (and submitted to the Employer duly and validly prepared Stage Payment Statements for an amount not less than 60% (Sixty per cent) of the Contract Price. Prior to the occurrence of Project Milestone-III, the Contractor shall have Completed the service area building in all aspects for eight numbers of service areas and completion of ground floor in all aspects for remaining nine numbers of service areas.

5.0 Scheduled Completion Date

5.1 The Scheduled Completion Date shall occur on the 545th (Five Hundred and Forty fifth) day from the Appointed Date.

5.2 On or before the Scheduled Completion Date, the Contractor shall have completed construction in accordance with this Agreement.

6.0 Extension Of Time

6.1 Upon extension of any or all of the aforesaid Project Milestones or the Scheduled Completion Date, as the case may be, under and in accordance with the provisions of this Agreement, the Project Completion Schedule shall be deemed to have been amended accordingly.

Schedule K - Tests on Completion

(See Clause 12.1.2)

1.0 Schedule for Tests

- 1.1 The Contractor shall, no later than 30 (thirty) days prior to the likely completion of construction, notify the Employer's Engineer and the Employer of its intent to subject the project components to Tests, and no later than 10 (ten) days prior to the actual date of Tests, furnish to the Employer's Engineer and the Employer detailed inventory and particulars of all works and equipment forming part of Works.
- 1.2 The Contractor shall notify the Employer's Engineer of its readiness to subject the project components to Tests at any time after 10 (ten) days from the date of such notice, and upon receipt of such notice, the Employer's Engineer shall, in consultation with the Contractor, determine the date and time for each Test and notify the same to the Employer who may designate its representative to witness the Tests. The Employer's Engineer shall thereupon conduct the Tests itself or cause any of the Tests to be conducted in accordance with Article 12 and this Schedule-K.

2.0 Tests

- 2.1 **Architectural & Interior Finishes:** Visual and physical check for all Architectural and Interior finishes, including but not limited to flooring, painting, glazing, GRC cladding, Murals, false ceiling, false flooring, door hardware, cladding & dado, polishes, etc. Operations of doors, windows, louvers shall also be checked.
- 2.2 **Landscape / softscape works:** Visual and physical check for softscape works, plants & saplings, lawns, shrubs, irrigation system including sprinklers & drip irrigation, etc., including performance verification.
- 2.3 **Civil and Hardscape works:** Visual check of construction to determine that all civil, structural and hardscape works conform to the provisions of this Agreement. Physical test if required by the client.
- 2.4 **Entry Gates and Boom Barriers:** Visual and physical check for Boom Barriers, Automated Entry gate operations including performance verification for sensors, remote and manual controls, etc.
- 2.5 **Electrical:** Visual and physical and commissioning test for HT and LT panels, transformers, UPS, DG set, DC System, Battery Banks, busducts, rising mains, distribution boards, power & control cables, SCADA system, , solar PV panels, lighting DB's, switches & sockets, safety features, luminaires / lighting fixtures, street lighting and pole, power supply, grounding, communication between luminaire to control panel and central control system, etc. including performance verification.
- 2.6 **HVAC:** Visual and physical and commissioning test for HVAC cooling system, dampers, VAV's, Outdoor and indoor Equipment of DX/VRV/VRF Units, sensors, Ventilation system, drives, control gauges, instrumentations, flow meters, automation, vibration & acoustic insulation, etc including performance verification.

At an appropriate time in consultation with Client / Consultant / Project In Charge the contractor shall demonstrate performance (noise level, power consumption, actual capacity at design conditions etc.) at rated capacity over a period of 6 working days on continuous operating hours. If the tests specified above show that the performance of Air-conditioning & Ventilation system has failed to achieve all the guaranteed parameters or some of them, the contractor shall rectify the defects and carry out modifications if necessary to meet the guaranteed figures and the guarantee tests shall be repeated at no extra cost.

- 2.7 **Fire Protection System:** Visual and physical and commissioning test for complete firefighting system equipment's, internal & external hydrants, sprinklers, electric & diesel engine pumps, portable fire extinguishers, etc., including performance verification.
 - 2.8 **Plumbing & Drainage:** Visual and physical and commissioning test for Plumbing & drainage system including water pressure, faucets & valves, sanitary fittings, flush tanks, urinals, faucet & urinal sensors, leakages, etc. including performance verification.
 - 2.9 **FDA & Public Address:** Visual and physical test for Fire Alarm sensors / detectors, alarms / hooters, Public address system, BMS, etc., including performance verification.
 - 2.10 **CCTV, Access Control, Surveillance, IBMS, Network Management System, Visitor Management System:** Visual and physical test for Security systems including access control card readers and cards, CCTV cameras, monitors, recording and retrieval system, Visitor management system, IBMS, operating software & hardware, etc., including performance verification.
 - 2.11 **Storm Water:** Visual and physical test for Rain water drainage system, storm water drains, manholes & manhole covers, rain water harvesting system, etc., including performance verification.
 - 2.12 **Other tests:** The Employer's Engineer may require the Contractor to carry out or cause to be carried additional tests, in accordance with Good Industry Practice, for determining the compliance of the project components with Standards and Specifications.
- 3.0 Audits**
- 3.1 **Environment Health and Safety Requirements:** The Employer's Engineer shall carry out a check to determine conformity of the project components with the environmental requirements set forth in Applicable Laws and Applicable Permits.
 - 3.2 **Safety Audit:** The Employer's Engineer shall carry out, or cause to be carried out, a safety audit to determine conformity of the project components with the safety requirements and Good Industry Practice.

Schedule L - Provisional Certificate and Completion Certificate

(See Clause 12.2 and 12.4)

Provisional Certificate

(See Clause 12.2)

1. I, (Name of the EMPLOYER's Engineer), acting as EMPLOYER's Engineer, under and in accordance with the Agreement dated (the "**Agreement**"), for "Design and Construction of Service Area Buildings" through Engineering, Procurement & Construction (EPC) Basis Contract through (Name of Contractor), hereby certify that the Tests in accordance with Article 12 of the Agreement have been undertaken to determine compliance of the Project with the provisions of the Agreement.
2. Construction Works that are incomplete on account of Time Extension have been specified in the Punch List appended hereto, and the Contractor has agreed and accepted that it shall complete all such works in the time and manner set forth in the Agreement. In addition, certain minor works are incomplete and these are not likely to cause material inconvenience to the users of the Project or other their safety. The contractor has agreed and accepted that as a condition of this Provisional Certificate, it shall complete such minor works within 30 (thirty) days hereof. These minor works have also been specified in the aforesaid punch list.
3. In view of the foregoing, I am satisfied that that Project can be safely and reliably placed in service of the users thereof, and in terms of the Agreement, the Project is hereby provisionally declared fit for entry into operation on this theday of20

ACCEPTED, SIGNED, SEALED
AND DELIVERED

For and on behalf of

CONTRACTOR by

EMPLOYER's Engineer by:

(Signature)

SIGNED, SEALED AND DELIVERED

For and on behalf of

(Signature)

Completion Certificate

(See Clause 12.4)

1. I, (Name of the EMPLOYER’s Engineer), acting as EMPLOYER’s Engineer, under and in accordance with the Agreement dated (the “**Agreement**”), for “Design and Construction of Service Area Buildings in Dholera Special Investment Region, Dholera” in the State of Gujarat under through Engineering, Procurement & Construction (EPC) Basis through (Name of Contractor), hereby certify that the Tests in accordance with Article 12 of the Agreement have been successfully undertaken to determine compliance of the Project with the provisions of the Agreement, and I am satisfied that the Project can be safely and reliably placed in service of the Users thereof..

2. It is certified that, in terms of the aforesaid Agreement, all works forming part of Project Works have been completed, and the Project Works is hereby declared fit for entry into operation on this theday of20

SIGNED, SEALED AND DELIVERED

For and on behalf of

EMPLOYER’s Engineer by:

(Signature)

(Name)

(Designation)

(Address)

Schedule M - Payment Reduction for Non-Compliance

(See Clauses 14.6., 15.2 and 19.7)

1.0 Payment reduction for non-compliance with the Maintenance Requirements

- 1.1 Monthly lump sum payments for maintenance shall be reduced in the case of non-compliance with the Maintenance Requirements set forth in Schedule-E.
- 1.2 Any deduction made on account of non-compliance with the maintenance Requirements shall not be paid even after compliance subsequently. The deduction shall continue to be made every month until compliance is done.
- 1.3 The Employer's Engineer shall calculate the amount of payment reduction on the basis of weightage in percentage assigned to non-conforming items as given in Paragraph 2.

2.0 Percentage reductions in lump sum payments

- 2.1 The following percentages shall govern the payment reduction:

**Table 1:
Percentage reductions for Architectural and Civil works**

Sr. No.	Item/Defect/Deficiency	Percentage
1	(a) + (b) + (c) (of the applicable monthly maintenance amount)	20%
(a)	Openings and glazing works (door, window, hatches, skylight, glazing coloured and otherwise etc.)	3%
(i)	Breakage or damage of openable shutters their finishes and accessories like handles, door closers, locks, vinyl, floor springs etc.	2%
(ii)	Repairs of fixed glazing, polycarbonate skylight, louvers, sealants, etc.	1%
(b)	Flooring/false flooring, ceiling/false ceiling, dado, painting, waterproofing, SS Railing, Electrical & ICT Shafts and trenches	7%
(i)	Defect, breakage, chip off, loosening of flooring/false flooring, dado, waterproofing, SS Railing, Electrical & ICT Shafts and trenches	3%
(ii)	Any breakage or damage of ceiling/false ceiling and peeling or chip off of painting.	4%
(c)	External- stone cladding, flooring, ramps, paving, hardscape, façade, glazing, fair finish concrete, mural, Fencing, Compound wall, Gates, Electrical & ICT Shaft and trenches	10%
(i)	Damage to façade	5%
(ii)	Any breakage, damage to hardscape, ramps, flooring, paving, Fencing, Compound wall, Gates, Electrical & ICT Shaft and trenches	5%

**Table 2:
Percentage reductions for Hardscape works**

Sr. No.	Item/Defect/Deficiency	Percentage
1	(a) of the applicable monthly maintenance amount	10%
(a)	Hardscape / signage - Faulty, damaged, Repair or replacement	10%

**Table 3:
Percentage reductions for Electrical works**

Sr. No.	Item/Defect/Deficiency	Percentage
1	(a) + (b) + (c) (of the applicable monthly maintenance amount)	32%
(a)	Any LT Electrical equipment / instrument/ cables/ Accessories	17%
	Faulty, damaged or non-working equipment, instrument, Accessories or cable	17%
(b)	ICT equipment / instrument/ cables/ Accessories & Electronics equipment / instrument/ cables/ Accessories	10%
	Faulty, damaged or non-working equipment, apparatus or cable	10%
(c)	External & Internal Lights and Fixtures	5%
	Repair or replacement of fittings, accessories	5%

**Table 4:
Percentage reductions for HVAC and Firefighting, Plumbing and Drainage**

Sr. No.	Item/Defect/Deficiency	Percentage
1	(a) + (b) + (c) + (d) (of the applicable monthly maintenance amount)	23%
(a)	HVAC (DX units, VRF/VRV units, Fans)	7%
(i)	Failure of any of the above systems.	3%
(ii)	Leakages / breakages or damage of piping, traps, valves, sensors, gauges	2%
(iii)	Non maintenance of design temperature	2%
(b)	Water Supply Network (Potable water)	4.5%
(i)	Rising and distribution network repairs,	2.5%
(ii)	valve and flow meters repairs and calibrations, refilling of trenches	2%
(c)	Sewage collection network	4.5%
(i)	De-silting, overflows in surrounding areas	2%
(ii)	Man holes damages.	2.5%
(d)	firefighting, plumbing and drainage	7%
(i)	Damage or leakage of Piping, traps, fittings, Gauges, sensors	2%
(ii)	Damage to Sprinklers, firefighting equipment's	2%
(iii)	Breakage or leakage of Sanitary Ceramic and CP fixtures	3%

**Table 5:
Percentage reductions for Fire detection, alarm system, access control, Network System, Visitor Management System, IBMS and CCTV surveillance**

Sr. No.	Item/Defect/Deficiency	Percentage
1	(a) of the applicable monthly maintenance amount	7%
(a)	Fire detection, alarm system ,access control, Network System, Visitor Management System, IBMS and CCTV surveillance - Non-functioning of any of above	7%

**Table 6:
Percentage reductions for Other Project Facilities and Approach Roads**

Sr. No.	Item	Percentage
1	(a) of the applicable monthly maintenance amount	6%
(a)	Damage or breakage of merging/connecting the Service area plot entry with external road/approach road network	6%
(i)	Potholes, cracks, other surface defects	2.0%
(ii)	Repairs of Edges, Rutting	0.5%
(iii)	Edge drop, inadequate cross fall, undulations, settlement, potholes, ponding, obstructions	1.0%
(iv)	Deficient slopes, rain cuts, disturbed pitching, vegetation growth, pruning of trees	1.0%
(v)	Damage, coming off of tiles in parking, lack of soil in grass pavers etc	1.0%
(vi)	Damaged vehicles or debris on the road	0.5%

**Table 7:
Percentage reductions for SWM**

Sr. No.	Item	Percentage
1	(a) of the applicable monthly maintenance amount	2%
(i)	Replacement of damaged bins	1%
(ii)	Default on bin lifting frequency	1%

2.2 The amount to be deducted from monthly lump-sum payment for non-compliance of particular item mentioned in Table-1 to 7 shall be calculated on a pro-rata basis for each of the above items as under:

$$R = P/100 * M * L1/L$$

Where

P= Percentage of particular item/non-compliance /Defect /deficiency for deduction. For example in Architecture and Civil works, if a broken flooring/tile is not repaired/replaced within 48 hours, the percentage of non-compliance item P is 3%.

M= Monthly lump-sum payment for maintenance in accordance with the Contract Agreement.

A1= Non-complying area (sqm) of the particular Item.

A= Total area (sqm) of the particular Item.

R= Reduction (the amount to be deducted for noncompliance for a particular item /Defect /deficiency).

The total amount of reduction shall be arrived at by summation of reductions for such items/Defects/deficiency or noncompliance.

For any Defect in a part of 10 sqm, the non-conforming area shall be taken as minimum 10 sqm.

Schedule N – Selection of Employer’s Engineer

(See Clause 18.1.1)

1.0 Selection of EMPLOYER’s Engineer

- 1.1 The provisions of the Model Request for Proposal for Selection of Technical Consultants, issued by the Ministry of Finance in May 2009, or any substitute thereof shall apply for selection of an experienced firm to discharge the functions and duties of an EMPLOYER’s Engineer.
- 1.2 In the event of termination of the Technical Consultants appointed in accordance with the provisions of Paragraph 1.1, the EMPLOYER shall appoint another firm of Technical Consultants forthwith and may engage a government-owned entity in accordance with the provisions of Paragraph 3 of this Schedule-N.

2.0 Terms of Reference

The Terms of Reference for the EMPLOYER’s Engineer (the “**TOR**”) shall substantially conform with Annex 1 to this Schedule N.

3.0 Appointment of Government entity as EMPLOYER’s Engineer

Notwithstanding anything to the contrary contained in this Schedule, the EMPLOYER may in its discretion appoint a government-owned entity as the EMPLOYER’s Engineer; provided that such entity shall be a body corporate having as one of its primary functions the provision of consulting, advisory and supervisory services for engineering projects; provided further that a government-owned entity which is owned or controlled by the EMPLOYER shall not be eligible for appointment as EMPLOYER’s Engineer.

Annexure I – Terms of Reference for Employer’s Engineer

(Schedule - N)

1. Scope

- 1.1 These Terms of Reference (the “**TOR**”) for the EMPLOYER’s Engineer are being specified pursuant to the EPC Agreement dated (the “**Agreement**”), which has been entered into between theName of EMPLOYER (the “EMPLOYER”) and (the “**Contractor**”) for “Design and Construction of Service Area Buildings in Dholera Special Investment Region, Dholera on Engineering, Procurement & Construction (EPC)” Basis, and a copy of which is annexed hereto and marked as Annex-A to form part of this TOR.
- 1.2 The TOR shall apply to design, construction and maintenance of the Project Roads and Services

2. Definitions and interpretation

- 2.1 The words and expressions beginning with or in capital letters and not defined herein but defined in the Agreement shall have, unless repugnant to the context, the meaning respectively assigned to them in the Agreement.
- 2.2 References to Articles, Clauses and Schedules in this TOR shall, except where the context otherwise requires, be deemed to be references to the Articles, Clauses and Schedules of the Agreement, and references to Paragraphs shall be deemed to be references to Paragraphs of this TOR.
- 2.3 The rules of interpretation stated in Clauses 1.2, 1.3 and 1.4 of the Agreement shall apply, *mutatis mutandis*, to this TOR.

3. General

- 3.1 The EMPLOYER’s Engineer shall discharge its duties in a fair, impartial and efficient manner, consistent with the highest standards of professional integrity and Good Industry Practice.
- 3.2 The EMPLOYER’s Engineer shall perform the duties and exercise the authority in accordance with the provisions of this Agreement, but subject to obtaining prior written approval of the EMPLOYER/PMNC before determining:
- (a) any Time extension;
 - (b) any additional cost to be paid by the EMPLOYER to the Contractor;
 - (c) the Termination Payment; or
 - (d) any other matter which is not specified in (a), (b) or (c) above and which creates an obligation or liability on either Party for a sum exceeding Rs.5,000,000 (Rs. fifty lakh).
- 3.3 The EMPLOYER’s Engineer shall submit regular periodic reports, at least once every month, to the EMPLOYER/PMNC in respect of its duties and functions under this Agreement. Such reports shall be submitted by the EMPLOYER’s Engineer within 10 (ten) days of the beginning of every month.

- 3.4 The EMPLOYER's Engineer shall inform the Contractor of any delegation of its duties and responsibilities to its suitably qualified and experienced personnel provided, however, that it shall not delegate the authority to refer any matter for the EMPLOYER's prior approval in accordance with the provisions of Clause 18.2.
- 3.5 The EMPLOYER's Engineer shall aid and advise the EMPLOYER on any proposal for Change of Scope under Article 13.
- 3.6 In the event of any disagreement between the Parties regarding the meaning, scope and nature of Good Industry Practice, as set forth in any provision of the Agreement, the EMPLOYER's Engineer shall specify such meaning, scope and nature by issuing a reasoned written statement relying on good industry practice and authentic literature.

4 . Construction Period

- 4.1 During the Construction Period, the EMPLOYER's Engineer shall review the Reports, Designs and Drawings furnished by the Contractor along with supporting data, including the geo-technical and hydrological investigations, characteristics of materials from borrow areas and quarry sites, topographical surveys, and the recommendations of the Safety Consultant in accordance with the provisions of Clause 10.1.6. The EMPLOYER's Engineer shall complete such review and send its observations to the EMPLOYER/ PMNC and the Contractor within 15 (fifteen) days of receipt of such Reports, Designs and Drawings; provided, however that in case of a Structure, the aforesaid period of 15 (fifteen) days may be extended up to 30 (thirty) days. In particular, such comments shall specify the conformity or otherwise of such Drawings with the Scope of the Project and Specifications and Standards.
- 4.2 The EMPLOYER's Engineer shall review any revised Reports, Designs and Drawings sent to it by the Contractor and furnish its comments within 10 (ten) days of receiving such Reports, Designs and Drawings.
- 4.3 The EMPLOYER's Engineer shall review the (a) Quality Assurance Plan (b) Health, Safety and Environmental Management Plan submitted by the Contractor and shall convey its comments to the Contractor within a period of 21 (twenty-one) days stating the modifications, if any, required thereto. The Employer's Engineer shall ensure the Contractor's Project Management requirements, BIM and CAD requirements regularly and submit report on a monthly basis to the Employer/ PMNC.
- 4.4 The EMPLOYER's Engineer shall complete the review of the methodology proposed to be adopted by the Contractor for executing the Works, and convey its comments to the Contractor within a period of 10 (ten) days from the date of receipt of the proposed methodology from the Contractor.
- 4.5 Deleted.
- 4.6 The EMPLOYER's Engineer shall review the monthly progress report furnished by the Contractor and send its comments thereon to the EMPLOYER/ PMNC and the Contractor within 7 (seven) days of receipt of such report.
- 4.7 The EMPLOYER's Engineer shall inspect the Construction Works and the Project Roads and shall submit a monthly Inspection Report bringing out the results of inspections and the remedial action taken by the Contractor in respect of Defects or deficiencies. In particular, the

- EMPLOYER's Engineer shall include in its Inspection Report, the compliance of the recommendations made by the Safety Consultant.
- 4.8 The EMPLOYER's Engineer shall conduct the pre-construction review of manufacturer's test reports and standard samples of manufactured Materials, and such other Materials as the EMPLOYER's Engineer may require.
- 4.9 For determining that the Works conform to Specifications and Standards, the EMPLOYER's Engineer shall require the Contractor to carry out, or cause to be carried out, tests at such time and frequency and in such manner as specified in the Agreement and in accordance with Good Industry Practice for quality assurance. For purposes of this Paragraph 4.9, the tests specified in the relevant Codes or any modification/substitution thereof and standards for shall be deemed to be tests conforming to Good Industry Practice for quality assurance.
- 4.10 The EMPLOYER's Engineer shall test check at least 20 (twenty) percent of the quantity or number of tests prescribed for each category or type of test for quality control by the Contractor.
- 4.11 The timing of tests referred to in Paragraph 4.9, and the criteria for acceptance/ rejection of their results shall be determined by the EMPLOYER's Engineer in accordance with the Quality Control Manuals and/or the relevant Codes and Standards... The tests shall be undertaken on a random sample basis and shall be in addition to, and independent of, the tests that may be carried out by the Contractor for its own quality assurance in accordance with Good Industry Practice.
- 4.12 In the event that results of any tests conducted under Clause 11.10 establish any Defects or deficiencies in the Works, the EMPLOYER's Engineer shall require the Contractor to carry out remedial measures.
- 4.13 The EMPLOYER's Engineer may instruct the Contractor to execute any work which is urgently required for the safety of the Project Works, whether because of an accident, unforeseeable event or otherwise; provided that incase of any work required on account of a Force Majeure Event, the provisions of Clause 21.6 shall apply.
- 4.14 In the event that the Contractor fails to achieve any of the Project Milestones, the EMPLOYER's Engineer shall undertake a review of the progress of construction and identify potential delays, if any. If the EMPLOYER's Engineer shall determine that completion of the Project Works is not feasible within the time specified in the Agreement, it shall require the Contractor to indicate within 15 (fifteen) days the steps proposed to be taken to expedite progress, and the period within which the Project Completion Date shall be achieved. Upon receipt of a report from the Contractor, the EMPLOYER's Engineer shall review the same and send its comments to the EMPLOYER/ PMNC and the Contractor forthwith.
- 4.15 The EMPLOYER's Engineer shall obtain from the Contractor two copies of all the Contractor's quality control records and documents before the Completion Certificate is issued pursuant to Clause 12.4.
- 4.16 EMPLOYER's Engineer may recommend to the EMPLOYER/ PMNC suspension of the whole or part of the Works if the work threatens the safety of the Users and pedestrians. After the Contractor has carried out remedial measure, the EMPLOYER's Engineer shall inspect such remedial measures forthwith and make a report to the EMPLOYER recommending whether or not the suspension hereunder may be revoked.

- 4.17 In the event that the Contractor carries out any remedial measures to secure the safety of suspended works and Users, and requires the EMPLOYER's Engineer to inspect such works, the EMPLOYER's Engineer shall inspect the suspended works within 3 (three) days of receiving such notice, and make a report to the EMPLOYER/ PMNC forthwith, recommending whether or not such suspension may be revoked by the EMPLOYER.
- 4.18 The EMPLOYER's Engineer shall carry out, or cause to be carried out, all the Tests specified in Schedule-K and issue a Completion Certificate or Provisional Certificate, as the case may be. For carrying out its functions under this Paragraph 4.18 and all matters incidental thereto, the EMPLOYER's Engineer shall act under and in accordance with the provisions of Article 12 and Schedule-K.

5. Maintenance Period

- 5.1 The EMPLOYER's Engineer shall aid and advise the Contractor in the preparation of its monthly Maintenance Programme and for this purpose carry out a joint monthly inspection with the Contractor.
- 5.2 The EMPLOYER's Engineer shall undertake regular inspections, at least once every month, to evaluate compliance with the Maintenance Requirements and submit a Maintenance Inspection Report to the EMPLOYER/ PMNC and the Contractor.
- 5.3 The EMPLOYER's Engineer shall specify the tests, if any, that the Contractor shall carry out, or cause to be carried out, for the purpose of determining that the Project Works is in conformity with the Maintenance Requirements. It shall monitor and review the results of such tests and the remedial measures, if any, taken by the Contractor in this behalf.
- 5.4 In respect of any defect or deficiency referred to in Paragraph 3 of Schedule-E, the EMPLOYER's Engineer shall, in conformity with Good Industry Practice, specify the permissible limit of deviation or deterioration with reference to the Specifications and Standards and shall also specify the time limit for repair or rectification of any deviation or deterioration beyond the permissible limit.
- 5.5 The EMPLOYER's Engineer shall examine the request of the Contractor for closure of any lane(s)/utilities lines of the Project Roads and/or Services for undertaking maintenance/repair thereof, and shall grant permission with such modifications, as it may deem necessary, within 5 (five) days of receiving a request from the Contractor. Upon expiry of the permitted period of closure, the EMPLOYER's Engineer shall monitor the reopening of such lane(s), and in case of delay, determine the Damages payable by the Contractor to the EMPLOYER under Clause 14.5.

6. Determination of costs and time

- 6.1 The EMPLOYER's Engineer shall determine the costs, and/or their reasonableness, that are required to be determined by it under the Agreement.
- 6.2 The EMPLOYER's Engineer shall determine the period of Time Extension that is required to be determined by it under the Agreement.
- 6.3 The EMPLOYER's Engineer shall consult each Party in every case of determination in accordance with the provisions of Clause 18.5.

7. Payments

7.1 The EMPLOYER's Engineer shall withhold payments for the affected works for which the Contractor fails to revise and resubmit the Drawings to the EMPLOYER's Engineer in accordance with the provisions of Clause 10.2.4 (d).

7.2 EMPLOYER's Engineer shall -

(a) within 7 (seven) days of receipt of the Stage Payment Statement from the Contractor pursuant to Clause 19.4, determine the amount due to the Contractor and recommend the release of 90 (ninety) percent of the amount so determined as part payment, pending issue of the Interim Payment Certificate; and

(b) within 15 (fifteen) days of the receipt of the Stage Payment Statement referred to in Clause 19.4, deliver to the EMPLOYER/ PMNC and the Contractor an Interim Payment Certificate certifying the amount due and payable to the Contractor, after adjustments in accordance with the provisions of Clause 19.10.

7.3 The EMPLOYER's Engineer shall, within 15 (fifteen) days of receipt of the Monthly Maintenance Statement from the Contractor pursuant to Clause 19.6, verify the Contractor's monthly statement and certify the amount to be paid to the Contractor in accordance with the provisions of the Agreement.

7.4 The EMPLOYER's Engineer shall certify final payment within 30 (thirty) days of the receipt of the final payment statement of Maintenance in accordance with the provisions of Clause 19.16.

8. Other duties and functions

The EMPLOYER's Engineer shall perform all other duties and functions as specified in the Agreement.

9. Miscellaneous

9.1 A copy of all communications, comments, instructions, Drawings or Documents sent by the EMPLOYER's Engineer to the Contractor pursuant to this TOR, and a copy of all the test results with comments of the EMPLOYER's Engineer thereon, shall be furnished by the EMPLOYER's Engineer to the EMPLOYER/PMNC forthwith.

9.2 The EMPLOYER's Engineer shall retain at least one copy each of all Drawings and Documents received by it, including 'as-built' Drawings, and keep them in its safe custody.

9.3 Within 90 (ninety) days of the Project Completion Date, the EMPLOYER's Engineer shall obtain a complete set of as-built Drawings, in 2 (two) hard copies and in micro film form or in such other medium as may be acceptable to the EMPLOYER, reflecting the Project as actually designed, engineered and constructed, including an as-built survey illustrating the layout of the Project Works and setback lines, if any, of the buildings and structures forming part of Project Facilities; and shall hand them over to the EMPLOYER against receipt thereof.

- 9.4 The EMPLOYER's Engineer, if called upon by the EMPLOYER/PMNC or the Contractor or both, shall mediate and assist the Parties in arriving at an amicable settlement of any Dispute between the Parties.
- 9.5 The EMPLOYER's Engineer shall inform the EMPLOYER/PMNC and the Contractor of any event of Contractor's Default within one week of its occurrence.
- 9.6 The Employer's Engineer, if called upon by the Employer/ PMNC, shall attend the meetings on Project reviews, discussions to be held at Employer/ PMNC office with required reports and presentations.

Schedule O - Form of Payment Statements

(See Clause 19.4.1, 19.6.1, and 19.8.1)

1.0 Stage Payment Statement for Works

The Stage Payment Statement for Works shall state:

- (a) The estimated amount for the Works executed in accordance with Clause 19.3.1 subsequent to the last claim;
- (b) Amounts reflecting adjustments in price for the aforesaid claim;
- (c) The estimated amount of each Change of Scope Order executed subsequent to the last claim;
- (d) Amounts reflecting adjustment in price, if any, for (c) above in accordance with the provisions of Clause 13.2.3 (a);
- (e) Total of (a), (b), (c) and (d) above;
- (f) Deductions:
 - (i) Any amount to be deducted in accordance with the provisions of the Agreement except taxes;
 - (ii) Any amount towards deduction of taxes; and
 - (iii) Total of (i) and (ii) above.
- (g) Net claim: (e) – (f);
- (h) The amounts received by the Contractor up to the last claim:
 - (i) For the Works executed (excluding Change of Scope orders);
 - (ii) For Change of Scope Orders, and
 - (iii) Any deductions
 - (iv) Taxes deducted

2.0 Monthly Maintenance Payment Statement

The monthly Statement for Maintenance Payment shall state:

- (a) the monthly payment admissible in accordance with the provisions of the agreement;
- (b) the deductions for maintenance work not done;
- (c) net payment for maintenance due, (a) minus (b);
- (d) amounts reflecting adjustments in price under Clause 19.12; and
- (e) amount towards deduction of taxes

3.0 Contractor's claim for Damages

Note: The Contractor shall submit its claims in a form acceptable to the EMPLOYER/ PMNC.

Schedule P - (Insurance)

(See Clause 20.1)

1.0 Insurance during Construction Period

1.1. The Contractor shall effect and maintain at its own cost, from the Appointed Date till the date of issue of the last Completion Certificate, the following insurances for any loss or damage occurring on account of Non Political Event of Force Majeure, malicious act, accidental damage, explosion, fire and terrorism:

- (a) insurance of Works, Plant and Materials and an additional sum of [15 (fifteen)] per cent of such replacement cost to cover any additional costs of and incidental to the rectification of loss or damage including professional fees and the cost of demolishing and removing any part of the Works and of removing debris of whatsoever nature; and
- (b) Insurance for the Contractor's equipment and Documents brought onto the Site by the Contractor, for a sum sufficient to provide for their replacement at the Site.

1.2 The insurance under paragraph 1.1 (a) and (b) above shall cover the EMPLOYER and the Contractor against all loss or damage from whatsoever cause arising under paragraph 1.1 other than risks which are not insurable at commercial terms.

2.0 Insurance for Contractor's Defects Liability

The Contractor shall effect and maintain insurance cover for the works from the date of issue of the Completion Certificate until the end of the Defects Liability Period for any loss or damage for which the Contractor is liable and arises from a cause occurring prior to the issue of Completion Certificate. The Contractor shall also maintain other insurances for maximum sums as may be required under the Applicable Laws and in accordance with Good Industry Practice.

3.0 Insurance against injury to persons and damage to property

3.1 The Contractor shall insure against each Party's liability for any loss, damage, death or bodily injury which may occur to any physical property (except things insured under Paragraph 1 and 2 of this Schedule or to any person (except persons insured under Clause 20.9), which may arise out of the Contractor's performance of this agreement and occurring before the issue of the Performance Certificate. This insurance shall be for a limit per occurrence of not less than the amount stated below with no limit on the number of occurrences.

The insurance cover shall be not less than: Rs. 20 Lakhs.

3.2 The insurance shall be extended to cover liability for all loss and damage to the EMPLOYER's property arising out of the Contractor's performance of this Agreement excluding:

- (a) the EMPLOYER's right to have the construction works executed on, over, under, in or through any land, and to occupy this land for the Works; and
- (b) Damage which is and unavoidable result of the Contractor's obligations to execute the Works.

4.0 Insurance to be in joint names

The insurance under paragraphs 1 to 3 above shall be in the joint names of the Contractor and the EMPLOYER.

Schedule Q - BIM & CAD Requirements

(See Clause 3.1.7 K)

1. Objective

The Employer mandates the use Building Information Modelling (BIM) and Geographic Information Systems (GIS) right from the existing site conditions, Preliminary & Detailed planning, design, engineering, construction and operations of the DSIR to allow simulation, visualization and engineering analysis of all transportation, utility, building, civil works and geospatial infrastructures.

This includes an aggregate dynamic Building Information Modelling (BIM) in 3D for the city infrastructure systems involves civil, landscape, treatment plants, underground and aboveground utilities systems participating.

Building Information Modelling (BIM) and Geographic Information Systems (GIS) technology shall be used to develop and produce project models and simulations (e.g. in case of natural calamity etc.) as required for submittals.

The BIM infrastructure information models are to be used throughout the design, construction and operational life-cycle of the assets, including but not limited to for system collision detection, materials quantification, construction sequencing, energy analysis, carbon impact analysis and facility management

BIM and GIS models use shall be maximized for project reviews, decision support, design analysis, quantity take offs, construction sequencing and quality assurance during all phases and asset management plan for ICT systems and their city wide uses.

2. Scope

All infrastructures, networks and facilities designed by the Contractors as part of this assignment shall be consolidated as part of a spatial database preferably using MS-SQL Server Spatial or Oracle Spatial or Geo Database or other systems. The Contractor shall coordinate with the Employer/Employer's Engineer on the design of data scheme of the spatial database beforehand. Both the 2D and 3D spatial data shall be stored in project spatial database for mapping, modelling and analysis.

To successfully implement Building Information Modelling (BIM) and Geographic Information Systems (GIS) the Contractors shall develop detailed project BIM Execution Plan, defines uses for BIM and GIS on the project, assets information details and asset supply chain approach for city wide ICT integrations.

To effectively introduce BIM into the project delivery process, the Contractors shall outlines the overall vision along with implementation details for the team to follow throughout the project but not limited to project information, BIM goal & uses, project member's roles, staffing and competency, BIM process and strategy, BIM exchange protocol and submittal format, BIM data requirement, collaboration procedures and method to handle shared models, BIM design and

drawings quality checklist, technology use, asset information's spreadsheet for facility management, BIM & GIS international best practices or the best available in the global market, followed during implementations, and asset information tagging and integration approach for ICT. Refer to Appendix Q I – BIM Project Execution Plan template.

The Contractor shall be responsible to prepare detailed construction project schedule plan including but not limited to BIM Execution Plan (BEP), Master Document Register (MDR), Site Layout Plan, Project Folder Information Structure Hierarchy, 3D designs and drawings, Level of Development (LOD), construction and operation asset information spreadsheet, 4D construction scheduling and sequencing plan with simulations, BIM & GIS spatial database, etc.

The Contractor shall provide structured BIM approach to the production of all required design and as-built data and information for these works under the Contract, modelled on BS1192 collaborative production of architectural, engineering and construction information; Code of practice, including BIM quality checklist. Refer to Appendix Q I – BIM Project Execution Plan template.

The Contractor shall provide all native and design models list through MDR which shall be part of BIM Execution Plan (BEP) and Monthly Progress Report (MPR) but not limited to 2D Drawings, 3D models, animations, PDF's, native software files, calculation data sheets and collision detection reports, 4D Models & simulation, 5D Estimates & Quantities reports Asset List with the schema, ArcGIS interoperability models and files etc.

The Contractor shall be responsible for development of Master Document Register (MDR), Site Layout Plan in a form of 2D/3D and drawing sheet name plate, in consultation with Employer's Representative, at the start of the works that shall list all the 'file identifiers' and information details of the assets with their delivery dates and intermediate milestones. The following metadata shall be included but not limited to Program ID, Contract No, Originator Code, Discipline Code, Type, Zone, Level, Description/Title, and Delivery Date. Refer to Annexure-II of CAD Guidelines.

The Contractor shall prepare and share available existing data sets in a form of 2D/3D/GIS models for reference and liable for validating the models before utilizing/enhancing further. Data sets with distinct owners, e.g. DP, TP1, TP2, etc. shall be referenced into the model.

3D Models, 2D CAD drawing files shall have original plot composition files containing all extractions, CAD drawings shall have a corresponding PDF's provenance shown on the plot, i.e. the references, extractions, model revision used to generate plot. Drawing title block shall be consistent with setup by the Employer/ Employer's Engineer for the Contractor to use for the project.

The PMIS or Common Data Environment (CDE) setup by the Employer/Employer's Engineer are mandated for the Contractors to use, to collect, manage and disseminate all relevant approved project documents. The Contractor shall develop project folder information structure hierarchy that is consistent with the principles of the CDE for all models and drawings. Refer to Schedule-H.

The Contractor shall outline a uniform and interoperable software/hardware platform across the entire Work Package, in that any software used shall be consistent with the principles of the sharing of multi-disciplinary object data in a CDE; That data shall include geometry and object attributes.

The coordinate system and unit convention for Design and drawings shall be consistent with completed/ongoing projects at Dholera SIR and geo reference details will be provided by the Employer. Vertical datum values/details will be provided by the Employer. DSIR falls in WGS84 UTM43N.

Document Management setups by Employer are mandated for the Contractor, Contractor shall follow and prepare asset spreadsheet as part of BIM Execution Plan (BEP) document. For effective and quality information, the Contractor shall represent Level of Development (LOD) i.e. Size, Volume, Shape, Height and Orientation for graphical/spatial data, non-graphical/spatial data

The Contractor shall be responsible to clearly outline the technology to be used for design and drawings production and software native outcomes in their BIM Execution Plan (BEP), in consultation with Employer/ Employer's Engineer and ICT Consultant.

The Contractor shall be responsible for preparation of construction-operations information exchange standard spreadsheet (COBie), and tag asset information within the infrastructure models but not limited to asset name, code, quantity, manufacturer, model no, serial no, etc. which controls the transition of As-Built data for operations and maintenance.

For seamless coordination and integration of drawing packages within BIM environment, the Contractor shall reference each models to other discipline models in timely manner and clash detection reports through software routines shall be run on the multi-discipline model. The reports of which will be included with transmittals during project delivery and on request of the Employer/ Employer's Engineer.

The Contractor shall also be responsible to develop GIS (Geographical Information System) spatial database and the Attribute database parameters (Schema) in Geo Data Base with level of details; extractions of vectors data from CAD and design models of each infrastructure component.

The Contractor shall carry out transfer of digital model files in mutually agreed conditions with the Employer and organize regular BIM conferences/Meeting as per the project management requirement.

3. Schedule of Deliverables

Project Information Model (PIM) and Asset Information Model (AIM) shall be submitted in a commonly accessible electronic formats as per the details given below;

Deliverables	Timeline
BIM Execution Plan (BEP)	Within 4 months of appointed date
Master Document Register (MDR)	Within 4 months of appointed date
BIM Design and Drawings Quality Checklist Plan	Within 4 months of appointed date
Designs and Drawings (Plan & Profile, design files, models, calculation sheets, Reports, all native files etc.) and Asset details in approved format	Along with submission of Designs and Drawings
4D Construction Logistic Scheduling Plan	Along with submission of GFCs
4D Simulation Models & Animations	Before start of Construction
As-Built Model with Asset Information	As per Project Schedule

Annexure – I – BIM Project Execution Plan (Sample Format)

(Schedule - Q)

Section A: BIM Project Execution Plan Overview

To successfully implement Building Information Modeling (BIM) on a project, the project team has developed this detailed BIM Project Execution Plan. The BIM Project Execution Plan defines uses for BIM on the project (e.g. design authoring, cost estimating, and design coordination), along with a detailed design of the process for executing BIM throughout the project lifecycle.

[INSERT ADDITIONAL INFORMATION HERE IF APPLICABLE. FOR EXAMPLE: BIM MISSION STATEMENT This is the location to provide additional BIM overview information. Additional detailed information can be included as an attachment to this document.

Please note: Instructions and examples to assist with the completion of this guide are currently in grey. The text can and should be modified to suit the needs of the organization filling out the template. If modified, the format of the text should be changed to match the rest of the document. This can be completed, in most cases, by selecting the normal style in the template styles.

Section B: Project Information

This section defines basic project reference information and determined project milestones.

1. PROJECT OWNER:
2. PROJECT NAME:
3. PROJECT LOCATION AND ADDRESS:
4. CONTRACT TYPE / DELIVERY METHOD:
5. BRIEF PROJECT DESCRIPTION: [NUMBER OF FACILITIES, GENERAL SIZE, ETC]
6. ADDITIONAL PROJECT INFORMATION: [UNIQUE BIM PROJECT CHARACTERISTICS AND REQUIREMENTS]
7. PROJECT NUMBERS:

PROJECT INFORMATION	NUMBER
CONTRACT NUMBER:	
TASK ORDER:	
PROJECT NUMBER:	

8. PROJECT SCHEDULE / PHASES / MILESTONES:

Include BIM milestones, pre-design activities, major design reviews, stakeholder reviews, and any other major events which occur during the project lifecycle.

PROJECT PHASE / MILESTONE	ESTIMATED START DATE	ESTIMATED COMPLETION DATE	PROJECT STAKEHOLDERS INVOLVED
PRELIMINARY PLANNING			
DESIGN DOCUMENTS			
CONSTRUCTION DOCUMENTS			
CONSTRUCTION			

Section C: Key Project Contacts

List of lead BIM contacts for each organization on the project. Additional contacts can be included later in the document.

Role	Organization	Contact Name	Location	E-Mail	Phone
Project Manager(s)					
BIM Manager(s)					
Discipline Leads					
Other Project Roles					

Section D: Project Goals / BIM Uses

Describe how the BIM Model and Facility Data are leveraged to maximize project value (e.g. design alternatives, life-cycle analysis, scheduling, estimating, material selection, pre-fabrication opportunities, site placement, etc.) Reference www.engr.psu.edu/bim/download for BIM Goal & Use Analysis Worksheet.

1. MAJOR BIM GOALS / OBJECTIVES:

State Major BIM Goals and Objectives

PRIORITY (HIGH/ MED/ LOW)	GOAL DESCRIPTION	POTENTIAL BIM USES

2. BIM USE ANALYSIS WORKSHEET: ATTACHMENT 1

Reference www.engr.psu.edu/bim/download for BIM Goal & Use Analysis Worksheet. Attach BIM Use analysis Worksheet as Attachment 1.

3. BIM USES:

Highlight and place an X next to the additional BIM Uses to be developed by the use of the BIM model as selected by the project team using the BIM Goal & Use Analysis Worksheet. See BIM Project Execution Planning Guide at www.engr.psu.edu/BIM/BIM_Uses for Use descriptions. Include additional BIM Uses as applicable in empty cells.

X	PLAN	X	DESIGN	X	CONSTRUCT	X	OPERATE
	PROGRAMMING		DESIGN AUTHORING		SITE UTILIZATION PLANNING		BUILDING MAINTENANCE SCHEDULING
	SITE ANALYSIS		DESIGN REVIEWS		CONSTRUCTION SYSTEM DESIGN		BUILDING SYSTEM ANALYSIS
			3D COORDINATION		3D COORDINATION		ASSET MANAGEMENT
			STRUCTURAL ANALYSIS		DIGITAL FABRICATION		SPACE MANAGEMENT / TRACKING
			LIGHTING ANALYSIS		3D CONTROL AND PLANNING		DISASTER PLANNING
			ENERGY ANALYSIS		RECORD MODELING		RECORD MODELING
			MECHANICAL ANALYSIS				

X	PLAN	X	DESIGN	X	CONSTRUCT	X	OPERATE
			OTHER ENG. ANALYSIS				
			SUSTAINABILITY (IGBC) EVALUATION				
			CODE VALIDATION				
	PHASE PLANNING (4D MODELING)		PHASE PLANNING (4D MODELING)		PHASE PLANNING (4D MODELING)		PHASE PLANNING (4D MODELING)
	COST ESTIMATION		COST ESTIMATION		COST ESTIMATION		COST ESTIMATION
	EXISTING CONDITIONS MODELING		EXISTING CONDITIONS MODELING		EXISTING CONDITIONS MODELING		EXISTING CONDITIONS MODELING

Section E: Organizational Roles / Staffing

Determine the project's BIM Roles/Responsibilities and BIM Use Staffing

1. BIM ROLES AND RESPONSIBILITIES:

Describe BIM roles and responsibilities such as BIM Managers, Project Managers, Draftspersons, etc.

2. BIM USE STAFFING:

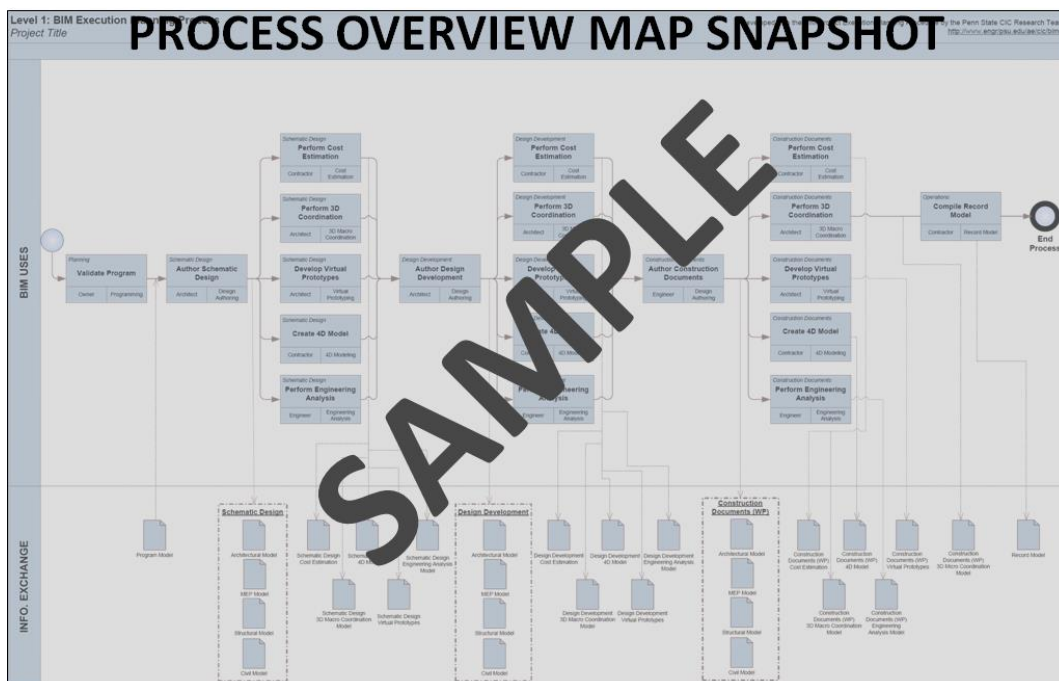
For each BIM Use selected, identify the team within the organization (or organizations) who will staff and perform that Use and estimate the personal time required.

BIM Use	Organization	Number of Total Staff for BIM Use	Estimated Worker Hours	Location(s)	Lead Contact
3D coordination	Contractor A				
	B				
	C				

Section F: BIM Process Design and Level of development (LOD)

Provide process maps & Level of Detail (LOD) for each BIM Use mentioned in section D: Project Goals/BIM Uses. These process maps provide a detailed plan for execution of each BIM Use. They also define the specific Information Exchanges for each activity, building the foundation for the entire execution plan. The plan includes the Overview Map (Level 1) of the BIM Uses, a Detailed Map of each BIM Use (Level 2), and a description of elements on each map, as appropriate. Level 1 and 2 sample maps are available for download at www.engr.psu.edu/BIM/download. (Please note that these are sample maps and should be modified based on project specific information and requirements). Please reference Chapter Three: Designing BIM Project Execution Process in the BIM Project Execution Planning Guide found at www.engr.psu.edu/BIM/PxP

1. LEVEL ONE PROCESS OVERVIEW MAP: ATTACHMENT 2



2. LIST OF LEVEL TWO – DETAILED BIM USE PROCESS MAP(S): ATTACHMENT 3

The following are examples. Modify for specific project. Some Process Maps may need to be removed, while some process maps may need to be added.

- a. Existing Conditions Modeling
- b. Phase Planning/ scheduling (4D Modeling)
- c. Quantity Take Offs & Cost Estimation (5D)
- d. Programming
- e. Site Analysis
- f. Design Reviews
- g. Design Authoring
- h. Energy Analysis

- i. Structural Analysis
- j. Lighting Analysis
- k. 3D Coordination
- l. Site Utilization Planning
- m. 3D Control and Planning
- n. Record Modeling
- o. Maintenance Scheduling
- p. Building System Analysis

[Delete unused or add additional process maps from list]

3. BIM MODELING SCOPE / ELEMENTS / LEVEL OF DEVELOPMENT (LOD)

Model elements by discipline, level of development, and any specific attributes important to the project are documented using information exchange worksheet. Each Party shall be responsible for any Contribution that it makes to a model or that arises from that party's access to that model. Management of BIM must be clearly stated throughout the process and in accordance with the BEP, since such is not always the responsibility of the Architect.

SECTION G: BIM INFORMATION EXCHANGES

Model elements by discipline, level of detail, and any specific attributes important to the project are documented using information exchange worksheet. See Chapter Four: Defining the Requirements for Information Exchanges in the BIM Project Execution Planning Guide for details on completing this template.

1. LIST OF INFORMATION EXCHANGE WORKSHEET(S): ATTACHMENT 4

The following are examples. Modify for specific project. Some Information Exchanges may need to be removed, while some Information Exchanges may need to be added.

- a. Existing Conditions Modeling
- b. Cost Estimation
- c. Phase Planning (4D Modeling)
- d. Programming
- e. Site Analysis
- f. Design Reviews
- g. Design Authoring
- h. Energy Analysis
- i. Structural Analysis
- j. Lighting Analysis
- k. 3D Coordination
- l. Site Utilization Planning
- m. 3D Control and Planning
- n. Record Modeling
- o. Maintenance Scheduling
- p. Building System Analysis
- q. [Delete unused information exchanges from list]

INFORMATION EXCHANGE (IE)

Information	Responsible Party
A Accurate Size & Location, include materials and object parameters	ARCHIT. Architect
B General Size & Location, include parameter data	CON. Contractor
C Schematic Size & Location	CE. Civil Engineer
	ME. Energy Manager
	MEP. MEP Engineer
	SE. Structural Engineer
	TC. Trade Contractor

BIM Use Title	Programming	Design Authoring	Existing Conditions Modeling	Cost Estimation	3D Coordination	Design Reviews									
Project Phase	Planning	Design	Design	Design	Design	Design Reviews									
Time of Exchange (DD, DD, DD, Construction)															
Responsible Party (Information Receiver)															
Receiver File Format															
Application & Version															
Model Element Breakdown	Info	Resp. Party	Additional Information	Info	Resp. Party	Additional Information	Info	Resp. Party	Notes	Info	Resp. Party	Notes	Info	Resp. Party	Notes
A. SUBSTRUCTURE															
Foundations															
			Standard Foundations												
			Special Foundations												
			Slab on Grade												
Basement Construction			Basement Excavation												
			Basement Walls												
B. SHELL															
Superstructure			Floor Construction												
			Roof Construction												
Exterior Enclosure			Exterior Walls												
			Exterior Windows												
			Exterior Doors												
Roofing			Roof Coverings												
			Roof Openings												
C. INTERIORS															
Interior Construction			Partitions												
			Interior Doors												
			Finings												
Stairs			Stair Construction												
Interior Finishes			Wall Finishes												
			Floor Finishes												
			Ceiling Finishes												
D. SERVICES															
Conveying Systems			Elevator & Lift												
			Escalators & Moving Walks												
			Plenum, Penetration Enclosure												

2. MODEL DEFINITION WORKSHEET: ATTACHMENT 5

(Attach Model Definition Worksheet)

MODEL DEFINITION (MOD)

Information	Responsible Party
A Accurate Size & Location, include materials and object parameters	ARCHIT. Architect
B General Size & Location, include parameter data	CON. Contractor
C Schematic Size & Location	CE. Civil Engineer
	ME. Energy Manager
	MEP. MEP Engineer
	SE. Structural Engineer
	TC. Trade Contractor

Project Phase Deliverable	Planning	Design	Construction	Operations								
Author File Format (if varies, specify in notes)												
Application & Version												
Model Element Breakdown	Info	Resp. Party	Additional Information	Info	Resp. Party	Additional Information	Info	Resp. Party	Notes	Info	Resp. Party	Notes
A. SUBSTRUCTURE												
Foundations			Standard Foundations									
			Special Foundations									
			Slab on Grade									
Basement Construction			Basement Excavation									
			Basement Walls									
B. SHELL												
Superstructure			Floor Construction									
			Roof Construction									
			Green Roof									
			Interior Columns									
			Beams									
			Trusses									
Exterior Enclosure			Exterior Walls									
			Exterior Windows - Glass Panels									
			Exterior Windows - Glass Panels Railing									
			Exterior Doors									
Roofing			Roof Coverings									
			Roof Openings									
C. INTERIORS												
Interior Construction			Partitions									
			Interior Doors									
			Finings									
Stairs			Stair Construction									
Interior Finishes			Wall Finishes									
			Floor Finishes									
			Ceiling Gips									
			CRSD Ceiling									
			Ceiling Finishes									
D. SERVICES												

SECTION H: BIM AND FACILITY DATA REQUIREMENTS

The section should include the employer BIM requirements. It is important that the employers's requirements on BIM for the purpose of the facility to be considered so that they can be incorporated into the project's BIM process.

SECTION I: COLLABORATION PROCEDURES

1. COLLABORATION STRATEGY:

Describe how the project team will collaborate. Include items such as communication methods, document management and transfer, and record storage, etc.

2. MEETING PROCEDURES:

The following are examples of meetings that should be considered.

MEETING TYPE	PROJECT STAGE	FREQUENCY	PARTICIPANTS	LOCATION
BIM REQUIREMENTS KICK-OFF				
BIM EXECUTION PLAN DEMONSTRATION				
DESIGN COORDINATION				
CONSTRUCTION OVER-THE-SHOULDER PROGRESS REVIEWS				
ANY OTHER BIM MEETINGS THAT OCCURS WITH MULTIPLE PARTIES				

3. MODEL DELIVERY SCHEDULE OF INFORMATION EXCHANGE FOR SUBMISSION AND APPROVAL:

Document the information exchanges and file transfers that will occur on the project.

INFORMATION EXCHANGE	FILE SENDER	FILE RECEIVER	ONE-TIME or FREQUENCY	DUE DATE or START DATE	MODEL FILE	MODEL SOFTWARE	NATIVE FILE TYPE	FILE EXCHANGE TYPE
DESIGN AUTHORIZING 3D COORDINATION	STRUCTURAL ENGINEER	(FTP POST) (COORDINATION LEAD)	WEEKLY	[DATE]	STRUCT	DESIGN APP	.XYZ	.XYZ .ABC
	MECHANICAL ENGINEER	(FTP POST) (COORDINATION LEAD)	WEEKLY	[DATE]	MECH	DESIGN APP	.XYZ	.XYZ .ABC

4. INTERACTIVE WORKSPACE

The project team should consider the physical environment it will need throughout the lifecycle of the project to accommodate the necessary collaboration, communication, and reviews that will improve the BIM Plan decision making process. Describe how the project team will be located. Consider questions like “will the team be collocated?” If so, where is the location and what will be in that space? Will there be a BIM Trailer? If yes, where will it be located and what will be in the space such as computers, projectors, tables, table configuration? Include any additional information necessary information about workspaces on the project.

5. ELECTRONIC COMMUNICATION PROCEDURES:

(Note: File Naming and Folder Structure will be discussed in Section L: Model Structure).

The following document management issues should be resolved and a procedure should be defined for each: Permissions / access, File Locations, FTP Site Location(s), File Transfer Protocol, File / Folder Maintenance, etc.

FILE LOCATION	FILE STRUCTURE / NAME	FILE TYPE	PASSWORD PROTECT	FILE MAINTAINER	UPDATE D
FTP SITE: ftp://ftp.****.com/**** /****	ROOT PROJECT FOLDER	FOLDER	YES *****	PW/PMIS	ONCE
	ARCH ROOT FOLDER	FOLDER			ONCE
	ARCH-11111-BL001.xyz	.xyz			DAILY
NETWORK drive @ PSU F:\PROJECT\BIM	ROOT PROJECT FOLDER	FOLDER	NO	PW/PMIS	ONCE
Project Management Software www.****.com					

SECTION J: QUALITY CONTROL

1. OVERALL STRATEGY FOR QUALITY CONTROL:

Describe the strategy to control the quality of the model.

2. QUALITY CONTROL CHECKS:

The following checks should be performed to assure quality.

CHECKS	DEFINITION	RESPONSIBLE PARTY	SOFTWARE PROGRAM(S)	FREQUENCY
VISUAL CHECK	Ensure there are no unintended model components and the design intent has been followed			
INTERFERENCE CHECK	Detect problems in the model where two building components are clashing including soft and hard			
STANDARDS CHECK	Ensure that the BIM and AEC CADD Standard have been followed (fonts, dimensions, line styles, levels/layers, etc)			
MODEL INTEGRITY CHECKS	Describe the QC validation process used to ensure that the Project Facility Data set has no undefined, incorrectly defined or duplicated elements and the reporting process on non-compliant elements and corrective action plans			

3. Model Accuracy and Tolerances:

Models should include all appropriate dimensioning as needed for design intent, analysis, and construction. Level of detail and included model elements are provided in the Information Exchange Worksheet.

PHASE	DISCIPLINE	TOLERANCE
DESIGN DOCUMENTS	ARCH	ACCURATE TO +/- [#] OF ACTUAL SIZE AND LOCATION
SHOP DRAWINGS	MECH CONTRACTOR	ACCURATE TO +/- [#] OF ACTUAL SIZE AND LOCATION

4. BIM Quality checklist:

The section will cover the proposed BIM quality checklist.

SECTION K: TECHNOLOGICAL INFRASTRUCTURE NEEDS

1. SOFTWARE:

List software used to deliver BIM. Remove software that is not applicable.

BIM USE	DISCIPLINE (if applicable)	SOFTWARE	VERSION
DESIGN AUTHORING	ARCH	XYZ DESIGN APPLICATION	VER. X.X (YEAR)

2. COMPUTERS / HARDWARE:

Understand hardware specification becomes valuable once information begins to be shared between several disciplines or organizations. It also becomes valuable to ensure that the downstream hardware is not less powerful than the hardware used to create the information. In order to ensure that this does not happen, choose the hardware that is in the highest demand and most appropriate for the majority of BIM Uses.

BIM USE	HARDWARE	EMPLOYER OF HARDWARE	SPECIFICATIONS
DESIGN AUTHORING	XXX COMPUTER SYSTEM	ARCHITECT X	PROCESSOR, OPERATING SYSTEM, MEMORY STORAGE, GRAPHICS, NETWORK CARD, ETC.

3. MODELING CONTENT AND REFERENCE INFORMATION

Identify items such as families, workspaces, and databases.

BIM USE	DISCIPLINE (if applicable)	MODELING CONTENT / REFERENCE INFORMATION	VERSION
DESIGN AUTHORING	ARCH	XYZ APP FAMILIES	VER. X.X. (YEAR)
ESTIMATING	CONTRACTOR	PROPRIETARY DATABASE	VER. X.X (YEAR)

SECTION L: MODEL STRUCTURE

1. FILE NAMING STRUCTURE:

Determine and list the structure for model file names.

FILE NAMES FOR MODELS SHOULD BE FORMATTED AS:	
DISCIPLINE - PROJECT NUMBER – BUILDING NUMBER.XYZ (example: ARCH-11111-BL001.xyz)	
ARCHITECTURAL MODEL	ARCH-
CIVIL MODEL	CIVIL-
MECHANICAL MODEL	MECH-
PLUMBING MODEL	PLUMB-
ELECTRICAL MODEL	ELEC-
STRUCTURAL MODEL	STRUCT-
ENERGY MODEL	ENERGY-
CONSTRUCTION MODEL	CONST-
COORDINATION MODEL	COORD-

2. MODEL STRUCTURE:

Describe and diagram how the Model is separated, e.g., by building, by floors, by zone, by areas, and/or discipline.

3. MEASUREMENT AND COORDINATE SYSTEMS:

Describe the measurement system (Imperial or Metric) and coordinate system (geo-referenced) used.

4. BIM AND CAD STANDARDS:

Identify items such as the BIM and CAD standards, content reference information, and the version of IFC, etc.

STANDARD	VERSION	BIM USES APLICABLE	ORGANIZATIONS APLICABLE
CAD STANDARD		DESIGN AUTHORIZING	ARCHITECT
IFC	VERSION/MVD(s)	RECORD MODELING	CONSTRUCTION MANAGER

SECTION M: PROJECT DELIVERABLES

In this section, list the BIM deliverables for the project and the format in which the information will be delivered.

BIM SUBMITTAL ITEM	STAGE	Approximate Due Date	FORMAT	NOTES
	Design Development			
	Construction Documents			
	Construction			
Record Model	Close out		(.xyz)	See Record Model Information Exchange to ensure that the proper information is contained in this model

SECTION N: DELIVERY STRATEGY / CONTRACT

1. DELIVERY AND CONTRACTING STRATEGY FOR THE PROJECT:

What additional measures need to be taken to successfully use BIM with the selected delivery method and contract type?

2. TEAM SELECTION PROCEDURE:

How will you select future team members in regards to the above delivery strategy and contract type?

3. BIM CONTRACTING PROCEDURE:

How should BIM be written into the future contracts? (If documents / contracts are developed, please attach as attachment 6)

4. AGREEMENT FOR TRANSFER OF DIGITAL MODEL FILES

How the Contractor proposes to transfer and use digital model files.

SECTION O: ATTACHMENTS

1. BIM USE SELECTION WORKSHEET [FROM SECTION D]
2. LEVEL 1 PROCESS OVERVIEW MAP [FROM SECTION F]
3. LEVEL 2 DETAILED BIM USE PROCESS MAP(S) [FROM SECTION F]
4. INFORMATION EXCHANGE REQUIREMENT WORKSHEET(S) [FROM SECTION G]
5. MODEL DEFINITION WORKSHEET [FROM SECTION G]
6. DEVELOPED DOCUMENTS / CONTRACTS [FROM SECTION H]
7. BIM QUALITY CHECKLIST (FROM SECTION J)
8. DELIVERY STRATEGY / CONTRACTS (FROM SECTION N)

Annexure – II – CAD Guidelines

(Schedule - Q)

1 OVERVIEW

1.1 Purpose

Programme Manager for New Cities (AECOM) has initiated to manage a program that will assist in standardizing the use of CAD across all departments. The primary goal is to create an environment for seamless integration/collaboration between all disciplines & business lines of all Consultants/Contractors regarding the use of CAD for production of any drawing. The document will achieve this through setting out the Guideline for drawing data production. This will then enable drawing data to be incorporated into the Delhi Mumbai Industrial Corridor Development Corporation (DMICDC) GIS.

1.2 Application

This CAD standard shall be applied to all disciplines in all offices and design houses working in this Project. The scope of this document is to provide guidelines and procedures for adopting AutoCAD layering standards in preparing design and as-built drawings for automated transference to DMICDC GIS. This Guideline will address the following:

- i. Layer assignments,
- ii. Standard symbols
- iii. Layers and layer names,
- iv. Attributes to each feature,
- v. Templates,
- vi. Colour usage associated with line widths for all Highways and Utility drawings.

The Guideline are to be applied for all drawings from Concept through to As Built handover stage.

2 Filing and Storage of Drawings

2.1 Filing and Storage of Drawings

In order that the project information is readily accessible it is essential that all drawing data is filed and stored in a consistent and logical manner.

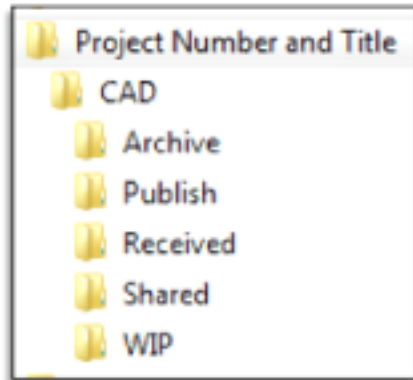
2.2 Electronic Copies

All electronic drawing and sketch files associated with a particular project shall be filed within the project folder.

2.3 Folder Structure

The standard folder structure for CAD data is as shown in Figure 1 below, it adopts the Code of Practice BS1192:2007 on Common Data Environment for collaborative working.

Figure 1:



2.4 Folder Name: Project Number and Title

This can be under the main office or discipline folder, or, if the number of files would render lists unwieldy, then further sub-folder are permissible. Folder names are not to include any symbols.

2.5 Sub Folder Name: CAD

Contains drawings and digital information organized as shown in Figure 1.

In a multi-disciplinary office the main sub-folders defined below may be sub-divided as necessary into the relevant disciplines:

2.5.1 Sub Folder Name: WIP (Work in Progress)

Contains the current working project drawings and sketches. This is where all files currently in the iterative process of design have not yet been approved to be shared.

This folder shall contain further sub-folders which can be amended to suit Project requirements.

2.5.2 Sub Folder Name: Shared

Contains verified, checked and approved CAD data for use by others for reference. This folder will hold the project specific drawings such as title frames, references, images, etc.

This folder shall contain further sub-folders which can be amended to suit Project requirements

2.5.3 Sub Folder Name: Published

Contains all final published sheet files, figures or sketches. This folder must contain the last issued Models/Xrefs. Data filed in this area shall never be deleted or overwritten, but will remain until archived.

2.5.4 Sub Folder Name: Archive

Contains all previous issues and superseded data. This folder is to allow retrieval of previously issued drawings at certain stages of design decisions. This folder will provide an audit trail of documentation and changes through the life of the project.

2.5.5 Sub Folder Name: Received

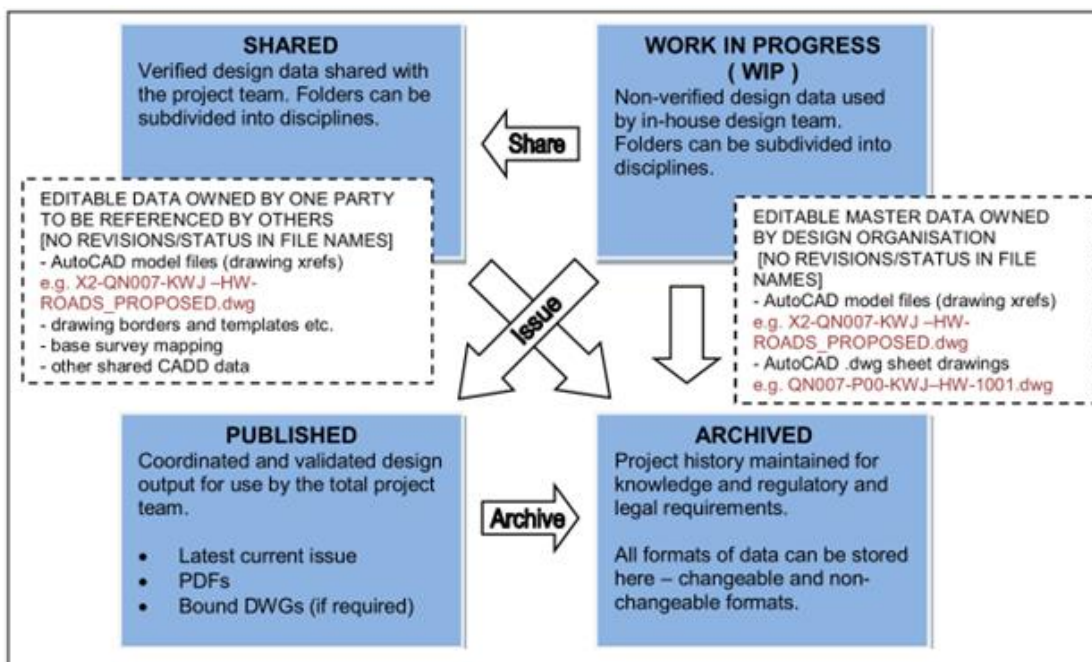
Contains read only copies of design data which have been received from Third Party sources or Stakeholders and will contain further sub-folders to identify the source and date of receipt.

The Received folder can be directly under the main project folder structure, under CAD or wherever the Employer / PMNC find it suitable. The vital concern is that a folder must be dedicated for incoming issues, where a full archive of all received information is stored with an audit trail that is related to the sending company and the date received and the current copy is easily identifiable throughout the project.

2.6 Collaborative Working

Figure 2 Application of Code of Practice BS1192:2007 on Common Data Environment (CDE)

Figure 2:



- i. Within WIP folder each discipline can create a folder structure to suit its needs.
- ii. Common resource files such as title sheets, mapping, surveys, imagery and other shared CAD data must be available to all disciplines in the Shared area.
- iii. Once data has been checked, verified and approved, it must be copied to the Shared area and other disciplines notified.
- iv. When models are revised or updated; other disciplines referencing the model will be affected, so effective communication between disciplines is essential.
- v. When data files have been authorized and verified for issue, it is copied to the Published area, to maintain a local copy within the design organization's server.
- vi. The previous version of the data in the Published area shall be moved to the Archive area as a historical record and to maintain an audit trail.

2.7 Hard Copies

The print containing the original stamped, checked and approved signatures becomes the hard-copy 'master plot' for the drawing. See Section 3.3.13.

2.7.1 Drawings

The Project Implementation Plan (PIP) will define the area where the hard-copies for projects are to be filed.

The electronic version of the master plot of the drawing shall be known as the 'reference master'. The reference master, if required, shall be utilized for the electronic issue of the file.

Superseded master plots shall be retained and endorsed "superseded".

2.7.2 Check Prints

All completed and signed check prints shall be filed within the drawing office by the drafting checker in an area in accordance with the Project Implementation Plan (PIP).

All check prints are to be retained at least for the term of the project unless otherwise agreed with the Employer / PMNC. No check prints are to be disposed of without the consent of the Project Manager.

3 DRAWING DEVELOPMENT

3.1 Drawing Numbering System

The drawing numbers are to be entered into the drawing register during creation of the drawings so as to eliminate duplicate drawing numbers being assigned. The drawing number

shall be unique for each drawing and will normally be in the form:

Table 1

	Originator code	-	Project Name	-	Discipline / Drawing Type code	-	Document code	Drawing Number	-	Sheet No
Example	AECOM	-	TP2E-RS	-	HW	-	DWG	1001	-	001
See Reference	3.1.1		3.1.2		3.1.3		3.1.4	3.1.5		

Fields will be separated by a hyphen (-)

Example: AECOM-TP2E-RS-HW-DWG-1001-01

3.1.1 Originator Code

A three letter code to identify who prepared the drawing. Refer to Appendix C.

3.1.2 Project Name

Refer to Appendix C

3.1.3 Drawing Type/ Discipline code

Two letter code to assist in identifying a discipline or type of drawing (i.e. HW for Highways, ST for Structures, LE for Landscape, SK for Sketch, etc.). Refer to Appendix C.

3.1.4 Document Code

Two letter code to assist in identifying type of document. Refer to Appendix C.

3.1.5 Drawing Number Code

Four digits sequential number for a specific drawing type series. Refer to Appendix C. Subsequent issue of a drawing shall have the revision coding incremented by the next sequential number or letter.

Note #3:

Working drawings shall not have the drawing status and revision in the file name.

3.2 Model File (Xref) Naming

Model Files shall be named in accordance with the convention described below

Table 2

	Model type Identifier	Originator code		Project Name	-	Discipline code	-	Short Description
Example	X2	AECOM	-	TP2E-RS	-	HW	-	Proposed _Centre_line
See Reference	3.2.1	3.1.2		3.1.3		3.1.4		3.2.5

Example

X2- AECOM-TP2E-RS-HW -Proposed_Centre_Line

3.2.1 Model Identifier Code

This code identifies the model file if it is in 2D or 3D drawing as defined below:

Table 3

Description	Model Type Identifier
2D Model	X2
3D Model	X3

3.2.2 Originator Code

A three letter code to identify the Employer / PMNC who prepared the drawing. Refer to Appendix C.

3.2.3 Project Name

Refer to Appendix C

3.2.4 Drawing Type/ Discipline code

Two letter code to assist in identifying a discipline or type of drawing (i.e. HW for

Highways, ST for Structures, LE for Landscape, SK for Sketch, etc.). Refer to Appendix C.

3.2.5 Short Description Field

A short description of the model/Xref file. An underscore is to be used in place of any spaces in the description field.

Working models shall not have the drawing status and revision in the file name.

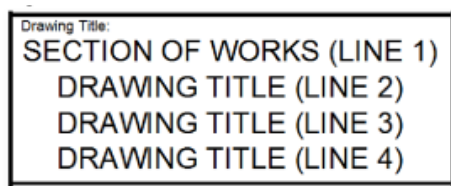
3.3 Drawing Title Blocks and Signatures

A standard drawing arrangement (drawing border and title block) shall be adopted for all drawings and shall be consistent across all drawings within the project. Title block entries shall be concise and informative to indicate fully the content of the drawing.

3.3.1 Drawing Title

- i) The top line shall identify the specific area or section within the contract, i.e. "HIGHWAYS", or it may be left blank where no such area or section exists.
- ii) The second third and fourth lines shall identify the content or purpose of the drawing, i.e. "TRAFFIC SIGNS AND ROAD MARKINGS"
- iii) Where several drawings depict similar detail and no other qualifications are available for distinguishing between them, the distinction shall be made by labelling each drawing consecutively with sheet numbers, such as "SHEET 1 OF 10", "SHEET 2 OF 10", etc.

Figure 3



3.3.2 Drawing Status

The issue DRAWING STATUS box shown below (Figure 4) shall be completed to describe the current status of the drawing. Refer to Table 5 for the list of drawing status/stages:

Figure 4

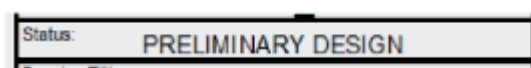


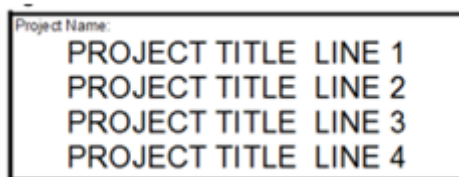
Table 4

Drawing Status
Concept Design
Preliminary Design
Detailed Design
Tender
Contract
As Built

3.3.3 Project Name Field

For Project Name refer to Baseline Assessment Report on detailed list of projects.

Figure 5

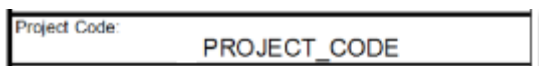


Project Name:
PROJECT TITLE LINE 1
PROJECT TITLE LINE 2
PROJECT TITLE LINE 3
PROJECT TITLE LINE 4

3.3.4 Project Code Field

For Employer / PMNC-specific project codes refer to Baseline Assessment Report on detailed list of prioritized projects.

Figure 6



Project Code: PROJECT_CODE

3.3.5 Drawing Creation Date Field

The drawing creation date shall be in the whole word format for Month and Year as highlighted below (Figure 7):

Figure 7

Drawn: R SINGH	Checked: Y CHAUHAN
Designed: S MONDAL	Approved: P KUMAR
Date: AUGUST 2014	SCALE (A1) : 1:500 (A3) : 1:1000
Originator Drawing No: XXXXXX	
Project Drawing No: LBG-TP2E-RS-HW-DWG-1001-01	REV. R01

3.3.6 Revision History Table

A concise description of each approved and issued revision shall be entered into the revision description column. The revision columns indicate the history and development of the drawing; therefore, the description shall be as informative as is practical.

Drawings that are issued under specific Submissions or Milestones sets shall have clear, consistent revision description that states the purpose of the submission. e.g. ISSUED FOR APPROVAL, etc.

Figure 8

D01	30SEP13	REISSUED FOR APPROVAL	RK	YC	JS
D01	24SEP13	ISSUED FOR APPROVAL	RK	YC	JS
Rev	Date	Revision Description	Drawn	Chkd	Appd.

The date shown in the revision history table shall be in the format DDMMYY as highlighted in Figure 9 below

Figure 9

D01	30SEP13	REISSUED FOR APPROVAL	RK	YC	JS
D01	24SEP13	ISSUED FOR APPROVAL	RK	YC	JS
Rev	Date	Revision Description	Drawn	Chkd	Appd.

The months shall be abbreviated as shown in table 6 below:

Table 5

Abbreviation	Month	Abbreviation	Month
JAN	January	JUL	July
FEB	February	AUG	August
MAR	March	SEP	September
APR	April	OCT	October
MAY	May	NOV	November
JUN	June	DEC	December

The date of completion of the revision and the initials of the person effecting the revision shall be stated.

The earliest revision descriptions shall be deleted when there is no space to include the current revision within the revision column.

3.3.7 Drawing Number Field

Drawing number field shall be completed as highlighted box below:

Figure 10

Drawn: R SINGH	Checked: Y CHAUHAN
Designed: S MONDAL	Approved: P KUMAR
Date: AUGUST 2014	SCALE (A1): 1:500 (A3): 1:1000
Originator Drawing No: XXXXXX	
Project Drawing No: LBG-TP2E-RS-HW-DWG-1001-01	REV. R01

Refer to Section 3.1 for drawing numbering convention.

3.3.8 Revision Field Box

Revision field box shall be completed as highlighted below: Refer to 3.10.3

Figure 11

Drawn: R SINGH	Checked: Y CHAUHAN
Designed: S MONDAL	Approved: P KUMAR
Date: AUGUST 2014	SCALE (A1): 1:500 (A3): 1:1000
Originator Drawing No: XXXXXX	
Project Drawing No: LBG-TP2E-RS-HW-DWG-1001-01	REV. R01

3.3.9 Name Fields

The ‘Drawn’, ‘Designed’, ‘Checked’ and ‘Approved’ field boxes on the title block, as highlighted below, shall include the first name initial and the full last name of the person who performed or is responsible for the major portion of the work.

Figure 12

Drawn: R SINGH	Checked: Y CHAUHAN
Designed: S MONDAL	Approved: P KUMAR
Date: AUGUST 2014	SCALE (A1): 1:500 (A3): 1:1000
Originator Drawing No: XXXXXX	
Project Drawing No: LBG-TP2E-RS-HW-DWG-1001-01	REV. R01

3.3.10 Drawing Scale Field

For completing the drawing scale field box in the title frame, refer to Section 3.6. A scale bar for presenting the scale of the drawing should be used in the drawing layout.

Figure 13

Drawn: R SINGH	Checked: Y CHAUHAN
Designed: S MONDAL	Approved: P KUMAR
Date: AUGUST 2014	SCALE (A1): 1:500 (A3): 1:1000
Originator Drawing No: XXXXXX	
Project Drawing No: LBG-TP2E-RS-HW-DWG-1001-01	REV. R01

3.3.11 Signatures

The revision history table shall contain the current issue revision number, date of issue, Drafter/Author, Checker, Approver signatures or initials and description of current revision.

Table 6

TITLE BLOCK	CAD	HARD COPY	PDF COPY
DRAWN BY	See 3.3.12	See 3.3.13	See 3.3.14
CHECKED BY	See 3.3.12	See 3.3.13	See 3.3.14
APPROVER BY	See 3.3.12	See 3.3.13	See 3.3.14

3.3.12 CAD Files

When issued, drawing files shall bear the typed CAD initials of the author, checker and approver on the revision history box.

Figure 14

Drawn: R SINGH	Checked: Y CHAUHAN
Designed: S MONDAL	Approved: P KUMAR
Date: AUGUST 2014	SCALE (A1) : 1:500 (A3) : 1:1000
Originator Drawing No: XXXXXX	
Project Drawing No: LBG-TP2E-RS-HW-DWG-1001-01	REV. R01

3.3.13 Hard Copy

The original hard copy set to be submitted to Employer/ PMNC shall be signed by hand and stamped. This set will become the control set for reference. The drawing shall bear hand signature of the drawing Approver beside his/her name in the Approved field box on the title frame as shown in Figure 15. Each drawing shall be stamped with the issuing company's official stamp.

Figure 15 Signed hard copy by Approver

Drawn: R SINGH	Checked: Y CHAUHAN
Designed: S MONDAL	Approved: P KUMAR PK
Date: AUGUST 2014	SCALE (A1): 1:500 (A3): 1:1000
Originator Drawing No: XXXXXX	
Project Drawing No: LBG-TP2E-RS-HW-DWG-1001-01	REV. R01

Original hand-signed copy is required for all ‘Final’ drawings submitted for: Concept design, Preliminary design, Detailed design, Tender set, Contract set, GFC drawings (during construction) and As Built.

Subsequent hard copies of the submitted original do not have to be hand signed. Scanned copies of the hand signed drawing are permitted as long as the clarity of the drawing is not compromised. Alternatively, copies may be printed directly from CAD. It is acceptable for these not to contain a copy of the hand signature, but to bear typed initials instead.

3.3.14 PDF Copy

When Issued, PDF copy can be generated electronically from the cad file bearing the typed initials of the author, checker and approver.

3.4 Units

All general drawing work (e.g. Xrefs) are to be in model space and be produced in meters to three decimal places. Drawing borders to be in paper space and in millimetres.

e.g. 54.000

78.720

0.325

Dimensions in metres and using whole numbers, can be expressed using the ‘m’ (metre) suffix as in the following

45.000m

The position of the decimal point shall be the same as a full stop and no space shall be left between the number and its units, to ensure clarity, as in the following example:

5.800m

All other non-linear measurements, e.g. areas and volumes, shall be followed by the unit symbol. The most common non-linear measurements are as follows

Square metre - m²

Cubic metre - m³

All detail drawing work (e.g. standard details) is to be in model space and be produced in millimetres in whole numbers (i.e. no decimal places).

e.g. 10000

787

Dimensions in millimetres using whole numbers, can be expressed using the 'mm' (millimetre) suffix as in the following

250mm

Chainages shall be in metres and written as shown

0+100 (Chainages in whole numbers can be written without the decimal accuracy)

15+255.345

Chainages are plan measurements taken along a setting out line, and provide a horizontal distance not taking into account slope lengths.

3.5 Drawing Sizes

Drawing sizes shall conform to the International Standards Organisation (ISO).

Sizes (in mm) are as follows: -

A0 – 1189 x 841

A1 – 841 x 594

A2 – 594 x 420

A3 – 420 x 297

A4 – 297 x 210

In general, all drawings shall be produced at the preferred A1 original size. The use of A0 size drawings shall be avoided wherever possible.

Each group or set of drawings shall use only one drawing size unless situations make this impractical.

3.6 Scales

Scales used on drawings shall be selected as indicated in the table below. Only standard metric scales shall be used. In all cases, the selected scale shall be large enough to permit easy and clear interpretation of the information depicted.

Specific scale requirements of particular drawings such as layouts will be as stated as per RFP.

Table 7

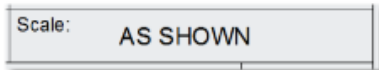
Permitted scales				
1:1	1:2		1:5	2:1
1:10	1:20	1:25	1:50	5:1
1:100	1:200	1:250	1:500	10:1
1:1000	1:2000	1:2500	1:5000	20:1
1:10,000	1:20,000	1:25,000	1:50,000	50:1

In exceptional cases where for functional reasons the recommended scale cannot be applied, intermediate scales may be chosen, provided that the required scale is of a whole number, such as 1:125, 1:150, etc.

The following scale notes shall be considered:

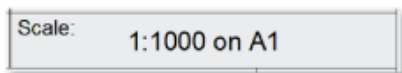
- ii. Number of scales on any one drawing shall be kept to a minimum.
- ii. CAD entities shall be drawn at full scale (1 Drawing unit = 1 Measurement unit). Final plotted scale shall be established during composition of the drawing layout for plotting.
- iii. Originators using AutoCAD shall employ the PAPER SPACE/MODEL SPACE facility to establish drawing layout and scales. All drawing entities shall reside in MODEL SPACE with the exception of view ports, general notes, revision clouding and its labels, title block and border.
- iv. Where different scales exist, each scale shall be specified under the title of the area of the drawing to which it applies and noted in the Title Block field as shown below:

Figure 16



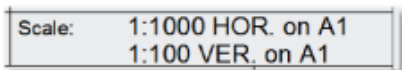
- v. Where a single scale is used on a drawing, it shall be specified within the title block only. (See the object area and shall be large enough to below). The scales selected shall depend on the object area and shall be large enough to permit easy and clear interpretation of information and ensure clarity of prints on the original as well as reduced copies i.e. A3 versions of A1 drawings.

Figure 17



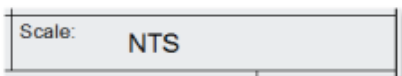
- vi. Where different scales are used for horizontal and vertical dimensions, such as in profiles, each scale shall be clearly indicated on the drawing as shown below:

Figure 18



When the drawing is not drawn to any scale, 'NTS' (Not to Scale) shall be placed in the title block as shown below:

Figure 19



Scale bars shall be shown on all drawings containing plans.

3.7 Key Plan

Where layout plans are produced on a number of drawings to cover the extent or section of the project, a Key Plan shall be included on each sheet, clearly indicating the section of the works under consideration. A dedicated box in the title frame is provided for the Key Plan as shown below.

Figure 20



3.8 Drawing Notes

Notes are to be numbered and positioned appropriately and shall include the following notes:

All Dimensions are in metres unless otherwise stated. (Only on drawings drawn in metres.)

All levels are in metres (Only on drawings where this note is applicable.)

All dimensions are in millimetres unless otherwise stated. (Only on drawings drawn in millimetres.)

3.9 General Notes

Where notes are extensive and apply on several drawings, a General Notes Drawing shall be provided which consolidates all notes. Deviation from these notes on a particular drawing may be permitted, provided this amendment is shown in the Notes section of the drawing.

Where a General Notes Drawing is used, the first note on each applicable drawing shall contain the following statement: -

“1. FOR GENERAL NOTES, REFER TO DRAWING NO. XXX”

3.10 Drawing Revision

3.10.1 Revision Clouds and Triangles

Each area where changes/revisions made since the last issue / submission shall be ringed with a cloud and marked with an equilateral triangle containing the current revision letter.

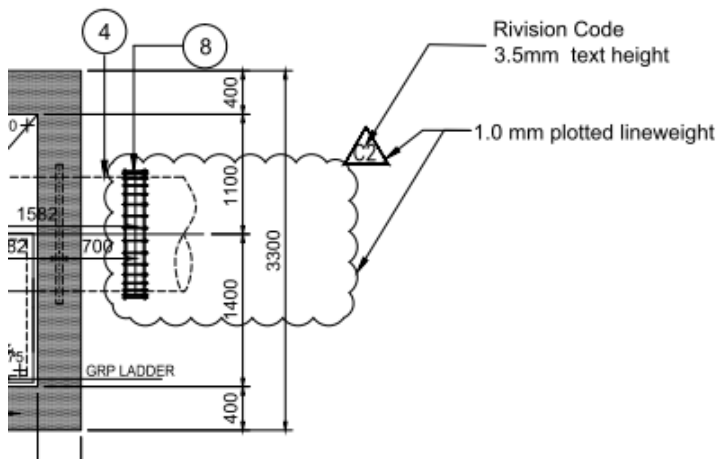
Revision clouds and its triangle label shall be placed on the paper space.

Arc length of cloud shall be 15 as a general rule to maintain consistency.

Revision clouds shall be 1.0mm thick (gray or colour 252) and triangles shall be placed on layer REV.

Clouding and revision triangles denoting the previous revision shall be removed from the CAD file.

Figure 21



3.10.2 Revision Description

The date and description of the revision / issue shall be given in the revision history table on the title frame.

3.10.3 Drawing Revision Code

This code identifies the drawing revision and shall be as defined in Table 11 below. Subsequent issue of a drawing shall have the revision coding incremented by the next sequential number or letter.

Table 8

Revision / Issue Code
R01,R02,R03....etc.

Note: As drawings move from one stage to another all historical revision history under that stage is to be removed from the revision history on the title block.

3.11 Drawing Register and Transmittal Record

The issue of drawings shall be recorded on the drawing register and a transmittal provided by drawing originators containing like information. The drawing register shall be a concise and continuous record of drawing revisions and issue history.

The current revision indicator shall be recorded for each issue.

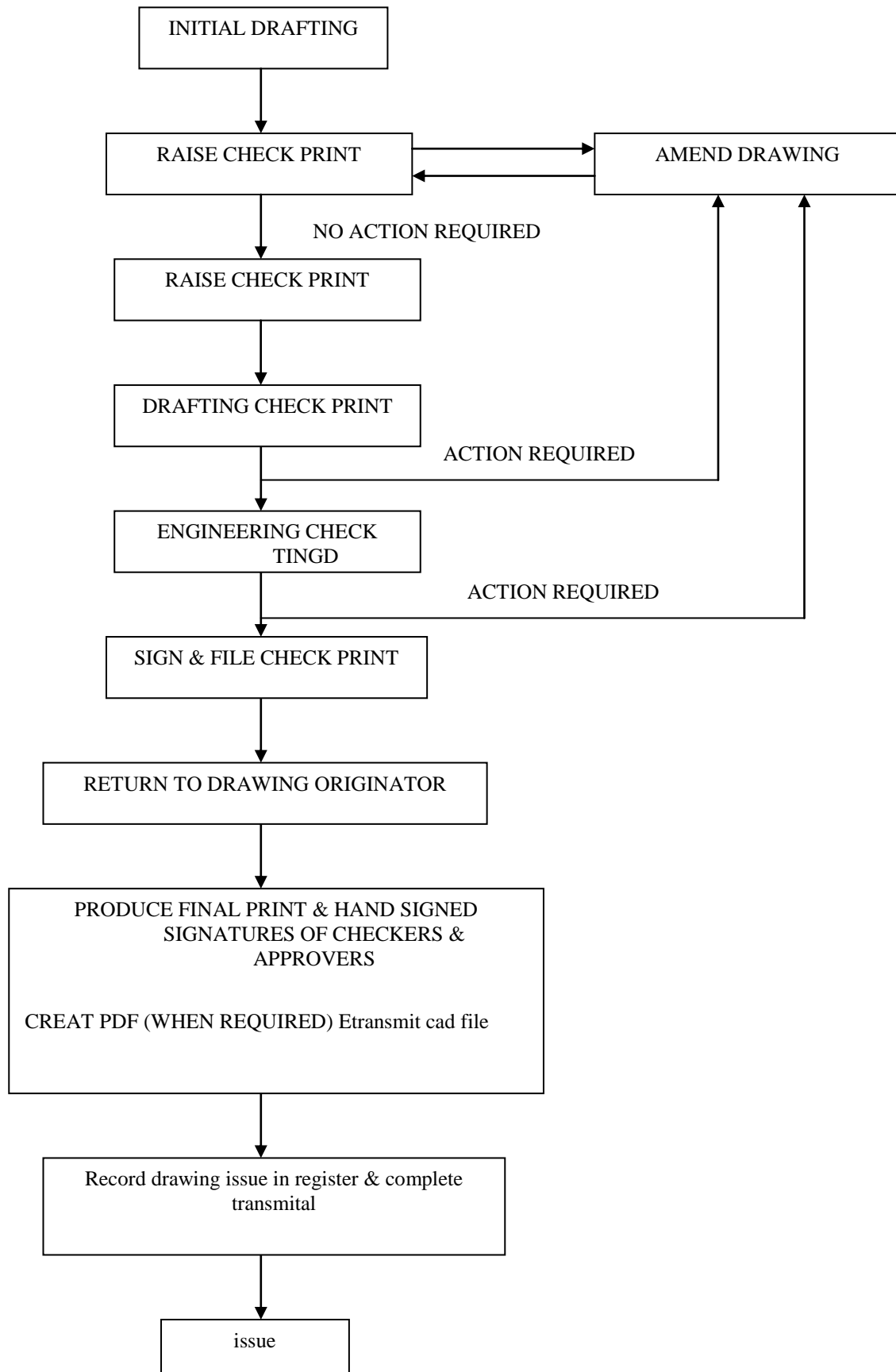
3.12 Checking and Approval of Drawings

During drawing production a system of continuous checking shall be employed by the Employer / PMNC to confirm that all CAD information fully complies with the conditions set out in this document.

It is imperative that all drawings are subjected to a Quality Assurance and Quality Control (QA/QC) check and are duly signed and authorized prior to issue.

Any drawing leaving the drawing office shall have been properly checked for presentation, clarity, accuracy, technical correctness and compliance with the relevant CAD Standard. Refer to the flow chart overleaf in Figure 22 for an overview of the checking procedure.

Figure 22: Flow diagram showing overview of CAD drawing checking procedure



3.12.1 Self Check

After preparation, the drawing shall be checked by the drawing originator and any required amendment to the drawing is to be carried out prior to handing over the check print for checking.

3.12.2 Drafting Check

Generally the Drafting Check must precede the Engineering Check.

The Drafting Check will normally be carried out by a person designated by the CAD Office representative/Manager.

The Drafting Check shall verify adherence to the Project Brief in conjunction with any applicable supplied criteria. The checker shall also make an assessment with respect to presentation, standard of workmanship and adherence to the CAD Standard Manual.

The Drafting Check shall, where deemed necessary, include an electronic check of the CAD File to ensure compliance with applicable standards and/or client requirements.

The check print shall be clearly marked by the checker with any required modifications.

Upon completion of the Drafting Check the checker shall then sign, date and highlight the required action to be taken.

Any amendment to the drawing requirements may, if required, be carried out prior to the Engineering Check and a new print raised, duly stamped and signed.

3.12.3 Engineering Check

The Engineering check will normally be carried out by a competent and relevant experienced Senior Engineer within the Employer / PMNC's organization.

The Engineering check shall verify adherence to the design calculations, design standards and associated construction issues.

Upon completion of the Engineering Check, the checker shall then sign, date and highlight the required action to be taken.

3.12.4 Further drawing amendments

Upon completion of the Drafting Check and Engineering Check the completed check print shall be returned to the originator of the drawing for amendment of the drawing.

Where required, further check prints shall be raised and the checks repeated.

3.12.5 Approval

Upon completion of the checking process, a clean print of the drawing shall be submitted to the relevant checkers for signature and to the designated authority for approval. This then becomes the controlled drawing for reference. The checker's and approver's initials together with the relevant dates shall be entered in the appropriate areas of the CAD file.

4.1 Drawing set up

- i. All AutoCAD drawings should be produced & saved in AutoCAD version not lower than 2009.
- ii. Pre-defined project drawing templates will be used for setting the layers of identifiable drawings (e.g. drainage, roads).
- iii. Units in AutoCAD shall be set to metres for Infrastructure layouts and profiles and millimetres for detail drawings such as standard details.
- iv. The CAD files provided will be in the current version of AutoCAD file format used on the project.
- v. Fonts and line types are to be followed as provided in this manual.
- vi. Files shall be purged before issue only.
- vii. Drawing features / entities must be in model space. Title frames must be in paperspace.
- viii. The colour and line type of each entity is drawn on BYLAYER.
- ix. All polygons shall be closed polylines.
- x. Do not place entities on layer 0. This layer is for the creation of blocks only.

4.2 Line Work

4.2.1 Line Types

The following guidelines shall apply to the use of line types:

LINETYPE to be set BYLAYER. (Deviation: Standard AutoCAD Blocks)

All layers shall have their entities set to 'BYLAYER'

All colours of AutoCAD objects to be BYLAYER. (Deviation: Standard AutoCAD Blocks)

The plotted appearance of line types shall be consistent across all drawings.

Modification of AutoCAD default source file is not permitted.

Lines on a drawing that cannot be represented by those in the default AutoCAD source file may be loaded from the approved Custom line types provided.

4.2.2 Line Weights

Table 9

Colour No.	Display Screen Color	Plotted Line Weight (mm)	Plotted Colour	
			DSIR_TP2_COL_A1.CTB	DSIR_TP2_BW_A1.CTB
1	RED	0.18	BLACK	BLACK
2	Yellow	0.25	BLACK	BLACK
3	Green	0.35	BLACK	BLACK
4	Cyan	0.50	BLACK	BLACK
5	Blue	0.70	BLACK	BLACK
6	Magenta	0.35	BLACK	BLACK
7	White	0.25	BLACK	BLACK
8	Dark Grey	0.20	Object Colour	BLACK
9	Light Grey	0.15	Object Colour	BLACK
10	Object Colour	0.6	Object Colour	BLACK
11-79 & 81-249	Object Colour	0.35	Object Colour	BLACK
80	Object Colour	0.6	Object Colour	BLACK
250-255 (Greys)	Object Colour	0.15	Object Colour	Object Colour

4.3 Text

4.3.1 General

The AutoCAD Styles shall have a default height setting = 0.

Sloping, italic, and elaborate fonts are not permitted.

The objective shall be to make all lettering highly legible so that information can be communicated with the minimal possibility of error in reading. Lettering sizes shall be chosen such that it shall remain legible when drawings are reduced to A3 size.

Lettering shall be consistent, both in size and placement. Lettering sizes for specific applications, such as notes or titles, shall not vary within the same drawing.

Lettering shall be uniform, clear, sharp and distinct. The mixing of lettering styles, sloping, italic, and elaborate fonts shall not be permitted.

All text shall be regularly spaced, upright and uppercase and not be underlined. Deviation: Titles under plans, details etc. are to be underlined.

All text shall be left justified. Deviation: Titles shall be centre justified and underlined.

Specific notations shall be carefully placed so they relate to the portion of the drawing or detail to which they apply.

The placing of notes through drawing lines is to be avoided.

Leader arrows relating to specific text or annotation shall be placed in model space with the detail it is referencing on the same layer as the text to which it relates.

4.3.2 Fonts

Permitted text fonts are as shown below:

Table 10

AutoCAD Style Name	AutoCAD Font File	CAD Usage
ISOCP	ISOCP.SHX	Technical/Engineering drawings
ARIAL	ARIAL.TTF	Presentation Drawings

4.3.3 Text Assignments

The table below indicates approved texts with their appropriate colour/application assignments:

Table 11

Plotted Text Heigh (mm)	Width Factor	Plotted Line weight	Usage
1.8	1	0.18	General text, Dimensions, Notes – used on A3 & A4 only where drawing is not plotted at a reduced scale.
2.5	1	0.25	General text annotations, Dimensions, Notes Special Notes
3.5	1	0.35	For more prominent notes or labels requiring special emphasis.
5.0	1	0.5	Normal Titles, Drawing Numbers, Section titles, Detail Titles
7.0	1	0.7	Major Titles

The preferred text height for general text and notes is 2.5mm.

The text height adopted for a project shall be consistent across all drawings unless situations make this impractical.

4.4 Dimensioning

Automated dimensioning commands within CAD software programs shall be used for creation and editing of dimensions, as shown in table 16 below.

The editing of dimension values via basic text editing commands is not permitted. Dimensions shall be associative and placed on their own unique layer.

Table 12

Dimension Text Height	Extension Line Offset	Extension Line Extension	Stack Offset	Arrow Size	Centre Mark
2.5mm	Dimexo = 2	Dimexe = 2	Dimdli = 6.25	Dimasz = 2.5	Dimcen = 1

4.5 Standard Symbols and Blocks

In order to promote consistency, standard symbols shall be utilized. All blocks are to be inserted into the drawing on its appropriate drawing layer. Where a symbol required is not available from the blocks provided with this manual, symbols compliant to international standards shall be used. These new blocks shall be submitted to Employer/ PMNC to update the list of standard symbols library for the programme.

All symbols shall be consistent within a drawing or set of drawings.

All blocks that need to be created as new blocks shall have all their elements saved on layer 0.

All symbols used within a drawing must be defined using a legend.

4.6 Hatching

Wherever possible, all hatching created shall be associative and placed on its own unique layer. Exploding of hatches must be avoided.

4.7 Colours

In AutoCAD, entity colour shall be assigned “ByLayer”. Deviation can be on standard blocks, i.e. are Road signs blocks where specific standard colours are assigned for each.

4.8 Layering

CAD Layering shall be in accordance with Employer/ PMNC AutoCAD Layering Standards as included in Appendix A of this document.

Additional layers may be required and the naming of such layers must be in the same format in accordance with Employer/ PMNC AutoCAD Layering Standards as shown in Section 4.8.1.

4.8.1 Layer Name Layout

Where new layers are to be created the AutoCAD layer naming convention is as follows:

1 2 3

RD_EX_CNRL

Where:

1 = Department Designator

2 = Status / Section Designator

3 = Feature / Entity Designator

Department Designator (Field 1)

This code identifies the Employer/ PMNC Department (i.e. B = Building Affairs, D = Drainage Affairs and RD = Roads Affairs.)

Status / Section Designator (Field 2)

This code identifies the main classification of the type of element within a discipline. For example

‘EX_SEW’ describes as existing sewer.

Feature / Entity Designator (Field 3)

This code further identifies the entity description feature name. For example ‘ABD’ describes as the abandoned sewerage network.

4.8.2 List of Employer/ PMNC Standard Layers

See Appendix A.

4.9 Models/Reference Files (Xrefs)

Where CAD data is to be shared between drawings the use of reference files is to be adopted.

All reference files are to be inserted in model space with the UCS set to ‘world’. All files are to be inserted at 0,0,0.

Unused reference files shall be detached upon completion of drawings.

The number of reference files on a project shall be kept to a minimum.

The preferred method of attaching Xrefs shall be Overlay option.

Reference files shall be inserted on unique layer that does not conflict with the general content of the drawing. (i.e. layer Z_XREF in AutoCAD).

Reference files shall be “CLIPPED” within the Active drawing sheet file to ensure that only the design data relevant to the drawing is displayed.

Reference files issued externally or shared between departments shall indicate revised areas with a revision cloud and triangle. A revision history shall be maintained within the reference file. In AutoCAD, the revision history log shall be placed in paper space, see Figure 29 below.

For Model File Naming refer to Section 3.2

4.10 Plotting

The following standard colour source files shall be used:

Table 13

Colour	Black and White
LBG-TP2-RS-COL_A1.CTB	LBG-TP2-RS-BW_A1.CTB

This standard colour source file shall be flexible and can be adjusted to suit user’s need during plotting. When drawing files are required, CTB file used for the plotting of the drawing must also be submitted.

4.10.1 Date and File location update

These are field entities contained within the drawing border and are used to print the date and time of print, file location, file name, etc.

Figure 23



4.11 Data Submission Standards

All drawing files must conform to the AutoCAD layering standards set forth in this document.

4.11.1 Submission

Refer to Programme Management Information System (PMIS) and Document Management procedures on submission of drawing.

4.11.2 File Format

Digital submittals shall be in PDF format & CAD format. DWG files must be in ZIP format when submitted in soft copy in CD. Also Refer to Document Management Procedures for submission of document.

Appendix A – AUTOCAD LAYERS DEFINITIONS

Annexure – II – CAD Guidelines

(Schedule - Q)

A.1 General Layers

CORE LAYERS NON DISCIPLINE				
Layer Name	Screen Colour	Line type	Plotted Line weight	Description
Z_18TEXT	red	Continuous	0.18	TEXT AT RESPECTIVE HEIGHT
Z_25TEXT	white	Continuous	0.25	TEXT AT RESPECTIVE HEIGHT
Z_35TEXT	green	Continuous	0.35	TEXT AT RESPECTIVE HEIGHT
Z_50TEXT	cyan	Continuous	0.50	TEXT AT RESPECTIVE HEIGHT
Z_70TEXT	blue	Continuous	0.70	TEXT AT RESPECTIVE HEIGHT
Z_DIMS	red	Continuous	0.18	ALL DIMENSIONS
Z_DWG_GRID	251	Continuous	0.15	DESIGN ROAD FEATURE : GRID
Z_DWG_SHT	white	Continuous	0.25	DRAWING SHEET & TITLE BLOCK
Z_NORTH	green	Continuous	0.35	NORTH POINT
Z_REV	yellow	Continuous	0.25	REVISION CLOUD SAND TRIANGLE
Z_SECMK	green	Continuous	0.35	SECTION AND DETAIL MARKS
Z_XREF	white	Continuous	0.25	EXTERNAL REFERENCE (XREF)

GIS LAYERS				
Layer Name	Screen Colour	Line type	Plotted Line weight	Description
GIS_ACQ_BDRY	20	ACAD_ISO13W100	0.25	LAND AQUISITION BOUNDARY
GIS_CADASTRAL	red	Continuous	0.18	CADASTRAL PLOT
GIS_CNTRS	9	Continuous	0.15	CONTOURS
GIS_CNTRS_TEXT	red	Continuous	0.18	CONTOURS TEXT
GIS_CSTL	90	Continuous	0.35	COASTLINE
GIS_FLOWLINE	8	Continuous	0.20	FLOWLINES
GIS_PPLN	252	Continuous	0.15	POLICY PLAN
GIS_RD01	121	Continuous	0.35	MAJOR ROAD
GIS_RD02	151	Continuous	0.35	MINOR ROAD
GIS_RD03	181	Continuous	0.35	STREETS
GIS_ROW_BDRY	170	PHANTOM2	0.35	PROPOSED RIGHT OF WAY BOUNDARY
GIS_ZONE	13	Continuous	0.35	ZONE

A.2 Drainage layers**A.2.1 Storm Water Drainage**

PROPOSED STORM WATER DRAINAGE (SWD)				
Layer Name	Screen Colour	Line type	Plotted Line weight	Description
D_PR_SWD	80	SWD_PR	0.6	PROPOSED STORM WATER LINES
D_PR_SWD_ATT	white	Continuous	0.25	PROPOSED SWD ATTRIBUTES (ID, Diameter, Length, Material etc.)
D_PR_SWD_DCH	90	Continuous	0.35	PROPOSED SWD DISCHARGE CHAMBER
D_PR_SWD_DT	yellow	Continuous	0.25	PROPOSED SWD DRAIN TRENCH
D_PR_SWD_FCH	90	Continuous	0.35	PROPOSED SWD FLUSHING CHAMBER
D_PR_SWD_FLOW	white	Continuous	0.25	ROPOSED SWD FLOW ARROW
D_PR_SWD_FMC	90	Continuous	0.35	PROPOSED SWD FLOWMETER CHAMBER
D_PR_SWD_GC	90	Continuous	0.35	PROPOSED SWD GULLY CONNECTION
D_PR_SWD_GL	90	Continuous	0.35	PROPOSED SWD GULLY
D_PR_SWD_ICH	90	Continuous	0.35	PROPOSED SWD INSPECTION CHAMBER
D_PR_SWD_ITCH	90	Continuous	0.35	PROPOSED SWD INTAKE CHAMBER
D_PR_SWD_MH	90	Continuous	0.35	PROPOSED SWD MANHOLE
D_PR_SWD_MH_ATT	white	Continuous	0.25	PROPOSED SWD MANHOLE ATTRIBUTES (ID, Depth, Cov. Lvl, Inv. Lvl, etc)
D_PR_SWD_OFCH	90	Continuous	0.35	PROPOSED SWD OUTFALL CHAMBER
D_PR_SWD_PS	90	Continuous	0.35	PROPOSED SWD PUMP STATION

D_PR_SWD_RM	90	RM_PR	0.35	PROPOSED SWD RISING MAIN
D_PR_SWD_VALV	90	Continuous	0.35	PROPOSED SWD VALVE
D_PR_SWD_VC	90	Continuous	0.35	PROPOSED SWD VALVE CHAMBER
D_PR_SWD_WCH	90	Continuous	0.35	PROPOSED SWD WASHOUT CHAMBER

EXISTING STORM WATER (SWD)				
Layer Name	Screen Colour	Line type	Plotted Line weight	Description
D_EX_SWD	96	SWD_EX	0.35	EXISTING STORM WATER LINES
D_EX_SWD_ATT	white	Continuous	0.25	EXISTING SWD ATTRIBUTES (ID, Diameter, Length, Material etc)
D_EX_SWD_DCH	96	Continuous	0.35	EXISTING SWD DISCHARGE CHAMBER
D_EX_SWD_DT	yellow	Continuous	0.25	EXISTING SWD DRAIN TRENCH
D_EX_SWD_FCH	96	Continuous	0.35	EXISTING SWD FLUSHING CHAMBER
D_EX_SWD_FLOW	white	Continuous	0.25	PROPOSED SWD FLOW ARROW
D_EX_SWD_FMC	96	Continuous	0.35	EXISTING SWD FLOWMETER CHAMBER
D_EX_SWD_GC	96	HIDDEN2	0.35	EXISTING SWD GULLY CONNECTION
D_EX_SWD_GL	96	Continuous	0.35	EXISTING SWD GULLY
D_EX_SWD_ICH	96	Continuous	0.35	EXISTING SWD INSPECTION CHAMBER

D_EX_SWD_ITCH	96	Continuous	0.35	EXISTING SWD INTAKE CHAMBER
D_EX_SWD_MH	96	Continuous	0.35	EXISTING SWD MANHOLE
D_EX_SWD_MH_ATT	96	Continuous	0.35	EXISTING SWD MANHOLE ATTRIBUTES (ID, Depth, Cov. Lvl, Inv. Lvl, etc)
D_EX_SWD_OFCH	96	DASHED2	0.25	EXISTING SWD OUTFALL CHAMBER
D_EX_SWD_PS	96	Continuous	0.35	EXISTING SWD PUMP STATION
D_EX_SWD_RM	96	RM_EX	0.35	EXISTING SWD RISING MAIN
D_EX_SWD_VALV	96	Continuous	0.35	EXISTING SWD VALVE
D_EX_SWD_VC	96	Continuous	0.25	EXISTING SWD VALVE CHAMBER
D_EX_SWD_WCH	96	Continuous	0.25	EXISTING SWD WASHOUT CHAMBER

A.2.2 Domestic Sewage

PROPOSED DOMESTIC SEWAGE LINE				
Layer Name	Screen Colour	Line type	Plotted Line weight	Description
SEW_DE_PSWR	242	SEW_PR	0.35	DESIGN SEWER FEATURE:PROPOSED SEWER LINES
SEW_DE_MH	242	Continuous	0.25	DESIGN SEWER FEATURE: MANHOLE
SEW_DE_SWPS	242	Continuous	0.25	DESIGN SEWER FEATURE: SEWAGE PUMPING STATION
SEW_DE_VSHFT	242	Continuous	0.25	DESIGN SEWER FEATURE: VENT SHAFT
SEW_DE_SCONN	242	Continuous	0.25	DESIGN SEWER FEATURE: SEWER CONNECTION
SEW_DE_MHFC	242	Continuous	0.25	DESIGN SEWER FEATURE: MANHOLE FRAME & COVER
SEW_DE_STP	242	Continuous	0.25	DESIGN SEWER FEATURE: SEWAGE TREATMENT PLANT
SEW_DE_PM	242	Continuous	0.25	DESIGN SEWER FEATURE: SEWAGE PUMPING MAIN

A.2.3 Industrial Effluent Design Layers

PROPOSED INDUSTRIAL EFFLUENT				
Layer Name	Screen Colour	Line type	Plotted Line weight	Description
INEFF_DE_PINEF	white	Continuous	0.35	DESIGN INDUSTRIAL EFFLUENT FEATURE:PROPOSED INDUSTRIAL EFFLUENT
INEFF_DE_VSHFT	white	Continuous	0.25	DESIGN INDUSTRIAL EFFLUENT FEATURE: VENT SHAFT
INEFF_DE_IEPS	white	Continuous	0.25	DESIGN INDUSTRIAL EFFLUENT FEATURE:INDUSTRIAL EFFLUENT PUMPING STATION
INEFF_DE_SINLET	white	Continuous	0.25	DESIGN INDUSTRIAL EFFLUENT FEATURE: SECONDARY TREATMENT PLANT INLET S
INEFF_DE_TERTIARY TREATMETN PLANT	white	Continuous	0.25	DESIGN INDUSTRIAL EFFLUENT FEATURE: TERTIARY TREATMENT PLANT

A.2.4 Potable Water

PROPOSED POTABLE WATER LINE				
Layer Name	Screen Colour	Line type	Plotted Line weight	Description
PW_DE_PWTM	Blue	Continuous	0.35	DESIGN POTABLE WATER FEATURE: POTABLE WATER TRANSMISSION MAIN
PW_DE_PWDIST	Blue	Continuous	0.25	DESIGN POTABLE WATER FEATURE: POTABLE WATER DISTRIBUTION
PW_DE_PWPS	Blue	Continuous	0.25	DESIGN POTABLE WATER FEATURE: POTABLE WATER PUMPING STATION
PW_DE_VCH	Blue	Continuous	0.25	DESIGN POTABLE WATER FEATURE: VALVE CHAMBER
PW_DE_FH	Blue	Continuous	0.25	DESIGN POTABLE WATER FEATURE: FIRE HYDRANT
PW_DE_POTRES	Blue	Continuous	0.25	DESIGN POTABLE WATER FEATURE: POTABLE WATER RESERVOIR
PW_DE_PWM	Blue	Continuous	0.25	DESIGN POTABLE WATER FEATURE: POTABLE WATER METER
PW_DE_PWFIT	Blue	Continuous	0.25	DESIGN POTABLE WATER FEATURE: POTABLE WATER FITTINGS

A.2.5 Recycled Water

PROPOSED RECYCLED WATER				
Layer Name	Screen Colour	Line type	Plotted Line weight	Description
RW_DE_RWPM	Green	Continuous	0.35	DESIGN RECYCLED WATER FEATURE: RECYCLED WATER PUMPING MAIN
RW_DE_RWDIST	Green	Continuous	0.025	DESIGN RECYCLED WATER FEATURE: RECYCLED WATER DISTRIBUTION
RW_DE_RWPS	Green	Continuous	0.025	DESIGN RECYCLED WATER FEATURE: RECYCLED WATER PUMPING STATION
RW_DE_RWRES	Green	Continuous	0.025	DESIGN RECYCLED WATER FEATURE: RECYCLED WATER RESERVOIR
RW_DE_RWVCH	Green	Continuous	0.025	DESIGN RECYCLED WATER FEATURE: RECYCLED WATER VALVE CHAMBER
RW_DE_RWFIT	Green	Continuous	0.025	DESIGN RECYCLED WATER FEATURE: RECYCLED WATER FITTINGS

A.3 Road Layers

A.3.1 Road Design Layers

PROPOSED ROAD				
Layer Name	Screen Colour	Line type	Plotted Line weight	Description
RD_DE_AFNCE	22	FENCELINE1	0.35	DESIGN ROAD FEATURE: ANIMAL FENCE
RD_DE_BICYL	green	Continuous	0.35	BICYCLE LANE
RD_DE_BRDG	yellow	Continuous	0.25	DESIGN ROAD FEATURE: BRIDGE FLYOVER
RD_DE_CHNL	red	HIDDEN2	0.18	DESIGN ROAD FEATURE: CHANNEL
RD_DE_CILND	green	Continuous	0.35	DESIGN ROAD FEATURE: ENTRAL/ROUNABOUT ISLAND
RD_DE_CLMN	red	Continuous	0.18	DESIGN ROAD FEATURE: COLUMN
RD_DE_CLVT	white	Continuous	0.25	DESIGN ROAD FEATURE : CULVERT
RD_DE_CNRL	red	CENTER2	0.18	DESIGN ROAD FEATURE: CENTERLINE
RD_DE_CSLPE	magenta	Continuous	0.35	DESIGN ROAD FEATURE: CONCRETE SLOPE PROTECTION
RD_DE_ECWAY	cyan	Continuous	0.5	DESIGN ROAD FEATURE: EDGE OF CARRIAGEWAY
RD_DE_FNCE	green	FENCELINE2	0.35	DESIGN ROAD FEATURE: FENCE
RD_DE_FTPH	11	Continuous	0.35	DESIGN ROAD FEATURE: FOOTPATH
RD_DE_GRAIL	white	Continuous	0.25	DESIGN ROAD FEATURE: GUARD RAIL
RD_DE_ILND	green	HIDDEN2	0.35	DESIGN ROAD FEATURE: ISLAND

PROPOSED ROAD				
Layer Name	Screen Colour	Line type	Plotted Line weight	Description
RD_DE_JLND	green	Continuous	0.35	DESIGN ROAD FEATURE: JUNCTION ISLAND
RD_DE_KBDD	green	HIDDEN2	0.35	DESIGN ROAD FEATURE : DROPPED KERB
RD_DE_KBED	white	Continuous	0.25	DESIGN ROAD FEATURE: EDGE KERB
RD_DE_KBFL	yellow	DASHED2	0.25	DESIGN ROAD FEATURE: FLUSH KERB
RD_DE_KBRD	cyan	Continuous	0.5	DESIGN ROAD FEATURE: RAISED KERB
RD_DE_LOW	blue	DASHDOT2	0.7	LIMIT OF WORKS
RD_DE_EMBK	yellow	Continuous	0.25	DESIGN ROAD FEATURE: EMBANKMENT
RD_DE_MEDIAN	green	Continuous	0.35	DESIGN ROAD FEATURE: MEDIAN
RD_DE_OTHR	red	Continuous	0.18	DESIGN ROAD DATA : OTHER INFORMATION
RD_DE_PBAY	green	Continuous	0.35	DESIGN ROAD FEATURE: PARKING BAY
RD_DE_PDCR	8	Continuous	0.2	DESIGN ROAD FEATURE: PEDESTRIAN CROSSING
RD_DE_PRAMP	green	Continuous	0.35	DESIGN ROAD FEATURE: PEDESTRIAN RAMP
RD_DE_PRKG	white	Continuous	0.25	DESIGN ROAD FEATURE: PARKING
RD_DE_PTS	yellow	Continuous	0.25	DESIGN ROAD DATA : IPS, CURVE POINTS ETC
RD_DE_PVMT	8	Continuous	0.2	DESIGN ROAD FEATURE: PAVEMENT (BITUMINOUS, CONCRETE ETC.)

PROPOSED ROAD				
Layer Name	Screen Colour	Line type	Plotted Line weight	Description
RD_DE_RAILWAY	white	TRACKS	0.25	DESIGN ROAD FEATURE: RAILWAY
RD_DE_RAMP	yellow	Continuous	0.25	DESIGN ROAD FEATURE: RAMP
RD_DE_RLVL	white	Continuous	0.25	DESIGN ROAD FEATURE: ROAD LEVEL
RD_DE_RNDA	white	Continuous	0.25	DESIGN ROAD FEATURE: ROUND ABOUT
RD_DE_RSTL	white	Continuous	0.25	DESIGN ROAD FEATURE: ROAD SPEED TABLE
RD_DE_SHLDR	green	Continuous	0.35	DESIGN ROAD FEATURE: SHOULDER
RD_DE_SPTR	20	Continuous	0.35	DESIGN ROAD FEATURE: ROAD SEPARATOR
RD_DE_UPSS	yellow	Continuous	0.25	DESIGN ROAD FEATURE: UNDERPASS TUNNEL
RD_DE_URAREA	40	DASHED2	0.35	DESIGN ROAD FEATURE: UTILITY RESERVE AREA
RD_DE_VBAR	magenta	Continuous	0.35	DESIGN ROAD FEATURE: VEHICLE BARRIER
RD_DE_VERGE	yellow	Continuous	0.25	DESIGN ROAD FEATURE: VERGE

EXISTING ROAD				
Layer Name	Screen Colour	Line type	Plotted Line weight	Description
RD_EX_AFNCE	22	FENCELINE1	0.35	EXISTING ROAD FEATURE: ANIMAL FENCE
RD_EX_BICYL	green	Continuous	0.35	BICYCLE LANE
RD_EX_BRDG	yellow	Continuous	0.25	EXISTING ROAD FEATURE: BRIDGE FLYOVER
RD_EX_CHNL	red	HIDDEN2	0.18	EXISTING ROAD FEATURE: CHANNEL
RD_EX_CILND	green	Continuous	0.35	EXISTING ROAD FEATURE: ENTRAL/ROUNDAABOUT ISLAND
RD_EX_CLMN	red	Continuous	0.18	EXISTING ROAD FEATURE: COLUMN
RD_EX_CLVT	white	Continuous	0.25	EXISTING ROAD FEATURE : CULVERT
RD_EX_CNRL	red	CENTER2	0.18	EXISTING ROAD FEATURE: CENTERLINE
RD_EX_CSLPE	magenta	Continuous	0.35	EXISTING ROAD FEATURE: CONCRETE SLOPE PROTECTION
RD_EX_ECWAY	cyan	Continuous	0.5	EXISTING ROAD FEATURE: EDGE OF CARRIAGEWAY
RD_EX_FNCE	green	FENCELINE2	0.35	EXISTING ROAD FEATURE: FENCE
RD_EX_FTPH	11	Continuous	0.35	EXISTING ROAD FEATURE: FOOTPATH
RD_EX_GRAIL	white	Continuous	0.25	EXISTING ROAD FEATURE: GUARD RAIL
RD_EX_ILND	green	HIDDEN2	0.35	EXISTING ROAD FEATURE: ISLAND
RD_EX_JILND	green	Continuous	0.35	EXISTING ROAD FEATURE: JUNCTION ISLAND

EXISTING ROAD				
Layer Name	Screen Colour	Line type	Plotted Line weight	Description
RD_EX_KBDD	green	HIDDEN2	0.35	EXISTING ROAD FEATURE : DROPPED KERB
RD_EX_KBED	white	Continuous	0.25	EXISTING ROAD FEATURE: EDGE KERB
RD_EX_KBFL	yellow	DASHED2	0.25	EXISTING ROAD FEATURE: FLUSH KERB
RD_EX_KBRD	cyan	Continuous	0.5	EXISTING ROAD FEATURE: RAISED KERB
RD_EX_LOW	blue	DASHDOT2	0.7	LIMIT OF WORKS
RD_EX_EMBK	yellow	Continuous	0.25	EXISTING ROAD FEATURE: EMBANKMENT
RD_EX_MEDIAN	green	Continuous	0.35	EXISTING ROAD FEATURE: MEDIAN
RD_EX_OTHR	red	Continuous	0.18	EXISTING ROAD DATA : OTHER INFORMATION
RD_EX_PBAY	green	Continuous	0.35	EXISTING ROAD FEATURE: PARKING BAY
RD_EX_PDCR	8	Continuous	0.2	EXISTING ROAD FEATURE: PEDESTRIAN CROSSING
RD_EX_PRAMP	green	Continuous	0.35	EXISTING ROAD FEATURE: PEDESTRIAN RAMP
RD_EX_PRKG	white	Continuous	0.25	EXISTING ROAD FEATURE: PARKING
RD_EX_PTS	yellow	Continuous	0.25	EXISTING ROAD DATA : IPS, CURVE POINTS ETC
RD_EX_PVMT	8	Continuous	0.2	EXISTING ROAD FEATURE: PAVEMENT (BITUMINOUS, CONCRETE ETC.)

EXISTING ROAD				
Layer Name	Screen Colour	Line type	Plotted Line weight	Description
RD_EX_RAILWAY	white	TRACKS	0.25	EXISTING ROAD FEATURE: RAILWAY
RD_EX_RAMP	yellow	Continuous	0.25	EXISTING ROAD FEATURE: RAMP
RD_EX_RLVL	white	Continuous	0.25	EXISTING ROAD FEATURE: ROAD LEVEL
RD_EX_RNDA	white	Continuous	0.25	EXISTING ROAD FEATURE: ROUND ABOUT
RD_EX_RSTL	white	Continuous	0.25	EXISTING ROAD FEATURE: ROAD SPEED TABLE
RD_EX_SHLDR	green	Continuous	0.35	EXISTING ROAD FEATURE: SHOULDER
RD_EX_SPTR	20	Continuous	0.35	EXISTING ROAD FEATURE: ROAD SEPARATOR
RD_EX_UPSS	yellow	Continuous	0.25	EXISTING ROAD FEATURE: UNDERPASS TUNNEL
RD_EX_URAREA	40	DASHED2	0.35	EXISTING ROAD FEATURE: UTILITY RESERVE AREA
RD_EX_VBAR	magenta	Continuous	0.35	EXISTING ROAD FEATURE: VEHICLE BARRIER
RD_EX_VERGE	yellow	Continuous	0.25	EXISTING ROAD FEATURE: VERGE

A.3.2 Traffic and Safety

TRAFFIC & SAFETY - DESIGN				
Layer Name	Screen Colour	Line type	Plotted Line weight	Description
RD_DE_TS_BARL	green	Continuous	0.35	TRAFFIC: BARRIERS, RAILS & BOLLARDS
RD_DE_TS_CTRL-BOX	red	Continuous	0.18	TRAFFIC: CONTROL BOX OR SERVICE BOX
RD_DE_TS_DET-LOOP	8	Continuous	0.2	TRAFFIC : DETECTOR LOOP
RD_DE_TS_DUCT	30	Continuous	0.35	TRAFFIC : DUCT
RD_DE_TS_HMPL	8	Continuous	0.2	TRAFFIC : SPEED HUMP
RD_DE_TS_INCH	12	Continuous	0.35	TRAFFIC : INSPECTION CHAMBER
RD_DE_TS_MNHL	yellow	Continuous	0.25	TRAFFIC : MANHOLE
RD_DE_TS_OHLL	white	Continuous	0.25	TRAFFIC : OVERHEAD CABLE/LINE
RD_DE_TS_OTHR	yellow	Continuous	0.25	TRAFFIC : OTHER
RD_DE_TS_PBDG	31	Continuous	0.35	TRAFFIC : PEDESTRIAN BRIDGE
RD_DE_TS_PGR	40	Continuous	0.35	TRAFFIC : PEDESTRIAN GUARDRAIL
RD_DE_TS_PUP	13	Continuous	0.35	TRAFFIC : PEDESTRIAN UNDERPASS
RD_DE_TS_RDSN	yellow	Continuous	0.25	TRAFFIC: ROAD DIRECTIONAL SIGNS (EX: DIRECTIONS, LIMITS ETC.)
RD_DE_TS_SIGN	white	Continuous	0.25	TRAFFIC: SIGNS (EX: WARNINGS, SPEED LIMITS ETC.)
RD_DE_TS_SIGN-POST	white	Continuous	0.25	TRAFFIC : SIGN POST
RD_DE_TS_SIGNAL	white	Continuous	0.25	TRAFFIC SIGNAL

TRAFFIC & SAFETY - DESIGN				
Layer Name	Screen Colour	Line type	Plotted Line weight	Description
RD_DE_TS_SIGNAL-POST	white	Continuous	0.25	TRAFFIC SIGNAL POST/POLE
RD_DE_TS_STNM	green	Continuous	0.35	TRAFFIC : STREET NAME POST/SIGN
RD_DE_TS_STUDS	8	Continuous	0.2	TRAFFIC : STUDS
RD_DE_TS_TEXT	white	Continuous	0.25	TRAFFIC : ANNOTATIONS /DESCRIPTIVE TEXT
RD_DE_TS_TPP	8	Continuous	0.2	TRAFFIC : POLICE PLATFORM
RD_DE_TS_UGLL	yellow	Continuous	0.25	TRAFFIC : UNDERGROUND CABLE/LINE

TRAFFIC & SAFETY - EXISTING				
Layer Name	Screen Colour	Line type	Plotted Line weight	Description
RD_DE_TS_BARL	green	Continuous	0.35	TRAFFIC: BARRIERS, RAILS & BOLLARDS
RD_EX_TS_CTRL-BOX	red	Continuous	0.18	TRAFFIC: CONTROL BOX OR SERVICE BOX
RD_EX_TS_DET-LOOP	8	Continuous	0.2	TRAFFIC : DETECTOR LOOP
RD_EX_TS_DUCT	30	Continuous	0.35	TRAFFIC : DUCT
RD_EX_TS_HMPL	8	Continuous	0.2	TRAFFIC : SPEED HUMP
RD_EX_TS_INCH	12	Continuous	0.35	TRAFFIC : INSPECTION CHAMBER
RD_EX_TS_MNHL	yellow	Continuous	0.25	TRAFFIC : MANHOLE

TRAFFIC & SAFETY - EXISTING				
Layer Name	Screen Colour	Line type	Plotted Line weight	Description
RD_EX_TS_OHLL	white	Continuous	0.25	TRAFFIC : OVERHEAD CABLE/LINE
RD_EX_TS_OTHR	yellow	Continuous	0.25	TRAFFIC : OTHER
RD_EX_TS_PBDG	31	Continuous	0.35	TRAFFIC : PEDESTRIAN BRIDGE
RD_EX_TS_PGR	40	Continuous	0.35	TRAFFIC : PEDESTRIAN GUARDRAIL
RD_EX_TS_PUP	13	Continuous	0.35	TRAFFIC : PEDESTRIAN UNDERPASS
RD_EX_TS_RDSN	yellow	Continuous	0.25	TRAFFIC : ROAD DIRECTIONAL SIGNS (EX: DIRECTIONS, LIMITS ETC.)
RD_EX_TS_SIGN	white	Continuous	0.25	RAFFIC : SIGNS (EX: WARNINGS, SPEED LIMITS ETC.)
RD_EX_TS_SIGN-POST	white	Continuous	0.25	TRAFFIC : SIGN POST
RD_EX_TS_SIGNAL	white	Continuous	0.25	TRAFFIC SIGNAL
RD_EX_TS_SIGNAL-POST	white	Continuous	0.25	TRAFFIC SIGNAL POST/POLE
RD_EX_TS_STNM	green	Continuous	0.35	TRAFFIC : STREET NAME POST/SIGN
RD_EX_TS_STUDS	8	Continuous	0.2	TRAFFIC : STUDS
RD_EX_TS_TEXT	white	Continuous	0.25	TRAFFIC : ANNOTATIONS /DESCRIPTIVE TEXT
RD_EX_TS_TPP	8	Continuous	0.2	TRAFFIC : POLICE PLATFORM
RD_EX_TS_UGLL	yellow	Continuous	0.25	TRAFFIC : UNDERGROUND CABLE/LINE

A.3.3 Street Lighting Layers

STREET LIGHTING - PROPOSED				
Layer Name	Screen Colour	Line type	Plotted Line weight	Description
RD_DE_ST_CBLE	cyan	Continuous	0.5	STREET LIGHTING CABLE
RD_DE_ST_DUCT	20	Continuous	0.35	STREET LIGHTING DUCT
RD_DE_ST_FDPL	magenta	Continuous	0.35	STREET LIGHTING FEEDER PILLAR
RD_DE_ST_POLE	yellow	Continuous	0.25	STREET LIGHTING POLE
RD_DE_ST_SUBSTN	cyan	Continuous	0.5	STREET LIGHTING SUBSTATION
RD_DE_ST_TEXT	white	Continuous	0.25	STREET LIGHTING ANNOTATION/TEXT

STREET LIGHTING - EXISTING				
Layer Name	Screen Colour	Line type	Plotted Line weight	Description
RD_EX_ST_CBLE	cyan	DASHED2	0.5	STREET LIGHTING CABLE
RD_EX_ST_DUCT	20	HIDDEN2	0.35	STREET LIGHTING DUCT
RD_EX_ST_FDPL	magenta	Continuous	0.35	STREET LIGHTING FEEDER PILLAR
RD_EX_ST_POLE	8	Continuous	0.25	STREET LIGHTING POLE
RD_EX_ST_SUBSTN	cyan	Continuous	0.5	STREET LIGHTING SUBSTATION
RD_EX_ST_TEXT	white	Continuous	0.25	STREET LIGHTING ANNOTATION/TEXT

A.3.4 Road Furniture Layers

ROAD FURNITURE LAYERS				
Layer Name	Screen Colour	Line type	Plotted Line weight	Description
RD_F_BNCH	yellow	Continuous	0.25	ROAD/STREET FURNITURE: BENCH/SEAT
RD_F_LGHT	white	Continuous	0.25	ROAD/STREET FURNITURE: LIGHTING
RD_F_OTHR	white	Continuous	0.25	ROAD/STREET FURNITURE: OTHERS
RD_F_POLE	yellow	Continuous	0.25	ROAD/STREET FURNITURE: POLE
RD_F_TEXT	white	Continuous	0.25	ROAD/STREET FURNITURE: ANNOTATION/TEXT

A.3.5 Roads – Common Layers

(ROADS) - COMMON LAYERS				
Layer Name	Screen Colour	Line type	Plotted Line weight	Description
RD_C_25DASH	white	DASHED2	0.25	HIDDEN DETAILS
RD_C_25HID	white	HIDDEN2	0.25	HIDDEN DETAILS
RD_C_50OUT	cyan	Continuous	0.5	ALL CONCRETE OUTLINES IN SECTION
RD_C_50REBARS	cyan	Continuous	0.5	REINFORCEMENTDETAILS
RD_C_CHAIN_TEXT	white	Continuous	0.25	CHAINAGE TEXT
RD_C_CHAIN_TICK	yellow	Continuous	0.25	CHAINAGE TICK MARK
RD_C_CONT_MAJR	8	Continuous	0.2	MAJOR CONTOUR
RD_C_CONT_MINR	9	Continuous	0.15	MINOR CONTOUR
RD_C_COORD_GRID	252	Continuous	0.15	COORDINATE GRID
RD_C_CTRLINE	red	CENTER2	0.18	CENTRE LINE
RD_C_HATCH	red	Continuous	0.18	HATCH
RD_C_MATCH_LINE	blue	PHANTOM	0.7	SHEET CONTINUATION MATCH LINE
RD_C_PROF	cyan	DASHED2	0.5	PROFILES
RD_C_PROF-LINE	green	Continuous	0.35	PROFILE LINES
RD_C_PROF_GRID_MAJR	8	Continuous	0.2	PROFILE GRIDLINE @ MAJOR STATIONS
RD_C_PROF_GRID_MINOR	9	Continuous	0.15	PROFILE GRIDLINE @ MINOR STATIONS

(ROADS) - COMMON LAYERS				
Layer Name	Screen Colour	Line type	Plotted Line weight	Description
RD_C_SPT_HGT	yellow	Continuous	0.25	SURVEY ROAD FEATURE : SPOT HEIGHT MARKER && TEXT
RD_C_SPT_NUM	yellow	Continuous	0.25	SURVEY ROAD FEATURE : SURVEY POINT NUMBER
RD_C_TABLE	white	Continuous	0.25	TABLES
RD_C_TEXT	white	Continuous	0.25	COMMON TEXT

A.4 Utilities Layers

A.4.1 Electricity

(ELECTRICITY)				
Layer Name	Screen Colour	Line type	Plotted Line weight	Description
SVE_11KV	240	ACAD_ISO04W100	0.35	SERVICES FIXTURES (ELECTRICITY) : 11KV
SVE_132K	240	ACAD_ISO04W100	0.35	SERVICES FIXTURES (ELECTRICITY) : 132KV
SVE_66KV	240	ACAD_ISO04W100	0.35	SERVICES FIXTURES (ELECTRICITY) : 66KV
SVE_ABDL	13	Continuous	0.35	SERVICES FIXTURES (ELECTRICITY) : ABANDONED LINE
SVE_DUCT	10	Continuous	0.35	SERVICES FIXTURES (ELECTRICITY) : ELECTRICITY DUCT
SVE_ERTH_PIT	8	Continuous	0.2	SERVICES FIXTURES (ELECTRICITY) : EARTH PIT
SVE_FT_TEE	30	Continuous	0.35	SERVICES FIXTURES (ELECTRICITY) : ELECTRICAL FITTING TEE
SVE_LOWV	220	Continuous	0.35	SERVICES FIXTURES (ELECTRICITY) : LOW VOLTAGE
SVE_MEDV	150	Continuous	0.35	SERVICES FIXTURES (ELECTRICITY) : MEDIUM VOLTAGE
SVE_MHLL	white	Continuous	0.25	SERVICES FIXTURES (ELECTRICITY) : UTILITY/MANHOLE
SVE_MNHL	white	Continuous	0.25	SERVICES FIXTURES (ELECTRICITY) : MANHOLE
SVE_MRKR	white	Continuous	0.25	SERVICES FIXTURES (ELECTRICITY) : MARKER

(ELECTRICITY)				
Layer Name	Screen Colour	Line type	Plotted Line weight	Description
SVE_OHLL	white	Continuous	0.25	SERVICES FIXTURES (ELECTRICITY) : OVERHEAD LINE
SVE_OTHR	white	Continuous	0.25	SERVICES FIXTURES (ELECTRICITY) : OTHER
SVE_POLE	white	Continuous	0.25	SERVICES FIXTURES (ELECTRICITY) : POST/POLE
SVE_PYLN	white	Continuous	0.25	SERVICES FIXTURES (ELECTRICITY) : PYLON
SVE_SBOX	white	Continuous	0.25	SERVICES FIXTURES (ELECTRICITY) : SERVICE BOX
SVE_SJNT	green	Continuous	0.35	SERVICES FIXTURES (ELECTRICITY) : ELECTRICAL STRAIGHT JOINT
SVE_SSTL	yellow	Continuous	0.25	SERVICES FIXTURES (ELECTRICITY) : SUBSTATION
SVE_TEXT	white	Continuous	0.25	SERVICES FIXTURES (ELECTRICITY): ANNOTATION / TEXT
SVE_TRANSF	cyan	Continuous	0.5	SERVICES FIXTURES (ELECTRICITY) : TRANSFORMER
SVE_UGLL	white	Continuous	0.25	SERVICES FIXTURES (ELECTRICITY) : UNDERGROUND LINE

A.4.2 Oil and Gas

OIL & GAS				
Layer Name	Screen Colour	Line type	Plotted Line weight	Description
SVO_BNDL	171	Continuous	0.35	SERVICES FIXTURES (OIL AND GAS) : BUND
SVO_DUCT	241	Continuous	0.35	SERVICES FIXTURES (OIL AND GAS) : OIL / GAS DUCT
SVO_GVLV	171	Continuous	0.35	SERVICES FIXTURES (OIL AND GAS) : GAS VALVE
SVO_MNHL	171	Continuous	0.35	SERVICES FIXTURES (OIL AND GAS) : MANHOLE
SVO_MRKR	171	Continuous	0.35	SERVICES FIXTURES (OIL AND GAS) : MARKER
SVO_OTHR	171	Continuous	0.35	SERVICES FIXTURES (OIL AND GAS) : OTHER
SVO_PLNL	171	Continuous	0.35	SERVICES FIXTURES (OIL AND GAS) : PIPE LINE
SVO_POLE	171	Continuous	0.35	SERVICES FIXTURES (OIL AND GAS) : POST / POLE
SVO_PUMP	171	Continuous	0.35	SERVICES FIXTURES (OIL AND GAS) : PUMP
SVO_SBOX	171	Continuous	0.35	SERVICES FIXTURES (OIL AND GAS) : SERVICE BOX
SVO_TANK	171	Continuous	0.35	SERVICES FIXTURES (OIL AND GAS) : TANK
SVO_TEXT	white	Continuous	0.25	SERVICES FIXTURES (OIL AND GAS) : ANNOTATION / TEXT

A.4.3 Telecommunications

TELECOMMUNICATIONS				
Layer Name	Screen Colour	Line type	Plotted Line weight	Description
SVT_ABDL	13	Continuous	0.35	SERVICES FIXTURES (TELECOMS) : TELEPHONE ABANDONED LINE
SVT_ACCOR	20	DASHED2	0.35	SERVICES FIXTURES (TELECOMS) : AERIAL CABLE CORRIDOR
SVQ_BCCOR	30	Continuous	0.35	SERVICES FIXTURES (TELECOMS) : BURRIED CABLE CORRIDOR
SVQ_BOOT	30	Continuous	0.35	SERVICES FIXTURES (TELECOMS) : TELEPHONE BOOTH
SVQ_DIST_PT	30	Continuous	0.35	SERVICES FIXTURES (TELECOMS) : DISTRIBUTION POINT
SVQ_DOTH	30	Continuous	0.35	SERVICES FIXTURES (TELECOMS) : OTHER
SVQ_DUCT	yellow	Continuous	0.25	SERVICES FIXTURES (TELECOMS) : DUCT
SVQ_JBOX	30	Continuous	0.35	SERVICES FIXTURES (TELECOMS) : JOINT BOX
SVQ_MNHL	30	Continuous	0.35	SERVICES FIXTURES (TELECOMS) : MANHOLE
SVQ_OHLN	30	Continuous	0.35	SERVICES FIXTURES (TELECOMS) : OVERHEAD LINE
SVQ_OTHR	20	Continuous	0.35	SERVICES FIXTURES (TELECOMS) : OTHER
SVQ_POLE	30	Continuous	0.35	SERVICES FIXTURES (TELECOMS) : POST / POLE
SVQ_SBOX	30	Continuous	0.35	SERVICES FIXTURES (TELECOMS) : SERVICE BOX

TELECOMMUNICATIONS				
Layer Name	Screen Colour	Line type	Plotted Line weight	Description
SVQ_SCCOR	30	Continuous	0.35	SERVICES FIXTURES (TELECOMS) : SURFACE CABLE CORRIDOR
SVQ_SSTA	30	Continuous	0.35	SERVICES FIXTURES (TELECOMS) : SUBSTATION
SVQ_TEXT	white	Continuous	0.25	SERVICES FIXTURES (TELECOMS) : ANNOTATION / TEXT
SVQ_TOWR	30	Continuous	0.35	SERVICES FIXTURES (TELECOMS) : TOWER
SVQ_TRAN_NT WK	10	DASHDOT	0.6	SERVICES FIXTURES (TELECOMS) : TRANSMISSION NETWORK
SVQ_TRAN_PT	30	Continuous	0.35	SERVICES FIXTURES (TELECOMS) : TRANSMISSION POINT
SVQ_UDCOR	30	Continuous	0.35	SERVICES FIXTURES (TELECOMS) : UNDER GROUND DUCT CORRIDOR
SVQ_UGLN	30	Continuous	0.35	SERVICES FIXTURES (TELECOMS) : UNDER GROUND LINE

A.4.4 Water

WATER				
Layer Name	Screen Colour	Line type	Plotted Line weight	Description
SVW_ABDL	13	Continuous	0.35	SERVICES FIXTURES (WATER) : ABANDONED WATER LINE
SVW_BNDL	130	Continuous	0.35	SERVICES FIXTURES (WATER) : BUND
SVW_CLR_PT	200	Continuous	0.35	SERVICES FIXTURES (WATER) : CHLORINATION POINT
SVW_CPRT	200	Continuous	0.35	SERVICES FIXTURES (WATER) : CASING PROTECTION
SVW_DRKL	130	Continuous	0.35	SERVICES FIXTURES (WATER) : DRINKING AREA
SVW_DUCT	30	Continuous	0.35	SERVICES FIXTURES (WATER) : DUCT
SVW_FT_ADPT R	150	Continuous	0.35	SERVICES FIXTURES (WATER) : FITTING ADAPTER
SVW_FT_BEND	150	Continuous	0.35	SERVICES FIXTURES (WATER) : FITTING BEND
SVW_FT_ENDCAP	150	Continuous	0.35	SERVICES FIXTURES (WATER) : FITTING ENDCAP
SVW_FT_RDCR	150	Continuous	0.35	SERVICES FIXTURES (WATER) : FITTING REDUCER
SVW_FT_TEE	150	Continuous	0.35	SERVICES FIXTURES (WATER) : FITTING TEE
SVW_GCHNL	200	Continuous	0.35	SERVICES FIXTURES (WATER) : GRAVITY CHANNEL
SVW_GPIPE	200	Continuous	0.35	SERVICES FIXTURES (WATER) : GRAVITY PIPE
SVW_HYDR	200	Continuous	0.35	SERVICES FIXTURES (WATER) : HYDRANT

WATER				
Layer Name	Screen Colour	Line type	Plotted Line weight	Description
SVW_METER	200	Continuous	0.35	SERVICES FIXTURES (WATER) : METER
SVW_MNHL	170	Continuous	0.35	SERVICES FIXTURES (WATER) : MANHOLE
SVW_MRKR	130	Continuous	0.35	SERVICES FIXTURES (WATER) : MARKER
SVW_PIPE	170	Continuous	0.35	SERVICES FIXTURES (WATER) : WATER PIPE LINE
SVW_PUMP	200	Continuous	0.35	SERVICES FIXTURES (WATER) : PUMP
SVW_SCSR	200	Continuous	0.35	SERVICES FIXTURES (WATER) : SCADA SENSOR
SVW_SPIPE	200	Continuous	0.35	SERVICES FIXTURES (WATER) : SERVICE PIPE
SVW_STRG_PT	200	Continuous	0.35	SERVICES FIXTURES (WATER) : STORAGE POINT
SVW_TANK	230	Continuous	0.35	SERVICES FIXTURES (WATER) : TANK
SVW_TANK_FIL_PT	200	Continuous	0.35	SERVICES FIXTURES (WATER) : TANKER FILLING POINT
SVW_TEXT	white	Continuous	0.25	SERVICES FIXTURES (WATER) : ANNOTATION / TEXT
SVW_VALV	160	Continuous	0.35	SERVICES FIXTURES (WATER) : WATER SLUICE VALVE, AIR VALVE, FLOW CONTROL VALVE, SERVICE VALVE, SYSTEM VALVEVALVE
SVW_WELL	200	Continuous	0.35	SERVICES FIXTURES (WATER) : WELL
SVW_WFAC	200	Continuous	0.35	SERVICES FIXTURES (WATER) : WATER FACILITY
SVW_WMAIN	170	DASHDOT 2	0.35	SERVICES FIXTURES (WATER) : WATER MAIN

WATER				
Layer Name	Screen Colour	Line type	Plotted Line weight	Description
SVW_WSCON	200	Continuous	0.35	SERVICES FIXTURES (WATER) : WATER SERVICE CONENCTION

A.4.5 Commercial

COMMERCIAL				
Layer Name	Screen Colour	Line type	Plotted Line weight	Description
SVC_TEXT	white	Continuous	0.25	SERVICE FIXTURES (COMMERCIAL) : ANNOTATION / TEXT
SVC_SBDL	white	Continuous	0.25	SERVICE FIXTURES (COMMERCIAL) : SIGNBOARD
SVC_POLE	white	Continuous	0.25	SERVICE FIXTURES (COMMERCIAL) : POST / POLE
SVC_OTHR	white	Continuous	0.25	SERVICE FIXTURES (COMMERCIAL) : OTHER FEATURES
SVC_BBDL	30	Continuous	0.25	SERVICE FIXTURES (COMMERCIAL) : BILLBOARD
SVC_BANK	white	Continuous	0.25	SERVICE FIXTURES (COMMERCIAL) : ATM AND SIMILAR FEATURES

Appendix B – USEFUL TABLES FOR AUTOCAD

Annexure – II – CAD Guidelines

(Schedule - Q)

Appendix B - Useful Tables for AutoCAD

Table 1 - Model Space Zoom XP Factors (Metres)

Scale of Drawing	Zoom XP Scale
1 : 1000	1
1 : 1250	0.8
1 : 2500	0.4
1 : 5000	0.2
1 : 10000	0.1
1 : 25000	0.04
1 : 50000	0.02
1 : 500	2
1 : 200	5
1 : 100	10
1 : 50	20
1 : 20	50
1 : 10	100
1 : 5	200
1 : 2	500
1 : 1	1000

Table 2 – Model Space Zoom XP Factors (Millimetres)

Scale of Drawing	Zoom XP Scale
1 : 500	0.002
1 : 200	0.005
1 : 100	0.01
1 : 50	0.02
1 : 20	0.05
1 : 10	0.1
1 : 5	0.2
1 : 2	0.5
1 : 1	1

Table 3 - Text Heights for use in Model Space (Metres)

Scale of Drawing	Factor (Multiply)	Text Height		
		0.25 Pen	0.35 Pen	0.5 Pen
1 : 1000	1.00	2.5	3.5	5
1 : 1250	1.25	3.125	4.375	6.25
1 : 2500	2.50	6.25	8.75	12.5
1 : 5000	5	12.5	17.5	25
1 : 10000	10	25	35	50
1 : 25000	25	62.5	87.5	125
1 : 50000	50	125	175	250
1 : 500	0.5	1.25	1.75	2.5
1 : 200	0.2	0.5	0.7	1
1 : 100	0.1	0.25	0.35	0.5
1 : 50	0.05	0.125	0.175	0.25
1 : 20	0.02	0.05	0.07	0.1
1 : 10	0.01	0.025	0.035	0.05
1 : 5	0.005	0.0125	0.0175	0.025
1 : 2	0.002	0.005	0.007	0.01
1 : 1	0.001	0.0025	0.0035	0.005

Table 4 - Text Heights for use in Model Space (Millimetres)

Scale of Drawing	Factor (Multiply)	Text Height		
		0.25 Pen	0.35 Pen	0.5 Pen
1 : 500	500	500	1250	1750
1 : 200	200	200	500	700
1 : 100	100	100	250	350
1 : 50	50	50	125	175
1 : 20	20	20	50	70
1 : 10	10	10	25	35
1 : 5	5	5	12.5	17.5
1 : 2	2	2	5	7
1 : 1	1	1	2.5	3.5

Appendix C – DRAWING TYPE AND DRAWING NUMBER SERIES

Annexure – II – CAD Guidelines

(Schedule - Q)

Appendix C Project Number

PHASE 1A	Project Codes
TP1 AND TP2 URBAN DEVELOPMENT	
TP2E Roads and Services	TP2E-RS
TP2W Roads and Services	TP2W-RS
TP1 Roads and Services	TP1-RS
Activation Area Roads and Services	TP2E-AA

Appendix C Originator Code

Originator Code	Design Consultant Name
AECOM	AECOM
DMICDC	Delhi Mumbai Industrial Corridor Development Corporation Limited
GIDB	Gujarat Industrial Development Board
GICC	Gujarat Industrial Corridor Corporation
DSIRDA	Dholera Special Investment Regional Development Authority
LBG	Louis Berger Group
DEP	Design Point
TCE	Tata Consulting Engineering
ATK	Atkins

Appendix C Drawing Type Code

Document Code	Description
DWG	DRAWING
DL	DRAWING LIST

Appendix C - Drawing Type and Drawing Number Series

Discipline / Drawing Type	Title Series	Drawing No.
SK – Sketch Drawings	General Layouts and miscellaneous drawings	0000 - 0249
	Geotechnical	0250 - 0499
	Highways	0500 - 0999
	Site Clearance	1000 - 1499
	Traffic	1500 - 1999
	Street Lighting	2000 - 2499
	Fencing	2500 - 2999
	Grading	3000 - 3999
	Structures	4000 - 4999
	Utility Services Corridors	5000 - 5499
	Surface Water	5500 - 5999
	Foul Sewer	6000 - 6499
	Treated Sewerage Effluent	6500 - 6999
	Potable Water	7000 - 7499
	Fire Water	7500 - 7999
	Electricity	8000 - 8499
	Telecommunications/	8500 - 8999
	Environmental	9000 - 9499
Landscape	9500 - 9999	

Discipline / Drawing Type	Title Series	Drawing No.
GE - General	Drawing Lists	0001 - 0999

GT - Geotechnical	General Notes, Abbreviations & Legends, Location Plan, General Key Plan, etc.	0001 - 0999

	Standard & Miscellaneous Details	7000 - 7999
HW - Highways	General Notes, Abbreviations & Legends, Location Plan, General Key Plan, District, Zone & Municipality Boundaries, Road Corridor etc..	0001 - 0999
	Cross Sections (Detailed and Typical), Pavement Types	1000 - 1999
	Proposed Road Layout & Key Plan	2000 - 2999
	Setting Out Plan (Horizontal Alignment Plan)	3000 - 3999
	Road Profiles	4000 - 4999
	Junction Layout Plan and Levels	5000 - 5999
	Swept Path Analysis For Junctions	6000 - 6999
	Standard & Miscellaneous Details	7000 - 7999
	Detail Road Signs & Markings	8000 - 8999
SC – Site Clearance	General Notes, Abbreviations & Legends, Location Plan, General Key Plan, etc.	0001 - 0999
	Site Clearance Layout & Key plan	2000 - 2999

Discipline / Drawing Type	Title Series	Drawing No.
	Standard & Miscellaneous Details	7000 - 7999

TR - Traffic/ Transport	General Notes, Abbreviations & Legends, Location Plan, General Key Plan, etc.	0001 - 0999
	Traffic Flow	1000 - 1999
	Bus Route	2000 - 2999
	Traffic Signal	3000 - 3999
	Traffic Management Plan	4000 - 4999
	Traffic Diversion Plan	5000 - 5999

	Standard & Miscellaneous Details	7000 - 7999

SL - Street Lighting	General Notes, Abbreviations & Legends, Location Plan, General Key Plan, etc.	0001 - 0999
	Street Lighting Typical Cross Sections	
	Street Lighting Layout & Keyplan	2000 - 2999
	Electrical Work For Road Lighting and Traffic Signs	3000 - 3999
	Standard & Miscellaneous Details	7000 - 7999
FE - Fencing	General Notes, Abbreviations & Legends, Location plan, General Key Plan, etc.	0001 - 0999

Discipline / Drawing Type	Title Series	Drawing No.
	Fencing Layout & Keyplan	2000 - 2999
	Standard & Miscellaneous Details	7000 - 7999

GR - Grading	General Notes, Abbreviations & Legends, Location Plan, General Key Plan, etc.	0001 - 0999
	Existing Grading and Topographic Survey Layout Plan & Keyplan	1000 - 1999
	Proposed Grading Layout & Keyplan	2000 - 2999

	Standard & Miscellaneous Details	7000 - 7999

ST - Structures	General Notes, Abbreviations & Legends, Location Plan, General Key Plan, etc.	0001 - 0999
	GAD of Structures	1000 - 1999

	Standard & Miscellaneous Details	7000 - 7999

UC - Utility Services Corridor	General Notes, Abbreviations & Legends, Location Plan, General Key Plan, etc.	0001 - 0999
	Utility Cross Sections	1000 - 1999
	Combined Utilities Plan Layout	2000 - 2999

Discipline / Drawing Type	Title Series	Drawing No.
	Standard & Miscellaneous Details	7000 - 7999

PW - Potable Water	General Notes, Abbreviations & Legends, Location Plan, General Key Plan, etc.	0001 - 0999
	Potable Water Network Plan	
	Proposed Potable Water Layout & Keplan	2000 - 2999
	Longitudinal Sections (Profiles)	3000 - 3999
	GAD of MBR and Pump Houses, SLD for the pumping arrangement from MBR, GAD of ESRs	4000 - 4999

	Standard & Miscellaneous Details	7000 - 7999
	SCADA system for Potable water distribution network	8000 - 8999
RW - Recycle Water	General Notes, Abbreviations & Legends, Location Plan, General Key Plan, etc.	0001 - 0999
	Recycle Water Network Plan	1000 - 1999
	Proposed TSE Layout & Keyplan	2000 - 2999
	Longitudinal Sections (Profiles)	3000 - 3999

	Standard & Miscellaneous Details	7000 - 7999

FS - Sewerage	General Notes, Abbreviations & Legends, Location Plan, General Key Plan, etc.	0001 - 0999
	Sewerage Network	1000 - 1999

Discipline / Drawing Type	Title Series	Drawing No.
	Sewer Layout & Keyplan	2000 - 2999
	Longitudinal Sections (Profiles)	3000 - 3999

	Standard & Miscellaneous Detail	7000 - 7999
IE- Industrial Effluent	General Notes, Abbreviations & Legends, Location Plan, General Key Plan, etc.	0001 - 0999
	Industrial Effluent Network Plan	1000 - 1999
	Proposed Industrial Effluent Layout & Keplan	2000 - 2999
	Longitudinal Sections (Profiles)	3000 - 3999

	Standard & Miscellaneous Details	7000 - 7999

SWD – Storm Water Drainage	General Notes, Abbreviations & Legends, Location Plan, General Key Plan, etc.	0001 - 0999
	Surface Water Network Plan	1000 - 1999
	Proposed Surface Water Layout & Keyplan	2000 - 2999
	Longitudinal Sections (Profiles)	3000 - 3999

	Standard & Miscellaneous Details	7000 - 7999

STP- Sewage Treatment Plant	General Notes, Abbreviations & Legends, Location Plan, General Key Plan, etc	0001 - 0999

Discipline / Drawing Type	Title Series	Drawing No.
	STP Layout Plan, Hydraulic flow, process flow diagram, Process And Instrumentation Diagram, Electrical single line diagram etc., STP Network Plan.	1000 - 1999
	Detail Layout & Keplan	2000 - 2999
	GAD of STP	4000 - 4999
	PLC /Automation system for the STP, PLC system for the Sewage pumping (intermediate and terminal) and treatment systems	5000 - 5999
	Standard & Miscellaneous Details	7000 - 7999

CETP – Common Effluent Treatment Plant	General Notes, Abbreviations & Legends, Location Plan, General Key Plan, etc	0001 - 0999
	CETP Layout Plan, Hydraulic flow, process flow diagram, Process And Instrumentation Diagram, Electrical single line diagram etc., CEPT Network Plan	1000 - 1999
	Detail Layout & Keplan	2000 - 2999
	GAD of CETP	4000 - 4999
	PLC /Automation system for the CETP, PLC system for the effluent pumping (intermediate and terminal) and treatment systems	5000 - 5999
	Standard & Miscellaneous Details	7000 - 7999

EL - Electricity	General Notes, Abbreviations & Legends, Location Plan, General Key Plan, Cluster layout, zoning etc.	0001 - 0999
	Sub-station & network Layout, Single line diagram, General Arrangement etc.	1000 - 1999

Discipline / Drawing Type	Title Series	Drawing No.
	Extra High Voltage Electricity Supply Layout & Keyplan	2000 - 2999
	High Voltage Electricity Supply Layout & Keyplan	3000 - 3999
	Medium Voltage Electricity Supply Layout & Keyplan	4000 - 4999
	Low Voltage Electricity Supply Layout & Keyplan	5000 - 5999

	Standard & Miscellaneous Details	7000 - 7999

ICT	General Notes, Abbreviations & Legends, Location Plan, General Key Plan, etc.	0001 - 0999
	ICT Network plan	1000 - 1999
	Telecom Layout & Keyplan	2000 - 2999

	Standard & Miscellaneous Details	7000 - 7999

EN - Environmental	General Notes, Abbreviations & Legends, Location Plan, General Key Plan, etc.	0001 - 0999
	Existing Site Features	1000 - 1999
	Sensitive Receptors	2000 - 2999
	Surveys & Investigations	3000 - 3999
	Monitoring Locations	4000 - 4999

Discipline / Drawing Type	Title Series	Drawing No.
	Standard & Miscellaneous Details	7000 - 7999

LS - Landscape	General Notes, Abbreviations & Legends, Location Plan, General Key Plan, etc.	0001 - 0999
	Landscape Layout & Key plan (General Arrangement)	1000 - 1999
	Hardscape	2000 - 2999
	Soft scape	3000 - 3999
	Grading & Levels	4000 - 4999
	Landscape Furniture & Lighting	5000 - 5999
	Irrigation (Mainline, Drip & Spray)	6000 - 6999
	Standard & Miscellaneous Details	7000 - 7999

Schedule R - (Guidelines for Quality, Health, Safety and Environment Plan)

(See Clause 3.1.7 L)

The Contractor shall prepare and submit a project specific Health, Safety and Environment (HSE) plan based on the Manual for Quality, Health, Safety, and Environmental Procedures within 30 days of the Appointed Date and implement the same diligently during the contract period

Schedule S - Project Control / Management - Terms of Reference

The Contractor shall perform all the Project Management activities necessary for proper planning, management and control of the work. Below are some of the typical tasks that are required to be performed by contractor:

1. Participate in the project kick-off workshop with project stakeholders designated by Employer/ PMNC. The kick-off workshop shall accomplish the following objectives:
 - Common understanding of the project goals and objectives
 - Define respective roles and responsibilities and
 - Agree on the methods of communication and reporting throughout the project duration.
2. Participate in monthly project status review meetings and present the project progress update in the meeting. The frequency of project status review meetings may change based on actual requirements.
3. **Schedule:** The Contractor shall submit a Level 3 schedule that cover's the full scope of Contractor's work within 20 calendar days from date of appointment. This will be reviewed within 10 calendar days by Employer /PMNC. The Contractor shall incorporate the comments and resubmit the schedule no later than 10 calendar days after receiving the comments from Employer/ PMNC. Upon approval the level 3 schedule will become the baseline schedule for all the future monitoring and tracking.

The Contractor should keep to the following guidelines

- i. Develop and incorporate a detailed Work Breakdown Structure (WBS) for all project schedules that are submitted.
 - ii. All schedules shall be created, maintained and submitted to Employer /PMNC in the latest version of Oracle Primavera P6 or equivalent in an electronic format.
 - iii. All schedules shall follow the Critical Path Method (CPM) of scheduling and shall have meaningful and realistic logical ties and relationships between activities.
 - iv. The use of negative lags is not permitted in the baseline and all other versions of the schedule.
 - v. The schedule must contain all the long lead procurement items identified.
 - vi. Shall exercise reasonableness while assigning constraints in schedule and milestones
 - vii. Upon approval, the copy of the Baseline schedule will become the first Current Schedule.
 - viii. The Current schedule shall be actively updated and maintained by the Contractor every month.
 - ix. The updated Primavera P6 or equivalent schedule file should be submitted every month along with Monthly progress report in electronic format. A pdf copy of the updated schedule with all activities also needs to be submitted
 - x. A schedule narrative document shall accompany the updated electronic schedule describing the work performed in the reporting period.
4. **Cash Flow:** Prepare project cash flow at the start of the project. Prepare monthly statements to show the actual versus plan spending; update the cost periodically

5. **Risk Register:** Maintain an active risk register addressing the risks and mitigation measures (could be in excel format) that lists the project risks related to their Scope of Work.
6. **Inter-Project Links:** Identify potential inter-project links, inter-dependencies or conflicts / interference to work or work areas and narrate them in the monthly progress report.
7. **Monthly Progress Report:** Prepare and submit a monthly progress report (standard format and template will be provided by Employer /PMNC at a later date). Items 3 to 6 mentioned above shall be the minimum information that will need to be included in the monthly progress report.
8. For better collaboration, Contractor shall use the Programme and Document Management system that will be provided by Employer/PMNC at a later date and pay for the cost of procuring licenses to use the system.
9. Timely submission of monthly progress report and the monthly updated electronic schedule file in the required and acceptable format.

Tender Drawings