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(URLIP)
Project Coordination Office

FINAL DETAIL PROJECT REPORT
DANDA RIVER CORRIDOR DEVELOPMENT

URLIP/SDN/CW/02

Volume 4: SPECIFICATION

For
Project Implementation Unit
Siddharthanagar Municipality, Rupandehi

Design Consultant

DOHWA ENGINEERING *in association with*
ERMC (P) Ltd., SILT Consultants (P) Ltd., and DIGICON (P) Ltd.

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TABLE OF CONTENTS

A.	EMPLOYER'S REQUIREMENT.....	1
1	EMPLOYER'S REQUIREMENT.....	1
1.1	SECURITIES AND INSURANCES	1
1.1.1	Performance Security	1
1.1.2	Insurance of Works, Plants and Equipment.....	1
1.1.3	Insurance of Contractors Workmen and Employees	1
1.1.4	Third Party Insurance Policy	1
1.1.5	Insurance of Employer's Personnel	2
1.1.6	Measurement and Payment	2
1.2	SITE SURVEYS, SETTING OUT AND DETAILING	2
1.2.1	General Description and Existing Layouts	2
1.2.2	Verification of Initial Survey Data and Benchmarks.....	2
1.2.3	Assistance to the Engineer	3
1.2.4	Working and Shop Drawings	3
1.2.5	Approvals of Working Drawings, Materials, and Construction (RFA).....	4
1.2.6	As-Built Drawings	4
1.2.7	Soil Investigation and Report	5
1.3	LABORATORY TESTING AND LABORATORY BUILDING.....	5
1.3.1	General Requirement and Scope	5
1.3.2	Utilization of Existing Project Laboratory	5
1.3.3	Laboratory Building and Facilities.....	5
1.3.4	Staffing Requirements.....	5
1.3.5	Equipment and Field Apparatus.....	5
1.3.6	Testing Procedures and Standards	8
1.3.7	Samples and Approvals	9
1.3.8	Third party Inspection	9
1.3.9	Measurement and Payment	9
1.4	ACCOMMODATION OF PUBLIC ACCESS, TRAFFIC AND SITE SAFETY	9
1.4.1	Scope.....	9
1.4.2	General Requirements.....	10
1.4.3	Temporary Diversions.....	10
1.4.4	Public Safety and Control	11
1.4.5	Measurement and Payment	11
1.5	MAINTENANCE OF ACCESS ROADS	11
1.5.1	Scope and Responsibility	11
1.5.2	Cost of Maintenance	11
1.5.3	Repair of Damages	11
1.5.4	Dust Mitigation and Site Cleaning	11
1.6	ENVIRONMENTAL MANAGEMENT AND MONITORING	12
1.7	OTHER REQUIREMENTS	12
1.7.1	Co-operation and Public Authorities.....	12
1.7.2	Personnel, Equipment, and Site Facilities	12
1.7.3	Project Safety Measures and Material Security	13
1.7.4	Publicly and privately Owned Services.....	13
1.7.5	Programme of Works	14
1.7.6	Method Statements.....	15
B.	ENGINEER'S FACILITIES.....	16
2	ENGINEER'S FACILITIES.....	16
2.1	DEFINITIONS	16
2.1.1	General	16

2.1.2	Tolerances.....	16
2.1.3	Measurement and Payment	16
2.1.4	Languages.....	16
2.1.5	Scope of work	16
2.2	FACILITIES FOR THE ENGINEER.....	18
2.2.1	Engineer's Site Office.....	18
2.2.2	Services to the Engineer.....	19
2.2.3	Vehicles for the Engineer.....	19
2.2.4	Occupational Health and Safety (OHS) and Safety Equipment's	19
2.3	ACCESS TO AND POSSESSION OF SITE	20
2.3.1	The Site	20
2.3.2	Temporary Way Leaves and Access.....	20
2.4	PROVISION AND MAINTENANCE OF SITE INSTALLATIONS.....	21
2.4.1	Establishment and Maintenance of Labour Camp and Site Facilities.....	21
2.4.2	Preparation of the temporary Stockyard in the Site of Sub-project.....	22
2.4.3	Contractor's Offices, Stores and Services.....	23
2.5	PROJECT INFORMATION BOARDS	23
2.6	PROJECT SAFETY MEASURES	23
2.7	SUBMISSIONS BY THE CONTRACTOR.....	23
2.7.1	Pre-Construction Surveys and Setting Out.....	23
2.7.2	Detailed Design of Temporary Works.....	24
2.7.3	Working Drawings.....	24
2.7.4	As-Built Drawings and GIS Data Creation.....	26
2.7.5	Construction Programme and Progress of Works.....	27
2.7.6	Detailed Fortnightly Programme	28
2.7.7	Progress Reports.....	28
2.7.8	Operation and Maintenance Manual.....	28
2.7.9	Record / Progress Photographs	28
2.7.10	Measurement and Payment	28
2.8	QUALITY CONTROL	29
2.8.1	Quality Control Plan and Procedures	29
2.8.2	Sampling and Testing	29
2.8.3	Daily Log Book, Daily Work Programme and Daily Site Report	30
2.8.4	Measurement and Payment	30
2.8.5	Other Provisional Items.....	30
2.8.6	Items Supplied by the Employer.....	30
2.9	NOTES ABOUT MEASUREMENT AND PAYMENT.....	30
2.9.1	Measurement	30
2.9.2	Payment.....	31
2.10	MATERIALS	32
2.10.1	Sources.....	32
2.10.2	Inspection And Acceptance of Materials	33
2.10.3	Samples And Tests.....	33
2.10.4	Defective Materials	33
2.10.5	Trade Names and Alternatives.....	33
2.10.6	Foreign Materials	34
2.11	CONTRACTOR'S DUTIES	34
C.	CIVIL WORKS.....	35
3	CIVIL WORKS.....	35
3.1	GENERAL NOTES	35
3.2	SITE CLEARANCE.....	36
3.2.1	Site Clearance by Removal of Grass, Shrubs Etc.....	36
3.2.2	Dismantling Culverts, Bridges, Other Structures and Pavement	36
3.2.3	Dredging Works.....	38
3.2.4	Clearance of Water Hyacinth, Aquatic Weeds, and Debris.....	39
3.3	EXCAVATION WORKS	40



3.3.1	Excavation in Foundation-All Type of Soil.....	40
3.3.2	EXCAVATION FOR STRUCTURES FOUNDATION (Mechanical Means)	41
3.4	BACKFILLING.....	41
3.4.1	Earth Back Filling	41
3.4.2	Sand Filling.....	43
3.4.3	Brickbat Filling	43
3.5	SOILING WORKS.....	43
3.5.1	Flat Brick Soling	43
3.5.2	Stone Filling Works.....	43
3.6	ANTI TERMITE WORKS	43
3.6.1	Scope of Work.....	43
3.6.2	Material Requirements	43
3.6.3	Execution and Treatment Stages	44
3.7	MASONRY WORK	44
3.7.1	One Or More Than One Brick Thick (Chimney Made)	44
3.7.2	Half Brick Thick	45
3.8	CONCRETE WORK	46
3.8.1	Plain Cement Concrete (Pcc) Work	46
3.8.2	Reinforced Cement Concrete (Rcc) Works	47
3.8.3	Reinforcement	57
3.8.4	Formwork	60
3.9	WOODWORK	63
3.9.1	Quality	63
3.9.2	Kind	63
3.9.3	Sawing	63
3.10	DOORS, WINDOWS & VENTILATIONS	63
3.10.1	uPVC Works	63
3.10.2	Aluminium Works	66
3.11	FLOORING.....	69
3.11.1	Plain Cement Concrete	69
3.11.2	Skirting.....	70
3.11.3	Cement Punning	70
3.11.4	Porcelain Floor/Wall/Skirting Tiles	70
3.11.5	Vitrified Floor/Wall/Skirting Tiles.....	71
3.11.6	Marble Flooring	72
3.11.7	Granite Flooring.....	73
3.11.8	Slate stone cladding	73
3.11.9	Machine Made Brick Telia Tile	73
3.11.10	Concrete Interlocking Tiles	74
3.11.11	Wooden Planking	74
3.11.12	Wood Composite Panel Flooring Works	75
3.11.13	Flag Stone Paving	76
3.12	PLASTERING.....	76
3.12.1	Cement Plastering Walls	76
3.12.2	Plastering Soffits Of Slabs And Independent Concrete Surface.....	77
3.12.3	Tile Shape Plaster	77
3.13	WATER PROFING TREATMENTS.....	78
3.13.1	Water Proofing Works in terrace and balcony.....	78
3.13.2	Water Proofing Works in toilet wall and floor	78
3.14	PAINTING.....	79
3.14.1	Applying Priming Coat Of Approved Brand	79
3.14.2	Wall Putty	80
3.14.3	Water Proof Cement Painting.....	81
3.14.4	Plastic Emulsion Painting (Interior).....	81
3.14.5	Enamel Painting	82
3.14.6	Plastic Emulsion Paint (Exterior)	82
3.14.7	Frech/Chapra Polish	83
3.14.8	Silicon Paint (Exterior)	83



3.15	ROOFING.....	84
3.15.1	Steel Tubular Trusses And Purlins	84
3.15.2	Gypsum Board M/F Suspended Ceiling/Wall (Regular Single Layer).....	85
3.15.3	Synthetic tensile Roofing work.....	85
3.15.4	25mm Thick Eaves Board	86
3.15.5	Rain Water Gutter	87
3.15.6	Rockwool Insulation	87
3.15.7	25mm THICK EPS THERMOCOL.....	88
3.15.8	10mm THICK CEMENT BOARD PARTITION	89
3.15.9	PUFF ROOF/WALL PANEL.....	89
3.15.10	EXTRUDED HOLLOW CLAY/TERRACOTTA VENTILATED RAINSCREEN FAÇADE TILES.....	90
3.15.11	SHRERA FLEXING BOARD	90
3.16	SITE DEVELOPMENT WORK.....	91
3.16.1	Pre-Cast Interlocking Concrete Block.....	91
3.17	ASPHALT PAVEMENT.....	92
3.17.1	Preparation of Sub-grade.....	92
3.17.2	Preparation of Sub Base.....	92
3.17.3	Preparation of Base.....	92
3.17.4	Prime Coat	92
3.17.5	Tack Coat	93
3.17.6	Laying of 50mm thick asphalt concrete.....	93
3.17.7	Opening to Traffic.....	93
3.17.8	Measurement	93
3.18	PREMIXED CARPET.....	93
3.18.1	Preparation of Sub-grade.....	93
3.18.2	Preparation of Sub Base.....	93
3.18.3	Preparation of Base.....	93
3.18.4	Prime Coat	94
3.18.5	Tack Coat	94
3.18.6	Laying of 20mm thick Premix Carpet.....	94
3.18.7	Seal Coat	94
3.18.8	Painting lines, dash, arrows	94
3.18.9	Opening to Traffic.....	95
3.18.10	Measurement	95
3.19	TURFING/GRASS SLIPS	95
3.19.1	Measurement	95
3.20	PLANTATION WORKS	96
3.20.1	Flower Plantation	96
3.20.2	Colourful Planting Works	96
3.20.3	Grass Turfing Works with Sods	96
3.20.4	Site Planting and Sowing (Grass Hedging Works).....	97
3.20.5	Trees, Shrubs and Ground Cover Plantation.....	101
3.21	SIDE WALK KERBSTONE.....	101
3.21.1	General	101
3.21.2	Measurement	101
3.22	CARRIAGEWAY CONCRETE KERBSTONE.....	101
3.22.1	General	101
3.22.2	Measurement	101
3.23	STONE MASONRY WORK	102
3.23.1	General	102
3.23.2	Materials.....	102
3.23.3	Construction	102
3.23.4	Test and Standard of Acceptance	104
3.23.5	Measurement	104
3.23.6	Payment.....	104
3.24	GABION WORK.....	105
3.24.1	General	105
3.24.2	Measurement and Payment	105

3.25	FILTER MATERIAL	105
3.25.1	Materials.....	105
3.25.2	Construction	105
3.25.3	Test and Standard of Acceptance	105
3.25.4	Measurement	105
3.25.5	Payment.....	105
3.26	METAL (MILD STEEL-MS) GRATING	106
3.26.1	Measurement	106
3.27	ROLLING SHUTTER.....	106
3.27.1	Guide Channel	106
3.27.2	Fixing.....	106
3.27.3	Painting.....	107
3.27.4	Measurement	107
3.28	BOUNDARY WALL USING MS GRILLS/ SQUARE HOLLOW PIPES.....	107
3.28.1	Materials.....	107
3.28.2	Installation.....	107
3.28.3	Measurement	107
3.29	BOUNDARY WALL USING MS ANGLE, POST, GI MESH AND FENCE WIRE	107
3.29.1	Materials.....	107
3.29.2	Installation	107
3.29.3	Measurement	108
3.29.4	Payment.....	108
3.30	MS GRILL WORKS.....	108
3.30.1	Scope of Works	108
3.30.2	Material Requirements	108
3.30.3	Fabrication and Erection	108
3.30.4	Measurement	109
3.30.5	Payment.....	109
3.31	STAINLESS STEEL WORKS.....	109
3.31.1	Materials.....	109
3.31.2	Fabrication and Construction Procedure	109
3.31.3	Measurement	109
3.31.4	Payment.....	110
3.32	STRUCTURAL STEEL WORK FABRICATION AND ERECTION.....	110
3.32.1	Scope of Works	110
3.32.2	Materials.....	110
3.32.3	Shop Drawings.....	110
3.32.4	Fabrication and Trail Assembly.....	110
3.32.5	Erection	110
3.32.6	Inspection and Testing	110
3.32.7	Measurement	110
3.32.8	Payment.....	111
3.33	PIPE DRAINS, PIPE CULVERTS	111
3.33.1	Scope.....	111
3.33.2	Material Requirements	111
3.33.3	Laying and Jointing (Flush Joint)	111
3.33.4	Bedding and Backfilling.....	111
3.33.5	Measurement	111
3.33.6	Payment.....	111

D. ELECTRICAL WORKS113

4 ELECTRICAL WORKS113

4.1	GENERAL SPECIFICATIONS	113
4.2	WIRING AND CONDUITS	113
4.3	SWITCHGEAR AND DISTRIBUTION BOARDS	113
4.4	OUTDOOR AND LANDSCAPE LIGHTING	114
4.5	INDOOR LIGHTING AND ACCESSORIES.....	114
4.6	CABLING, NETWORK AND INFRASTRUCTURE.....	114

4.7	EARTHING AND LIGHTNING PROTECTION	115
4.8	SUBSTATION EQUIPMENT	115
4.9	SHOP DRAWINGS	116
4.10	SAMPLES.....	116
4.11	LOCATION OF FIXTURES.....	116
E.	WATER SUPPLY, PLUMBING AND SANITARY WORKS.....	118
5	WATER SUPPLY, PLUMBING AND SANITARY WORKS.....	118
5.1	GENERAL	118
5.1.1	Scope.....	118
5.1.2	Standards.....	118
5.1.3	Materials and Methods.....	120
5.1.4	Drawings and Specifications	121
5.1.5	As built Record.....	121
5.2	INTERNAL WATER SUPPLY.....	122
5.3	EXTERNAL WATER SUPPLY	125
5.4	STAINLESS STEEL TANK	125
5.5	SOIL, WASTE, VENT, AND RAIN WATER PIPES	126
5.5.1	Scope.....	126
5.5.2	General Requirements.....	126
5.5.3	PVC Pipes and Fittings: Soil, Waste and Vent Pipes.....	126
5.5.4	UPVC Pipes.....	127
5.5.5	Clamps	127
5.5.6	Pipe Supports and Hangers.....	128
5.5.7	Waste Pipe from Appliances	128
5.6	SANITARY WARES.....	128
5.6.1	General	128
5.6.2	Commode and Water Closet	129
5.6.3	White Glazed Wash Basin	129
5.6.4	Mixing Fittings	129
5.6.5	Angle valve.....	130
5.6.6	Urinals.....	130
5.6.7	Sinks	130
5.6.8	Flush Valves	131
5.6.9	Mirrors	131
5.6.10	Towel Rails and Rings.....	131
5.6.11	Robe Hook, Toilet Paper, and Soap Dish.....	131
5.6.12	CP Fittings	132
5.6.13	Multi Floor Trap and Gratings.....	132
5.7	SUBMERSIBLE PUMP	132
5.7.1	Material	132
5.7.2	Measurement	132
5.8	OUTDOOR PIPE INSTALLATIONS, MANHOLE, SEPTIC TANK, AND SOAK PITS	132
5.8.1	Valve chambers	132
5.8.2	HDPE /PVC Pipe System	132
5.8.3	Manholes.....	133
5.8.4	Soak Pit	134
5.9	PERFORATED PIPE FOR DRAINAGE WORKS	134
5.9.1	Material	134
5.9.2	Perforation Specifications	134
5.9.3	Construction and Laying Procedure.....	135
5.9.4	Measurement	135
5.9.5	Payment.....	135
5.10	135	
5.11	ANAEROBIC SEWAGE TREATMENT PLANT	135
5.12	EXCAVATION & RELATED WORKS FOR EXTERNAL PLUMBING.....	136
5.12.1	Alignment and grade.....	136
5.12.2	Opening out trenches	136

5.12.3	Obstruction of Roads.....	136
5.12.4	Removal of filth	136
5.12.5	Excavation to be taken to proper depths.....	136
5.12.6	Refilling	136
5.12.7	Contractor to restore settlements and damage	137
5.12.8	Disposal of Surplus Soil.....	137
5.12.9	Timbering of sewer and trenches.....	137
5.12.10	Shoring of buildings/structures	137
5.12.11	Dewatering of Trenches	137
5.12.12	Cement concrete, brickwork and finishing.....	137
5.12.13	Excess excavation	138
5.12.14	Increased Width, Depth of Trench	138
5.12.15	Measurement	138
5.13	LIST OF APPROVED MAKES OF MATERIALS.....	138
F.	FURNITURE WORKS.....	140
6	FURNITURE WORKS.....	140
6.1	CUSTOMER SERVICE DESK/CSD (RT).....	140
6.2	TELLER COUNTER (TC)	140
6.3	STAFF DESK (T1)	140
6.4	FILING CABINET	140
6.5	STAFF/MEETING CHAIR (RC1):.....	141
6.6	OFFICE VISITORS CHAIR(C1):.....	141
6.7	MEETING TABLE (MT)	141
6.8	SOFA (1/2/3/5-SEATER)	141
6.9	AIRPORT SOFA (C2) (4/8/12-SEATER)	141
6.10	CURTAINS	141
6.11	ULTIMATE DOOR MAT	141
6.12	PLANTER BOX	141
6.13	HELMET RACK.....	142
6.14	GUARD CHAIR.....	142
6.15	GUARD TABLE.....	142
6.16	TOUGHEN GLASS.....	142
6.16.1	Measurement	142
6.17	LIST OF APPROVED MAKES OF MATERIALS.....	142



A. EMPLOYER'S REQUIREMENT

1 EMPLOYER'S REQUIREMENT

The employer's requirements given in this section shall be read in conjunction with Technical Specifications and Conditions of Contract.

The following services are to be provided by contractor during the entire period of the Contract. Some of these services may/may not have been itemized separately in the Bill of quantities but the cost of providing these services is deemed to be included in the pay items of the Bill of Quantities.

1.1 SECURITIES AND INSURANCES

1.1.1 Performance Security

The Contractor shall provide Performance Security in the required amount and currencies from an approved bank/financial institutions in accordance as per the Conditions of Contract.

The Performance Security must be maintained and kept valid for the entire **Project Period** (duration of construction and O&M period) plus a thereafter additional **1-Year Defect Liability Period (DLP)**, or as explicitly instructed by the Engineer. The contractor is responsible for timely renewals of the security if the project period is extended.

Payment for the "Performance Security Bank Commission" shall be reimbursed strictly **as per actuals**. To claim this reimbursement, the Contractor must submit original, verifiable bank receipts, statements, or invoices demonstrating the exact commission fee charged by the approved bank/financial institution for issuing and maintaining the Performance Security. Payment will be released from the Provisional Sum only upon the thorough verification and approval of these financial documents by the Engineer.

1.1.2 Insurance of Works, Plants and Equipment

The Contractor shall insure the Works and all his plants and equipment against damages and losses with an approved insurance agency/institution as stipulated in the Conditions of Contract. The insurance coverage must remain valid continuously for the entire project construction period and O&M period and the subsequent Defect Liability Period (DLP) until the final handover of the project.

1.1.3 Insurance of Contractors Workmen and Employees

The Contractor shall insure all his employees and workmen against such liability as stipulated in the Conditions of Contract. This insurance coverage must span the entire project period and the DLP until the final handover of the project. The Contractor is required to submit the original policy document to the Engineer within the stipulated date.

1.1.4 Third Party Insurance Policy

The Contractor shall obtain a Third-Party Insurance Policy as stipulated in the Conditions of Contract from an approved insurance agency/institution in a form acceptable to the Employer. This policy must explicitly cover all legal liabilities arising from the injury or death of any third-party persons/public, as well as any loss or damage to third-party property caused directly or indirectly by the execution of the works. This policy must remain active and valid continuously throughout the entire project period and the Defect Liability Period (DLP) until the final handover of the project.



1.1.5 Insurance of Employer's Personnel

The Contractor shall insure all nominated personnel of the Employer, including the Consultant's personnel, against such liability as stipulated in the Conditions of Contract. This insurance must cover the entire project period and the DLP until the final handover of the project. The Contractor shall submit the original policy document to the Engineer within the stipulated date.

1.1.6 Measurement and Payment

Only the cost of providing the Insurance Policies as described above shall be paid to the Contractor as a lump sum amount, as provisioned in the Bill of Quantities (BOQ). Payment shall be processed exclusively against the submission of the original insurance policies along with the appropriate premium payment receipts, in a form acceptable to the Employer.

1.2 SITE SURVEYS, SETTING OUT AND DETAILING

1.2.1 General Description and Existing Layouts

The Contractor shall be responsible for the true and proper setting-out of the works in relation to the lines and levels of reference given by the Engineer or shown on the Drawings, for the correctness of the position, levels, dimensions, and alignment of all parts of the works, and for the provision of all necessary instruments, appliances, and labor used in connection therewith. The Contractor shall carry out a detailed route alignment survey of the site in advance of the commencement of construction work and supply full details to the Engineer. All setting out and levelling shall be based on permanent Benchmarks provided by the Employer/Engineer.

Before commencing operations on any section of the works, the Contractor shall survey all existing details in that section, in plan and in level, and shall plot the results in such detail and to such scales as shall be to the satisfaction of the Engineer. These survey plots shall be supplied to the Engineer at least four weeks before the intended commencement of construction on the section. Unless otherwise instructed, the detailed survey plots will be supplied in 1:200 scales both as soft and color hard copies.

Horizontal control lines shall be marked out by pegs at intervals of not more than 20m, and the lines traversed with a theodolite by steel band or by any other method acceptable to the Engineer. The alignments established shall be referenced by pegs offset at suitable distances on each side of the horizontal control lines. These offset pegs shall be painted in a conspicuous color. Cross-sections of the existing ground and of the ground after completion of earthworks shall be taken at intervals not exceeding 20m along the horizontal control lines in an approved manner and submitted in both soft and color hard copies.

1.2.2 Verification of Initial Survey Data and Benchmarks

During the period of commencement of works, the Contractor shall resurvey the Base Lines, Traverse Points, and Benchmarks, and confirm the coordinates and levels of the stations. The Contractor shall immediately notify the Engineer of any discrepancies and shall agree with the Engineer on any amended values to be used during the contract, including replacements for any stations missing from the original survey.

As the work proceeds, the Contractor shall establish, at suitable locations, substantial permanent benchmarks, clear of the works, from which all subsequent setting out and levelling shall be carried out. The locations of the benchmarks shall be agreed upon with the Engineer before they are established. Benchmarks shall be constructed in class 20/20 concrete, with minimum dimensions of 0.3m x 0.3m, the upper surface being approximately 50mm above ground level. A 20mm diameter mild steel rod, not less than 300mm in length, shall be cast into the concrete so

that it projects about 10mm above the center of the surface. The concrete surface shall be clearly engraved with the reference number of the benchmark. The coordinates and level of each benchmark shall be determined in meters to 3 decimal places.

The Contractor shall check coordinates and levels of benchmarks at monthly intervals and immediately notify the Engineer of any discrepancies. The Contractor shall check, replace, and supplement as necessary the station points and agree on any revised or additional station details with the Engineer. All stations and reference points shall be clearly marked and protected to the satisfaction of the Engineer.

1.2.3 Assistance to the Engineer

The Contractor shall provide the Engineer with all necessary assistance for checking the setting out, agreement of levels, and any other survey or measurement which the Engineer needs to carry out in connection with the contract during the entire period of the contract. Such assistance shall include:

- a) Provision of suitably qualified surveyors to work under the direction of the Engineer as required.
- b) Provision of all necessary support for these surveyors including assistants, chainmen, labor, hand tools, pegs, and materials.
- c) Provision of survey equipment (Precision automatic levels, Total Station/Theodolite, and distomat) as required by the Engineer for survey works.

1.2.4 Working and Shop Drawings

The drawings issued with these Tender Documents are Tender Drawings, prepared to give a comprehensive idea of the works. These may be modified, expanded, or replaced subsequent to the opening of the tender. The finalized drawings, together with any modified drawings signed and made part of the contract, will be called Construction Drawings. Any questions or alterations affecting the requirements shall be submitted in writing to the Engineer for review.

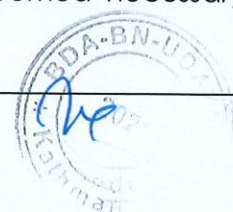
The lines indicated on the Construction Drawings denoting locations of existing utilities or services are approximate. The Contractor must confirm the exact location of the utilities in consultation with relevant authorities and receive approval. The locations, layouts, and scope of works may be altered, and the Contractor shall not be entitled to any claim for such alterations over and above the measured works at tendered rates, except in accordance with the Conditions of Contract.

The Construction Drawings shall be supplemented by working or shop drawings prepared by the Contractor. The Contractor shall prepare alignment survey drawings as part of the working drawings as soon as work commences. Existing ground levels shall be taken at intervals not exceeding 10m. Information related to all existing structures, obstructions, and services must be located in the survey drawing.

Plans of the alignment showing the location of proposed alignments, the width of the right of way, existing services, obstructions, and edges of existing carriageways/pathways shall all be presented in Working Drawings before commencing work. The drawing shall clearly indicate the location of plot boundary walls. The existing services, as determined by site excavation, should also be marked up on these plans.

The shop drawings shall include, but not be limited to:

- a) General layout drawings for equipment and like items as deemed necessary by the Engineer.



- b) Detailed layout drawings of all roads, drainages, and structures to be built.
- c) Specific chainages and information to illustrate in detail the arrangement and integration of the various sections of the works.

All drawings shall be computerized and submitted both in color hard copy and digital data. Working drawings and documents shall be made available in sufficient time to maintain the Programme of Work. Delays due to a lack of approvals for working/shop drawings are the Contractor's risk, and no compensation shall be claimed.

To facilitate this, the Contractor shall employ two (2) Engineers, two (2) AutoCAD Technicians. And other required helpers. These staff members shall have not less than five years of experience specifically for the planning and preparation of working drawings, and their qualifications must be approved by the Engineer. The Contractor shall also provide, as part of the site mobilization, the latest model computers and software together with a new A3 size color printer. The Engineer shall have access to this computer. If the Contractor fails to mobilize such staff and equipment, the Engineer reserves the right to mobilize the necessary staff and deduct the cost from any money due to the Contractor.

1.2.5 Approvals of Working Drawings, Materials, and Construction (RFA)

The Contractor shall liaise with the Engineer for the period required for any approval, which shall be a maximum of two weeks.

Procedure for review of drawings: The Engineer shall mark up the drawing in yellow (showing acceptance) and red (showing requirement for revision). The Contractor shall revise the red portions and round them off in green color to demonstrate compliance. On resubmission, the Engineer shall check the revisions and mark them in yellow to approve the drawing. Approved drawings shall be filed for future reference.

Material and Equipment Ordering: The Contractor shall ensure all ordered items can be accommodated in the positions shown. No materials or equipment shall be ordered, nor construction commenced, until approval is obtained. The Contractor is deemed to have a full understanding of the Engineer's design intents. No claim regarding a lack of knowledge will be admissible.

Request for Approvals (RFA) for Materials: The Contractor shall submit RFAs for all materials early in the contract period. The request must comprise the reference to the BoQ item, specification clause, source details, and supplier specifications. The Contractor shall submit samples prior to approval if requested. The Engineer shall generally give comments/approval within 15 days of RFA submission.

Request for Approval for Construction: The Contractor shall submit an RFA prior to commencing any construction works for specific stretches of roads, drainages, or structures. Each stage of construction shall be approved by the Engineer prior to and after completion. The RFA must be accompanied by a copy of the approved working drawing for that location.

1.2.6 As-Built Drawings

The Contractor shall prepare and submit as-built drawings in appropriate format as instructed by Engineer for approval immediately upon the completion of roads, drainages, and all structures. These shall be developed from the approved working drawings and must show the exact plan, profile, and structural details. The final as -built drawings (after incorporating Engineer-approved corrections) shall be submitted in soft and color hard copies with the final IPC or before taking Final Completion Certificate. The as-built drawings of the work completed within the month must also be included in every monthly progress report and interim payment request submitted by the Contractor.

1.2.7 Soil Investigation and Report

A soil investigation has been undertaken during the Design phase. However, in case additional investigations are required during the course of construction the Contractor shall be advised of such requirement and the Contractor shall promptly carry out such investigations as advised by the Engineer.

1.3 LABORATORY TESTING AND LABORATORY BUILDING

1.3.1 General Requirement and Scope

The Contractor shall provide, equip, and maintain a site laboratory within 25 days after signing the Agreement and maintain it continuously until the Contract period expires. The laboratory shall be established at any one of the sites chosen by the Engineer, where the tests for all relevant sites shall be processed.

- a) The laboratory building and equipment shall be used exclusively for material testing and shall, together with all equipment, samples, and records, be open to inspection by the Engineer during all working hours.
- b) The provision of laboratory facilities on site shall in no way relieve the Contractor of the responsibility for providing additional laboratory space and testing equipment as necessary to control materials at mixing plants and elsewhere to fulfill obligations under the Contract.
- c) The testing of the works by the Engineer in no way absolves the Contractor from their responsibility to carry out their own testing of the quality of works and materials used.

1.3.2 Utilization of Existing Project Laboratory

The main testing laboratory has been established under the URLIP Type A project. The Contractor shall utilize the existing testing machines from the project (such as the Compressive Strength Testing Machine) to assure the quality of the materials and works.

1.3.3 Laboratory Building and Facilities

The Contractor shall furnish, equip, keep clean, and maintain a weatherproof laboratory building to the satisfaction of the Engineer.

1.3.4 Staffing Requirements

The laboratory shall be adequately staffed by the Contractor with materials and quality control technicians and assistants so that no interruption or unnecessary delay occurs to construction activities due to delays in sampling or testing.

Contractor's Materials Engineer / Senior Lab Technician: The Contractor shall provide a full-time Senior Lab Technician/Materials Engineer responsible for the day-to-day activities of the laboratory and for site testing. This individual shall have not less than five years of experience in a soil test laboratory (including the testing of earthworks and concrete for structures) and shall be fully conversant with the testing of materials as per the latest Indian Standards. The CV, detailing experience and qualifications, must be submitted to the Engineer for approval. They shall report directly and solely to the Engineer or designated staff.

Lab Assistant: The Contractor shall provide at least one qualified Lab Assistant to support testing operations.

1.3.5 Equipment and Field Apparatus

The Contractor shall independently provide all necessary field-testing apparatus in working condition, along with the materials required for tests.



At the commencement of the Contract, the Contractor shall submit a detailed list of the equipment proposed for provision, showing each item's type, model, serial number, manufacturer's name, and year of manufacture for the Engineer's approval.

List of Equipment's Required

S. N	Description	Quantity	Unit
A	General		
1	Weigh Balance		
i	Platform balance 300 kg	1	Set
ii	Electronic Balance Model CH30R11 30kgx5gm OHAUS or Equivalent	1	Set
iii	Electronic Balance Model CH30R11 20 kg0.5gm OHAUS or Equivalent	1	Set
iv	Electronic Balance Model CT6000 Capacity 6010x0.5gm OHAUS or Equivalent	1	Set
v	Electronic Balance Model NDB110 Capacity 2100x0.1gm OHAUS or Equivalent	1	Set
2	Waterbath Serological 2 rack electric as per IS 6593	1	Set
3	Thermometer		
i	Mercury Thermometer 250°C	2	Set
ii	Dial Thermometer 400°C	2	Set
iii	Gun Thermometer 250°C	2	Set
iv	Mercury Thermometer 50°C	2	Set
v	Wet and Dry Thermometer	1	Set
4	Stopwatch 1/5 sec Accuracy	1	Set
5	Glassware: Containers and small tools including		
6	Enamel Coated GI Trays		
i	300x300x75	6	Set
ii	400x400x75	6	Set
iii	600x600x75	6	Set
7	Aluminum Moisture Container 75x50mm	50	Set
8	Rubber Mallet	1	Set
9	Aggregate Steel Scoop (690*300*100mm)	2	Set
10	Aluminium Scoop (125*200*75mm)	1	Set
11	Guaging Trowel	2	Set
12	S.S Bowlb 2 Lit	2	Set
13	Volumetric Flasks		
	1000ml	2	Set
	500ml	2	Set
	250ml	2	Set
14	Measuring Cylinders		
	1000ml	2	Set
	500ml	2	Set
	250ml	2	Set
15	Beakers		
	1000ml	2	Set
	500ml	2	Set

S. N	Description	Quantity	Unit
	250ml	3	Set
16	Vernier Caliper 150mm	1	Set
17	Steel Ruler 300mm	1	Set
18	Pairs of heat resistant Aesbestos handgloves	4	Set
19	Set of sampling tools all materials	1	Set
20	Set of crowbars, pick and spade	2	Set
21	GI Sieve 450mm dia Size per IS 462 with lid and pan		
	75 mm	1	Set
	63 mm	1	Set
	50 mm	1	Set
	45mm	1	set
	37.50 mm	1	Set
	31.50 mm	1	Set
	26.5 mm	1	Set
	22.4mm	1	Set
	20 mm	1	Set
	19 mm	1	Set
	13.2 mm	1	Set
	12.50 mm	1	Set
	9.50 mm	1	Set
	6.30 mm	1	Set
	5.6 mm	1	set
	4.75 mm	1	Set
	Lid and pan set	1	Set
22	Brass Sieve 200mm dia Size(IS460 or BS 410)		
	4.75 mm	1	Set
	2.80 mm	1	Set
	2.36 mm	1	Set
	2.00 mm	1	Set
	1.18 mm	1	Set
	600 micro	1	Set
	425 micro	1	Set
	300 micro	1	Set
	150 micro	1	Set
	0.71 micro	1	Set
	0.09 micron	1	Set
	0.075 micron	1	Set
	Lid and pan set	1	Set
23	Specific Gravity Bottle 100ml	2	Set
24	Steel Bowl 750ml	5	pic.
B	Soil Test & Aggregate Test (Soil,sub-Base,Base)		
1	Organic Content testing kit (set)	1	Set
2	Sodium Sulfate	5	kg
3	Modified AASHTO Compaction apparatus as per IS 2720 (part 8) or heavy compaction, complete with collar, base plate and hammer with all other accessories	1	Set

S. N	Description	Quantity	Unit
i	Compaction Mould 150mm	1	Set
ii	Sample Splitters (Riffle boxes) 50 mm	1	Set
iii	Scraper Tool	1	no
4	Liquid limit & Plastic Limit device with grooving tools As Per IS 2720	1	Set
i	Glass Plate 400x600x6mm	1	Set
ii	Spatulas 200mm	1	Set
iii	Evaporating Disc 150mm	1	Set
5	Sand Pouring Apparatus 150mm AS Per IS 2720 part 28	1	Set
i	Standard sand(Zone I,II,III)	9	Bags
i	Wash Bottle	2	Set
6	CBR Test Apparatus With Proving ring 10kn & 25kn as per IS 2720 part 16, electrically operated with speed control with all complete accessories	1	Set
i	Dial gauges 25 mm travel 0.01 mm/ division	1	Set
ii	Annular Weight 2.5kg	1	Set
iii	Central Hole Weight 2.5kg	1	Set
iv	CBR Mould 150mm	9	Set
v	Perforated Plate Brass	1	Set
vi	Spacer Disc	1	Set
vii	Tripod	1	Set
viii	Rammer 4.89 kg	1	Set
7	Sand equivalent test set, complete with graduate plastic cylinder, manual or mechanical shaker and stock solution IS 2720 Part 37	1	Set
8	Filter Paper(150mm Dia)	10	pkt.
C	Cement & Concrete Test		
1	Slump Test Apparatus BS 1881 Part 102	2	Set
2	Cube Mould 150mm	24	Set
3	MortarCube Mould 70.7 mm	24	Set
4	Light weight Hammer Test	1	Set
5	Rubber Hammer For Concrete cube Moulding	6	Set
6	Tool kit Box (195*240*435)Stainless Steel Materials Made including 6-22mm combination set 12 inch.sliding wrench 8 inch plier 5*6 screw driver,allen key set and other necessary accessories all complete set	1	Set
D	Bitumen & Asphalt Test		
1	Standard spray trays For Tray test Prime & Tack Coat	12	Set
2	Camber board and spirit level	1	Set

The list of equipment might be added or modified as per field condition and as per Employer/Engineer's instruction.

1.3.6 Testing Procedures and Standards

The Contractor shall arrange and carry out the tests of materials to be used in the Works or any other tests deemed necessary by the Engineer.

Standards: All tests shall be performed in strict accordance with the appropriate NS/IS or other standards as approved by the Engineer.



External Testing: Tests that cannot be carried out at the site laboratory or the laboratory set up by the Municipality and must be done in a recognized and well-established external laboratory approved by the Engineer. If external testing is required, the Contractor must obtain approval for the external laboratory within 15 days of the commencement of the Contract.

1.3.7 Samples and Approvals

The Contractor shall submit samples of all materials and goods for inclusion in the works to the Engineer promptly to avoid delays.

Only materials approved by the Engineer and meeting the specified standards may be ordered for supply.

All executed work shall be of equal standard in all respects to the approved samples. The Engineer retains the right to reject any work that does not comply with the approved samples.

1.3.8 Third party Inspection

The contractor shall carry out the third-party inspection for the materials export from others country than Nepal such as Bitumen, any other materials like tensile shed roofing materials, electrical items, etc.

1.3.9 Measurement and Payment

Payment and cost allocations for the site laboratory and testing shall be handled as follows:

Bill of Quantities (BoQ) Payments: Payment under the BoQ is strictly limited to the rental fee for the site lab office, the remuneration for one Senior Lab Technician, one Lab Assistant, and the depreciation cost for field-testing apparatus and equipment. Payment for these specified provisions will be made proportionately based on the progress of the work.

Contractor's Costs: All other costs shall be borne entirely by the Contractor, including but not limited to:

- a) The operation and maintenance (excluding BoQ-covered depreciation) of all field-testing apparatus and equipment.
- b) Transporting testing materials and samples from any site to the laboratory.
- c) Any external testing required at independent laboratories (unless explicitly stated otherwise in the BoQ).
- d) Additional testing facilities or space required at mixing plants.
- e) Demobilization and site reinstatement upon project completion

1.4 ACCOMMODATION OF PUBLIC ACCESS, TRAFFIC AND SITE SAFETY

1.4.1 Scope

This Clause covers the construction and maintenance of the necessary detours, diversions, temporary pathways, barricades, and signs, and everything necessary for the safe and easy passage of all public traffic (including pedestrians, park visitors, and local vehicular traffic) during the construction period, as well as the removal of diversions as they become redundant, including bringing the area back to its original condition.

The Contractor shall take all necessary precautions regarding safety at the construction site. The Contractor shall strictly adhere to the stipulations of the latest applicable national safety codes, including the "SAFETY AT ROAD WORKS: A Code of Practice for Signing at Road Works" published by the Department of Roads, adapting these guidelines as necessary to ensure strict pedestrian and visitor safety within the corridor.



1.4.2 General Requirements

The Contractor shall at all times carry out works within the river corridor in a manner creating the least possible interference to the flow of pedestrian and vehicular traffic. For all works involving improvements to existing trails, access roads, or public areas, the Contractor shall provide and maintain a passage for users either along a part of the existing route under improvement, or along a temporary diversion constructed close to the worksite. The Contractor shall take prior approval from the Engineer regarding access arrangements during construction.

The Contractor may be allowed to stop access temporarily for safety critical works. The period of such closure shall be as agreed by the Engineer at least 14 days in advance, to enable the Engineer to issue the relevant public notices.

1.4.3 Temporary Diversions

(a) *Provisions of Diversions*: Where portions of the existing pathways, trails, or access roads cannot be used by through traffic, diversions as may be required to deviate users from such portions shall be constructed.

(b) *Survey Beacons and Monuments*: Diversions shall be constructed so as not to damage or displace trigonometrical survey beacons and project monuments. In exceptional cases where this is not possible, arrangements shall be made to have survey beacons suitably referenced before they are displaced and relocated after the completion of the work.

(c) *Access to Properties*: Access to properties which fall within or adjoin the area over which work is being carried out shall be provided in the same manner as existed before the start of the work.

(d) *Temporary Works*: If diversions are provided, they shall include the construction of temporary gates, pedestrian barriers, fences, drainage works, and other incidentals considered necessary.

(e) *Public Services*: Arrangements shall be made for the continuity of all public services such as power lines, telephone lines, water mains, sewerage, drainage, etc., if the existing services are likely to be affected.

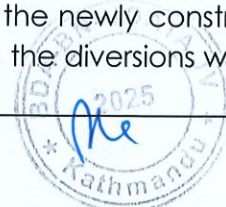
(f) *Width of Diversions*: The usable width for the accommodation of shared vehicular and pedestrian traffic shall be determined based on site conditions, but generally not less than 3.0 m. Where diversions consist of pedestrian-only pathways, the minimum usable width shall not be less than 1.5 m, or as directed by the Engineer.

(g) *Temporary Drainage Works*: All necessary temporary drainage works required for proper surface run-off, such as side drains, catch water drains, temporary cross-drainage structures, etc., shall be constructed.

(h) *Earthworks for Diversion*: Diversions shall be shaped and graded making full use of all material that can be salvaged. If sufficient material cannot be obtained in this manner, material shall be imported from other sources. Where necessary, cuttings shall be made to obtain a satisfactory vertical alignment. All necessary clearing including the removal of all trees and stumps shall be performed.

(i) *Maintenance of Diversions*: All diversions shall be maintained in a safe, smooth, and easily traversable condition. Whenever required, the diversions shall be leveled to provide a smooth walking or riding surface free of severe unevenness. All potholes and washouts shall be promptly repaired. Diversions shall be watered to keep down dust and facilitate the proper compaction of the surface. All drainage works shall be maintained in good working condition and kept unblocked.

(j) *Removal of Diversions*: When access is routed permanently onto the newly constructed park pathways or access roads following the completion of construction, the diversions which are no



longer required shall be removed and the ground reinstated to its original or proposed landscaping condition.

1.4.4 Public Safety and Control

The Contractor shall provide, erect, and maintain such barricades, including signs, markings, flags, lights, and flagmen as may be required for the information and protection of the public approaching or passing through the section of the corridor under development. Barricades, signs, and warning boards shall be provided in accordance with the relevant local codes and the Traffic Signs Manual published by the Department of Roads, adapted appropriately for pedestrian park environments.

The barricades erected on either side of the construction zones close to the movement of the public shall be of strong design to resist violation and clearly marked. On all approaches, suitable regulatory and/or warning signs shall be installed for the guidance of park users and vehicles. On each approach, at least two signs shall be placed.

Where applicable, steel or heavy-duty plastic drums may also be placed. These drums shall be clearly visible, painted or sandblasted, and provided with retro-reflective tape strips (red on the left-hand side facing oncoming traffic and white on the right-hand side as appropriate). The minimum size of these tapes shall be 0.01 sq. m. The drums shall be maintained in a clean and effective condition, and no stones or unapproved warning devices shall be placed on top of them.

1.4.5 Measurement and Payment

Unless stated otherwise, no separate measurement and/or payment shall be made for all materials and works required under this Clause. All costs in connection with the work specified herein shall be considered to be included within other related items of the work in the Bill of Quantities (BoQ).

1.5 MAINTENANCE OF ACCESS ROADS

1.5.1 Scope and Responsibility

The Contractor shall be solely responsible for the continuous maintenance and upkeep of all existing and temporary access roads, pathways, and routes leading to and within the Danda River Corridor Development zone area for the entire duration of the contract.

1.5.2 Cost of Maintenance

All works related to the maintenance of these access routes shall be carried out entirely at the Contractor's own cost. No separate measurement or payment shall be made for this work, and all associated costs shall be deemed included in the rates of other applicable items within the Bill of Quantities.

1.5.3 Repair of Damages

Any damage caused to existing public or private roads, trails, park infrastructure, or adjacent properties by the Contractor's construction vehicles, heavy equipment, or personnel during the execution of the works shall be strictly the Contractor's responsibility. The Contractor shall promptly repair and reinstate any such damage to its original condition, or better, to the satisfaction of the Engineer, entirely at their own expense.

1.5.4 Dust Mitigation and Site Cleaning

The Contractor shall implement stringent dust control and cleaning measures along all access routes. The Contractor shall be responsible for:



- Regular watering of unpaved access roads and active work zones to suppress dust generation.
- Immediate sweeping and cleaning of paved public roads or trails if mud, debris, or materials are tracked out of the construction site by project vehicles.
- Ensuring that dust, dirt, and debris generated by construction activities do not cause a nuisance to local residents, park visitors, or result in environmental degradation of the river corridor.

1.6 ENVIRONMENTAL MANAGEMENT AND MONITORING

Environmental Management Plan (EMP): The Contractor shall prepare and implement an EMP, incorporating air dust control and other environmental mitigation measures throughout the project duration. All environmental protection works shall comply with the prevalent laws, regulations, and the Environmental Management Plan (EMP).

Environmental Monitoring: The Contractor shall conduct periodic environmental monitoring as instructed by the Engineer. This shall include testing for (a) Air Quality, (b) Noise level, (c) Surface Water Quality, (d) Ground Water Quality, and (e) Soil Quality

1.7 OTHER REQUIREMENTS

1.7.1 Co-operation and Public Authorities

- a) *Co-operation:* The Contractor shall establish full coordination with the officials of PIU, municipality and the Consultants and extend co-operation to complete the work.
- b) *Public Authorities:* The Contractor shall comply with all rules and regulations, bylaws, and directives given from time to time by any local or public authority in connection with this work and shall himself pay fees or charges which are leviable on him without any extra cost.
- c) *Acquaintance with Site and Work Conditions:* The Bidder shall study the site and general conditions in respect of approaches, laborers, climate, and the data included in the tender documents and get it verified with actual inspections of the site before submitting the tender. In case of doubt about any item or data included in the tender, the same shall be clarified in the pre-bid meeting. Once the tender is accepted, it shall be concluded that the Contractor has verified and made himself conversant with all the details required for completing the work as stipulated in the conditions and specifications.

1.7.2 Personnel, Equipment, and Site Facilities

- a) *Personnel:* The Contractor shall depute sufficient staff to carry out construction, installation, maintenance, and repair work efficiently and satisfactorily. In the case of a Joint Venture, the Lead Partner shall deploy a suitably qualified and experienced Contractor's representative besides not less than two key professionals responsible for performing overall contractual obligations including, but not limited to, project planning, management, and resource mobilization on behalf of the contractor.
- b) The Contractor shall undertake to comply with applicable legislation and the code of labor law on matters of health, hygiene, and safety, and shall assume responsibility for works required in the event of any change in applicable regulations.
- c) The Contractor shall provide all necessary superintendence during the execution of works and during maintenance. The Contractor's staff shall include adequate and competent persons with proven, suitable, previous experience on similar contracts to supervise the works and sufficient skilled, semi-skilled, and unskilled labor to ensure completion of works in time.
- d) The Contractor shall not remove any representative or skilled labor from the site without prior approval of the Engineer for the proper fulfilling of the contractor's obligations under the

contract. The contractor or a competent and authorized agent or representative approved in writing by the Employer is to be constantly on the works and shall give his whole time to the superintendence of the work.

- e) The Contractor must demonstrate it shall deploy at the site the Key personnel having the required qualifications.
- f) *Records, Procedures, and Reports:* A work order book shall be maintained by the Contractor at the site/workshop for taking instructions from the Employer/Engineer or his representative. The Contractor shall maintain records pertaining to the quality of installation/erection work and inspection, testing, and compliance with all technical requirements. The Contractor shall submit such records to the Employer/Engineer after the completion of any particular work before submitting the bill. All such records shall be as verified and approved by the Engineer.
- g) *Store Shed, Repairs Shop, Office, etc.:* The Contractor shall make necessary arrangements at his own cost for a store shed, repairs shop/office, meter test bench, etc.
- h) *Equipment Requirements:* The Bidder must demonstrate it has the key equipment required for the project.

1.7.3 Project Safety Measures and Material Security

- a) *Site Safety and OHS:* The Contractor shall bear full liability for the safety and security of the construction site, as well as for the health, injury prevention, and accident management of all construction workers. To ensure absolute safety at the site, the Contractor must implement comprehensive Occupational Health and Safety (OHS) measures covering the entire project period. This entails fully equipping all site workers and staff with appropriate Personal Protective Equipment (PPE)—including, but not limited to, safety helmets, safety boots, gloves, safety masks, aprons, face shields, and safety belts for scaffolding work, alongside necessary health screenings such as RDT/PCR tests when applicable.
- b) *First Aid and Fire Safety:* The Contractor shall ensure the provision of fully stocked first aid boxes and fire extinguishers at all camp and storage sites. All OHS implementations and PPE provisions shall be executed strictly as per the direct instructions of the Site Engineer and the Client.
- c) *Safety of Materials:* The Contractor will be responsible for the safety of the material supplied and kept in the joint custody of the employer and the contractor till completion of the contract. The Contractor shall at his own expense arrange for the safety of his labor/supervisor staff employed by him directly or indirectly for performing the work, as per statutory requirement. The Contractor shall report any accident or unusual occurrence with the work at the site to the employer immediately, detailing the action which he might have taken.

1.7.4 Publicly and privately Owned Services

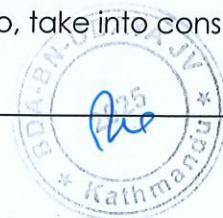
- a) If any privately owned service for water, electricity, drainage, etc., passing through the Danda River Corridor Development site is affected by the works, the Contractor shall provide a satisfactory alternative service in full working order to the satisfaction of the owner of the services and of the Engineer before terminating the existing service.
- b) Drawings and schedules of the affected services like water pipes, sewers, cables, etc., owned by various authorities (including Public Undertakings and Local Authorities) included in the contract documents shall be verified by the Contractor for the accuracy of the information prior to the commencement of any park development, earthwork, or landscaping work.



- c) Notwithstanding the fact that the information on affected services may not be exhaustive, the final position of these services within the works shall be assumed to have been indicated based on the information furnished by different bodies and to the extent those bodies are familiar with the final position. The Contractor must also allow for any effect of these services and alternative alignments upon the park works and for arranging regular meetings with the various utility bodies at the commencement of the contract and throughout the period of the works in order to maintain the required coordination. During the period of the works, the Contractor shall agree if the public utility bodies vary their decisions in the execution of their proposals in terms of program and construction, provided that, in the opinion of the Engineer, the Contractor has received reasonable notice thereof before the relevant alterations are put in hand.
- d) No clearance or alterations to the utilities shall be carried out unless instructed by the Engineer.
- e) Any services affected by the corridor development works shall be restored immediately by the Contractor, who must also take all measures reasonably required by the various utility bodies to protect their services and property during the progress of the construction.
- f) The Contractor may be required to carry out the removal or shifting of certain services/utilities on specific instruction from the Engineer, for which payment shall be made to him. Such works shall be taken up by the Contractor only after obtaining clearance from the Engineer and ensuring adequate safety measures for both the workers and the public.
- g) Unless stated otherwise in the Bill of Quantities, no separate measurement and payment shall be made for the work of temporarily supporting and protecting the publicly and privately owned services and/or for the construction and maintenance of temporary services in lieu of them.

1.7.5 Programme of Works

- a) In respect of the programme of works required under Clause 35 of the General Conditions of Contract, the following specific requirements shall apply:
- b) The Work Programme shall be prepared using software such as MS Project or Primavera. The programme shall state the sequencing of work, the interrelationship between elements of work, and the time taken for completion of different elements of work; it will also show the histograms of plant and equipment and personnel.
- c) The works shall be programmed in such a way as to minimize disruption to public traffic and access. Works shall not be carried out simultaneously over large areas of the site but shall be sequenced so that all operations likely to cause disruption to the public shall be undertaken and completed in a discrete area before the commencement of operations in other areas. Works which, by their nature, will create disruption and/or obstructions to vehicular or pedestrian traffic, such as pavement rehabilitation or trench work, shall be programmed to be undertaken in a continuous sequence of events from the initial disruption until the restoration of access without any significant delay between operations.
- d) The programme submission shall be accompanied by outline traffic management plans in sufficient detail to indicate to the Engineer that the Contractor has considered this aspect of the work in his programme. Notwithstanding the above, acceptance of the Contractor's programme will not in any way relieve him of his responsibilities for traffic management. The Contractor's Programme shall, insofar as it is practicable to do so, take into consideration the



commercial interest of individual shopkeepers (e.g., operations should not be sequenced so as to disrupt access to individual shops having only one access).

- e) The Contractor's Programme of Works shall be subject to the approval of the Engineer and the Employer. If the Contractor's programme, in the opinion of the Engineer/Employer, has not properly achieved the objectives of the programme, then the Contractor shall be instructed to revise his Programme, and the Contractor shall revise it forthwith; for this reason, the Contractor is advised to liaise closely with the Engineer during the production of his Programme.
- f) In addition to the Works Programme, the Contractor shall produce individual programmes for each element of the works likely to cause significant disruption to public and vehicular traffic, for the approval of the Engineer and prior to the commencement of the element of the works, clearly showing the sequencing of construction operations in such a manner as to minimize the duration of the disruption.
- g) The Contractor shall note that different work in various parts of the site by other contractors may be in progress or may commence during the Contract Period. It will be the Contractor's responsibility to liaise with contractors on adjacent sites in order to ensure detailed progress. The Contractor's Programme will be phased and will make full allowance for the need for cooperative timing with adjacent contractors.

1.7.6 Method Statements

- a) Immediately upon getting the Engineer's approval for the work programme, the Contractor shall submit method statements for the construction of his chosen work fronts. These method statements shall as a minimum describe the following:
- b) The specific length or area of the river protection works, cycle tracks, footpaths, or park landscaping sections proposed to be taken up.
- c) The equipment to be mobilized for earthworks, riverbank stabilization, structural steel erection, and the strict consideration of the narrowness and environmental sensitivity of the river corridor.
- d) The maximum width and footprint of the work area to be occupied at any one time.
- e) The material specifications and sizing for pathway base courses, river protection structures, walking bridge components, and associated metal/steel works.
- f) The special requirements for executing excavation, riverbank contouring, foundation laying for bridges and fiber statues, and soil preparation for tree plantation.
- g) The special requirements for safely carting away excavated material, surplus soil, and construction debris without polluting the riverway.
- h) The designated locations where excavated material or fertile topsoil can be temporarily and safely stockpiled for reuse in landscaping, ensuring no obstruction to the natural river flow or public access.
- i) The sequence and duration of each task – including, but not limited to, excavation, backfilling, river protection works, steel and metal fabrication, installation of railings, walking bridge construction, placement of fiber statues, and final tree plantation and landscaping.
- j) The number and types of equipment and plant that will be deployed for the specific stretch, alongside the detailed numbers and qualifications of engineers, structural and metalwork specialists, supervisory staff, and skilled labor to be utilized.



B. ENGINEER'S FACILITIES

2 ENGINEER'S FACILITIES

2.1 DEFINITIONS

2.1.1 General

Acceptable/Approved (Approval) - Acceptable to/approved (approval) by the Engineer in writing.

Agreed - Agreed in writing.

As detailed - As detailed on the drawings.

Authorized/ordered/rejected - Authorized/ordered/rejected by the Engineer in writing.

Designated - Shown on the drawings or otherwise specified by the Engineer or, in relation to an item scheduled in the Bill of Quantities, description of an item.

Indicated - Indicated in or reasonably to be inferred from the contract or indicated in writing by the Engineer.

Instructed/directed/permitted - Instructed/directed/ permitted by the Engineer.

Satisfactory - Capable of fulfilling or having fulfilled the intended function.

Submitted - Submitted to the Engineer.

Working easement – Area required by the Contractor for execution of the Works, including the permanent right of way obtained or land purchased by the Employer plus any temporary way leaves arranged by the Contractor.

Working strip - The working easement on the pipeline route

2.1.2 Tolerances

Deviation - The difference between the actual (i.e., measured) size or position and the specified size or position.

Permissible deviation - The specified limit(s) of deviation.

Tolerance - The range between the limits within which a size or position must lie.

2.1.3 Measurement and Payment

Bill/schedule - The bill/schedule of quantities.

Billed/scheduled rate - The unit rate or price entered in the bill/schedule at which the Contractor undertakes to execute the particular work or to provide the required material, article or service, or to do any or all of these things, as set out in the item concerned.

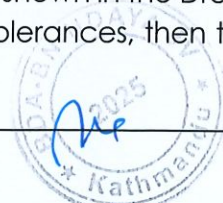
Billed/scheduled - Listed in the bill/schedule of quantities.

2.1.4 Languages

All drawings, instructions, signs, notices, nameplates, etc. for use in the operation and maintenance of the completed Works shall be in English.

2.1.5 Scope of work

These Specifications shall apply to all park development, landscaping, and associated works within the Danda River Corridor Development as required to be executed as per the Contract or as per the instruction of the Engineer. All Work performed shall be in conformity with the lines, grades, slopes, cross-sections, landscaping contours, and dimensions as shown in the Drawings. If the Drawings, Special Provisions, or these Specifications state specific tolerances, then the work shall be performed within those limits.



The quality of materials, processing of materials as may be needed at the site, salient features of the construction work, and quality of the finished work shall comply with the requirements set forth in the succeeding sections. Where the drawings and Specifications describe a portion of the work in only general terms, and not in complete detail, it shall be understood that only sound engineering and landscaping practices are to prevail, materials and workmanship of the highest quality are to be employed, and the instructions of the Engineer are to be fully complied with.

- a) The work to be carried out under the Contract shall be generally described in the Bid Documents as well as in the Bill of Quantities.
- b) The works to be performed shall also include all general works preparatory to the development of the park, including landscaping, pathways, riverbank stabilization, drainage, and all due and satisfactory construction, completion, and maintenance of works to the intent and meaning of the drawings and these specifications, and further drawings and other instructions that may be issued by the Engineer from time to time.

The scope of work shall include compliance by the Contractor with all conditions of Contract whether specifically mentioned or not in the various Clauses of these Specifications, all materials, apparatus, plant, equipment, tools, fuel, water, strutting, timbering, transport, offices, stores, workshop, staff, labour, and the provision of proper and sufficient protective works, diversions, temporary fencing, and lighting. It shall also include: safety of workers at the construction site, first-aid equipment, suitable accommodation for the staff and workmen with adequate sanitary arrangements, the effecting and maintenance of all insurances, the payment of all wages, salaries, fees, royalties, duties, or other charges arising out of the erection of works and the regular clearance of rubbish, reinstatement and clearing-up of the site as may be required on completion of work, safety of the public, and protection of the works and adjoining land.

- c) The Contractor shall ensure that all actions are taken to build in quality assurance (QA) in the planning, management, and execution of works. The quality assurance shall cover all stages of work such as setting out, selection of materials, selection of construction methods, selection of equipment and plant, deployment of personnel and supervisory staff, quality control testing, etc. The QA program shall cover but not be limited to the following:
 - I. Organization and management responsibility
 - II. Document and data control
 - III. Construction program
 - IV. Method statement
 - V. Process control
 - VI. Working Inspection, Testing, and documentary procedures
 - VII. Arrangement for smooth, safe public access and pedestrian flow during construction and maintenance
 - VIII. Control and documentation of purchasing and handling of materials
 - IX. Maintenance of records for non-conformity and timely corrective actions
 - X. Internal quality audit
 - XI. Training to staff
 - XII. Environment Management Plan (EMP)



The QA plan shall be submitted to the Engineer for approval not later than 28 days from the date of signing of the contract agreement. Work of building in quality assurance shall be deemed to be covered in the scope of the work.

2.2 FACILITIES FOR THE ENGINEER

2.2.1 Engineer's Site Office

2.2.1.1 General Requirements and Scope

The Contractor shall provide, establish, furnish, equip, and maintain a dedicated Site Office and accommodation facility in a rented permanent house near the Danda River Corridor Development project site (or as otherwise approved by the Engineer) for the sole use of the Engineer's resident site staff for the entire project duration.

The Contractor shall submit proposals for the site office within 7 days of the Notice to Commence. The office building and all associated accommodation facilities shall be fully ready for occupancy, with all equipment provided, within 14 days after the Commencement of Works.

2.2.1.2 Building and Layout Specifications

The facility shall be designed for both office and residential use as approved by the Engineer.

- a) *Space & Rooms:* The facility must include a minimum of five (5) standard-sized, air-conditioned rooms (for office and residential use), one (1) standard-sized, air-conditioned meeting hall/conference room, one (1) kitchen, and separate, adequate toilet and bathroom facilities. The ceiling height shall be at least 2.5 m.
- b) *Windows & Ventilation:* Each room must be well-ventilated, featuring at least two opening windows. Window frames shall be close-fitting and protected by fly screens. Sun blinds shall be provided for all windows.
- c) *Parking:* The facility must include secure parking for site vehicles

2.2.1.3 Utilities, Services and Housekeeping

Electricity & Climate Control: The Contractor shall ensure uninterrupted electricity and pay regular monthly electric bill. Each room shall be provided with dedicated air-conditioning facilities, fluorescent lighting, ceiling fan and power sockets.

Water & Drainage: A continuous supply of cold water under adequate pressure, meeting drinking water quality standards, shall be maintained, water filter system (RO filter), water dispenser (hot and cold).

Communications: The office shall have a telephone connected to the public system and a broadband internet connection with a Wi-Fi system, available for the Engineer's use at all times.

Housekeeping: The facility shall be maintained with regular, dedicated housekeeping services, including the provision of a designated office attendant for the entire project duration.

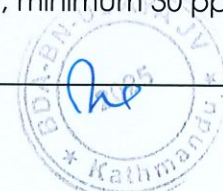
2.2.1.4 Furniture's and Appliances

The site office shall be fully furnished to the complete satisfaction of the Engineer. The Contractor shall provide a complete office furniture setup and residence setup, including all necessary kitchen utensils, as required by the Engineer.

2.2.1.5 Office and IT Equipment

The Contractor shall provide the following new equipment for the Site Engineers.

- a) 1 nos. A3 and A4 color LaserJet Printers-2-Tray (with paper tray, minimum 30 ppm).
- b) 1 TB Hard Drive



c) Multiplugs

2.2.1.6 Consumables and Amenities

The contractor shall provide the continuous supply of all office consumables, stationery, kitchen supplies, and bathroom amenities throughout the project period.

2.2.1.7 Demobilization and Ownership

Each site office component and all provided equipment shall remain the property of the Contractor upon the completion of the Contract and shall be subsequently removed from the site.

2.2.2 Services to the Engineer

The Contractor shall be responsible for the proper maintenance of the above listed offices during the Contract period. He/she shall keep the offices and toilets clean and shall provide one cleaning staff for this purpose throughout the Contract period.

The Contractor shall regularly, and when required, clean, repair, and maintain the Engineer's offices, shall carry out emptying of the septic tanks and supply water to the water tanks.

All electricity, water and telephone charges, internet, fuel and gas relating to the Engineer's offices, including connection and disconnection fees and rental charges shall be paid by the Contractor.

2.2.3 Vehicles for the Engineer

The Contractor shall lease, maintain, and make available to the Engineer the vehicles specified in the Bill of Quantities (BoQ) for the sole use of the Engineer and their resident site staff. Both one 4WD vehicle and one Motorbike latest made model shall be maintained in excellent working condition and made available at all times as per the instruction of the Engineer.

The Contractor shall provide one 4WD Supervision Vehicle on a rental basis. As per the BoQ, the quoted rate for this item shall strictly include the rental charge, a qualified driver (including all driver expenses, allowances, and meals), all regular maintenance costs, and fuel. All comprehensive insurance, applicable taxes, duties, and required accessories shall be borne solely by the vehicle owner/Contractor, all to the complete satisfaction and approval of the Engineer.

The Contractor shall provide one motorbike for site supervision. This provision shall include the supply of the motorbike along with all required fuel, all regular maintenance costs, driver/rider expenses, and accessories. The rate must also cover all applicable taxes, duties, and comprehensive insurance coverage as per the specifications and to the approval of the Engineer.

2.2.4 Occupational Health and Safety (OHS) and Safety Equipment's

The Contractor shall implement comprehensive Occupational Health and Safety (OHS) measures covering the entire project period. This includes the mandatory provision and enforcement of appropriate Personal Protective Equipment (PPE) for all workers and staff at the construction sites. Furthermore, the Contractor shall ensure the provision of fully stocked first aid boxes and properly maintained fire extinguishers at all camp and storage sites, all strictly as per the instruction of the Engineer.

In addition to the general site safety provisions for the workforce, the Contractor shall provide the Engineer with the specific safety equipment set listed below in the site office. The Contractor shall promptly replace each item after it wears out or becomes unsuitable for use;

- a) Safety Helmets
- b) Umbrellas



- c) Raincoats
- d) Safety Boots/Site Shoes
- e) Sunglass
- f) Hat/Cap
- g) Handy Sanitizers

Measurement and payment for this item shall be made as per the Bill of Quantities (BoQ). The quoted rate shall comprehensively cover all costs associated with the implementation of site wide OHS measures, the provision of PPE for all construction personnel, the supply and maintenance of first aid and fire safety equipment at camps and storage sites, and the continuous provision and replacement of the specified safety equipment for the Engineer throughout the entire project period.

2.3 ACCESS TO AND POSSESSION OF SITE

Access to and possession of the site shall be granted to the Contractor in accordance with the provisions stipulated in the General Conditions of Contract (GCC) and the Particular Conditions of Contract (PCC).

Specifically, as per GCC 1.1 (ii), the Start Date for the project works shall be fifteen (15) days from the date of signing the Contract Agreement.

2.3.1 The Site

As defined under GCC 1.1 (ff), the Site is located at Ward No. 3 and 13 of Siddharthanagar Municipality along the Danda River, Siddharthanagar, Rupandehi District of Lumbini Province. The site details and boundaries will be as indicative in the relevant Particular Conditions of Contract (PCC) clause.

2.3.2 Temporary Way Leaves and Access

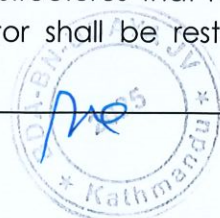
The Contractor shall be responsible for obtaining temporary wayleaves.

The cost of obtaining wayleaves, including crop compensation, for temporary working areas, additional working easement and for any additional areas, required by the Contractor in connection with the Works as well as for the access to all of these shall be borne by the Contractor himself. The Contractor shall arrange for the serving of any Statutory Notices in connection with any temporary working area and shall give to the occupier of each such area seven days' notice of his intention to enter and shall ensure that his methods of working cause the minimum of disturbance to the land and to its owners and occupiers.

The Contractor shall at all times provide proper facilities for access and inspection of the Works by the Engineer, his assistants, inspectors, agents and representatives of public agencies having jurisdiction.

The extent of each temporary working area and the period of time for its occupation shall be such as the Engineer considers necessary having regard to the Contractor's reasonable requirements which shall be submitted together with the Work Program to the Engineer.

The Contractor shall reinstate any temporary working areas to the condition prevailing prior to his initial entry as soon as possible after the work in those areas has been completed so as to keep the period of occupation to a minimum. The Contractor shall in any event restore the areas to a tidy and workmanlike condition. Boundary walls, fences and other structures that have been damaged, removed or otherwise interfered with by the Contractor shall be restored to a condition at least equivalent to their original condition.



2.4 PROVISION AND MAINTENANCE OF SITE INSTALLATIONS

2.4.1 Establishment and Maintenance of Labour Camp and Site Facilities.

2.4.1.1 Scope and Camp Requirement

The Contractor shall construct, guard, and comprehensively manage a fully functional labour camp for his workmen near the project site, together with necessary workshops, stores, and offices. In strict accordance with the Bill of Quantities, the labour camp accommodation shall consist of at least of **16 rooms**, with each room measuring minimum **10' x 12'**.

The Contractor must ensure that all accommodation rooms are well-ventilated, fully equipped with safe and reliable electric facilities, and specifically constructed with plinth levels safely elevated above historically known water-logging limits to protect workers during adverse weather. Furthermore, the Contractor shall actively implement and strictly monitor a comprehensive heat stress management protocol to safeguard the workforce during periods of extreme temperature.

2.4.1.2 Facilities and Services

To ensure the welfare of the workforce, the Contractor shall provide the following mandatory facilities and services:

- a) *Medical & Sanitary Facilities:* A dedicated medical room and separate toilet and bathroom facilities for ladies and gents.
- b) *Utilities & Services:* Uninterrupted provision of all necessary sanitation, potable water supply, and general utilities, heater and fan in extreme weathers.
- c) *Maintenance:* Dedicated housekeeping services to ensure the standard of accommodation, ablution, and canteen facilities are kept in a seemly and highly hygienic state until the conclusion of the Contract.

2.4.1.3 Location and Alternative Arrangements

The exact site of the camp and all associated temporary buildings must be submitted to and approved by the Engineer prior to construction. Considering the potentially limited available space within the Danda River Corridor project site, the Contractor may elect to hire existing space or building(s) for the camp, workshops, stores, and offices in the nearest adjacent area, subject to the prior approval of the Engineer. If this option is utilized, the Contractor shall be strictly responsible for the timely payment of all rents and fees for such hired space/building(s).

2.4.1.4 Storage

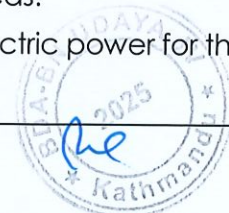
Safe, dry and properly covered storage place shall be provided by the Contractor for all materials, particularly for cement. The capacity of the cement storage go downs shall be minimum 500 bags stored at each work site.

2.4.1.5 Water Supply and Power Supply

The contractor shall make his own arrangement for the supply of water, including portable water, for the purpose of construction and consume by workers. The quality of the water shall be to the approval of the engineer and suitable for the purpose for which it is intended.

Wastewater shall be disposed of clear of the site to the satisfaction of the Engineer so as to cause no damage or nuisance to the Environment and the surrounding areas.

The contractor shall make his own arrangements for the supply of electric power for the purposes of the construction works.



2.4.1.6 Medical Arrangements

The contractor shall make arrangements for treatment on the site of casualties and sick persons in first-aid units or in such other wards as may be necessary in accordance with the appropriate regulations.

Notwithstanding the minimum requirements prescribed above, the Contractor shall be responsible for the adequacy of all the arrangements made as per the provisions of the Contract.

2.4.1.7 Latrines

The Contractor shall provide throughout the period of construction of the Works and shall maintain and clean suitable and sufficient latrines for use by his employees; he shall ensure that his employees do not foul the site but make proper use of the latrines.

2.4.1.8 Notice of Operations

The contractor shall give full and complete written notice of all-important operations including setting out to the Engineer sufficiently in advance to enable the Engineer to make such arrangements, as the Engineer may consider necessary for inspection and for any other purpose. The Contractor shall not start any important operation without the written approval of the Engineer.

2.4.1.9 Supply of Fuel Oils

The Contractor shall be responsible for arranging and ensuring that adequate supplies of high-speed diesel oil, motor spirit, kerosene, lubricants and other petroleum products are available at all times to meet his requirements for the purposes of or in connection with the Contract; the Contractor's particular attention is drawn to this requirement as from time-to-time shortages and interruptions in the supply of fuel oils, etc. occur in the region.

2.4.1.10 Demobilization and Site Reinstatement

Upon Completion of the Contract, the Contractor is responsible for the complete dismantling, clearing, and reinstatement of the camp area. All temporary buildings constructed in the camp shall be completely demolished, and the sites shall be left clean, tidy, and reinstated to their original condition (or as instructed), with all materials and debris thoroughly removed from the site, strictly adhering to the technical specifications and to the absolute satisfaction of the Engineer.

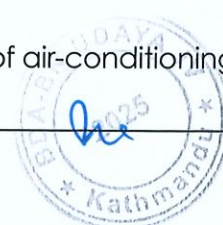
2.4.1.11 Measurement and Payment

Measurement and payment for these works shall be made as per the specific item stipulated in the Bill of Quantities, which encompasses the complete establishment, operation, maintenance, and ultimate dismantling of the aforementioned facilities.

2.4.2 Preparation of the temporary Stockyard in the Site of Sub-project

The preparation of the stockyard for construction materials shall include:

- a) Clearance of the Site
- b) Construction of side drains around the stockyards to avoid water logging
- c) Construction of access tracks
- d) Erection of a security fence
- e) Construction of a guard house / store keeper's office
- f) Erection of stores for jointing material etc. including the provision of air-conditioning where necessary.



2.4.3 Contractor's Offices, Stores and Services

The Contractor shall provide, erect, construct, maintain, and subsequently remove proper offices, stores, workshops, laboratories, storage, and parking areas for his own use. Such facilities shall be sufficiently sized and equipped to enable him to manage his operations and those of his Subcontractors in a professional manner and to enable him to carry out all his obligations under the Contract.

Sheds for storage of materials that may deteriorate or corrode if exposed to the weather shall be weatherproof, adequately ventilated and provided with raised floors. No material or equipment shall be placed directly on the ground.

Within his offices, a meeting room shall be made available for site meetings with the Engineer and the Employer.

2.5 PROJECT INFORMATION BOARDS

The Contractor shall provide and install a project information board at an approved location, strictly following the instructions of the Consultant's Site Engineer. The board shall measure 1.80 m x 1.2 m and consist of a 5mm thick zinc-coated steel plate fixed to a MS pipe frame. It must be securely mounted with appropriate foundation, with the installation encompassing all necessary site works, including excavation, concreting for the post foundations, and backfilling, all complete. Furthermore, the board shall be painted in an approved color and prominently display the details of the contract in the exact format and wording directed by the Engineer. This displayed information must explicitly include the proposed construction works and details of the Employer, the Implementing Agency, the Contractor, the Consultant, and any other project information as directed by the Engineer. All costs associated with the provision, installation, and related site works for these boards shall be covered and paid as per the respective item amount placed in the Bill of Quantities (BoQ).

2.6 PROJECT SAFETY MEASURES

The Contractor shall bear full liability for the safety and security of the construction site, as well as for the health, injury prevention, and accident management of all construction workers. To ensure absolute safety at the site, the Contractor must implement comprehensive Occupational Health and Safety (OHS) measures covering the entire project period. This entails fully equipping all site workers and staff with appropriate Personal Protective Equipment (PPE)—including, but not limited to, safety helmets, safety boots, gloves, safety masks, aprons, face shields, and safety belts for scaffolding work, alongside necessary health screenings such as RDT/PCR tests when applicable. Furthermore, the Contractor shall ensure the provision of fully stocked first aid boxes and fire extinguishers at all camp and storage sites. All OHS implementations and PPE provisions shall be executed strictly as per the direct instructions of the Site Engineer and the Client.

2.7 SUBMISSIONS BY THE CONTRACTOR

2.7.1 Pre-Construction Surveys and Setting Out

The Contractor shall verify all measurements and be responsible for their correctness. Any differences which may be found between actual measurements and the dimensions given in the Contract Documents shall be submitted to the Engineer, in writing, for consideration and directives before proceeding with the Works.

Site benchmarks shall be accurately and safely established, maintained and removed upon completion of the Works, all to the satisfaction of the Engineer. The Engineer will indicate the position, co-ordinates and elevation of benchmarks near the works, as shown on the Drawings.

The Contractor shall prepare a plan detailing the location of the benchmarks and keep this up to date throughout the period of the Contract. Reproducible copies of the plan so prepared shall be supplied in soft and hard copy to the Engineer, as and when he may require.

The Engineer reserves the right to order levels, considered necessary for the full and proper supervision and measurement of the works, to be taken at any time.

Before the Works, or any part thereof, are commenced, the Contractor and the Engineer shall together make a complete survey, and take levels, of the Site and agree on the dimensions and elevations upon which setting out of the Works shall be based.

These levels shall be related to the benchmarks and shall be plotted and drawn up by the Contractor. After agreement of the drawings, which shall be signed by the Engineer and the Contractor, these levels shall form the basis of setting out of the Works.

The Contractor shall submit the original of the drawings in soft and hard three copies, to the Engineer.

The Contractor shall be responsible for the true and proper setting out of the Works in relation to reference data given on the Drawings and shall accurately set out the positions, levels and dimensions of all parts of the Works. Any delay or loss resulting from errors in the setting out of the Works shall be the responsibility of the Contractor.

Setting out shall be reviewed by the Engineer before commencing the Works, but any approval shall, in no way, relieve the Contractor of his responsibility for the correct execution of the Work.

Setting out of the Works shall use methods and the necessary instruments described in BS 5606 "Code of Practice for Accuracy in Building". The Contractor shall maintain, in good working order at all times, the instruments provided by him for the setting out of the Works and shall make such instruments available to the Engineer as instructed for checking or taking measurements.

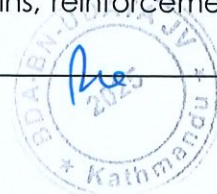
The Contractor shall provide all assistance which the Engineer may require for taking measurements of the Works, including labor, equipment and transportation.

2.7.2 Detailed Design of Temporary Works

- a) The Contractor shall submit for approval full particulars, including drawings of any of the site installations and Temporary Works. If required the Contractor shall also submit calculations of the stresses, strains and deflections which will arise in false work or other Temporary Works and these calculations shall be accompanied by detailed Working Drawings to show the Contractor's proposals.
- b) Approval by the Engineer of the Contractor's proposals, calculations or drawings shall not relieve the Contractor of any of his duties or responsibilities under the Contract.

2.7.3 Working Drawings

- a) The Drawings prepared by the Engineer, are called Engineer's Drawings. They may be modified or added to as provided by the following clauses.
- b) The proposals shown on the Engineer's Drawings are based on information available prior to preparation of the Tender Documents. All levels indicated or proposed are based on survey information previously available but will need to be revised subject to the results of survey and site investigation carried out by the Contractor. Nevertheless, the Contractor shall follow such proposals in preparing his own proposals consistent with his own experience.
- c) Working Drawings shall be submitted by the Contractor to the Engineer. Working Drawings shall include, but not be restricted to, roads and drains, reinforcement detail



- drawings and bending schedules, shop drawings for structural steel and miscellaneous metal work, and drawings for other work for which the Engineer's approval is required.
- d) It shall be the Contractor's own responsibility to prepare such Working Drawings as he may require for the proper setting out and construction of all structures and facilities. Work shall not commence on an individual structure or facilities until the relevant Working Drawings have been approved by the Engineer.
 - e) Within 28 days of the date of the Letter of Acceptance, the Contractor shall submit to the Engineer a Drawings Submittal Schedule for the Working Drawings listing the anticipated dates upon which they will be submitted for approval by the Engineer. The submission dates shall be spaced at reasonable intervals to allow at least 14 days for the Engineer to duly check and to either approve them or to request changes or modifications, as the case may be.
 - f) All dimensions shall be in metric units and each drawing shall be properly identified by a drawing head and a numbering code in the form prescribed by the Engineer upon commencement of the Works. ISO or DIN standard size sheets shall be used.
 - g) Drawings shall be scaled at A3 size and plotted at A3 size and A3 size.
 - h) Prior to submittal, the Contractor shall also check the drawings prepared by his Subcontractors for accuracy and completeness, especially that the relation to adjoining work is accurately shown.
 - i) The Contractor shall submit color 3 (three) copies of all drawings for approval.
 - j) Any changes or modifications to the Working Drawings that the Engineer considers necessary shall be made by the Contractor promptly and the drawings resubmitted for approval.
 - k) Approval of Working Drawings will be given by the Engineer in the form of a stamp "RELEASED FOR CONSTRUCTION" together with the date and the authorized signature. Only those Working Drawings carrying the signed and dated stamp shall be used for execution.
 - l) Copies of all such approved Working Drawings together with one unreduced transparency shall be supplied to the Engineer by the Contractor immediately after approval. The cost of preparing and providing all Working Drawings shall be included in the Contract Rates.
 - m) Should it be found at any time after approval has been given by the Engineer to a Working Drawing submitted by the Contractor that the said Working Drawing does not comply with the terms and conditions of the Contract or that the details do not agree with the Working Drawings previously approved, such alterations and additions as may be deemed necessary by the Engineer shall be made therein by the Contractor and the work carried out accordingly without entitling the Contractor to extra payment on account thereof, except where such alternations and additions are to be made in direct consequence of written order by the Engineer to vary the Works.
 - n) No examination by the Engineer of any document submitted by the Contractor or of the Contractor's Working Drawings, nor the approval expressed by the Engineer in regard thereto, either with or without modification, shall absolve the Contractor from any liability imposed upon him by any provision of the Contract. Notwithstanding the Engineer's approval of the Working Drawings the Contractor shall be responsible for any dimensional or other errors.



2.7.4 As-Built Drawings and GIS Data Creation

2.7.4.1 As-Built Drawings

Such approved Working Drawings as have been selected by the Engineer shall be correctly modified for inclusion in the As-Built Drawings incorporating such variations to the Works as have been ordered and executed. Such drawings shall show the actual arrangement of all structures and items of equipment installed under the Contract. The Contractor shall submit 1 (one) reproducible copy and 3 (three) prints of all As-Built Drawings clearly named as such to the Engineer for approval before applying for the Taking-Over Certificate for the respective Section of the Works. After approval of the As Built Drawing the Contractor shall supply an electronic copy of the drawing in together with a licensed copy of the drafting software (at least AUTOCAD 2013). The software shall become the property of the Employer and shall be used to view the As-Built Drawings.

During the course of the Works, the Contractor shall maintain a fully detailed record of all changes from the approval to facilitate easy and accurate preparation of the As-Built Drawing.

Irrespective of the other contractual prerequisites no Section of the Works will be considered substantially completed until the respective As-Built Drawings have been approved by the Engineer.

2.7.4.2 GIS Data Creation and Drone Videography and Photography

In parallel with the preparation of as-built drawings, the Contractor shall produce comprehensive GIS data of the constructed works along the Danda River Corridor. The Contractor shall conduct all necessary survey work and ensure that vertical and horizontal measurements are captured at an accuracy of $\pm 0.1\text{m}$ at a 95% confidence level, using the most suitable and cost-effective field data collection technology and methodology. All horizontal and vertical survey measurements will be strictly referenced to the national geo-reference system.

The Contractor shall develop a checklist of Quality Control (QC) checks for each type of deliverable and will be responsible for ensuring that these QC checks are meticulously performed. The Contractor shall assign a dedicated GIS Quality Officer to manage the quality review process. This officer shall be independent of the primary data capture and production teams.

The Contractor shall be required to integrate the GIS deliverables with the municipality's existing data, ensuring that the GIS data connects seamlessly to the national geo-reference system. This may entail revising GIS data of existing infrastructure or utilities at connection points. GIS data for the project will be delivered in an ESRI ArcGIS-compliant file geo-database.

The Contractor shall carry out professional drone videography and high-resolution aerial photography of the project site. This aerial documentation must be executed in two distinct phases:

Phase 1 (Pre-Construction): Immediately prior to the commencement of any site mobilization or construction activities.

Phase 2 (Post-Construction): Upon full completion of the works, immediately prior to final handover.



- i. To facilitate a direct visual comparison of the project's impact, the Contractor must ensure that the post-construction flight replicates the exact GPS coordinates, altitudes, and camera angles of the initial pre-construction flight. Flight operations must capture a minimum of 4K resolution video and high-resolution photographs.
- ii. Measurement and payment for these items shall be strictly as per the stipulated rates in the Bill of Quantities (BoQ). The item rate shall comprehensively cover all costs associated with:
- iii. Mobilization of all specialized survey/GIS personnel, drone operators, and equipment.
- iv. Securing any mandatory local aviation flight permits from relevant authorities.
- v. Conducting all flight operations and field surveys.
- vi. Basic media editing, GIS data compilation, and quality control.
- vii. The final submission of all raw and processed digital media files, as well as the complete ArcGIS geo-database, on a high-capacity portable storage device, strictly in accordance with these requirements and as directed by the Engineer.

2.7.5 Construction Programme and Progress of Works

2.7.5.1 Construction Programme

- a) In amplification of the requirements as per the Conditions of Contract, the program shall be in the form of a Critical Path Method (CPM) Diagram showing, sequences, dependencies, durations and dates for execution of all major items following the subdivisions in the Bills of Quantities for the execution of the Works within the periods stated in the Contract. It shall be supported by:
 - b) Data of the construction methods
 - c) Equipment Utilization Schedule
 - d) Manpower Utilization Schedule
 - e) Subcontracting Schedule
 - f) Mobilization/Demobilization Schedule
- g) The CPM diagram incorporating the above-mentioned schedules shall be prepared using Microsoft Project, or similar approved project management software, and shall be presented in hard copy and electronic form to the Engineer.
- h) In carrying out the Works due attention shall be paid to all measures which can reasonably be taken in order to diminish the inconvenience which the work may cause to services and access to property.

2.7.5.2 Updating, Monitoring and Progress Reporting

- a) The Contractor shall monitor the progress of the Works including information provided by his Sub- contractors and suppliers, as necessary, for purpose of network planning, scheduling and updating and shall confirm the actual progress on each current activity shown on applicable CPM networks. The CPM networks shall form part of the Monthly Progress Report and shall indicate changes of schedule, if any in network activity duration and start/finish-imposed dates. It shall also be provided in electronic form.
- b) The Contractor shall prepare written explanatory notes on the particular activities which are overrunning or going to overrun against the Master Schedule. If any such overrunning work is on the critical path, the Contractor shall state what corrective actions will be taken by him to bring it back on the schedule.



2.7.6 Detailed Fortnightly Programme

The contractor shall submit at the end of each working week a detailed bar chart program for the next fortnight. The program shall identify where further drawings or instructions are to be issued by the Engineer to avoid disruption to the progress of the Works.

2.7.7 Progress Reports

- i. The Contractor shall furnish the Engineer with 5 copies of Progress Reports at regular monthly intervals in a form agreed with the Engineer, containing the following information:
- ii. Physical progress for the report month and estimated progress for the next month;
- iii. CPM networks and explanatory notices
- iv. Updated S-curves for physical progress at different sections of the Works
- v. Progress on Quality Control and Quality testing Plan
- vi. List of activities and obligations completed and planned for next month
- vii. Any report which may be specifically requested by the Employer and/or the Engineer.
- viii. These monthly progress reports shall be submitted not later than 7 days after the end of the reporting month.

2.7.8 Operation and Maintenance Manual

The Contractor shall prepare and submit a comprehensive Operation and Maintenance (O&M) manual for all park development works, landscaping features, river protection structures, pathways, cycle tracks, footpaths, bridges, and associated metal/railings works. The manual shall provide detailed recommendations, standard operating procedures, and schedules for routine and periodic maintenance works to ensure the long-term structural integrity and aesthetic quality of the park corridor, all to the satisfaction of the Engineer.

2.7.9 Record / Progress Photographs

The Contractor shall arrange each month at least 18 Nos. of photographs to be taken by a professional photographer as Record Photographs and shall provide the electronic files and 2 color prints each on glossy paper unmounted and of a size not less than 210 mm x 297 mm (A4) in transparent plastic pockets contained in hard cover album. Each print shall contain upon its back the date and description of the view taken. The Contractor shall ensure that no use is made of any negative or print without permission from the Employer.

Out of these Record Photographs the Contractor shall select 10 characteristic ones as Progress Photographs, copies shall be made of these to be attached to the Progress Reports.

2.7.10 Measurement and Payment

Measurement and payment for quality control and documentation shall be made as per the specific item provided in the Bill of Quantities (BoQ).

The quoted rate shall comprehensively cover all costs associated with providing quality control, documentation, reporting services, test reports, material certificates, and site records (including daily logbooks and monthly progress reports). This rate includes all efforts and materials required to ensure all documentation and works meet the specification requirements necessary to maintain the quality of work, to the complete satisfaction and approval of the Engineer.



2.8 QUALITY CONTROL

2.8.1 Quality Control Plan and Procedures

- The Contractor shall be responsible for establishing and maintaining procedures for quality control that will ensure that all aspects of the Works comply with the requirements of the Contract.
- As soon as reasonably practicable prior to the commencement of Works the Contractor shall submit for approval a Quality Control Plan giving detailed proposals for control of quality of all aspects of work on the Site and at suppliers' workshops.
- The Quality Control Plan shall include the following:
 - a list of the Contractor's staff engaged in quality control
 - a list of any outside testing agencies employed by the Contractor for work in connection with quality control where a testing laboratory is to be established on Site under the Contract, a list of major items of equipment and a layout of the laboratory, together details of the tests which will be carried out there
 - a list of manufactured items and materials, obtained by the Contractor for the Works, which require inspection at the suppliers' premises, and the proposed procedures for ensuring quality control
 - a list of materials and operations to be inspected by the Contractor at the various stages of construction work on Site, together with inspection procedures, test types and frequencies
 - sample of proposed quality control records, testing and reporting forms.
- Unless the Engineer permits otherwise, the approved Quality Control Plan shall be followed throughout the construction of the Works. Any approval by the Engineer of the Contractor's plan and procedures shall not relieve the Contractor of his obligation to ensure that the Works comply with the requirements of the Contract.
- The Contractor shall appoint a suitably qualified member of his staff to be responsible for all aspects of quality control and to maintain effective liaison with the Engineer.

2.8.2 Sampling and Testing

The Contractor shall provide for the approval of the Engineer, samples of all construction materials and manufactured items required for the Permanent Works. All samples rejected by the Engineer shall be removed from Site. All approved samples shall be stored by the Contractor in a sample room, at a location approved by the Engineer, for the duration of the Contract, and any materials or manufactured items subsequently delivered to Site for incorporation in the Permanent Works shall be of a quality at least equal to the approved sample. The approved samples may only be disposed of with the Engineers approval.

Samples shall be submitted, and tests carried out sufficiently early to enable further samples to be submitted and tested if required by the Engineer. Samples for testing will generally be selected by the Engineer from materials to be utilized in the project and all tests will be under the supervision of, and as directed by, and at such points as may be convenient to the Engineer.

Material requiring testing shall be furnished in sufficient time before intended use so as to allow for testing. No materials represented by tests may be used prior to receipt of written approval of said materials.

The Contractor shall give the Engineer at least 14 days' notice in writing of the date on which any of the materials will be ready for testing or inspection at the suppliers' premises or at a



laboratory approved by the Engineer and unless the Engineer shall attend at the appointed place and time the test may proceed in his absence. The Contractor shall in any case submit to the Engineer within 7 (seven) days after every test such number of certified copies of the test readings as the Engineer may require.

Approval by the Engineer as to the placing of orders for materials or as to samples or tests shall not prejudice any of the Engineer's powers under the Contract.

The provisions of this Clause shall also apply to materials supplied under any nominated subcontract.

2.8.3 Daily Log Book, Daily Work Programme and Daily Site Report

- The Contractor shall keep a Daily Log Book at each location where construction activities are taking place. This Daily Log Book shall be in a form approved by the Engineer and shall contain, but not be limited to, the following major items of information:
- name of Contractor and Package No.
- date
- weather conditions (max./min. temperature, hours and intensity of rainfall, cloudy, sunny, windy)
- work carried out during the day per Section (description, quantities)
- major equipment used per section (on contractual work, on extra work ordered, approximate operating time on either)
- strength of labour force per Section (on contractual work, on extra work ordered, hours worked on either)
- delays (cause, effects such as idle time etc.)
- unusual events (earthquakes, floods, fires, storms, accidents, strikes, agitation, rallies etc.)
- visitors at Site.
- Each daily log shall be signed by the responsible Site Manager of the Contractor and "noted" by the Engineer.

2.8.4 Measurement and Payment

Unless otherwise provided in the Contract, no separate measurements and/or payment shall be made for all materials and works required. All the cost associated under this clause is deemed to be included in the item rates of the Bill of Quantities.

2.8.5 Other Provisional Items

All provisional items in the schedule shall be carried out at the discretion of the Engineer and shall form part of the contract. In case, the provisional items are carried out by the Contractor, the rates shall be settled as for extra items as stated in the conditions of contract.

2.8.6 Items Supplied by the Employer

Items supplied by the Employer, if any, are described in Specification.

2.9 NOTES ABOUT MEASUREMENT AND PAYMENT

2.9.1 Measurement

Unless specified, all measurements shall be made in metric system. Different items of work shall be measured in accordance with the procedures set forth in the relevant Sections read in conjunction with the General conditions of Contract. The same shall not, however, apply in the case of lump sum contracts.



All measurements and computations, unless otherwise indicated, shall be carried nearest to the following limits:

Length and Width	10 mm
Height, Depth or Thickness of Earthwork, Subgrade	5 mm
Height, Depth or Thickness of Sub-base, Bases, Surfacing	5 mm
Structural members	2.5 mm
Areas	0.01 sq. m
Volume	0.01 cu. M

In recording dimensions of work, the sequence of length, width and height or depth or thickness shall be followed.

The tolerances specified in these Specifications are for evaluation of accuracies only based on which the work shall be accepted or rejected. However, the measurement of the work performed within the limits of tolerances shall be the measurement of actual work done in place, if their dimensions are less than what have been specified or instructed by the Engineer. If the actual work done in place is more than what has been specified or instructed by the Engineer, but within the limit of tolerance, the measurement shall be the measurement of the work what has been specified or instructed by the Engineer.

2.9.2 Payment

Unless otherwise specified in the Contract, the unit rates and/or prices for items as set out in the Bill of Quantities are the full and the final compensation to the Contractor for:

- i. General works such as setting out, clearance of site before setting out and clearance of works after completion.
- ii. A detailed programme using modern project management software for the construction and completion of the works giving, in addition to construction activities, detailed networks activities for the submission and approval of materials, procurement of critical materials and equipment, fabrication of special products/equipment and their installation and testing, for all activities of the Engineer/Employer that are likely to affect the progress of works, etc., including updating of all such activities on the basis of the decisions taken at the periodic site review meeting or as directed by the Engineer;
- iii. Sampling and Testing of various materials such as bitumen, cement, concrete, bearing etc. proposed to be used on the Works as required under these Specifications and furnishing test reports/certificates.
- iv. Design of mixes as per the relevant Sections of the Specifications giving proportions of ingredients, sources of aggregates and binder along with accompanying trial mixes as per the relevant Sections of these Specifications to be submitted to the Engineer for his approval before use on the Works.
- v. Cost of laying trial stretches.
- vi. Preparation of Detailed drawings as per site condition.
- vii. Detailed design calculations and drawings for all Temporary Works (such as form-work, staging, centring, specialized constructional handling and launching equipment and the like);
- viii. Detailed drawings for templates, bar bending and cutting schedules for reinforcement, material lists for fabrication of structural steel, etc.



- ix. Mill test reports for all mild and high tensile steel and cast steel as per the relevant provisions of the Specifications.
- x. Supply of all materials necessary to complete the item as per relevant specifications.
- xi. Use of materials, labours, tools, equipment, machines and other resources as per need.
- xii. All handling, packing charges and transportation.
- xiii. Site commissioning.
- xiv. Cost of all operations like storing, erection, moving into final position, etc. necessary to complete and protect the work till handing over to the Employer.
- xv. Inspection Reports in respect of formwork, staging, reinforcement and other items of work as per the relevant Specifications.
- xvi. Any other data which may be required as per these Specifications or the Conditions of Contract or any other annexures/schedules forming part of the Contract.
- xvii. All temporary works, formwork and false work.
- xviii. Cost of in-built provisions for Quality Assurance.
- xix. Cost of providing "As built" drawings.
- xx. Maintenance and making good.
- xxi. All duties and obligations as set out in the contract.
- xxii. All incidental costs to complete the work, and other items necessary for complying with the provision of the Contract not covered under above stated.

Where the Bill of Quantities does not include the items mentioned in Section 100 of DoR Specifications, no separate payment shall be made for such works. The costs in connection with the execution of the works specified herein shall be considered to be included in the related items of other works specified in the Bill of Quantities or shall be considered to be incidental to the works specified. Items specified in this Section and included in the Bill of Quantities shall be paid at the contract unit rates as agreed and shown in the Bill of Quantities.

2.10 MATERIALS

The materials supplied and used in the Works shall comply with the requirements of these Specifications. They shall be new, except as may be provided elsewhere in the Contract or permitted by the Engineer in writing. The materials shall be manufactured, handled and used in a workmanlike manner to ensure completed work in accordance with the Contract. Where an Indian Standard is specified, the latest version of the standard quoted shall be considered to apply. All related Indian standard codes of Practice must be available at Contractor's Laboratory all the time during the tenure of the Contract.

2.10.1 Sources

The use of any kind or class of material from more than one source is prohibited, except by written permission of the Engineer. Such permission, if granted, will set forth the conditions under which the change may be made. The sources or kinds of materials shall not be changed at any time without written permission of the Engineer. If the product from any source proves unacceptable at any time, the Contractor shall make such arrangements as may be necessary to assure availability of the acceptable material, either by alterations in plant operations or by a change of source. Claims for increased costs, which maybe occasioned by such alterations or changes will be given consideration, unless the source of the unacceptable material was designated in the Contract as a source of material. When any manufactured product, either new or used, is furnished by the Employer, the location at which such material will be delivered to the Contractor

will be designated in the contract. In such cases the Contractor shall haul the materials from the designated delivery point to point of use, and compensation for such hauling will be considered to be included in the Contract unit price for placing the materials in the finished work.

2.10.2 Inspection And Acceptance of Materials

Final inspection and acceptance of materials will be made only at the site of the work. The Engineer reserves the right to sample, inspect and test materials throughout the duration of the work, and to reject any materials, which are found to be unsatisfactory at the time of use. A preliminary inspection of materials may be made at the source for the convenience of the Contractor, but the presence of the Engineer at the source shall not relieve the Contractor of the responsibility of furnishing materials, which comply with these Specifications. The Engineer shall have free access at all times to plants, quarries, place of manufacture etc. for the materials required for works.

2.10.3 Samples And Tests

The Contractor shall submit samples of all materials for the approval of the Engineer at least ten days prior to commencement of Works. The Contractor shall give immediate notification of the placing of orders for shipping of materials to permit testing; he shall furnish without charge all samples required and he shall afford such facilities as the Engineer requires for collecting and forwarding such samples. The Contractor shall not incorporate into the work the materials represented by the samples until the tests have been made and the materials are found to comply with the requirements of the Specifications, except that any materials which have a satisfactory record of compliance with the Specifications may, at the discretion of the Engineer, be used until the tests are completed. If the material fails the tests, no further use thereof shall be made until the Contractor has taken steps satisfactory to the Engineer to correct the deficiencies. When required by the Engineer preliminary samples of the character and quantity prescribed shall be submitted by the Contractor for examination and shall be tested in accordance with the methods referred to in this Specification. Only the materials actually delivered at site will be considered and their acceptance or rejection will be based on the results of the tests and inspections prescribed in these Specifications.

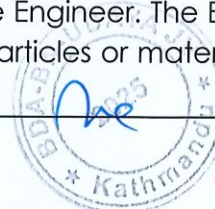
2.10.4 Defective Materials

All materials, which do not conform to the requirements of the Contract, will be rejected whether in place or not. They shall be removed immediately from the site unless otherwise permitted by the Engineer. No rejected material, the defects of which have been subsequently corrected, shall be used in the work unless approval in writing has been given by the Engineer. Upon failure of the Contractor to comply promptly with any instruction of the Engineer regarding removal and replacement of rejected material the cost of such materials thereof shall be deducted from any moneys due to the Contractor.

2.10.5 Trade Names and Alternatives

For convenience in designation in the Contract, certain articles or materials to be incorporated in the work may be designated under a trade name or the name of a manufacturer and his catalogue information. The use of an alternative article or material, which is of equal or better quality and of the required characteristics for the purpose intended will be permitted, subject to the following requirements.

a) The burden of proof as to the quality and suitability of alternatives shall be upon the Contractor and he shall furnish all necessary information required by the Engineer. The Engineer shall be the sole judge as to the quality and suitability of all alternative articles or materials and his decision shall be final and binding.



b) Whenever the specifications permit the substitution of a similar or equivalent material or article, no tests or action relating to the approval of such substitute material will be made until the request for substitution is made in writing by the Contractor accompanied by complete data as to the equality of the material or article proposed. Such request shall be made at least before two weeks to permit approval without delaying the work.

2.10.6 Foreign Materials

The materials which are manufactured, produced or fabricated outside Nepal shall be delivered to a distribution point in Nepal, unless otherwise required in these specifications or the special provisions, where they shall be retained for a sufficient period of time to permit inspection, sampling, and testing. The Contractor shall not be entitled to an extension of time from acts or responsibility to deliver materials obtained from outside Nepal to the point of entry into Nepal insufficient time to permit timely delivery to the job site. The Contractor shall supply the facilities and arrange for any testing required at his own cost. All testing by the Contractor shall be subject to witnessing by the Engineer.

The foreign manufacturer, producer or fabricator shall furnish to the Engineer a "Certificate of Completion" with the specifications where required. In addition, certified manufacturer's test reports clearly identifiable to the lot of delivered shall be submitted to the Engineer. Where structural materials requiring manufacturer's test reports are obtained from foreign manufactures, such materials shall be furnished only from those manufacturers already approved by the Engineer. The sufficiency of their ability to furnish only from those foreign manufacturers, who have previously established, to be satisfied by the Engineer. The sufficiency of their in-plant quality control as deemed necessary be the Engineer to give satisfactory assurance of their ability to meet these specifications must be established.

2.11 CONTRACTOR'S DUTIES

The Contractor is bound to execute and realize the Project Works covered under these Contract Documents. These contract Documents to cover the said work shall along with that is normally understood therein comprise of:

- (a) These Contract Documents comprising of volume 1, 2 & 3 and any addenda.
- (b) All Working Drawings issued are prepared by the Engineer.
- (c) All site instructions made in the site order book or logbook by the Engineer.
- (d) All instructions given to the contractor, but the Engineer shall have form of sketches, directions along with requests for additional data, shop drawings, measurements details etc. from the Contractor related to this work.
- (e) All shop drawings & samples approved by the Engineer.
- (f) All manufacture's specifications, data brochures information etc. approved by the Engineer.
- (g) All aspects of work checked & approved by the Engineer either on, or off, the project site.
- (h) All samples, guidelines that the Engineer shall instruct the Contractor to follow. In particular covering all Works where the Contractor shall follow the existing designs, decoration, methods of construction, finishes proportions, elevations etc. of the existing building.
- (i) All aspects of Safety work (such as Safety Sign, Signal and Notice, Emergency Exit and Assembly Point and Availability of Sufficient PPE etc.) checked & approved by the Engineer on the project site.

C. CIVIL WORKS

3 CIVIL WORKS

3.1 GENERAL NOTES

- i. Read structural drawings in conjunction with Architectural, Sanitation/Plumbing, Mechanical and Electrical drawings. Report any discrepancies to the Engineer prior to fabrication or construction. Any conflict between specifications and drawing shall be likewise reported.
- ii. Contractor shall be responsible for checking field dimensions and site conditions.
- iii. Unless otherwise indicated all construction joints shall be roughened joints with 5 mm minimum Amplitude.
- iv. No measurement shall be directly taken from the print only written dimensions shall be followed.
- v. The Standard Codes, wherever mentioned, shall be of latest revision ones.
- vi. Foundations shall be on undisturbed soil.
- vii. Soil bearing capacities shall be verified in the field. Notify Engineer immediately of any soft pockets or other adverse soil conditions encountered.
- viii. The line of slope between adjacent excavations for footings or along stepped footing shall not exceed a rise of 1 in a run of 2.
- ix. Placing of foundation concrete shall be done as soon as excavations have been completed and approved by the Engineer.
- x. Backfilling to foundation wall shall be done simultaneously on both sides.
- xi. Backfilling shall be done in layers of not more than 150 mm, each layer being properly compacted to at least 95 % modified protector density.
- xii. Cast-in-situ concrete shall have minimum 28 days compressive cube strength as specified in the Specifications. Minimum cylinder strength shall be 85 % of cube strength.
- xiii. Reinforcing steel shall be new hot rolled deformed bars having a minimum yield strength of 415 N/mm² and conforming to IS 1786;1979 or IS 1139; 1966 marked.
- xiv. Minimum reinforcing laps shall be in accordance with IS - 456;1978 and as specified on structural drawings.
- xv. Cover to reinforcing steel shall be in accordance with IS - 456;1978 and as specified in structural drawings.
- xvi. Welded wire mesh for reinforcement shall conform to IS - 4948;1974.
- xvii. Provide corner bars to match horizontal reinforcing steel in walls and footings.
- xviii. Provide dowels to walls and piers, to match vertical bars in walls and piers, unless otherwise indicated.
- xix. Plumbing slots, holes around pipes, ducts or other items which pass through concrete slab or wall shall be filled and patched to the same depths as the slab or wall.
- xx. Unless otherwise indicated, all horizontal and vertical construction joints shall be roughened joints with 5 mm. minimum Amplitude.
- xxi. Slabs on grade shall be cast in panels bounded by column guidelines in a checkered board pattern allow at least 48 hours between casting of adjacent panels.
- xxii. In the slabs on grade, welded wire fabric of equivalent area may be used in lieu of reinforcing bars, reinforcing steel shall be 35 mm. clear from the top of slab.
- xxiii. Hanging devices for piping shall be provided at the time of casting, breaking out concrete for hanging from reinforcing bars will not be permitted.

3.2 SITE CLEARANCE

Earthwork in excavation in trenches, foundation/raft foundation etc. in soil including dressing of sides, ramming of bottom, dewatering, shoring/Shuttering, if necessary, lift up to 5 m, stacking of excavated materials at least 4m clear from the edge of excavation within a lead of 10m and then returning the stacked soil in 0.15m layers when required in plinth, under floors, sides of foundation, laying and depositing the layer by properly watering and ramming and then disposing off all surplus excavated soil within the premises of the Site or within 30m outside the site as directed. It shall be paid in m³.

3.2.1 Site Clearance by Removal of Grass, Shrubs Etc.

Cutting and unrooting of grasses, Cutting or filling of topsoil up to 0.15m, cutting and levelling of construction site by cutting of soil hips, filling of pits and ditches and clearing of all the organic materials from construction Site.

The maximum depth of excavation or fill shall be 0.15m; 6m around the building shall be dressed and levelled properly with outward slope of 1 in 100 or as per engineer's instruction. The surplus excavated material shall be disposed of as directed. Any trees or hedges shall be measured and paid separately. The payment shall be made in square metre.

3.2.1.1 Measurement

The quantity of site cleared shall be the product of length and breadth actually cleared.

3.2.2 Dismantling Culverts, Bridges, Other Structures and Pavement

3.2.2.1 Scope

This work shall consist of removing as hereinafter set forth existing culverts, bridges, pavements, buildings and other structure like guard-rails, kerbs, manholes, catch basins, inlets, walls, drains etc., which are in place but interfere with the new construction or are not suitable to remain in place, and salvaging and disposing off the resulting materials and back filling the resulting trenches and pits.

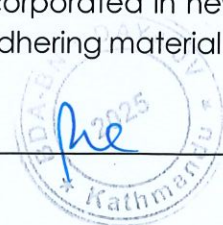
3.2.2.2 General

Only those structures designated by the Engineer, or shown on the Drawings, shall be demolished or removed.

(b) Dismantling and removal operations shall be carried out in such a way that the adjacent pavement, structures are left intact and in place. All operations necessary for the removal of any existing structure which might endanger new construction shall be completed prior to start of new work.

(c) Existing culverts, bridges, buildings and other structures which are within the road and which are designated for removal, shall be removed up to the limits and extent specified on the Drawing or as indicated by the Engineer.

(d) Materials that are to be salvaged shall be carefully removed and stockpiled near the site at a location designated by the Engineer. Materials which are to be salvaged or used in the reconstructed work, have been damaged or destroyed as a result of and disposed away from the site by the contractor at his own expenses. In general, piling, piers abutments and pedestals shall be removed to at least 300 mm below ground level measured at the face unless a different depth is designated or specified. Existing reinforcement that is to be incorporated in new work shall be protected from damage and shall be thoroughly cleaned of all adhering material before being embedded in new concrete.



(e) When pipe culverts, wooden culverts, gabion walls or other structures with a salvaged value are removed, care shall be exercised in their safe removal. The material involved shall be kept intact without damage. The Contractor shall be responsible for the satisfactory removal of such structures in a usable condition.

(f) Salvaged reinforced concrete pipes, corrugated steel pipes, wooden boxes or other structures shall be stored at places as directed by the Engineer or shown on the Drawing. Structures or portions thereof which are specified in the contract for re-erection shall be stored in separate piles.

(g) Timber or lumber from old structures which is designated by the Engineer as materials to be salvaged shall have all nails and bolts removed therefrom and shall be stored in neat piles in locations suitable for loading.

(h) All operations necessary for the removal of any existing structure which might endanger new construction shall be completed prior to the start of new work.

(i) All salvaged materials shall be the property of the Employer.

(j) All materials obtained from dismantling operations which, in the opinion of the Engineer, cannot be used or auctioned shall be disposed of.

3.2.2.3 Dismantling Culverts and Bridges

The structures shall be dismantled carefully, and the materials shall be so removed as not to cause any damage to the serviceable materials to be salvaged. The part of the structure to be retained and other structures nearby shall be safeguarded against any damages.

Where existing culverts/bridges are to be otherwise incorporated in the new work, only such parts of the existing structure shall be removed as are necessary and directed by the Engineer to provide a proper connection to the new work. The connection edges shall be cut, chipped and trimmed to the required lines and grades without weakening or damaging any part of the structure to be retained.

Steel structures shall, unless otherwise provided, be carefully dismantled in such a manner as to avoid damage to members thereof. The structure shall be removed in a condition suitable for re-erection unless otherwise shown on the Drawing. All members shall be match-marked by the Contractor with white lead paint before dismantling; end pins, nuts, loose plates, etc., shall be similarly marked to indicate their proper location; all pins, pin holes and machined surfaces shall be painted with a mixture of white lead and tallow and all loose parts shall be securely wired to adjacent members or packed in boxes.

3.2.2.4 Dismantling Other Structures and Pavements

In removing pavements, kerbs, gutters, walls and structures like catch pits, outlets, etc., where portions of the existing construction are to be left in the finished work, the same shall be removed to an existing joint or cut and chipped to a true line with face perpendicular to the surface of existing structure. Sufficient removal shall be made to provide connections with the new work as directed by the Engineer. All pavements, base courses in carriageway and shoulders, etc. designated for removal shall be broken to pieces whose volume shall not exceed 0.02 cubic meters and stockpiled at designated locations if the materials are to be used later or otherwise arrange for disposal.

3.2.2.5 Back-Filling

Holes and depressions caused by dismantling operations shall be backfilled with excavated or other approved materials and compacted to required density as directed by the Engineer.

3.2.2.6 Measurement

Prior to commencement of dismantling, the work of dismantling structures shall be measured in the units given below:

Type of Work	Unit
Dismantling brick/stone masonry/Concrete (Plain and Reinforced)	Cu.m
Dismantling Gabion	Cu.m
Dismantling Steel Structures	ton
Dismantling Timber Structures	Cu.m
Dismantling pipes, guard rails, Kerbs and gutters	Lin.m
Utility Services	Lump sum
Pavement	Cu.m
Dismantling pipe culverts	no
Dismantling pitching and rip raps	Sq.m

Associated works like disposal, stockpiling, marking and numbering, etc., shall not be measured separately.

3.2.2.7 Payment

The various dismantling works shall be paid at their respective contract unit rates which shall be full and the final compensation to the Contractor and for the cost of all operations involved for completion of this item.

3.2.3 Dredging Works**3.2.3.1 Scope of Works**

This work shall consist of the bed leveling and profiling of the underwater bed to the specified design levels using suitable equipment (such as a Dredger, Bed Leveler, or Drag Bar). The operation involves shifting and redistributing in-situ material without disposal or removal from the site. The scope includes all necessary pre-construction and post-construction hydrographic surveys, equipment mobilization, labor, and tools required to complete the task as per the Drawings.

3.2.3.2 Material Classification

For the purpose of this specification, the underwater in-situ material shall be classified under Marshy Soil. According to the standard classification of excavated materials, marshy soil includes soft clays and peats excavated below the original ground level of marshes and swamps, as well as soils excavated from other areas requiring continuous pumping, bailing out of water, or specialized underwater equipment.

3.2.3.3 Measurement

The quantities of dredging and bed levelling shall be measured in cubic meters, computed from the original and final underwater cross-sections (obtained via the hydrographic surveys) using the average end area method. No separate measurement shall be made for equipment mobilization, surveys, or temporary works, as these are deemed incidental to the primary operation.

3.2.3.4 Payment

The dredging and profiling work, measured as described above, shall be paid at the contract unit rate for Roadway Excavation in Marshy Soil (DoR Norms 905). This contract unit rate shall be the full and final compensation to the Contractor for the cost of all labor, equipment, surveys, tools, and incidental works necessary to complete the item in accordance with this Specification.

3.2.4 Clearance of Water Hyacinth, Aquatic Weeds, and Debris

3.2.4.1 Scope of Work

This work shall consist of the comprehensive clearance and removal of water hyacinth (Jalkumbhi), other invasive aquatic weeds, and physical debris from both the water surface and the riverbed of the Danda River. The scope encompasses the complete uprooting, collection, extraction, and environmentally safe disposal of all waste materials at designated sites, strictly in accordance with DWRI Norms 2.1 and 2.2.

3.2.4.2 Methodology and Equipment

The Contractor shall execute the clearance using an approved combination of manual labor and specialized mechanical equipment to suit the varying site conditions of the river.

Mechanical Extraction: Where access permits, the Contractor shall deploy suitable mechanical equipment, including but not limited to amphibious excavators or long-boom excavators, to efficiently dredge and extract weeds and debris.

Manual Extraction: Manual labor shall be utilized in shallow, sensitive, or inaccessible areas to ensure thorough uprooting without damaging the existing riverbanks or retaining structures.

3.2.4.3 Execution and Disposal Requirements

- *Complete Uprooting:* Aquatic weeds must be uprooted entirely rather than merely cut at the surface to prevent rapid regrowth.
- *Debris Removal:* All submerged, semi-submerged, and floating debris (including plastic waste, deadwood, and trash) within the designated clearance zone must be extracted.
- *Designated Disposal:* Extracted vegetation and debris must be immediately transported and disposed of at designated spoil sites approved by the Engineer. Dumping waste on adjacent riverbanks, floodplains, or unapproved locations is strictly prohibited.

3.2.4.4 Measurement

The clearance and removal of aquatic weeds and debris shall be measured in square meters (sq.m) of the cleared river area, or as otherwise specified in the Bill of Quantities, calculated from the designated length and average width of the cleared sections.

3.2.4.5 Payment

This rate shall be the full and final compensation to the Contractor for all labor, equipment **mobilization** (including excavators/long-boom excavators), tools, hauling, disposal fees, and all other incidental operations necessary to successfully complete the item.

3.3 EXCAVATION WORKS

3.3.1 Excavation in Foundation-All Type of Soil

3.3.1.1 Scope of Works

Foundation trench shall be dug to the exact width and depth and levels as indicated in the drawings or to such lesser or greater extent as the Engineer may advice. Sides of trenches shall be vertical. In case the soil does not permit vertical sides, the Contractor shall protect side with timber shoring. Excavated earth shall not be placed within 1.5 meter of the edge of the trench. The Project Engineer may direct the Contractor to place excavated earth at a particular site up to 30 meter away from the building. The bottom of the trench shall be perfectly levelled both longitudinally and transversely. The bed shall be lightly watered and well rammed. Excess digging if done through mistake shall be filled with 1:4:8 concrete. Water, if any accumulated in the trench, shall be bailed out and all necessary precaution taken to prevent surface water from entering the trench. Soft and defective spot in the trench shall be dug out and removed and filled with concrete or materials prescribed by the Project Engineer. If rocks or boulders are found during excavation, they should be removed, and the bed trench shall be levelled and made hard by consolidating the earth, at no extra cost. Above mentioned items or any variation thereof from the Bills of Quantities shall be measured and valued by the Engineer as a variation. After the completion of foundation masonry, the remaining portion of the trench not filled by masonry shall be filled up with earth in layers of 15cm, watered and well-rammed. Such filling shall be free from rubbish, refuse matters and clods, surplus earth, if any shall be removed and site shall be levelled and dressed. Trenches shall be measured as per drawings and rate shall be for complete Work including trench filling, for 30-meter lead and 1.5-meter lift including all tools and plants required for the completion of the work, removal of boulders, side shoring, pumping, and filling in voids by mass concrete (1:4:8). No excavation or foundation work shall be filled in or covered up before the inspection and approval of the Project Engineer. The starting level for excavation shall be deemed to be ground level or such level as may be specified by the Project Engineer, before the commencement of the Work.

3.3.1.2 Measurement

Measurement of all works will be made in m³.

Measurement for payment under the contract will be limited to the lines, grades, slopes and dimensions shown on the Drawings or as determined by the Engineer as the work proceeds on the basis of his evaluation of the soil/rock characteristics and site-conditions set forth in the Clause. All required and accepted excavation shall be measured from its original position. The volume shall be determined in cubic meters by average area method to be computed from the original and final cross-sections of the completed works as per the drawings or as directed by the Engineer. Where it is not practicable to use the above method of measurement, the Engineer may use volumetric method or any other method that in his opinion is best suited for accurate assessment. Any over-excavation shall be reinstated at the risk and cost of the Contractor as directed by the Engineer.

3.3.1.3 Payment

Payment for work under these clauses will be made on the basis of contract unit price indicated in the BOQ. The payment will be full and final compensation for all material, labour, and equipment to complete the works as specified.

3.3.2 EXCAVATION FOR STRUCTURES FOUNDATION (Mechanical Means)

3.3.2.1 Scope of Works

This work shall consist of the excavation and removal of material for the construction of foundations for structures, strictly conforming to the lines, grades, and dimensions shown on the Drawings or as instructed by the Engineer. The scope encompasses the use of mechanical means for excavation in ordinary soil, the construction and subsequent removal of necessary sheeting, shoring, and bracing, dewatering and pumping operations, the removal of stumps, logs, and other deleterious matter, and final backfilling with approved materials.

3.3.2.2 Construction Operations

Shoring and Bracing: Where the nature of the soil or the depth of the trench does not permit vertical sides, the Contractor shall put up necessary shoring, strutting, and planking to ensure the safety of personnel and works.

Dewatering: Where water is encountered due to stream flow, seepage, springs, or rain, the Contractor shall take adequate measures (such as bailing, pumping, and constructing cofferdams or drains) to keep the foundation pit or trenches dry.

Preparation of Foundation Base: The bottom of the foundation pit shall be levelled (longitudinally and transversely) or stepped as directed by the Engineer.

Backfilling: After structure completion, the foundation pits and trenches shall be refilled with approved pervious or common backfill material. The backfilling material shall be placed and compacted in layers to prevent overloading or affecting the stability of the structure.

3.3.2.3 Measurement

Foundation excavation for structures shall be measured in cubic meters (cu. m.). The measurable quantity shall be the net cubic content of the voids formed by the removal of the materials, enclosed between the bottom of the footing and the existing ground level by a surface generated by vertical lines passing through the periphery of the bottom of the footing. Excavation over increased width or length for cutting slopes, shoring, shuttering, or planking shall be deemed as a convenience for the Contractor and shall not be measured for payment.

3.3.2.4 Payment

This contract unit rate shall be the full and final compensation to the Contractor for the cost of carrying out the required operations to excavate to the required lines and levels, disposal of excavated materials, preparation of the foundation base, sheeting, shoring, bracing, dewatering/pumping, removal of stumps, backfilling, and all incidental works necessary to complete the item in accordance with this Specification.

3.4 BACKFILLING

3.4.1 Earth Back Filling

This work is related to all types of structures that require filling with specified material in the remaining volume or space of excavation left unoccupied by any permanent construction. Activities involved are collection and transportation of suitable material from local borrow pits or hill side excavation, placing the specified backfill material in layers, removal of foreign material if any, watering, compacting to required density, lines and levels as indicated in the drawings or as directed by the Engineer. Compaction shall proceed after the Contractor together with the Engineer identifies the optimum thickness of each layer of suitable material, its optimum moisture content, and the corresponding number of passes required for a roller to arrive at the corresponding OMC. Prior to the start of works, the contractor shall prepare a trial stretch to

establish the above parameters and shall repeat it as often as necessary due to change in layer thickness, borrow pits, and /or change in equipment. The Contractor may use the Standard Specifications for Roads and Bridge Works of GON, MWOT, DOR as guide for the above purpose. Backfill, classified according to their nature, are presented in the following Sub-Clauses.

3.4.1.1 Backfill in Plinth of Building and Parking

This work shall consist of filling for construction of embankment for plinth of building, road works and parking area and includes furnishing, placing, watering, compacting and shaping suitable material obtained from approved sources in accordance to lines, levels, grades, dimensions shown on the Drawings and or as required by the Engineer. Fill material used shall not exceed 150 mm and 75 mm within the 300 mm and 150 mm of formation level respectively. Fill material shall not have organic content value exceeding 5% and soaked CBR value less than 6% unless otherwise approved by the Engineer. Activities involved shall be preparation of surface, scarifying, supply, and laying of suitable material in layers. Except where material is laid close to the formation level, each layer shall not exceed 300 mm in thickness before compaction. Each layer of material shall then be watered and compacted to 95% dry density at optimum moisture content. Testing shall be carried out by sand cone using relevant BS or ASTM Standards. The top level of such fill executed shall be regarded as the formation level.

3.4.1.2 Common Backfill in Structures

Common backfill includes stacked suitable material recovered from excavations or material transported from outside. This may include granular material passing through 75 mm sieve or sandy soil. The backfill material shall be spread uniformly in layers, levelled, watered, and then compacted to 95% of its optimum density in layers not exceeding 200 mm for buildings works and 250 mm for others. Compaction may be done manually or with mechanical means. Manual compaction in each layer will be done using 2 to 5 kg rammers made of cast-iron or wood. Mechanical compaction shall be executed with either plate compactors, earth rammers, depending on site conditions. Compaction tests shall be conducted with sand cones using relevant BS or ASTM standards.

3.4.1.3 Transportation And Handling of Excess Disposable Material

This work will be required in connection with transportation of materials from demolition works (unless otherwise specified) and excess suitable or unsuitable material from excavation. Transport will include all distance beyond the initial lead (30m unless otherwise specified) for safe disposal as specified by the Engineer. Activities involved will be supply of necessary means of transport, loading, and transportation safely without damage/loss, unloading and levelling properly at disposal sites. The disposed materials shall be laid in layers mechanically or manually compacted to the satisfaction of the Engineer. The excess material shall be disposed manually with or without equipment like wheelbarrows or by trucks depending on the location of disposal sites.

3.4.1.4 Measurement

Measurement will be based first in m³ of loose volume of accepted works with 35% deduction for voids for all leads indicated in the BOQ. The measurement will be made at the disposal site.

3.4.1.5 Payment

Payment for work under this Clause will be made on the basis of contract unit price indicated in the BOQ. The payment will be full and final compensation for all material, labour, and equipment to complete the works as specified.



3.4.2 Sand Filling

3.4.2.1 Scope

Sand filling in foundation of floor with materials from pit or riverbed as approved including machine compaction in 150 mm layers with sprinkling water required to obtain 95% density.

Filling in plinth floor with river or mine sand brought from outside in 0.15m layers under floors including ramming, consolidation, and dressing, all complete.

3.4.2.2 Material and workmanship

The sand for filling shall be brought from outside the site shall be approved by the Engineer prior to filling. The sand for filling shall be either pit sand or river sand.

The work shall be done with sand in 0.15m layers, each layer being rammed thoroughly. It shall include excavation of sand, transportation, screening, if necessary, filling and all the cost of labour etc., all complete.

3.4.3 Brickbat Filling

Brickbat boulders shall be hard, tough, sound and durable. No brickbat shall be more than 5cm. Boulders shall be laid in their natural bed. Smaller size boulders/pebbles shall be used to fill up gaps between boulders in order to form uniform well-knitted floor structure. Measurement shall be in cubic meter of actual length, breadth and depth.

3.5 SOILING WORKS

3.5.1 Flat Brick Soling

The flat brick soling shall be made in foundation and floor. The brick laying/ soling shall be done over the 5cm sand filling in line and level Each brick shall be laid separately and tamped firmly in place in the sand bed. Joints between bricks shall be filled with dry sand. On completion the surface shall be true to line and level with no part deviating from true line and level by more than 20mm. No mud on sand filling shall be allowed when level is not maintained in excavation.

3.5.2 Stone Filling Works

Stone filling shall be done as stone masonry works in general but with the omission of mortar. All stones shall be carefully shaped to obtain as close a fit as possible at all beds and joints, any interstices between the stones being filled with selected stone spalls. The stones in courses shall be laid perpendicular to the batter face.

3.6 ANTI TERMITE WORKS

3.6.1 Scope of Work

This specification covers the provision and injection of pre-construction anti-termite treatment to create a complete chemical barrier. The treatment shall be applied to foundations, footings, column pits, trenches, inside floor backfills, plinth levels, retaining walls, external perimeters, and surrounding pipes or conduits. All work shall conform to IS 6313 or equivalent BIS specifications.

3.6.2 Material Requirements

Chemical Agent: The treatment shall utilize Imidacloprid 30.5% SC (commercially known as Premise 30.5% SC).

Concentration: The chemical shall be mixed and applied at a concentration of 0.07%.

Properties: The selected termiticide must be an environmentally friendly, odorless, and non-repellent chemical that is safe for mammals.



3.6.3 Execution and Treatment Stages

Foundation Treatment (Isolated or Combined Footings): The bottom surface of the excavated foundation trenches shall be levelled and sprayed with the chemical emulsion at a rate of 7 liters per square meter prior to laying the soling. Pit surfaces shall also be treated up to a height of 300 mm using a high-power foot sprayer to ensure uniform spread and soil penetration. For pile foundations, this treatment applies just below the pile cap.

Backfill Treatment: Treatment shall commence at a depth of 500 mm below the final ground level. Soil in immediate contact with the vertical surfaces of RCC foundations shall be treated at a rate of 7 liters per running meter. For pile foundations, rod holes shall be made up to 1 meter deep around the tip of the pile caps, and the solution applied at 7 liters per running meter.

Plinth Level Treatment: The top surface of the consolidated earth within the plinth level shall be treated with the chemical emulsion at a rate of 7 liters per square meter before the placement of soling and PCC.

Outer Periphery Treatment: Following the clearing and compaction of the apron earth, holes measuring 1 to 1.5 feet deep shall be made at 1-foot intervals adjacent to the external perimeter wall. The chemical emulsion shall be poured into these holes at a rate of 9 liters per running meter, after which the earth shall be refilled and compacted.

3.7 MASONRY WORK

3.7.1 One Or More Than One Brick Thick (Chimney Made)

Providing and laying brick masonry work with first class chimney burnt bricks in 1:6 cement sand mortar in foundation, plinth and superstructure including curing, cleaning, racking out mortar joints & making ducts, recesses, scaffolding wherever necessary with RCC band in horizontal & vertical as per drawing (Measurement of concrete, re-bar, formwork will be done separately in respective items).

It shall be paid in Cu.m.

3.7.1.1 Bricks

The bricks shall be chimney burnt hand cast bricks of first-class quality. These shall be of quality approved by the Engineer, free from grit and other impurities such as lime, iron and other deleterious salts. These shall be well-burnt, sound, and hard with sharp edges and shall emit ringing sound when struck with a mallet. These shall be of uniform size. The Brick work shall also include 4" thick RCC Horizontal Band of 1:1.5:3 nominal Mix Concrete with 2 nos. of 10 mm dia. longitudinal re-bar bind with 8mm dia re -bar @ 10" c/c transversally in each band at sill and lintel level. The rebar must be properly anchored with columns as per drawing and instructions. (Measurement of concrete, re-bar, formwork will be done separately in respective items). The bricks shall conform to IS 3495 and be tested in accordance with IS 1077.

Sampling: Brick samples shall be randomly selected for testing in quantities not less than 5 bricks per one thousand for each lot supplied for the construction works.

Acceptance Criteria: Compressive Strength: The average compressive strength of the brick shall be minimum of 105 kg/sq.cm. The compressive strength of any individual brick shall not fall below the above mentioned minimum average compressive strength by more than 20%.

Water absorption: The average water absorption of the brick samples shall not be more than 15% over the dry weight after immersion in cold water for 24 hours.

Efflorescence: The rating of efflorescence shall not be more than "Slight".



3.7.1.2 Mortar

Cement mortar shall be mixed in proportion of materials as indicated. The ingredients shall be accurately measured by volume and shall be well and evenly mixed together in a mechanical pan mixer. Too much water shall not be used. River sand shall be used unless otherwise specified. If hand mixing is allowed, it shall be done in brick tanks. The gauged materials shall be put in the tank and mixed dry thoroughly. Water in required quantity will then be added and the whole mix will be mixed again until it is homogeneous and of uniform colour.

3.7.1.3 Workmanship

All the bricks shall be thoroughly soaked in water (preferably 12 hours) before use till the bubbles cease to come up. The bricks shall be laid in cement mortar bed in proper band. When bonding, the brickwork must be set back in every course. The vertical toothing shall not be accepted. The courses shall be truly horizontal and the work strictly in plumb. The mortar joints shall be broken vertically. All the joints shall be raked out to a depth of 6mm to receive setting beds and / or for pointing work where required.

The walls are to be carried up in a uniform manner with level courses and perpends strictly kept, no one portion being built up more than 14 single courses per day. The top of the walls shall be well wetted before the work recommences.

There shall be smooth mortared surface to receive any structural slab, beam, lintel etc. on the brick courses. The brickwork shall be thoroughly cleaned off on completion.

3.7.1.4 Measurements

The measurements of work shall be the product of the length, height and thickness. Deductions for doors, windows and other openings including lintels shall be made to arrive at the net quantity of work. Nothing shall be paid extra for forming such openings. However, no deductions shall be made for openings of areas less than 0.1 sqm overall and for bearing of lintels, beams, girders and hold fast blocks but nothing extra like formwork shall be paid for embedding these. Similarly, no deductions shall be made for chimney flue left in the walls, but nothing extra shall be allowed for rendering for flue opening as specified. Brickwork as covering to RCC structures and in continuation of the main wall shall be measured in thickness of quarter brick unit. Unless otherwise specified nothing extra shall be admissible for cutting shape other than straight or any cutting necessary for shaping the walls to the structural design. Rate shall be inclusive of all necessary scaffolding, watering, cutting of bricks, curing, materials and labour.

3.7.2 Half Brick Thick

Providing and Laying Half brick Partition wall of local made first class brick in cement sand ratio of (1:4). Including 4" thick RCC Horizontal Band of 1:1.5:3 nominal Mix Concrete with 2 nos. of 10 mm dia. longitudinal re-bar bind with 8mm dia re -bar @ 10" c/c transversally in each band at regular interval as per drawing and instructions. The rebar must be properly anchored with columns (Measurement of concrete, re-bar, and formwork will be done separately in respective items).

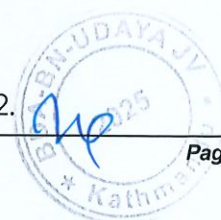
The bricks shall conform to IS 3495 and be tested in accordance with IS 1077. It shall be paid in sq.m. Steel reinforcement shall be paid separately in Kg.

3.7.2.1 Laying of Bricks

It shall be laid in stretcher course as for brickwork specification.

3.7.2.2 Mortar

Mortar shall be 1:4(1 cement: 4 sand) mixed as per specification of item 7.1.2.



3.7.2.3 Measurement

Measurement shall be done in square meter of the wall. Measurement of concrete, re-bar, formwork will be done separately in respective items. Deduction shall be made as for brickwork stated in item no. 7.1.4.

3.8 CONCRETE WORK

3.8.1 Plain Cement Concrete (Pcc) Work

Supplying, mixing, placing, compacting & curing different mixes of plain cement concrete for foundation bases & floors excluding the cost of formwork as per drawing, specification & instruction all complete.

M10 grade cement concrete approximately (1:3:6) (1 cement: 3 sands: 6 stone aggregate 20 mm. and down gauge) and M15 grade concrete approx. 1:2:4 (1 cement: 2 sands: 4 stone aggregate 20 mm. and down gauge excluding cost of formwork complete as required. It shall be paid in m³.

3.8.1.1 Materials

Cement, sand and stone aggregate shall conform to the specifications as under Reinforced Cement Concrete Works.

3.8.1.2 Mixing

All proportions of materials shall be by weight or by volume if agreed by the Engineer. Mixing shall be done in a mechanical mixer as per specifications of Reinforced cement concrete work. However, in special cases, hand mixing may be allowed by the Engineer, when the following procedure shall be adopted. The several materials shall be accurately gauged in boxes or weighed and thoroughly mixed on a watertight platform of adequate size, being turned over at least thrice till the color is uniform and then twice when wet. Water shall be added gradually and not more than necessary to sufficiently wet the materials. Only that much concrete shall be mixed which can be used within half an hour. Each stack shall, however, be no larger than consuming one bag of 50 kg of cement. All such stacks shall be placed distinct from each other. The Contractor shall put in 10% more cement than specified without extra charges in case of Normal/Ordinary mixer to get the required strength (25N/mm²). All of RC concrete shall be mixed with Polycarboxylate (PC) ether based super plasticizer concrete admixtures, Remicrete-SP10 (FM), SPC-99- Engineers Plus, Perma Plast or equivalent. Minimum 200ml per 50 kg of cement shall be used either directly on the wet concrete mix in the concrete mixer under operation or along with gauging water to get the required strength of concrete of 25N/mm².

3.8.1.3 Laying

Concrete shall be laid in horizontal layers of not more than 0.15m thick and gently rammed.

3.8.1.4 Curing

After laying, the concrete shall be kept wet for seven days. If cast in hot weather, it shall be covered with gunny bags, which shall be kept constantly wet. Other work on concrete shall not start until 3 days after laying of concrete.

3.8.1.5 Measurement

In cubic metre of exact length, breadth and depth. This shall be exclusive of any formwork required to complete the item. Rate shall include all materials, Labour and Contractor's Overhead.

3.8.2 Reinforced Cement Concrete (Rcc) Works

3.8.2.1 General

All R.C.C. work shall be carried out in strict accordance with these specifications, IS specifications and the working drawings. Any discrepancies in the dimensions on the drawings or any points not clear to the Contractor shall be brought to the notice of the Engineer and clarified in advance before proceeding with the work.

The Contractor shall allow for all wastage in all materials. He shall also allow for all tests of concrete materials unless issued by the Employer. No R.C. concrete work shall be cast in the absence of the Engineer. The Contractor's Engineer shall personally check that both the formwork and reinforcement have been correctly placed and fixed and satisfy himself that all work preparatory to casting is completely ready for inspection and approval and for this purpose at least 24 hours prior notice shall be given to the Engineer by the Contractor.

3.8.2.2 Materials

The materials used in the Works shall be of the qualities and kinds specified. Materials shall be delivered to the Works at least 30 days before it is required for use in work. Delivery shall be made sufficiently in advance of constructional requirements to enable samples to be selected, tested and approved by the Engineer. No material shall be used in the Works until approved. Materials failing to comply with the approved samples and specification shall be removed within 24 hours of the instructions of the Engineer from the Works at the Contractor's cost.

3.8.2.3 Water

Water for concrete shall be clean and free from injurious amounts of oils, acids, salts, sugars, organic materials or other substances that may be deleterious to concrete or steel. Whenever required to do so by the Engineer, the Contractor shall take samples of the water being used or which it is proposed to be used for mixing concrete and test them for quality. The details of test shall be as per the recommendations in the IS: 3025-1964 (latest revision).

Permissible limits, maximum for Solids

Organic	200mg/l
Inorganic	3000mg/l
Sulphates	500mg/l
Chlorides	2000mg/l for PCC works and 1000mg/l for RCC works
Suspended matter	2000mg/l

3.8.2.4 Cement

The cement shall be Ordinary Portland cement (OPC) of approved brand and manufacture and shall comply in all respects with the IS 269- 1967 for Ordinary Portland Cement. It shall be delivered on the site in packages with an unbroken seal fixed by the makers and plainly marked with the names of Brand and the Manufacture. It shall be stored in a dry place, in regular piles not exceeding ten bags high and in such a manner that it will be efficiently protected from moisture and contamination. Set cement should immediately be removed from the work and replaced by the Contractor at his own expense. If described tests shall be made by taking samples of cement from stores or elsewhere from the Works the selection of samples and procedure for testing shall comply with appropriate IS code.



3.8.2.5 Aggregate

All aggregates shall conform to IS 383 - 1970. Aggregates shall as far as possible, be derived from a source that normally produces aggregate satisfactory for concrete, and if requested by the Engineer the Contractor shall supply evidence to this effect. If he is instructed to do so, the Contractor shall supply samples of the aggregate for the purpose of making preliminary concrete test cubes as hereinafter specified.

Aggregate shall consist of naturally occurring sand and stone crushed. They shall be hard, strong, dense, durable, clean and free from veins and adherent coating. As far as possible, flaky and elongated pieces should be avoided.

Aggregate shall not contain any harmful materials, such as iron pyrites, coal, mica, shale or similar laminated materials, clay, alkali, soft fragments, sea shells, organic impurities etc. in such quantity as to affect the strength or durability of the concrete or in addition to the above for reinforced concrete, any material which attack the reinforcement. Aggregates, which are chemically reactive with the alkalis of cement are harmful, as cracking of concrete may take place.

a) Fine Aggregates

The fine aggregate shall be natural sand or sand derived by crushing suitable gravel or stone and shall be free from coagulated lumps. Sand derived from a stone unsuitable for coarse aggregate shall not be used.

The fine aggregate shall conform to the requirements of IS 383 - 1970. Fine aggregate shall contain no more than 3% of material removable by decantation test, nor more than 1% removable by dry tube. The total of coal, clay lumps, shale, soft fragments and other deleterious substance shall not be more than 5%.

The percentage of clay lumps shall be determined by examining the various fractions that remain after the material has been tested for grading. Any particulars that can be broken with fingers shall be classified as clay lumps and the total percentage of clay lumps shall be determined on the basis of the total original weight of the sample. The fine aggregate shall be well graded from fine to coarse and shall meet the gradation requirements.

Blending will be permitted in order to meet the gradation requirements for the fine aggregate.

IS, BS and ASTM Grading Requirements for Fine Aggregate

IS Sieve Designation	Grading Zone I	Grading Zone II	Grading Zone III	Grading Zone IV	Standard C 33 - 57
10 mm	100	100	100	100	100
4.75 mm	90 – 100	90 – 100	90 – 100	95 – 100	95 – 100
2.36 mm	60 – 95	75 – 100	85 – 100	95 – 100	80 – 100
1.18 mm	30 – 70	55 – 90	75 – 100	90 – 100	50 – 85
600 micron	15 – 34	35 – 59	60 – 79	80 – 100	25 – 60
300 micron	5 – 20	8 – 30	12 – 40	15 – 50	10 – 30
150 micron	0 – 10	0 – 10	0 – 10	0 – 15	2 – 10

B) Coarse Aggregate

The coarse aggregate shall be crushed stone. The pieces of aggregate shall be angular. Friable, flaky and laminated pieces and Mica shall only be present in such quantities as not to affect

adversely the strength and durability of the concrete as ascertained by tests on concrete cubes. After twenty-four hours immersion in water, a previous dried sample shall not have gained in weight more than 5% and not more than 10% if it is to be used in plain concrete or elsewhere as described. The coarse aggregate shall conform to the requirements of IS 383-1970. The percentage of wear at 500 revolutions of Los Angeles Rattler Test shall not be more than 50%. The coarse aggregate shall meet the gradation of 2.

IS and BS Grading Requirements for Coarse Aggregate

IS Sieve	Percentage passing for single sized aggregate of nominal size						Percentage passing for graded aggregate of nominal size			
	63m m	40m m	20m m	16m m	12.5m m	10m m	40m m	20m m	16m m	12.5m m
80mm	100	-	-	-	-	-	100	-	-	-
63mm	85-100	100	-	-	-	-	-	-	-	-
40mm	0-30	85-100	100	-	-	-	95-100	100	-	-
20mm	0-5	0-2	85-100	100	-	-	30-70	95-100	100	100
16mm	-	-	-	85-100	100	-	-	-	90-100	-
12.5m m	-	-	-	-	85-100	100	-	-	-	90-100
10mm	0.5	0-5	0-20	0-30	0-45	85-100	10-35	25-55	30-70	40-85
4.75m m	-	-	0-5	0-5	0-10	0-20	0-5	0-10	0-10	0-10
2.36m m	-	-	-	-	-	0-5	-	-	-	-

3.8.2.6 Concrete Admixture

Silica Cement Admixture Confining with ASTM C1240-2015, IS 15388:2003 or equivalent having SiO₂ above 86% from volcanic ore having the Blaine surface area of 60,000 cm²/gm and particle size of 0.4µm and grain density of 2.8 gm/cm³. Characteristics of the material should be Amorphous, shapeless with white colour for waterproofing, salinity infiltration resistance, freezing & Thawing, Anticorrosion and protection of the reinforcement of Bar reducing heat of hydration resistance against cracks for the durability of the concrete all complete as per drawing, specification & to be mix 3% weight of Cement during RCC in Staircase cover slab and beam, roof top slab and beam, water tank as per instruction of Engineer.

3.8.2.7 Measurement and Proportioning of Concrete Materials

The aggregate shall be measured by weight or by volume if approved by the Engineer in a gauge box of correct and approved size based on the weight of the material or by other approved accurate means. The gauge box or other container shall be filled with the aggregate without

compacting to a predetermined uniform depth, accurate allowance being made for bulking due to moisture content of the fine aggregate.

The cement shall be measured by weight, one or more complete bags containing 50 kgs being used for a single batch of concrete and as the size of the mixer shall permit this to be done.

The normal proportions of cement and aggregate shall comply with the quantities specified below of the concrete described for each part of the work. The specified quantities shall be altered if instructed after examination of the aggregate materials in samples or in bulk in order to obtain the densest concrete with approved materials. Any such alterations within the range of 1 part of fine aggregate to 1- 1/2 parts of coarse aggregate and 1 part of fine aggregate to 2-1/2 parts of coarse aggregate shall be made without any alteration in the rate of Bill of Quantities.

3.8.2.8 Properties of Concrete

Concrete Grade and Strength

The compressive strength (cube strength) for Portland cement concrete shall be in accordance with IS 456 –2000 and shall not be less than that shown in the following table:

Grade	Preliminary Test: at 28 days	Works Test: at 28 days
M ₁₀	15 N/mm ²	10 N/mm ²
M ₁₅	20 "	15 "
M ₂₀	26 "	20 "
M ₂₅	32 "	25 "

3.8.2.9 Concrete Proportions

The minimum cement content of mix shall be as below:

Grade	Minimum cement content in Kg/ Cu.m.
M ₁₅	220
M ₂₀	320
M ₂₅	400

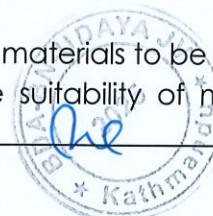
The quantity of water used shall be varied to suit the moisture content of the aggregate and shall be just sufficient to produce a dense concrete, consistent with practical workability.

If the strength of the respective grade concrete does not meet the compressive strength as stated above, the ratio of the cement shall be increased to meet the minimum compressive strength of the concrete.

3.8.2.10 Control of Concrete

Preliminary tests

The Contractor shall be called upon to submit representative samples of materials to be used for concrete in order that they may be tested at a laboratory and the suitability of materials



established. All expense in connection with the above materials, tests shall be borne by the Contractor.

Works Cube Tests

During the progress of the work 15 cm cubes shall be made as per IS 456-2000 as necessary and tested in accordance with IS 516-1959.

3.8.2.11 Measurement of Consistency/Workability

The consistency shall be determined by making trial mixes with dried aggregates. The consistency of the trial mixes of approved consistency shall be measured as instructed.

The workability of the concrete shall be checked at frequent intervals by slump test. Where facilities exist and if required by the Engineer, alternatively, the compacting factor test in accordance with IS: 1199, shall be carried out. The degree of workability necessary to allow the concrete to be well consolidated and to be worked into the corners of formwork and around on the type and nature of structure shall be based on experience and tests within the preferred limits of consistency as specified in Table below for various types of experience and tests within the preferred limits of consistency as specified in table below for various types of structures.

Degree of Workability	Slump in mm		Use for which concrete is suitable
	min.	max.	
Low	20	40	Mass concrete foundations without vibrations, simple reinforced section with vibration
Medium	50	100	Normal reinforced beams, columns, slabs without heavily reinforced section with vibration
High	100	150	Section with congested reinforcement not normally suitable for vibration.

The slump test shall be done at the commencement of each grade of concrete placing and such other times as instructed.

The apparatus used for the slump test shall be standard cone. When cone is filled it shall be raised vertically clear of the concrete and the measurement of the slump shall be taken. Care shall be taken to prevent vibration of the sample being tested. If the Engineer requires the use of other means for testing the consistency of the concrete it shall be done as instructed without any extra charge.

3.8.2.12 Concrete Mixing

The cement and aggregates shall be thoroughly mixed together in the specified proportions in a batch type mechanical mixer. All the cement and aggregates constituting a batch is mixed till the mix is of uniform colour. The mixing time in no case shall be less than one minute. If the drum rotates at lower speeds, the minimum period shall be increased inversely proportional to speed. The period of mixing shall be measured from time when all the materials including water are put in the drum. The entire contents of the drum shall be discharged before materials for the succeeding batch are fed into the drum. Materials spilled from the skip or other container shall not be used. No partly set or frozen concrete shall be used in the work. Partly set concrete shall not be remixed with the addition of cement or aggregate.

3.8.2.13 Distribution of Concrete

The concrete shall be distributed from the mixers to the position of placing by approved means that do not cause separation or segregation or otherwise impair the quality of the concrete.

3.8.2.14 Preparation for placing concrete

Before the concrete is placed the shuttering shall be trued - up and any water accumulated therein shall be removed. All saw dust, chips, nails, and other debris shall be washed out or otherwise removed from within the formwork. The reinforcement shall then be inspected for accuracy of fixing. Immediately before placing the concrete the formwork shall, except in frosty weather, be well wetted and inspection opening closed.

3.8.2.15 Placing concrete

The interval between adding the water to the dry mix and completion of the concrete placing operation shall not exceed 30 minutes nor, when an approved admixture that accelerates the initial setting of the cement is used, exceed ten minutes.

Except where otherwise approved for slabs and large sections concrete shall be placed in the formwork by shovels or other approved implements and shall not be dropped from height nor handled in a manner to cause separation or segregation. Accumulations of hardened concrete dropping on the reinforcement shall be avoided.

Each layer of concrete while being placed shall be consolidated by approved methods of ramming, tamping, or mechanical vibrations to form a dense surface free honeycombing and tolerably free from watermarks and air holes or other blemishes. The concrete shall be tamped against the face of the formwork so as to produce dense fair surface. The number and type of mechanical vibrations shall be approved before consolidating by vibration. Placing and consolidation of concrete shall be done in such a manner as not to disturb concrete already placed, and reinforcement projecting from concrete already placed shall not be vibrated or jarred. For reinforced concrete walls each other layer of concrete placed shall be properly consolidated by approved methods of mechanical vibrations produced by internal or external mechanical vibration.

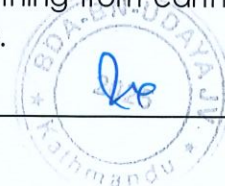
Any water accumulating on the surface of the newly placed concrete shall be removed by approved means and no further concrete shall be placed thereon until such water be removed. No fresh concrete shall be brought into contact with the concrete containing cement of different type. Unless otherwise approved or instructed, concrete shall be placed in a single operation to the full depth of slabs, beams, and members similar to these and shall be placed in horizontal layers not exceeding 0.90m deep in walls, columns until completion of the part of the work between construction joints as specified. At the completion of a specified or approved part of the construction, joints of the form and in the position herein after specified shall be made. If a temporary cessation of concrete placing is unavoidable a construction joint shall likewise be made.

3.8.2.16 Placing concrete in extreme weather

Work shall be done according to Clause 20.1 of IS. 456-2000.

3.8.2.17 Vibration**Appearance**

The concrete that is to be compacted by vibration should appear anything from earth dry to slightly glistening. The mix should have the appearance of lacking in fines.



Placing

Segregation is likely to take place when the concrete is tipped into the formwork and this should be avoided. The concrete mix should not contain surplus water and sand, which will develop segregation under influence of vibrator compaction. The distribution of new concrete should be uniform for the whole section and the surface kept horizontal for the whole section all the time thus ensuring the movement of concrete is downward only. Vibrators shall not be used as a spreading or distributing agent.

The vibrators shall be of rotary out of balance immersion type or the electro-magnetic type and operate at a frequency of not less than 4,000 cycles per minute. The vibration shall be of such a power- input as to produce an acceleration of 1 to 3 m/sec in the mass of the compacted concrete. The vibrators shall be provided for continuous operation.

Disposition of Vibrators

Internal vibrators shall be disposed within the mix, when placed, so as to maintain the whole of the concrete under treatment in adequate state of agitation such that de-aeration and effective compaction may be achieved at a rate commensurate with the supply of concrete from the mixers. Insertion of vibrators at about 450 mm centre is considered sufficient.

Period of Vibration

Vibration shall continue during the whole period occupied by placing the concrete, the vibration being adjusted so that the centre of vibration approximates to centre of the mass being compacted at the time of placing. The concrete should not be over vibrated and the period of insertion of internal vibration should be about 15 seconds at any point.

3.8.2.18 Compactness

The concrete shall be considered fully compacted when the mortar fills the spaces between the coarse aggregate so as to form a glistening and even surface except for slight irregularities where the coarse aggregate breaks this smooth surface. When this condition has been attained the vibrators shall be withdrawn slowly.

The vibrator must not be placed against the steel or the formwork. The minimum distance shall be 8 mm. The compactor must be placed in such a position that formwork, reinforcement and recently laid concrete may be subjected to the minimum amount of vibration.

3.8.2.19 Construction Joints

When the work is to be interrupted, the concrete shall be rebated at the joint to such shape and size as may be required by the Engineer or as shown on the drawing. All vertical construction joints shall be made with step boards that are rigidly fixed and slotted to allow for the passage of the reinforcing steel. If desired by the Engineer, keys and /or dowel bars shall be provided at the construction joints. In the case of water retaining structures water stops of approved material shall be provided if so, specified in the drawings or desired by the Engineer. Construction joints shall be provided in positions as described; the joints shall be in accordance with the followings:

In a column, the joints shall be formed about 75mm below the lowest soffit of the beams forming into it.

Concrete in a beam shall be placed throughout without a joint, but if provision of a joint is unavoidable, the joint shall be vertical at the point of balanced moment along the span. A joint in a suspended floor slab shall be vertical at the face of balanced moment and at right angles to the principal reinforcement. The locations of construction joints shall be planned by the contractor well in advance of pouring and will have to be approved by the Engineer.

Before fresh concrete is placed the cement skin of the partially hardened concrete shall be thoroughly removed and surface made rough by hacking, sand blasting, water jetting, air jetting or any other method as directed by the Engineer. The rough surface shall be thoroughly wetted for about two hours and shall be dried and coated with 1:1 freshly mixed cement sand slurry or epoxy chemical, as directed by the Engineer, before placing the new concrete. The new concrete shall be worked against the prepared surface before the slurry/epoxy sets. Special care must always be taken to see that the first layer of concrete placed after a construction joint is cold. The new concrete shall be well rammed against the prepared face before the grout sets. Joints during pour shall be treated with 1:1 freshly made cement sand slurry or epoxy only after removing all loose materials.

Construction joints will not be paid separately.

3.8.2.20 Protection and Curing of Concrete

Immediately after placing or finishing, concrete surface not covered by forms shall be protected from loss of surface moisture for at least seven days when the average daily temperature is at least 21°C, where Portland cement has been used. Protection from loss of surface water shall be done by any of the following methods where applicable to the type of work involved:

- i) By water covering.
- ii) By covering of surface with water - impervious paper.
- iii) By application of approved impervious membrane.

surface from which forms have been removed before the curing period has elapsed shall be protected as specified for surfaces not covered by forms. Membrane cutting shall not be used on surfaces required to receive additional concrete or concrete fill, nor on cement finish coats that are to receive dust proofing or hardening treatments, nor during hot weather.

Ater curing shall be performed by keeping the concrete surface wet by ponding, by continuous spraying or by covering the surface with an approved water- saturated covering such as 2.5 mm. of sand or sawdust, or by one or more layers of burlap. The exposed concrete surfaces shall be saturated with water throughout the full stipulated curing period, they shall be kept sufficiently wetted with clean water to reduce cracks and to prevent joints from opening in the forms.

The impervious membrane curing compound shall be an approved non bituminous, colourless, liquid, sealing compound in atomized form so as to preserve the natural colour of the concrete. The curing compound shall be applied as soon as surface water has disappeared from concrete surfaces with approved pressure spraying equipment in accordance with the manufacturer's directions and in sufficient thickness to form an effective water seal. No compounds shall be used which will adversely affect the subsequent installation of finished flooring.

Joints of sheet membrane used for curing shall be lapped at least 150 mm. and sealed with water proof tape as recommended by the manufacturer. Polyethylene sheet shall be considered the water-impervious paper for purposes of interpretation of this item. No liquid curing compound may be used without specific written approval of the Engineer regarding type, manufacturer, location and extent of use and application procedures.

3.8.2.21 Finishes

The concrete surface shall in general be smooth enough. However, immediately after stripping form work, minor defects and honey combed areas shall be patched and holes filled before the concrete is thoroughly dry, patch areas shall be chipped away to 2.5 mm. depth, with regular edges perpendicular to the surface. Area to be patched shall be thoroughly wet including the

areas at least 150mm. wide entirely surrounding them, just prior to placing the patching mortar. Mortar shall be of the same material and portions as used for the concrete, without coarse aggregate. A sufficient quantity of white cement shall be substituted for part of the ordinary cement so that the patching mortar, when dry, will match the surrounding concrete. Water in the mix shall be kept to a minimum and mortar shall be re tempered without adding during which time it shall be mixed to prevent setting. The mortar shall be thoroughly compacted into place, screened so as to leave the patch slightly higher than surrounding surfaces, left undisturbed for one to two hours to permit initial shrinkage and finished to match the adjoining work. Where patches exceed 2.5 mm depth, they shall be trimmed and wet as specified, after which the opening shall be filled to within 2.5 mm. of the surface. After sufficient shrinkage time has elapsed, the patching shall proceed as described above. Patches shall be kept wet for five days. Tie holes left by the withdrawal of rods, or holes left by removal of ends of ties shall be filled solidly with mortar. For holes passing entirely force mortar through the wall, starting at the back face, shall be used. When hole is completely filled, excess mortar shall be struck off with a cloth flush with the surface. Holes not passing entirely through walls shall be filled solidly with mortar. Any excess mortar shall be struck off with a cloth on the wall surface. The surface of non-shuttered faces concrete work other than slabs shall be smoothed with a wooden float (or if approved with a steel trowel) to give a finish equal to that of the rubbed down shuttered faces. Concealed concrete faces shall be left as it is except that honeycombed surfaces shall be made good.

The top faces of slabs not intended to be surfaced shall be levelled and floated to a smooth finish at the levels or falls shown on the drawings or elsewhere.

The floating shall not be executed to the extent of bringing excess fine material to the surface. Ribbed surfaces of slabs shall where instructed be formed at the time of taming and levelling. Indentation in slab or stair surfaces shall be formed by approved implements giving the depth and patterns instructed. The top faces of slabs intended to be covered with screed, granolithic or similar surfacing shall be left with a spade finish.

The soffits of slabs and faces of walls intended to be rendered shall be roughened by approved means to form a key. Concrete surfaces to take finishes other than those specifically referred to herein shall be prepared in an approved manner to suit the finish as instructed.

3.8.2.22 Test of Structure

The Engineer shall instruct that a loading test be deemed necessary for one or more of the following reasons.

- (a) The site - made concrete test cubes failing to attain the specified strength.
- (b) Over - loading during construction of the Works or part thereof.
- (c) The shuttering being prematurely removed.
- (d) Concrete improperly cured.
- (e) Any other circumstances attributable to alleged negligence on the part of the Contractor, which in the opinion of the Engineer may result in the Works or part thereof being less than the expected strength.
- (f) Any reason other than the foregoing.

If the loading test be instructed to be made solely or in part for the reasons from (a) to (e) the test shall be made at the Contractor's own cost.



If the test be instructed to be made for the reason (f) the Contractor shall make the test and shall be reimbursed for all cost relating thereof irrespective of the result of the test.

For the purpose of a loading test on floors, roofs and similar structures and their supports, the test load shall be equivalent to 1 and 2/3 times the superimposed load for which the Works or part thereof to be tested has been designed. The test load shall not be applied within 90 days (or 28 days if rapid hardening Portland cement be used) of the completing of placing of the concrete in the part of the Works to be tested, and the latter shall not be supported during the test by shuttering or other non-permanent support. Measures shall be taken to ensure that in the event of a failure under the test temporary support of the loaded member shall be immediately available. The test shall proceed strictly as instructed. For the loading test on floors, roofs or similar structures the result shall be deemed satisfactory if upon removal of the test load the residual deflection does not exceed one-quarter of the maximum deflection after 24 hours loading. If the residual deflection exceeds this amount the test loading shall be repeated, and the result shall be deemed to be satisfactory if the residual deflection after removal of the second test load does not exceed one-quarter of the maximum deflection occurring during the second test.

If the result of the loading test is not satisfactory the Engineer shall instruct that part of the Works concerned shall be taken down or removed and reconstructed to comply with the specification, or that such other remedial measures shall be taken as to make the Works secure. If the test is instructed to be made for one or more of the reasons (a) to (e) as herein before specified, the Contractor shall take down, remove and reconstruct the defective work or shall take remedial measures instructed at his own cost.

3.8.2.23 Measurement

In calculating the contents of any R.C.C. member, for measurement proposes the dimensions adopted shall be structural concrete members exclusive of any finish,

- a) *Raft, slabs and beams*: It shall be measured in cum. of work done as per drawing. Measurement shall be done for the raft concrete below the column junction to the raft slab/beam. Nothing extra shall be paid for any odd size or shapes.
- b) *Beams*: Measurement shall be between R.C.C. columns or resting on walls cubic meter of the work done as shown on the drawing. The depth shall be taken from the bottom of the rib to the top of the slab or chajja, if any. Lintels when connected to main RCC structure shall be measured as beams.
- c) *Columns*: These shall be measured in cu.m. of work done according to the drawings from top of the footing or raft slab to the top of slab in case of ground floor and from top of slab to the top of slab for all other floors. Unless specified otherwise nothing extra shall be admissible for any odd size and for any special section and shape of column i.e. square, rectangular, round, elliptical etc. and laid at any angle as may be shown on drawings.
- d) *Walls*: These shall be measured from end of slab / column / beam, termed wall. It shall be paid in cubic meter excluding the finish.
- e) *Lintels*: All lintels spanning over independent openings unrelated to main RCC structure shall be measured under lintels, in cubic meter of the work done according to drawing. Width of the lintels shall be taken according to wall thickness specified unless set back or projected from wall as shown on the drawing. Unless otherwise described or shown on the drawings, bearing over the openings shall be depth of the lintel or 150 mm, whichever is higher.

- f) *Stairs*: These shall be measured in cu.m. of the concrete work done as per drawing. Unless specified otherwise nothing extra shall be admissible for steps laid in any shape or not straight in plan.
- g) *Folded Staircase*: The folded staircase shall be measured excluding the vertical main column. It shall be measured for step of any shape size and paid in cubic meter excluding the finish.
- h) *Fins and Louvers*: The RCC fins or louvers as provided shall be measured and paid in cubic meter. Nothing extra shall be allowed due to its shape, location or size.
- i) *Facia and parapets*: These shall be measured in cu.m. of the concrete work done as per design, drawing, excluding of finishing. For sills all projections upto 100mm. beyond the wall on either side shall be made without any extra charge and these shall be inclusive of forming any pattern of drip mould.
- j) *Mullions*: The RCC mullions shall be measured for all the slab, walls etc. forming the water tank. Nothing extra shall be allowed for its shape, size and location. It shall be paid in cubic meter of the concrete work.
- k) *Water tank*: These shall be measured in cu.m. of the propping, shuttering, and finishing the top and facing surface smooth with neat cement slurry complete but excluding the cost of reinforcement. It shall be paid in cu.m.

3.8.2.24 Miscellaneous Concrete Works

- a. Cement concrete M150 in window sill including formwork & cement plaster in 1: 3 (1 cement: 3 sand) complete.
- b. Cement concrete M150 shall conform to as in 6.3.4. The windowsill will be of specified thickness and size, shall be pre-cast or cast in situ with all the necessary formwork complete.
- c. The exposed underside and the top and facing shall be plastered neatly with cement mortar 1: 3: (1 cement: 3 sand).
- d. The grooved drip course shall be provided. The concrete shall be laid in slope as required as per drawing or as directed.
- e. Measurement: It shall be measured in cubic meter of the work done. The rate shall include all materials labor complete. It shall be paid in cu.m.

3.8.3 Reinforcement

3.8.3.1 Supplying and Fixing TMT Steel Bars

Supplying, cutting, bending, placing in position and binding TMT reinforcement bars of all sizes with provision of cover block of cement mortar (1:1), providing and fixing chairs, spacers to keep the bars in intended position including the cost of 18-gauge black iron binding wire all complete Thermo Mechanically Treated (TMT) Steel Reinforcement bars conforming to IS 1786-1985 or IS. 1139-1966 shall be used in RCC works. This item shall consist of supplying and fixing TMT Steel bars including bending, binding with 18 Gauge MS wire, placing in position including the cost of binding wire, as per drawing. This shall be paid in kg.



3.8.3.2 Mild Steel Reinforcement

Grade 1 M.S reinforcing bars shall conform to IS 432-1966 in RCC work. This item shall consist of supplying and fixing MS bars including bending, binding with 18 Gauge MS wire, placing in position including the cost of binding wire as per drawing. This shall be paid in kg.

Reinforcement shall be free from pitting due to corrosion, loose rust, mill scale, paint, oil, grease, adhering earth, ice or other materials that may impair the bond between the concrete and the reinforcement or that may in the opinion of the Engineer cause corrosion of the reinforcement.

3.8.3.3 Bar Reinforcement

Bar reinforcement described as "mild steel" shall be plain round hot rolled steel bars. Bar reinforcement described, as "TMT steel" shall be Thermo Mechanically Treated steel bars. With respect to manufacture, quality, physical properties and related requirements, reinforcement of the fore-going descriptions shall comply with appropriate parts of IS Standards Nos. 423-1966, 1139-1966 and IS. 1786-1985 for mild steel and TMT steel respectively. Panchakanya or Himal Jagadamba or Ambe TMT Steel is recommended to use.

3.8.3.4 Certificates and Tests for Reinforcement

For each consignment of reinforcement bars used in the Works the Contractor shall supply manufacturer's test certificate giving the ultimate strength, yield stress and elongation and the result of the cold bend test for each type and each size of bar. Tests for the purpose of obtaining the information shall confirm to relevant IS.

After the delivery of the reinforcement bars at site if it is found that the Manufacturer's Test Certificate for the lot is not available or on inspection by the Engineer the reinforcement bars thus supplied are found rusted/corroded the contractor will collect as many samples as required by the Engineer and get them tested on his own cost in an independent laboratory.

3.8.3.5 Dimensions of Reinforcement

The size of reinforcement bar described on the working drawings or elsewhere shall be the minimum and the rolling margin and other tolerance shall be wholly above this size. The length of a reinforcement bar shall be not less than the length on the drawing or elsewhere and shall not be more than 50 mm. in excess of that length. Bar bending schedule shall be prepared by the Contractor and submitted for approval of the Engineer. Such schedules shall be prepared based on reinforcement details, prior to the execution of the work. Nothing extra shall be paid for this.

3.8.3.6 Bending Reinforcement

Reinforcement bars shall be bent by approved means producing a gradual and even motion. Bars shall comply with the dimensions described in the drawings. Overall dimensions of bent or internal dimensions of bending or the like shall be within a tolerance of 30 mm. Any discrepancies or inaccuracies found by the Contractor in the drawings or other documents shall be immediately reported to the Engineer whose interpretation and requirements relating thereto shall be accepted. The internal radius of bends shall be not less than twice the size of the bars unless described to the contrary on the bending lists or elsewhere in the drawing. Hooks and other end anchorage bends for mild steel shall be bent to an internal radius of twice the diameter of the bar. This internal radius of the Bends of corners binders or stirrups or links shall be half.

3.8.3.7 Fixing Reinforcement

Reinforcement shall be accurately fixed by approved means maintained in the position described. Bars intended to be in contact shall be securely wired together at all such points with

16-gauge soft G.I. tying wire. Binders, stirrups and links shall tightly embrace the bars with which they are intended to be in contact and shall be securely wired or, if approved, spot-welded thereto.

Reinforcement shall be lapped, joined or spliced only at the positions described. Splices and like found to be necessary elsewhere shall be formed only if and as instructed. Lapping shall be provided as shown in the drawing and as permitted. Where practicable bars in each member shall be assembled and fixed in the form of a rigid cage or skeleton before placing in the moulds or formwork.

Immediately before concreting, the reinforcement shall be checked for position, cleanliness, freedom from rust or retarding liquid. Measure shall be taken to ensure that reinforcement remains correctly in position with required cover during the placing and consolidating of the concrete.

Reinforcement projecting from work being concreted or already concreted shall not be bent from its correct position for any reason unless approved and shall be protected from deformation for future extensions and also shall be thoroughly coated with cement grout wash or encased in concrete or otherwise protected from corrosion as instructed.

3.8.3.8 Cover of Concrete and Spacing of Bars

Unless otherwise described, the clear cover of concrete to the reinforcement shall be as follows:
Horizontal, vertical or inclined slabs: 15 mm. or the size of the main bars whichever is greater.

Lintels: 20 mm. or the size of the main bar whichever is greater.

Beams: 25 mm. or the size of the main bars whichever is greater. Binders and the like 15 mm. minimum.

Columns: Main bars for columns not exceeding 20 mm. diameter shall be 25 mm. and the main bars in columns exceeding 20 mm. diameter shall be 40 mm. or the size of the main bars whichever is greater. Rectangular binders or links or helical binding, 15 mm. minimum.

Piles: 75 mm or the size of the main bar whichever is greater.

Pile Caps: 50 mm or the size of the main bar whichever is greater.

Raft/mat footing: 50 mm or the size of the main bar whichever is greater.

General RCC Footings: 50 mm or the size of the main bar whichever is greater.

3.8.3.9 Measurement

For the purpose of ascertaining payments due to the Contractor the basis of measurements of bars or wire reinforcement used in the Works shall be the calculated weight in kg, which shall be computed from the sizes and lengths of the bars or wires described on the working drawings or elsewhere. No allowance in the weight shall be made for cutting to waste, rolling margin, extra length or other tolerances. Nothing extra, whatsoever shall be admissible on bars 12 mm and below rolled, the Contractor is deemed to have taken this factor into consideration and quoted accordingly in the tender. The Contractor's rate for unit weight of bars reinforcement shall be deemed to include all allowances omitted in calculating the weight and for any other tolerances, and for providing tying wire, chairs, spacer bars, and cover blocks as specified hereinafter for carriage and handling, for bending hooking, cranking, and for fixing and maintaining in the correct position in the Works. Standard laps of the lengths as shown in the drawing or as instructed at site shall be admissible. Standard hooks (9 times the diameter for each hook for mild steel) shall be added to the finished length to arrive at the length of the bar for cutting and measurement. No hooks are required for ribbed or for steel.



3.8.4 Formwork

Providing, placing, fixing, cantering and shuttering of plywood or steel formwork in any shape and sizes for slabs, beams, columns, shear walls, Lintel, foundation etc including nails, propping supports and removal of the same at any leads and lifts all complete

Supply, erection and removal of all types of formworks (cantering and shuttering) for concrete work including the erection of all supporting structures (scaffolding) such as props, struts, etc. including nailing, propping, strutting, wedging etc.; placing, levelling and aligning forms, applying form oil; sealing to prevent leakage of grout; and removal of forms all complete. It shall be paid in square metre.

3.8.4.1 Design

Formwork shall be designed and constructed in such a manner that concrete can be properly placed and thoroughly compacted without any movement in the formwork. Formwork shall be firmly supported and adequately strutted, braced, or tied. It shall be capable of adjustment to the lines and dimensions of the finished concrete and it shall be sufficiently strong to resist without distortion, the pressure of concrete during its placing and compaction, and other loads to which it may be subjected. It shall not be liable to suffer distortion under the influence of the weather. When concrete is to be vibrated, special care shall be taken to ensure that the formwork will remain stable and the joints tight. The safety and adequacy of cantering and shuttering shall be the sole responsibility of the Contractor. The Contractor shall if required supply to the Engineer shop drawings and calculations for the formwork he proposes to use.

3.8.4.2 Deflection and Camber

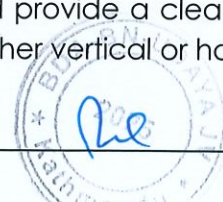
The Contractor shall make allowance for any settlement or deflection of the formwork that is likely to arise during Construction, so that the hardened concrete conforms accurately to the specified line and level. The Contractor shall also make allowance in the formwork for any camber specified by the Engineer to allow for the elastic deflection of structural members and deflection due to creep of the concrete. In the absence of any specified camber, the soffit of all beams and slabs shall be given a camber equal to $1/240$ of the span length to ensure that the structure has the prescribed shape after removal of the forms.

3.8.4.3 Supports

Formwork shall be constructed in such a way that the formwork to the sides of members can be removed without disturbing the soffit formwork or its supports. Props and supports shall be designed to allow the formwork to be adjusted accurately to line and level and to be erected and removed in an approved sequence without injury to the concrete. Supports shall be erected on sufficiently strong base to avoid injury to any portion of the structure by its settlement. Props and bracing shall be provided for the temporary support of composite construction where separately specified.

3.8.4.4 Joints and Edges

All joints in the formwork shall be close-fitted to prevent leakage of cement slurry from the concrete. At construction joints formwork shall be tightly secured against previously cast or hardened concrete to prevent the formation of stepping or ridges in the concrete. Formwork shall be constructed to provide straight and true angles, arises or edges. Where chamfers are shown to provide a smooth and continuous accurate alignment at sides and provide a clean line at construction joints in the concrete, they shall be fixed with their joints either vertical or horizontal, unless otherwise specified.



3.8.4.5 Sundries

Formwork shall be provided to the top surface of concrete where the slope or the nature of the work requires it. Provision shall be made for forming holes and chases for services and for building in pipes, conduits and other fixings, as shown on the drawings. The material and position of any ties passing through the concrete shall be to the Engineer's approval. Except where corrosion of a metal tie is unimportant it shall be possible to remove a tie so that no part of it remaining embedded in the concrete shall be nearer to the finished surface of the concrete than the specified thickness of cover to the reinforcement. Any holes left after the removal of ties shall be filled with concrete or mortar of approved composition.

3.8.4.6 Cleaning and Treatment of Formwork

Space to be occupied by concrete shall be free from all rubbish, chipping, shaving, sawdust, dirt and tying wire etc., before concrete is placed. The formwork to be in contact with the concrete shall be cleaned and treated with suitable non-staining form oil or other approved material. Care shall be taken that oil or composition is kept away from contact with the reinforcement or with concrete at any construction joints. Surface retarding agents shall not be used except with the permission of the Engineer. Formwork shall be thoroughly cleaned after each use. Damaged or distorted formwork shall not be used.

3.8.4.7 Striking or Removal of Formwork

All formwork shall be removed without shock or vibration that might damage the concrete. Before the soffit and props are removed the surface of the concrete shall be exposed where necessary in order to ensure that the concrete has hardened sufficiently. In no circumstances shall formwork be struck off until the concrete reaches cube strength of at least three times the stress to which the concrete may be subjected at the time of striking. The formwork to vertical surfaces such as walls, columns and sides of beams may be removed after 24 hours in normal weather conditions although care must be taken to avoid damage to the concrete, especially to arise and features. In cold weather a longer period may be necessary before striking. The concrete must be properly protected from any damage and from premature drying that may reduce the ultimate strength of the concrete. Curing should continue immediately follow the removal of the formwork until the concrete has reached its design strength. Suitable curing methods should immediately follow the removal of the formwork.

Forms for various types of structural components shall not be removed before the minimum periods specified below and shall be subject to the approval of the Engineer.

Ordinary Portland Cement Concrete				Rapid Hardening Portland Cement Concrete	
Temp. (°C)	40 – 20	20 – 5		40 – 20	20 – 5
Part of Structure	Days	Days		Days	Days
a. Column & Walls	1	2	Do not remove forms until site cured test	½	2

b. Beams sides	2	4	Cylinders develop 50% of 28 days strength	1	3
c. Slabs 125mm	7	14		4	7
d. Slab below 125mm	14	21		8	14
e. Soffit of main beam	21	28		10	16
f. Cantilever beam & slab	28	28		14	21

3.8.4.8 Before removing any formwork, the contractor must notify the Engineer well in advance to enable him to inspect the concrete if he so desires.

The times given for the removal of props are based on the assumption that the total live plus dead weight to be supported at the time of removal is not more than one half the total design load. For horizontal members where the loading is a higher proportion of the total design load these times may need to be increased.

The contractor shall record on the drawing or in some approved manner the date on which the concrete is placed in each part of the work and the date on which the formwork is removed and the record shall be checked and countersigned by the Engineer. The contractor shall be responsible for the safe removal of the formwork. However, the Engineer may delay the time of removal if he considers it necessary. Any work showing signs of damage through premature removal of formwork or loading shall be entirely reconstructed at the contractor's own expense.

3.8.4.9 Tolerances

The formwork shall be so made as to produce a finished concrete true to shape, lines, levels, plumb and dimensions as shown on the drawings subject to the following tolerances unless otherwise specified elsewhere in this specification or drawings or directed by the Engineer.

- a. Sectional dimension - 5mm
- b. Plumb - 1 in 1000 of height
- c. Levels - 3 mm before any deflection has taken place.

3.8.4.10 Reusing Forms

Formwork that in any way has been damaged in removal, handling or storage, or shuttering that is not absolutely clean and free of foreign matter and old concrete shall not be reused unless approved by the Engineer. Formwork shall not be used or reused if declared unfit or unserviceable by the Engineer.

3.8.4.11 Rate

Rate shall include the supply and storage of all material, scaffolding, equipment and labour to erect, align, form oil and its application, seal and remove formwork for any shape, size and quantity of concrete work as specified in the design and bill of quantities, all complete.



3.8.4.12 Measurement

Measurement for payment shall be done of the area on which cantering shuttering has been done. It shall include the application of the form oil, scaffolding and removal of the formwork as well.

3.9 WOODWORK

3.9.1 Quality

Generally, the timber shall be Sal wood unless otherwise stated of the best quality obtained from an approved sawmill. Timber for carpentry shall be straight and free from twist, sapwood, shakes, dead and loose knots, worm holes, other holes, signs of decay and other defects, and seasoned and shall comply with the requirements of IS 883-1994 All the timber shall be seasoned and free from decay, harmful fungi and insect attacks and from any other damage of harmful nature which will affect the strength, durability, appearance or its usefulness for the purpose for which it is required. The minimum compressive strength of the timber shall be 70 kg/cm².

3.9.2 Kind

The timber shall be best quality timber as specified in the item. The samples of the approved timber to be used shall be deposited in the office of Engineer for the purpose of comparison.

Colour:

The Colour shall be uniform as far as possible, the darkness of colour amongst colour species of timber being generally a sign of strength and durability.

Moisture:

The natural moisture content of any untreated timber delivered to site shall not exceed those as recommended by IS 287-1993. All timber shall be seasoned to moisture content of not more than 22% for frames and 15% for shutter. The contractor's price must include for any kiln drying that may be necessary to achieve these figures.

3.9.3 Sawing

All beams and scantling shall be sawed straight lines, planes and of uniform thickness with full measurement from end to end and shall be sawn along grain and under no condition beams, rafters, wall plates, blocks etc. shall be sawed across grain. They shall be sawn with such sufficient margin as to secure specified dimensions, lines and planes after being brought and dressed.

All woodwork except door/window frames or ceiling shall be painted with two coats of creosote conforming to IS 218 1952. Any timber rejected shall at once be removed from the site. The contractor shall be responsible up to the end of the maintenance period for executing at his own cost all work necessary to eradicate insect attack of timber which becomes evident, including the replacement of timber attacked or suspected of being attacked, notwithstanding that the timber concerned may have already been inspected and passed.

3.10 DOORS, WINDOWS & VENTILATIONS

3.10.1 uPVC Works

3.10.1.1 UPVC Window & Ventilation/ Louver Frames & Shutters

Polyvinyl chloride Resin suspension grade is the basic raw material for forming PVC compound. PVC resin then is mixed with chemicals like Calcium, Stearate, Hydrocarbon Wax, Titanium Dioxide, Calcium Carbonate, and acrylic processing aids. Further, additives like impact

modifiers, pigments, epoxy plasticizer, UV stabilizer, lubricants, chemical blowing agent etc. are added. The purpose of adding the chemicals and additives is to impart cellular structure, strength, surface finish, colour and resistance to fading by light rays. These chemicals are mixed in the desired proportion and shall be used in the formulation of PVC material and for free and smooth extrusion of PVC profiles.

The Upvc work as scheduled and detailed shall be fabricated as per the Drawings. Fabricated Upvc work covered by this specification. shall be supplied and installed by the well-known local Upvc fabricators or manufacturer as approved by the Engineer.

Before placing any orders, the Contractor shall state the name of the window manufacturer he has selected from the list of approved manufacturers. The nominated manufacturer shall not be changed without prior approval of the Engineer.

The Quantity of UPVC door (Casement/Swing/Sliding etc.), window (Casement/Sliding etc.), and ventilator/Louvers frames and shutters may vary as per the requirement of site conditions in the revised drawings later. It shall be paid in sq.m.

3.10.1.2 UPVC Sections

- a) Providing and fixing UPVC Sliding window with net, frame 50x80mm, sash 58x36mm, white color with 5mm glass all complete.
- b) Providing and fixing UPVC Casement window with frame 60x60mm, sash 60x78mm, white color with 5mm glass all complete.
- c) Providing and fixing UPVC Fixed window with net, frame 50x80mm, sash 58x36mm, white color with 5mm glass all complete.
- d) Providing and fixing UPVC Single Door with full panel frame 60x60mm, sash 60x104mm, with color all complete.

The UPVC work as scheduled and detailed shall be fabricated as per drawings.

3.10.1.3 Fabricated UPVC Work

Fabricated UPVC work covered by this specification shall be supplied and installed by the well-known UPVC fabricators as approved by the Engineer.

Before placing any orders, the Contractor shall state the name of the manufacturer he has selected from the list of approved manufacturers. The nominated manufacturer shall not be changed without prior approval of the Engineer.

3.10.1.4 Materials

Extruded aluminium components shall be manufactured from aluminium alloy B 6063 - T5. The lining to louver panels shall be 1.0 mm thick sheet aluminium powdered as specified. Hardware and hinges shall be as approved by the Engineer.

3.10.1.5 Manufacture

UPVC work shall be fabricated in accordance with the prevalent practice among the local Manufacturers and as per drawings showing jointing details, hardware and extrusion profiles.

It will be the UPVC fabricators as well as the Contractors' responsibility to ensure that all fabricated aluminium work is carried out in accordance with drawings of the current series.

3.10.1.6 Finish and Protection

Fabricated UPVC work shall be caustic etched, powdered and sealed as required by AS K182 and finished with two coats of an approved lacquer.



All components shall be powdered 0.03 mm thick

3.10.1.7 Workshop Drawings

The Contractor shall arrange for the preparation of complete workshop drawings of all fabricated UPVC work and shall submit the same to the Engineer for his approval.

3.10.1.8 Fixing and Strength of Main Members

Main members shall be of such strength that a wind pressure of 1.16 kPa shall cause a deflection of not more than 1/240 of the span of the member. No permanent deflection shall result from such conditions of loading.

Fixing to members shall be such that the above loading shall be generated in the members without sufficient stress to cause failure or movement to be evident at any joint.

The UPVC fabricator and the Contractor shall take full responsibility that all fabricated aluminium work shall comply with the above conditions.

Load bearing brackets shall be fabricated and fixed as shown on the architectural drawings.

3.10.1.9 Expansion

Provision for vertical and horizontal expansion must be fully detailed on the UPVC fabricator's workshop drawings.

Vertical and horizontal expansion joints shall be so designed as to cover all weather conditions likely to be encountered on the site.

3.10.1.10 Flashing

All flashing required to be built in as the work proceeds shall be supplied by the building contractor and built in by the trade concerned.

All other flashing as detailed on the drawings shall be supplied and fixed in position by the UPVC fabricator.

The UPVC door, window, ventilation frames shall be installed in position and fixed rigidly in the wall, columns with metal grips confirming ISI and stainless-steel screws of dia. 6 - 8 mm. The spacing of grips shall be kept at 500mm.

3.10.1.11 Weather seals

Approved British or Dow corning or equivalent weather seals as approved by the Engineer shall be metal backed/backing foam, siliconized, of the size called for on the relevant Public Works Department drawings. The adjacent glass areas are masked using a masking tape before application of silicone. The surface is cleaned with cleaning solvent. Now the sealant application is started by injecting weather sealant in between the glass over the backing foam or between glass and frame or between composite panels or between wall and aluminium frame. The sealant is immediately tooled after the sealant application and the masking tape is removed. Finally, the glass and aluminium is cleaned from inside and outside

3.10.1.12 Glazing

Providing and fixing approved brand, and type and thickness of glass and for double glazed and single glazed as mentioned in the bill of quantities in door, clerestory, window, and ventilator/Louvers shutters with gaskets as shown in the Drawing. The strong adhesive double-sided tape shall be applied for structural glazing work as directed by the Engineer.

3.10.1.13 Material

The glass of specified thickness and type shall be provided of approved make and shade. The glass shall be free from shacks, bubbles, and air holes, veins blisters or any other defects. It shall be of uniform thickness. Samples shall be approved prior to use.

3.10.1.14 Workmanship

All windows shall have glazed fixed on outside face or as shown on drawings. The glass shall be cut to size to fit slightly loose. The panel pins shall be spaced not more than 500 mm. apart.

There shall be minimum 44 glazing clips per square metre of glass. Cracked, scratched glass shall be rejected. Rubber channels can also be used in place of gaskets.

3.10.1.15 Fly wire mesh

Providing and fixing GI fly wire mesh of 16gauge to window/ventilation as per design, drawing and approval of Engineer.

3.10.1.16 Measurement

It shall be done in square metre of the area done. Rate shall include labour, materials, fabrication and fixing including all necessary accessories such as French rollers, U shaped P.V.D.F gasket, Steel hook-locks, Japanese floor spring, Chrome Handle and with Double lock, Jointing to masonry shall be set with 1st class silicone on foam seal, 5 mm clear float glass in windows/ventilators and 8 mm clear float glass in doors with sand blast and high edge polish, MS Fly screens of 18 gauge on all openable windows and other necessary fixtures and fittings all complete. It shall be paid in sq.m.

3.10.1.17 Payment

Payment for work will be made on the basis of contract unit price indicated in the BOQ. The payment will be full and final compensation for all material, labour, and equipment to complete the works as specified.

3.10.2 Aluminium Works**3.10.2.1 Aluminium Window & Ventilation/ Louver Frames & Shutters**

Providing, fabrication and fixing of powder coated (30 microns thickness) Aluminium window and ventilator/Louvers frames and shutters (1.2- 2 mm thickness) including all necessary accessories such as 4 mm clear float glass in windows/ventilators and 6 mm clear float glass in doors with sand blast, 8mm, 10 mm th. Laminated particle board for doors of toilets and balconies, 16-gauge fly screens on all openable windows and high edge polish, French rollers, U shaped P.V.D.F gasket, Steel hook-locks, Japanese floor spring, Chrome Handle and with Double lock, 18-gauge Fly screens on all openable windows all complete as per drawing using the following sections and necessary fixtures and fittings. The Quantity of aluminium door (Casement/Swing/Sliding etc.), window (Casement/Sliding etc.), and ventilator/Louvers frames and shutters may vary as per the requirement of site conditions in the revised drawings later. It shall be paid in sq.m.

3.10.2.2 Aluminium Sections

Providing and fixing 2 or 3 panel sliding window of aluminium section in naturally anodized or black anodized/powder coated color, section size (87x56x1.2mm) fitted with 5mm clear glass with stainless steel fly mesh shutter.



Providing and fixing fixed window of aluminium section in naturally anodized or black anodized/powder coated color, section size(87x25+12*1.2mm) fitted with 5mm clear glass with stainless steel fly mesh shutter.

Supply and Installation of Aluminium Louver System Ventilation with naturally anodized color with section 101.6mmx44mmx1.5mm with 5mm clear glass and steel net including materials, labour, fixing and fitting all complete as per drawings, specification and instruction of the Engineer.

The aluminium work as scheduled and detailed shall be fabricated as per drawings.

3.10.2.3 Fabricated Aluminium Work

Fabricated aluminium work covered by this specification shall be supplied and installed by the well-known aluminium fabricators as approved by the Engineer.

Before placing any orders, the Contractor shall state the name of the manufacturer he has selected from the list of approved manufacturers. The nominated manufacturer shall not be changed without prior approval of the Engineer.

3.10.2.4 Materials

Extruded aluminium components shall be manufactured from aluminium alloy B 6063 - T5. The lining to louver panels shall be 1.0 mm thick sheet aluminium powdered as specified. Hardware and hinges shall be as approved by the Engineer.

3.10.2.5 Manufacture

Aluminium work shall be fabricated in accordance with the prevalent practice among the local Manufacturers and as per drawings showing jointing details, hardware and extrusion profiles.

It will be the aluminium fabricators as well as the Contractors' responsibility to ensure that all fabricated aluminium work is carried out in accordance with drawings of the current series.

3.10.2.6 Finish and Protection

Fabricated aluminium work shall be caustic etched, powdered and sealed as required by AS K182 and finished with two coats of an approved lacquer.

All components shall be powdered 0.03 mm thick.

3.10.2.7 Workshop Drawings

The Contractor shall arrange for the preparation of complete workshop drawings of all fabricated aluminium work and shall submit the same to the Engineer for his approval.

3.10.2.8 Fixing and Strength of Main Members

Main members shall be of such strength that a wind pressure of 1.16 kPa shall cause a deflection of not more than 1/240 of the span of the member. No permanent deflection shall result from such conditions of loading.

Fixing to members shall be such that the above loading shall be generated in the members without sufficient stress to cause failure or movement to be evident at any joint.

The aluminium fabricator and the Contractor shall take full responsibility that all fabricated aluminium work shall comply with the above conditions.



Load bearing brackets shall be manufactured from 40 x 6 mm. mild steel bent to shape, hot dipped galvanised, bitumen coated only on surfaces coming in contact with aluminium and spaced at not more than 500 mm. Centres as approved by the Engineer.

Load bearing brackets shall be fabricated and fixed as shown on the architectural drawings.

3.10.2.9 Expansion

Provision for vertical and horizontal expansion must be fully detailed on the aluminium fabricator's workshop drawings.

Vertical and horizontal expansion joints shall be so designed as to cover all weather conditions likely to be encountered on the site.

3.10.2.10 Flashing

All flashing required to be built in as the work proceeds shall be supplied by the building contractor and built in by the trade concerned.

All other flashing as detailed on the drawings shall be supplied and fixed in position by the aluminium fabricator.

The aluminium door, window, ventilation frames shall be installed in position and fixed rigidly in the wall, columns with metal grips confirming ISI and stainless-steel screws of dia. 6 - 8 mm. The spacing of grips shall be kept at 500mm.

3.10.2.11 Weather seals

Approved British or Dow corning or equivalent weather seals as approved by the Engineer shall be metal backed/backing foam, siliconized, of the size called for on the relevant Public Works Department drawings. The adjacent glass areas are masked using a masking tape before application of silicone. The surface is cleaned with cleaning solvent. Now the sealant application is started by injecting weather sealant in between the glass over the backing foam or between glass and frame or between composite panels or between wall and aluminium frame. The sealant is immediately tooled after the sealant application and the masking tape is removed. Finally, the glass and aluminium is cleaned from inside and outside.

3.10.2.12 Glazing

Providing and fixing approved brand, and type and thickness of glass and for double glazed and single glazed as mentioned in the bill of quantities in door, clerestory, window, and ventilator/Louvers shutters with gaskets as shown in the Drawing. The strong adhesive double-sided tape shall be applied for structural glazing work as directed by the Engineer.

3.10.2.13 Material

The glass of specified thickness and type shall be provided of approved make and shade. The glass shall be free from shacks, bubbles, and air holes, veins blisters or any other defects. It shall be of uniform thickness. Samples shall be approved prior to use.

3.10.2.14 Workmanship

All windows shall have glazed fixed on outside face or as shown on drawings. The glass shall be cut to size to fit slightly loose. The panel pins shall be spaced not more than 500 mm. apart.

There shall be minimum 44 glazing clips per square meter of glass. Cracked, scratched glass shall be rejected. Rubber channels can also be used in place of gaskets.

3.10.2.15 Fly wire mesh

Providing and fixing GI fly wire mesh of 16 gauge to window/ventilation as per design, drawing and approval of Engineer.

3.10.2.16 Laminated particle board

Providing and fixing of 10mm thick laminated particle board for doors of toilets and balconies may be used as per BOQ and drawing.

3.10.2.17 Measurement

It shall be done in square meter of the area done. Rate shall include labour, materials, fabrication and fixing including all necessary accessories such as French rollers, U shaped P.V.D.F gasket, Steel hook-locks, Japanese floor spring, Chrome Handle and with Double lock, Jointing to masonry shall be set with 1st class silicone on foam seal, 6 mm clear float glass in windows/ventilators and 8 mm clear float glass in doors with sand blast and high edge polish, MS Fly screens of 18 gauge on all openable windows and other necessary fixtures and fittings all complete. It shall be paid in sq.m.

3.11 FLOORING

3.11.1 Plain Cement Concrete

Providing, mixing, laying and compacting (1:2:4 concrete) screeding of specified thickness on floor in true line and level including the cost of curing all complete

Plain cement concrete M15 (1:2:4) flooring with cement, sand and stone ballast, including laying in panels (the side of the panels shall be bounded with teak wood batten or flat iron bars of same size and fixed with weak mortar or with nails or hooks), providing proper slope for draining wash water, all complete, in sqm.

3.11.1.1 Preparation of Base

Before laying the cement concrete screeding, base shall be cleared of all foreign matter. If necessary, the base shall chip and cleaned with wire brushes. Clean base shall then be wetted with water thoroughly, but no water pool shall be allowed. Necessary slope shall be given as per the drawing and instruction of Engineer.

3.11.1.2 Proportion

The proportion shall be 1 cement: 2 sands: 4 stone aggregate 12 mm. and down gauge by volume as specified in the schedule. Grading of aggregate shall be as per reinforced concrete specification.

3.11.1.3 Placing

The screeding shall be laid to specify thickness and maintain the slope as per the drawing and instruction of Engineer. Screeding of the flooring shall be casted in one operation.

3.11.1.4 Finishing

Compact first with wood float. The blows shall be fairly heavy but as consolidation takes place, light rapid strokes shall be given. Beating shall continue till all hollows in concrete are filled with mortar cream. Then the surface shall be troweled till the moisture disappears. The surface shall be checked with straight edge. The finish surface shall be cured for 7 days. Sample of workmanship shall be got approved prior to work.

3.11.1.5 Measurement

Measurement shall be the exact length and breadth. It shall be paid in Sq.m of the work done. Nothing shall be admissible for slope, small area, corners and work in any shape. No deduction shall, however, be made for protruding or independent columns occurring in the floor, door frame embedded in floor or any other part, when the area involved does not exceed 0.1 sq. m. Rate shall include materials and labour complete.

3.11.2 Skirting**3.11.2.1 Cement skirting**

Providing and laying 20 mm. thick cement plaster skirting up to 150 mm. height with cement mortar 1:3 (1 cement: 3 sand) finished with a floating coat of neat cement and hardening liquid including curing.

It shall be paid in rm.

The thickness of the skirting shall be governed by the thickness of internal plaster. It shall project by 6 mm. from the finished surface of the plaster. The receiving surface shall be prepared similar to that for the plastering on walls.

3.11.2.2 Mortar

Mortar shall be 1 cement: 3 sand well mixed and applied as per cement plaster. When the surface becomes even it shall be uniformly covered with a coat of neat cement mixed integrally with the hardening liquid 2 litres to 50 Kg. of cement 6 mm. thick finished smooth. The corners, angles, junctions shall be truly vertical and or horizontal. Rounding of corners and junctions as required shall be done without any extra charge. The finished surface shall be cured for 7 days.

Samples of workmanship shall be got approved prior to execution of work.

3.11.2.3 Measurement

It shall be measured in ruining metre of the work done. The rate shall include material and labour complete. It shall be paid in RM.

3.11.3 Cement Punning

Providing, mixing, laying cement punning (1:1) in true line and level including the cost of curing, grooving (if any) as per drawing, specification

It shall be paid in sq. m.

Measurement: It shall be in square metre of the work done and rate shall include material and labour complete.

3.11.4 Porcelain Floor/Wall/Skirting Tiles

Providing and laying natural glazed/mat finish coloured homogeneous porcelain tiles on wall / floor / skirting of Indian/Chinese brand of approved colour and size in cement mortar 1:4 or 1:2, as indicated in the Bill of Quantity and Drawings all complete.

3.11.4.1 Materials

Mat finish porcelain tiles (soman/ Nitco/AGL/Kajariya or equivalent) shall be of homogeneous natural finish of approved colour, model and make. These shall be of specified size approved by the Engineer.



3.11.4.2 General

Prior to installing any tile, the Contractor shall inspect surfaces and conditions in areas to receive tile work and shall notify the Engineer of any serious defects or conditions that will interfere with or prevent a satisfactory tile installation and shall co-ordinate with other trades of work.

3.11.4.3 Installing the Tile

The surface shall be brushed, cleaned and wetted. Tile shall be soaked completely by immersing in clean water at least 30 minutes and drained. No free moisture shall be allowed to remain on the backs of the tiles at the time of setting. Tiles shall be installed by applying a skim coat of plastic mix of 1:4 (1 cement: 4 sand) or 1:2 (1 cement: 2 sand), as may be the case, cement mortar maximum 12 mm thick on wall/floor by firmly pressing tile into the cement mortar applied on the wall so that the back of the tile is completely in touch with the mortar. Joints in the tile work shall be accurately aligned with horizontal joints level and vertical joints in plumb. Joints shall be maintained uniformly 1.5 mm wide or as directed by the Engineer by aligning spacer lugs on tile edges if tiles are so manufactured or by use of wetted strings. Tiles shall be laid out in such a way that no tile is less than half size course. Where tile must be cut at edges or penetrated the cut edges shall be carefully filed and neatly ground. Chipped, cracked or broken tiles shall not be used and all defective work shall be replaced and repaired to the satisfaction of the Engineer at the Contractor's expense. After tiles have been set firm and strings from set tiles removed tiles shall be dampened and joints grouted full with a plastic mix of white cement by trowel, brush or finger application. During grouting all excess grout shall be cleaned off the tile surface with damp cloth or sponge. All tile work finishing shall be adequately protected from damage during the progress of construction till completion and any damage shall be repaired to the satisfaction of the Engineer at the Contractor's expense. Upon completion prior to final inspection and acceptance, the Contractor shall clean all tile work. Acids or other agents liable to damage the work shall be avoided. If tile surface shows mass scratches, cracks or other imperfections, which cannot be removed by cleaning; the contractor shall remove the defective material and replace with new material at no additional expense.

Sample of workmanship shall be approved prior to execution of work.

3.11.4.4 Measurement

The measurement shall be done in square metre of the work done on floor/wall/skirting including the setting mortar. Rate shall be for the material and labour complete. This shall be paid in sq.m.

3.11.5 Vitrified Floor/Wall/Skirting Tiles

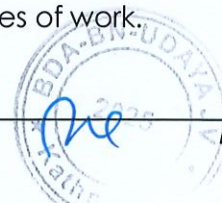
Providing and laying natural glazed/mat finish coloured homogeneous 8mm thick vitrified tiles on wall / floor / skirting of Indian/Chinese brand of approved colour and size in cement mortar 1:4 or 1:2, as indicated in the Bill of Quantity and Drawings all complete.

3.11.5.1 Materials

Mat/glazed finish vitrified tiles (somany/ Nitco/AGL/Kajariya or equivalent) shall be of homogeneous natural finish of approved colour, model and make. These shall be of specified size as per BOQ or approved by the Engineer.

3.11.5.2 General

Prior to installing any tile, the Contractor shall inspect surfaces and conditions in areas to receive tile work and shall notify the Engineer of any serious defects or conditions that will interfere with or prevent a satisfactory tile installation and shall co-ordinate with other trades of work.



3.11.5.3 Installing the Tile

The surface shall be brushed, cleaned and wetted. Tile shall be soaked completely by immersing in clean water at least 30 minutes and drained. No free moisture shall be allowed to remain on the backs of the tiles at the time of setting. Tiles shall be installed by applying a skim coat of plastic mix of 1:4 (1 cement: 4 sand) or 1:2 (1 cement: 2 sand), as may be the case, cement mortar maximum 12.5 mm thick on wall/floor by firmly pressing tile into the cement mortar applied on the wall so that the back of the tile is completely in touch with the mortar. Joints in the tile work shall be accurately aligned with horizontal joints level and vertical joints in plumb. Joints shall be maintained uniformly 1.5 mm wide or as directed by the Engineer by aligning spacer lugs on tile edges if tiles are so manufactured or by use of wetted strings. Tiles shall be laid out in such a way that no tile is less than half size course. Where tile must be cut at edges or penetrated the cut edges shall be carefully filed and neatly ground. Chipped, cracked or broken tiles shall not be used and all defective work shall be replaced and repaired to the satisfaction of the Engineer at the Contractor's expense. After tiles have been set firm and strings from set tiles removed tiles shall be dampened and joints grouted full with a plastic mix of white cement by trowel, brush or finger application. During grouting all excess grout shall be cleaned off the tile surface with damp cloth or sponge. All tile work finishing shall be adequately protected from damage during the progress of construction till completion and any damage shall be repaired to the satisfaction of the Engineer at the Contractor's expense. Upon completion prior to final inspection and acceptance, the Contractor shall clean all tile work. Acids or other agents liable to damage the work shall be avoided. If tile surface shows mass scratches, cracks or other imperfections, which cannot be removed by cleaning; the contractor shall remove the defective material and replace with new material at no additional expense.

Sample of workmanship shall be approved prior to execution of work.

3.11.5.4 Measurement

The measurement shall be done in square metre of the work done on floor/wall/skirting including the setting mortar. Rate shall be for the material and labour complete. This shall be paid in sq.m.

3.11.6 Marble Flooring

Providing and laying 16 -18mm thick Rajasthani Marble in floor & wall skirting (approved colour and pattern) in 1:2 green mortar including the cost of cutting, grinding, polishing, groove making, moulding, placing and filling with grout and screeding of required thickness in 1:6 cement mortar as required all complete as per specification

3.11.6.1 Materials

Marble stone floor shall be used for specified areas. The marble slabs shall be of selected quality, hard, sound, dense, and homogeneous in texture free from cracks, decay, weathering and flaws.

The Sample shall be approved by Engineer before supplying and laying.

The thickness of the marble slab shall be 16-18 mm and shall be machine cut to required dimensions. The bedding mortar for the marble slab shall be minimum 12 mm thick 1:2 (1 cement: 2 sand mortar). Before laying marble floor it is essential that a level surface is required. The joints shall be as fine as possible. The flooring shall be cured for a minimum period of seven days. Slight unevenness at the meeting of edges of marble slabs shall be removed by chiselling. The surface shall be ground evenly with machine fitted with finest grade grinding stones. Then oxalic acid shall be dusted over the surface sprinkled with water and rubbed hard with pad and woollen rags to give smooth and shining finished surface.