NEEDS STATEMENT
FOR
DESIGN AND BUILD WORKS

(Civil Engineering Requirements For Buildings Projects)

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SECTION A

GENERAL

A GENERAL

1.0 Scope of Works

The Works shall cover planning, design, construction supervision, testing, commissioning and maintenance thereof for the period on the following works:-

B1. ~~EARTHWORKS~~
B2. ~~DRAINAGE SYSTEM~~
B3. ROAD WORKS
B4. ~~EXTERNAL WATER SUPPLY SYSTEM~~
B5. ~~SEWERAGE SYSTEM~~
B6. ~~WASTE DISPOSAL SYSTEM~~
B7. FENCING AND GATES

2.0 Special Requirements

2.1 All Works with respect to investigations, design, construction and maintenance shall comply with all the Government Requirements Regulations and By-laws.

2.2 All engineering investigations, design, construction, and supervision shall be carried out, developed and refined by the Contractor who shall engage qualified Consultants or P.E. (Professional Engineers registered with the Board of Engineers, Malaysia) and License Surveyor for the relevant disciplines of the Works. The Contractor shall undertake to do all detailed drawings and alterations as and when necessary at no cost variation to the accepted Tender Sum.

2.3 Prior to the engagement of a qualified Consultant or P.E as the Independent Checking Engineer (referred to as the Checker hereinafter) for this project, the Contractor shall submit and propose a minimum of 3 names to JKR for approval. The Checker shall take full responsibility for integrity, thoroughness and competence of his report and recommendation. It's adequately carried out in accordance with the accepted engineering practice and to ensure the structural integrity and stability of the proposed construction. The Checker's criteria and scope of services shall be referred to the relevant clauses below.

2.4 All designs shall optimally satisfy the requirement of the latest standard engineering practice in respect of functional adequacy, safety, robustness, suitability and effectiveness. The designs shall be approved by the local and the central authorities and be in the best layout with most suitable material to give the best economic and good aesthetic values.

2.5 The Contractor shall include the Design Development Plan (DDP) in the Critical Path Method (CPM) to be submitted to the Project Director (PD). The DDP shall include all the design phases in detail.

2.6 The Contractor shall submit detailed designs for all aspects of the Works mentioned in Clause 1.0. Any changes in the design shall be supported with design reports and subjected to the PD's approval.

2.7 All engineering and shop drawings prepared and signed by P.E engaged in the design and supervision of the works shall be submitted to PD's and/or the Local Approving Authorities.

2.8 The onus of obtaining timely approval from each relevant Local Approving Authority for each design drawing shall be the Contractor's responsibility. Untimely receipt of approvals which may affect the Contractor's design/construction program shall not in any way be a basis/cause for consideration of time extension or variation to the contract.

2.9 All design calculations shall be prepared and signed by the respective P.E. The calculations shall be submitted to the PD for approval.

2.10 Approval or acceptance by the PD or the Local Approving Authority of the Consultants drawings and design calculations shall not relieve the Contractor of his responsibilities and liabilities in the design.

2.11 The Contractor shall submit his detail design plan indicating progressive interactive submission and approval, within 2 weeks from the date of issuance of Letter of Acceptance (L.A).

3.0 Design Criteria

3.1 The Works shall be designed by the Consultants engaged by the Contractor in accordance with the particular design criteria and design methods as stated in the design statements. In the absence of any such statements for any design aspect or any design element, it shall be the responsibility of the Contractor to adopt well-known and internationally accepted updated edition of the Codes of Practice/ Standards/ criteria and method in the design.

3.2 All design criteria shall be subjected to the acceptance of the PD with the submission of the necessary justification-implication by the Contractor.

3.3 The design concept shall adhere to that shown in drawings and other relevant document.

4.0 Standards and Codes Of Practice.

4.1 Codes of Practice, Manual and Standards adopted to cover design, materials workmanship, performance, etc. shall be relevant to Malaysian Standards or International Codes of Practice or Standards.

4.2 The design and construction of the Works shall be professionally undertaken by the Contractor. The Contractor shall comply with the requirements of relevant Malaysian Standards and Manual or International Codes of Practice or Standards.

4.3 The order or preference of Codes of Practice and Standards shall be Malaysian, British and followed by any other approved International Codes of Practice or Standards. Where International Codes of Practice or Standards are quoted in the Specifications, these shall be substituted by equivalent Malaysian Codes of Practice, Manual and Standards where available. Should there be any conflict in the Codes of Practice or Standards requirements, and then unless otherwise approved by the Project Director, the more stringent criteria are to be adopted.

4.4 The Contractor shall adopt the latest edition of each Standard, Manual and Code of Practice as at the time of award of Tender, notwithstanding the reference year of the edition of that stated in the Standards, Manual and Codes of Practice in the ensuing Clauses of this Specification.

5.0 Independent Checker.

5.1 Professional Criteria.

The name of personel and their qualifications of at least one individual expert for the field of structural, geotechnical and civil disciplines respectively shall be committed by the Contractor for JKR approval.

The experts shall have at least 10 years of working experiences at the professional level in their respective design works or have published several technical papers in their specialised fields (not less than 5 technical papers in National/International seminar, conferences or journals); and by virtue of professional standing and experiences, deserving of such a designation.

The Checker shall not have any financial or professional interest in the project he is undertaking such related materials. The report may include the checkers suggestion, amendments, alternative solutions and designs for amendments and or alternative solutions.

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5.2 Scope of Services.

The Checker shall issue a certificate in respect of the plans relating to the structure, geotechnical, civil and associated Works stating that, to best of his knowledge and belief, the plans so checked do not show any inadequacy in the design and details of the key elements.

The checker shall evaluate, analyse and review the structural, geotechnical and civil design and details in the plan and perform such independant calculations with a view to determine the adequacy of key elements.

The checker shall verify that the key elements designed are consistent with general layout shown and in any amendments there to.

The Contractor shall make sure sufficient working drawing details and specifications be made available to the checker.

The checker in carrying out this is required to (but not limited):

a. verify the use of Code of Practice, Design Standards and Manual and Arahan Teknik JKR.
b. check the design loadings.
c. check the standards and specifications of materials to be used.
d. ascertain the design concept used and identify the key elements.
e. check the civil, structural and geotechnical detailing, and.
f. determine the adequacy of other aspects of the design which are peculiar and other associated civil works.

5.3 Reporting .

The checker's report shall be submitted in writing to JKR within 2 weeks of the Independent Check being done or otherwise as agreed in writing.

The report shall specifically describe the deficiencies, potential or real, which have been identified along with the relevant references to accepted standards, practices and design principles. The point shall be illustrated wherever practicable by marking-up the plans or with sketches, drawings and such related materials. The report may include the checkers suggestion, amendments, alternative solutions and designs for amendments and or alternative solutions.

6.0 Soil Investigation.

6.1 The Contractor shall (if necessary) carry out sufficient soil investigations prior to commencement of any geotechnical design works.

JKR may provide the preliminary soil investigation result for the sole purpose of guiding the Contractor to provide the following costs estimate:

a. to determine the construction measures to be adopted by the Contractor, including temporary works, and.
b. design considerations for all geotechnical design works.

JKR will not be responsible for any inaccuracies of the soil data presented prior to tender.

6.2 The Factual Soil Data of all soil investigations and results of laboratory testing undertaken by the Contractor shall be submitted to the Project Director.

6.3 The Contractor shall comply with the Rules and By-Laws of Local Authorities in executing the soil investigations works to ensure complete safety and harmony with the surroundings to the satisfaction of the Project Director.

7.0 Anti-Termite Treatment.

7.1 The contractor shall control the subterranean termite infestation to all of the proposed buildings and structures in the Contract.

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7.2 The termite control treatment application shall be carried out by a reputable specialist soil treatment company approved by the Project Director.

7.3 The standards and procedures of anti-termite treatment shall comply with the recommendations of the Pesticides Board of Malaysia (LRMP), National Certification of Conformity from the Australian Building Codes Board (ABCB), the National Pest Control Association of America, the British Pest Control Association or the relevant local regulations governing such treatment where applicable.

7.4 The treatment method shall be submitted to the Project Director for record. All relevant documents, certificate of approval, guarantee letter, brochures and technical catalogues shall be submitted to the Project Director before commencement of works.

7.5 The recommended chemical shall meet with the approval of the Pesticide Board of Malaysia and has an effective residual period of period recognised by the Pesticide Board on normal soil. All applications shall strictly adhere to standard safety measures and shall be in accordance to sound environmental practice.

7.6 The chemical recommended shall not have any detrimental effects whatsoever on human beings, animals or materials used in the construction of the substructure especially the reinforced concrete works and waterproofing materials etc. The chemical shall be environmentally friendly. Termiticide shall be 'imidacloprid' or equivalent which is approved by Pesticides Board of Malaysia (LRMP). The dilution and application rate will strictly be in accordance with the product label and manufacturer's recommendations.

7.7 All loose timber, wood shavings and other cellulose-bearing materials shall be removed from build-on areas before the application of termite control treatment.

7.8 Areas of anti-termite treatment shall include the following:

a. Impregnation of excavated surfaces around the pile caps/stumps or prior to laying of lean concrete for footings.
b. Impregnation of ground beams boards and columns with termiticidal mixtures.
c. Impregnation of surfaces below ground floor slab areas after the hardcore has been laid but prior to the casting of concrete slab. Application of termiticide mixtures shall be made the same to the underside of suspended ground slab.
d. Impregnation of surfaces below apron/terraces and areas within 1.5 metre beyond the edge of the building apron/terraces.
e. Any other surfaces or areas through which termites' infestation are likely to occur.

7.9 Soil treatment shall not be carried out when the soil is saturated or excessively wet (for example, during or after rainfall) or when it is likely to rain.

7.10 On completion of soil treatment, the treated soil shall be cast with a layer of lean concrete or ground slab. Soil treatment and concreting shall be carried out on the same day or the following day, the latest.

7.11 Soil treatment shall be repeated when the condition prevails in the event that any areas that have been treated is affected by water or the rain before concreting works commences or has been completed.

7.12 The termite control treatment shall be a replenishable system. The approved chemical shall be replenished periodically in accordance to the liquid termicide manufacturer's recommendations. The Contractor shall include the replenishment program of suitable termicide in the planned preventive program (PPM).

7.13 The piping used for the replenish able system shall be of the standard UPVC High Pressure Class 15 pipe conforming to AS 1477.1 (or local equivalent) and UPVC High Pressure Class 18 fittings conforming to AS 1477.2 (or local equivalent) and installed in accordance with the required standard.

7.14 The Contractor shall provide a warranty for a minimum period of five (5) years commencing from the completion date of treatment. The Contractor shall allow for annual inspection to the treated areas and carry out remedial treatment whenever necessary without additional charges.

8.0 Materials and Workmanship

8.1 All materials to be incorporated in the Works shall be new and the workmanship throughout the work shall be of high quality. Unless otherwise specified, all materials and workmanship shall comply with JKR Standard Specifications for Building Works 2005 as the minimum criteria, Malaysian Standards and Manual and with all relevant Specifications and Codes of Practice.

8.2 The Contractor shall provide the necessary facilities for any tests and inspections and arrange for certification as specified in the civil works requirement and/or deemed necessary by the Project Director.

8.3 Whenever in the Specification any proprietary materials are specified such are to be deemed as being the minimum standard/quality acceptable, alternatives of such materials may be considered for acceptance by the Project Director provided they comply in all aspects with strength, size appearance and quality to that specified. The Contractor shall submit to the Project Director, proof and proper technical evidence of such alternative material to substantiate their compliance with the Specifications. The Contractor shall comply with the requirements of all tests deemed necessary by the Project Director for such alternative material. The Contractor is responsible for all such test implications, cost-wise and time-wise.

8.4 Approval or acceptance by the Project Director of materials and workmanship shall not relieve the Contractor of his responsibility under the Contract for the quality of materials and standard of workmanship required in the Works.

9.0 Contractor's Proposal.

The Contractor's proposal for the Works shall include the following details and information:.

a. Description on the Scope of Works.
b. Layout plans denoting the limit of works including detail components of earthwork layout, drainage system, water supply system, sewerage system, internal road system.
c. Design criteria, loading data, design standards and calculations, wherever appropriate.
d. The design proposal shall be professionally developed and refined to meet its proper function. The Contractor shall undertake to do all the alterations to the detail working drawings prior to construction at no cost variation.
e. Any associated works, temporary or otherwise, deemed necessary for the proper execution of the final permanent works. The cost of these associated works having been already included in the pricing for the Works.
f. Materials and Components Specifications.
g. Works Specifications.
h Original technical information for all proposed system.
i. Project Quality Assurance which shall include procedures for selection, testing of materials, method of statement, acceptance of works, remedial of defective works etc.

10.0 Samples

The Contractor shall submit samples of materials together with supporting technical information for approval prior to incorporating them in the Works and as when required. Where so directed test certificates shall be produced. All samples which are approved shall indicate the standard to be maintained in the execution of the Works. Materials which are rejected shall not be used in the Works.

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11.0 Compliance to Rules And Regulations

11.1 All Works shall be in accordance with good engineering practice and shall comply with the By-Laws and latest Rules and Regulations of all Approving Authorities. A copy of all correspondences with approving authorities shall be extended to the Project Director.

11.2 Prior to the commencement of the construction works and handing over at the end of the contract period, approval from all Relevant Authorities must be obtained.

11.3 All designs and drawings shall be prepared by P.E. Detail working drawings, workshop drawings and amendments etc shall be submitted and agreed by the Project Director prior to construction or fabrication.

11.4 The functional adequacy and professional liabilities of the design shall be the sole responsibilities of the Contractor.

12.0 Sufficiency of Proposal

The Contractor shall have satisfied himself before submitting his proposal as to the correctness and sufficiency of his proposal for the Works, and the Contract Sum, except in so far as is otherwise provided in the Contract, shall cover all his obligations under the Contract and all matters and things necessary for the proper design, construction, completion, maintenance and guarantee of the Works.

13.0 Standard Specification

13.1 The following standard specification as listed:

Manual Saliran Mesra Alam (MSMA),

Design Criteria and Standard for Water Supply System (JKR),

Design Criteria and Standard for Water Supply System (Malaysia Water Association,

Malaysian Standard Code of Practice for Design and Installation of Sewerage Systems - MS 1228,

Guidelines for Developers on the Design and Installation of Sewerage Systems JKR Standard Specification for Building Works 2005,

JKR Standard Specification for Roadworks (JKR/SPJ/1988),

Arahan Teknik Jalan,

JKR Standard Specification for Bridgeworks,

JKR Standard Specification for Structural Steel Work (JKR 200600-0019-99),

Standard Specification for Prefabricated Timber Roof Trusses (JKR 20600-0020-99),

Standard Specification for Cold Formed Roof Trusses (JKR 20600-0022-2001),

including any relevant amendments there of, shall be adopted by the Contractor. Where the words Superintending Officer or S.O. appear in the Standard Specification they shall be taken to mean the Project Director.

13.2 For works which are not covered by the Standard Specifications and for any details where the Contractor deems necessary to make modifications, the Contractor shall submit addendum to the Standard Specifications in his proposal, giving complete details of the proposed specification or modifications.

14.0 Material Testing Laboratory And Staff (if required)

14.1 The Contractor shall provide, maintain laboratory at the site throughout the duration of the contract. Earthworks, road works, concrete and structural works etc. shall not commence until the laboratory and staffs have been equipped. The laboratory shall be staffed with a full time competent technician well experienced in material testing.

14.2 The Contractor shall provide all testing equipments necessary to carry out any test requirements for civil and structural works etc. The Contractor shall carry out test on materials and a complete record of all test results shall be kept up to date by the

Contractor.

14.3 Without limiting the Contractor's responsibility as above, the facilities of the laboratory shall be available for the use of the Project Director who may wish to perform control tests on the workmanship and materials.

14.4 Testing which are specifically required by the Standards/Codes of Practice to ensure compliance with the contract but cannot be done in the site testing laboratory shall be carried out at approved laboratory and the cost incurred shall be borne by the Contractor.

15.0 Supervision, Inspection And Test

15.1 The Contractor shall employ a Supervision Team. The Supervision Team shall be headed by P.E who is solely responsible for the supervision, quality control, certification of tests etc.

15.2 For the case where laboratory at site is not provided, all tests which are specifically required by the Standards/Codes of Practice to ensure compliance with the contract shall be carried out at Kumpulan Ikram Sdn Bhd. (KISB) or at an approved laboratory and the cost incurred shall be borne by the Contractor.

15.3 The Project Director may at any stage of the Works carry out inspection, measurement and tests on any part of the Works to ensure compliance with the contract. The Contractor shall provide the necessary attendance whenever required by the Project Director.

15.4 The Consultant Engineer appointed by the Contractor shall be responsible for the supervision of the civil and structural works including certifications of all works as provided in the Scope of Work.

15.5 The Consulting Engineer appointed by the Contractor will ensure that the supervisory staff is stationed at the site as soon as the construction works commences and at all time until the construction is completed.

15.6 The Contractor shall follow strictly the instructions issued by the Project Director in carrying out the supervision of the works.

15.7 The Consulting Engineer appointed by the Contractor shall show proof of the validation of the design inputs.

16.0 Covering Up Of Works

16.1 Before any part of the Works is permanently covered up, the P.E shall certify in writing that the work have been inspected by him and completed as per contract and all necessary quality control tests have been carried out and approved. A copy of the quality control test results shall be submitted to the Project Director.

17.0 Submittals

17.1 The Contractor shall prepare and submit TWO (2) copies of complete sets of detailed design documents for all permanent and temporary works to be reviewed / approved by the Project Director.

17.2 The detailed design documents shall include, but not limited to the following:

a. Report on Design criteria, Codes of Practice and Standards used.

b. Design calculation sheets, including computer input and output, if any, (where computer software used in the analysis is not available in the market, the Contractor shall demonstrate the accuracy of the software, and a copy of such software shall be made available to the Project Director for verification and checking).

c. Design/working drawings including notes and symbols.

d. Catalogues and other relevant information necessary for the Project Director to

review the design documents.

e. Loading data sheets which shall include the data to be supplied by the suppliers of special building components to verify the loading used in the structural analysis.

f. Method Statements for the construction operation of permanent and temporary works.

g. Additional Design / work specifications, other than specified in 11.0.

h. An outline of the method of erection envisaged by the Contractor, giving the sequence for erecting the structure taking into account any phasing of the Works.

i. Define the responsibilities at the interface between the steelwork and other trades.

17.3 All the above must be endorsed by the P.E in the relevant fields.

17.4 Guidelines on the item to be submitted and included in the Pre-bid Document is listed in the Schedule for Works Submission Items in Attachment B. The schedule is to serve as a guide on the basic items to be submitted by the Contractor. The Contractor should consider and include all other items as required in the Need Statement.

18.0 Quality Assurance Plan.

The Contractor shall submit to the Project Director detailed Quality Assurance Plan prior to the execution of the Works. Each and every Quality Assurance Plan shall conform to the requirements of Sistem Pengurusan Kualiti JKR (SPK JKR) and EMS 14001.

19.0 Familiarisation with Site and Local Conditions.

The Contractor is deemed to have visited the site and familiarised himself with all site and local condition that pertain to the successful design and execution of this work. The Contractor shall take all necessary precautions during the construction works so as not to affect any surrounding buildings, structures and roadwork.

In addition to this, the Contractor shall familiarise himself with basic requirements and needs of the design as illustrated in the Architectural drawings and specifications.

20.0 Obligation of Contractor and Consultant On Safety on Site and Adjoining Properties.

The Contractor and Consultant shall ensure adequate safety on site and to the adjoining properties. The Contractor shall ensure the full compliance to the requirements of the Local Authority, Jabatan Keselamatan dan Kesihatan Pekerja and the Project Director.

21.0 As-Built Drawings.

21.1 All as built drawings are to be duly prepared, updated and maintained throughout the contract period. All such drawings duly dated where applicable and duly certified by P.E shall be submitted to the Project Director not later than three (3) months after the completion of the construction works. The as-built drawings shall be in the format as follows:

a. Linen Copy.

b. Three (3) binded sets of drawings/prints in A1 size.

c. One (1) full set of P.E endorsed drawing in DVD format.

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SECTION B

B1 EARTHWORKS

1.0 General

1.1 The earthworks shall consists of all the required site clearing, excavation, filling, rock blasting, compaction, grading, levelling and other earthworks within the limits of the works. It shall include the removal and proper utilisation and hauling or disposal of all excavated material and constructing, shaping and finishing of all excavation over the entire of the works in conformity with the drawings and the specifications.

1.2 The excavation shall be executed in such manner and order as approved by the Project Director. The Contractor shall be responsible for the compliance with the Rules and Regulations and By-Laws of Local Authorities.

1.3 The Contractor shall construct and maintain an approved concrete water trough with an elevated ramp throughout the construction period for washing of vehicle's tyres before leaving the site. The Contractor shall also, construct and maintain approved silt traps. The Contractor will be held completely responsible to pay any fine imposed by the Local Authority as a result of his own negligence or that of his employees or agent in this connection. On completion of the works or whenever directed, the Contractor shall remove the water trough including making good all damage done and payment of all charges.

1.4 The entire site formation levels shall be designed and filled higher than the known flood levels provided by Jabatan Pengairan dan Saliran.

1.5 Licensed surveyors shall undertake surveys of site boundaries, spot levels and topographical features within the site and extending beyond the site boundaries.

2.0 Site Clearing and Earthworks

2.1 The site shall be cleared and debris to be removed from the site. The top soil may be stripped and stocked at suitable places to be used for turfing and landscaping purposes and approved by Project Director. Existing utilities and services that are affected by the construction shall be relocated.

2.2 Earthworks shall be carried out according to good engineering practice, conforming to the Malaysian Standards/British Standards Code of Practice B.S. 6031:1981 and Manual Saliran Mesra Alam Malaysia (MSMA) where applicable.

2.3 The characteristic of the soil has to be studied to determine its engineering properties and its suitability as filling materials. The slope shall be designed for stability and suitable slopes protection has to be provided where necessary.

2.4 Earthworks shall be planned and conducted without causing silting up of canals, streams, drains, culverts or any other drainage structures. Precautions shall also be taken to prevent earth moving plants and vehicles from effecting cleanest public road or causing objectionable dust to the atmosphere.

2.5 Temporary drainage shall be constructed within the site so as to prevent any ponding or water logging. Good surface drainage must always be maintained to prevent erosion and to stabilise cut and embankment slopes.

2.6 Filling to formation levels shall be designed for good drainage. Consideration has to be given to erosion problem, stability of embankment slopes.

2.7 Unsuitable material such as running silt, peat, logs, stumps, perishable or toxic material, slurry, mud or any material that is soft. They shall be excavated to such depth and over such area and transported and disposed of in an approved manner. The Contractor shall be responsible for providing his own dumpsite for such unsuitable materials. Voids created due to removal of it shall be backfilled with suitable material compacted to a dry density not less than that of the surrounding or that specified for the respective part of the earthworks or as directed by the Project Director.

2.8 If the removal of unsuitable material is to be done under standing water, voids created due to removal of it shall be backfilled with hard clean crushed rock, natural gravel or sand having grading within the respective limits.

2.9 Prior to forming embankment over soft ground, the soil over which fill material shall be placed shall be given strength improvement treatment by means of replacement of unsuitable material as specified in Clauses 2.7 and 2.8 or other approved method. The first layer or layers of fill materials shall be deposited over the full width of the embankment in thickness and compacted using suitable compaction plant for working over soft ground.

2.10 The embankment shall be built to different heights in stages with or without surcharge with allowance for consolidation time periods in between stages. Where surcharge is specified, the Contractor shall be responsible for the provision of surcharge material and the removal and disposal of excess material on completion of consolidation or when directed by the Project Director.

2.11 The Contractor shall also be responsible to provide ground monitoring instrumentations such as piezometer, settlement markers and plates and inclinometer within embankment and soil replacement area such as to facilitate the monitoring and reporting phase of any ground improvement methods/slope stabilization method where necessary or as directed by the Project Director.

3.0 Turfing

3.1 All turfing works shall conform to the JKR Standard Specification for Building Works 2005 and JKR Green Mission.

4.0 Earth Retaining Structures

Refer to the Geotechnical Need Statement.

5.0 Cross-Section And Slope Stability

5.1 All slopes shall be provided with adequate protection against soil erosion and lined drains shall be provided for each berm of all slopes. If any, all unstable rock slopes shall be adequately protected and stabilized with acceptable techniques.

5.2 All cut and fill slopes shall be designed to the requirement of Geotechnical Need Statement.

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B2. DRAINAGE SYSTEM

1.0 General

1.1 The Drainage Works shall consist of all required design and construction of the drainage system and shall conform to the requirements of Jabatan Kerja Raya, Jabatan Pengairan dan Saliran and Local Authorities.

1.2 Proper sustainable drainage system shall be provided compliance with Manual Saliran Mesra Alam (MSMA). All drains shall be properly designed and constructed to give the best hydraulic features. There shall be no flooding, ponding, silting-up either during construction or after completion of the works.

1.3 Drains shall be designed around the buildings and on both sides of the roads. All perimeter drains around buildings shall be covered drains.

1.4 Drainage system shall include construction of drains, sumps, culverts, scupper drains, cascading drains, subsoil drains, interceptor drains and pumping stations etc where necessary.

2.0 Design Consideration

2.1 The drainage system shall comply to the relevant standard. It shall also comply with the minimum following criteria:

a. Perimeter Drainage - Designed for 2 year ARI and checked for 5 year ARI.
b. Surface Water Drainage - Designed for 5 year ARI and checked for 10 year ARI.
c. Pond - Designed for 25 year ARI and checked for 100 year ARI.

2.2 Drainage system shall be designed with regard to both operation and ease of maintenance. Adequate gradients shall be provided to enable self-cleaning flow.

2.3 Side walls of drains, wing walls and apron of culverts shall be properly designed and constructed to prevent erosion or scouring.

2.4 All culverts shall be designed to a relevant Standard approved by JKR.

2.5 All deep sumps, deep drains shall be covered with high strength grating to ensure safety of pedestrian or vehicles. All drains other than the above at the entrances and exits to buildings or otherwise must be properly covered by suitable cover slabs or grating.

2.6 Other safety structures like parapet wall, guardrails shall be provided where necessary.

2.7 Rain water harvesting tank and system shall be designed to recycle rainwater for non-consumable use such as gardening and toilet flush.

B3. ROAD WORKS

1.0 General

The starting point for the proposed alignment of the road network will form a junction at the existing roads towards the site proper. The alignment shall be proposed by the Contractor.

1.1 Road Works will comprise the following major components:

a. Construction of main entrance road from the Federal/State road including all the works required by Local Authorities / JKR.

b. Construction of a second entrance road from public road including all the works required by the Local Authorities / JKR.

c. Construction of earth retaining structure where necessary along the proposed road.

d. Construction of proper drainage system to drain out water from areas along the road to suitable discharge points.

e. Construction of road intersections, road furniture, traffic control devices, public utilities service culvert, relocation/protection of existing services, street lightings, traffic lights, pedestrian sidewalk, landscaping, environmental protection and all other associated works.

f. Construction of hard standing at required areas.

g. To carry out the Traffic Impact Assessment (TIA) where necessary and directed by the Project Director.

2.0 Design Consideration

2.1 All designs must optimally satisfy the requirements of Arahan Teknik JKR and other International Standard and in respect of visual elegance, functional adequacy, safety, suitability, robustness, ease of maintenance, cost effectiveness and aesthetics.

2.2 The Contractor shall collect and analyse all available data, records, proposals, and drawings. Any further study, survey or investigation shall to be carried out if additional information is required for the design and construction of the whole Works.

2.3 The Contractor shall analyse all the available ground details such as topographical features, existing tractorist and location of existing utility services to confirm the information contained in the existing survey drawings and also in areas where site survey data is not available. Additional field survey is to be carried out if only further information required is not available or inadequate.

2.4 The Contractor shall prepare and submit the preliminary design reports, together with cost estimates for each element of design for consideration by the Project Director. The design report should include design criteria, justifications, calculations, drawings etc.

2.5 Upon acceptance of the preliminary report by the Project Director, the Contractor shall carry out detailed engineering design, construction drawings, detailed specification and detailed priced bill of quantities of the Works.

2.6 The Contractor shall prepare the specification on work methods, materials and workmanship for the works which is not covered by the JKR Standard Road Specification bearing reference JKR/SPJ/1988.

2.7 The Contractor shall identify all public utilities inclusive of High Tension Transmission lines affected by the works and provision for relocation and protection of services to the satisfaction of the relevant utility authorities or companies.

2.8 The Contractor shall identify of all roads, culverts and any earth retaining structures to be constructed.

2.9 The Contractor shall identify all associated drainage facilities comprising culverts, sub-surface and surface drainage works and the relocation, repair and removal of existing drainage structures where required in full compliance to all Jabatan Pengairan dan Saliran requirements.

2.10 The Contractor shall identify all existing structures to be demolished.

2.11 The Contractor shall provide for all road markings and roadside furniture.

2.12 The Contractor shall identify the need lightings at junctions, streets and where required.

2.13 The Contractor shall ensure that all other works and services necessary to satisfactorily design, construct, complete and maintain the whole works to comply with the Government's Requirement.

3.0 Sufficiency of Proposal

The Contractor shall have satisfied himself before submitting his proposal as to the correctness and sufficiency of his proposal for the Works, and the Contract Sum, except in so far as is otherwise provided in the Contract, shall cover all his obligations under the Contract and all matters and things necessary for the proper design, construction, completion, maintenance and guarantee of the Works.

4.0 Relocation/Protection of Utility Services

The Contractor shall, during the design stage, liaise with all affected utility companies or authorities with regard to existing utility installations on the necessity of relocation/protection or diverting such installations. The Contractor shall, if required, establish exact locations of these installations by trial trenching. The Contractor shall put up detailed plans and proposals for the relocation, temporary or otherwise, of such services if affected by the Works. The Contractor shall also incorporate necessary safeguards to protect the existing services against damage or destruction during construction. Design and construction of such relocation/protection works shall be subjected to the approval of the respective utility companies or authorities. The cost of such relocations and protection works shall be deemed to be included in the Contract Price. These services should include utility gas pipes, electrical and telecommunication lines, water pipes and others.

5.0 Works under Water

The Contractor will be deemed to have ascertained for himself before pricing, of the extent of the work which will have to be carried out under water and his rates and prices shall include for all costs and charges whatsoever arising out of such working.

6.0 Survey, Subsurface Exploration and Design Requirements

6.1 General

The Contractor shall search and study all reports on feasibility study, development plans and investigations related to the Works so as to enable full understanding of factors which may affect the works. Notwithstanding requirements stipulated herein the Contractor shall ensure that all designs satisfy the aspects of aesthetics, functional requirements, safety, suitability and effectiveness completely to the intent of the Works.

6.2 Surveys

The survey has been carried out and the contractor shall carry out when required additional land surveys of the proposed site of the Works, which may be necessary to supplement available survey information, for the satisfactory execution of design and construction of the Works. Survey plans shall be prepared in scales appropriate to their purpose.

6.3 Subsurface Exploration

The Contractor shall undertake additional soil investigation and material surveys for the purpose of preparing of engineering design and construction of the Works.

6.4 Detailed Design, Drawings and Specifications

The Contractor shall carry out and prepare detailed analysis, design, drawings and specifications following the approval of the preliminary design by the Government. This shall include the following:

a. Detailed analysis and design of the Works.

b. Scale plans and drawings for the complete construction of the Works. These shall include:

i Layout plans of the earth retaining structure and road showing details of geometric elements and existing ground levels.

ii Detailed setting out plans for the road alignment, intersections, slope protection, drains and culverts and other related structures all to a suitable scale including the invert levels and reduced levels at appropriate intervals and locations.

iii Typical cross-sections of the road, culverts, connecting roads, temporary diversion roads and crossings, earth embankments, retaining walls, etc. showing the various dimensions of the elements at appropriate locations

iv Longitudinal sections of the road, culverts, connecting roads, temporary diversion roads and crossings, earth embankment, retaining wall, etc. showing the existing levels, proposed levels, super-elevation and also invert levels of drains and culverts.

v Drainage and sub-soil drainage plans, showing details such as type, size and length and other dimensions of the proposed drainage system.

vi Structural drawings for the structures shall include the engineering design of the foundations, and the design of the earth retaining structure.

vii Plans showing road and lane markings and traffic signs including advance directional signs and those used for construction works.

viii Plans showing proposal for environmental protection and mitigation works. Plans showing details of public utility services; which shall include 'ducting'.

ix Land acquisition plans as required by the Land Office if required for the construction (if required).

7.0 Roads Design Criteria

7.1 Road Geometrics

The geometric design of the road and bridge structures shall satisfy the minimum criteria for JKR R3/U3* standard laid down in Arahan Teknik Jalan 8/86 - "A Guide to Geometric Design of Roads", where appropriate. In selecting the design alignment the following requirement should be considered:-

a. Minimum land acquisition and minimum overall construction cost.

b. Minimizing services relocation works.

c. Minimizing the number of river, stream/canal crossing.

7.2 Vertical Alignment (if needed)

A desirable grade shall be allowed for the approach roads.

7.3 Lane width

Lane width shall be 3.0m with an additional marginal strip of 0.25m throughout the whole stretch.

7.4 Road Shoulders

Road shoulders shall be minimum of 0.6 meter unless conditions require otherwise.

7.5 Road Median (if required)

Road median shall be of 3.0 m wide.

7.6 Pedestrian Walkway

The pedestrian walkway if required shall be of minimum 2.5m wide throughout the whole stretch of the road on both sides of the road or only at one side of the road where space is s restraint for the construction of the walkways.

7.7 Road Drainage

A drain reserve of 2.5 m wide shall be provided for on both sides of the road. Surface runoff, stream and river flow in the vicinity of the roadway shall be computed and from such computation design shall be made for drainage system of the road which includes culvert, roadside drain, subsoil drain, interceptor drain, etc. All drainage design shall be in accordance with the guidelines and criteria established by JKR as well as procedures in MSMA published by Jabatan Pengairan dan Saliran. The structural design of reinforced box culverts shall be in accordance with BS 8110 and the loading shall be in accordance with that of BS 5400: Part 2.

7.8 Design Flood Levels

The following criteria for estimation of design flood levels shall be adopted:

a. For embankments in areas subjected to flooding, the final road level shall be designed to be at least 300mm above the 25-year ARI (Average Recurrence Interval).

b. Surface drains shall be designed for a 10-year ARI and shall cater for efficient removal of stormwater from road surface, erosion protection and slope stabilisation.

c. Culverts shall be designed for a design storm to a maximum of 50 years ARI.

8.0 Pavement

The pavement for approach roadwork shall be of the flexible type and designed in accordance with the Standard Road Specification JKR/SPJ/1988 and Arahan Teknik (Jalan) 5/85. The design life of the flexible pavement is to be 15 years.

9.0 Intersection and Access

The layout, design and type of control at intersections shall be prepared to suit the traffic volume.

10.0 Temporary Control Devices and Signs

Temporary control devices and signs during construction shall be in compliance with JKR Arahan Teknik (Jalan) with respect to traffic control devices, temporary sign and work zone control.

11.0 Carriageway Marking

The design covers all carriageway markings such as centre line, edge line, chevron, arrows, etc. The marking shall be made from reflective paints. Types and colour of the markings shall be designed in accordance to Arahan Teknik (Jalan) 2D/85

published by JKR.

12.0 Guardrails (if required)

The design of traffic guardrails shall generally follow the "Design Guide Line for Longitudinal Traffic Barrier - Arahan Teknik Jalan (Rev.1/89)" published by JKR.

13.0 Humps (if required)

Humps shall be provided at appropriate locations and shall be in accordance to the requirements of the Local Authority.

14.0 Temporary Works or Diversions

The Contractor shall include in his design any temporary work or diversion that are needed during the construction period. All temporary works shall be able to cater for uninterrupted flow of traffic for the period concerned. All temporary control devices and signs shall be in accordance with the Standard Road Specification JKR/SPJ/1998 and Arahan Teknik (Jalan) 2C/85 \93Manual on Traffic Control Device Temporary Signs and Work Zone Control\94 published by JKR.

15.0 Traffic Control Devices

The Contractor shall provide adequate traffic control devices and roadside furniture such as directional signs and pavement markings all in accordance with JKR Arahan Teknik (Jalan) 2A/85, 2B/85, 2D/85 and 2E/87.

16.0 Slopes

Refer to the Geotechnical Need Statement.

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B4. EXTERNAL WATER SUPPLY SYSTEM

1.0 General

1.1 The Works shall consist of all required design and construction of the external water supply system in order to provide reliable and sufficient water supply to the proposed project. The external water supply system shall be designed and implemented in harmony with other utilities and surroundings to meet the Client's needs in terms of functionality ease of operation & maintenance and durability.

1.2 The information in relation to the project such as location, number of buildings, building height, the basic functions of the buildings etc, shall be obtained from the Architectural Need Statement or other documents in the Pre-Bid Document.

1.3 The total water demand for the project shall be estimated based on the basic function of the proposed project. The Contractor shall design, construct, complete and commission the external water supply systems to cater for the total demand.

1.4 The criteria for estimated demand and total water demand shall be based on the Design Criteria and Standard for Water Supply System published by JKR Malaysia and The Malaysia Water Association.

1.5 The Water Authority (SWA) or the State Jabatan Bekalan Air (JBA) shall provide the source of water supply. In the case where the SWA/JBA cannot supply the water required, the Contractor shall propose alternative supply subject to the approval of the SWA/JBA and the Project Director.

1.6 works may comprise but not limited to the following items:

a. Distribution pipes from tapping points to elevated water tank or roof top storage tanks of the proposed buildings with/without pumping system or with/without suction tank depending on the available pressure at the tapping points.

b. Suction tank and booster pump house complete with M&E system and automatic control system, where pumping system is required.

c. Instruments and meters.

d. Testing and commissioning.

e. All ancillary works necessary for the completion of the project.

Any item which is not specifically stated in the Scope of Works but is necessary for the completion of the project shall deem to be included and provided for in terms of design and pricing.

2.0 Design Consideration

2.1 All design shall be generally based on the Design Criteria and Standards for Water Supply System published by JKR Malaysia or The Malaysia Water Association. However, the Contractor shall at all time comply with the requirements of the Local Authorities. All construction works shall be carried out in accordance with the relevant specifications specified in the Section A, Clause 12.

2.2 All workmanship, materials, components, equipment and instruments shall be chosen, considering the environment and medium contact for long-life time. It shall be of high quality and resistant to corrosion. Supporting literature and specifications from the manufacturers should be obtained to substantiate this. It shall comply with the relevant and current Malaysia Standards or Codes of Practice on the date submission of proposal.

3.0 Approvals

The Contractor shall be required to obtain the approval of the various authorities concerned for the works, related to water consumption demand, power supply,

consent of landowners and other relevant authorities, etc. The Contractor shall pay all fees, charges or contributions to the relevant authorities if required.

4.0 Distribution Pipes

4.1 The contractor shall propose the distribution pipes for the Works. Distribution pipes for general building blocks such as hostel / administration / lecture blocks etc shall be separated from the distribution pipe for cafeteria / canteen block. Each separate distribution pipe system shall have its own tapping point and water meter, where required.

4.2 If the available pressure at the tapping point is not adequate, pumping system shall be required for the distribution of water to all the building blocks of the project. The system shall consist of suction tank, pump house, M & E equipment and pumping mains to the roof tanks. However, subject to the requirement of the SWA/JBA, the Contractor may need to construct external elevated water storage tank of nominal capacity equivalent to the require storage of the total water demand. Water shall be pumped to this storage tank and then gravitated to all the buildings roof tanks.

4.3 Material for all water tanks shall be approved the by Project Director and the water authorities.

4.4 Air valves complete with isolating valve, scour valves and gate valves must be adequately and strategically provided.

4.5 Hydrants of minimum size of 100mm shall be adequately installed at strategic locations to the approval of Jabatan Bomba. All hydrants shall be of double outlet type. Separate hydrant line and meter may be proposed subject to the approval of water authorities.

4.6 All pipes shall be anchored or restrained by thrust blocks where necessary.

5.0 Storage and Suction Tank

The Contractor shall design and construct approved type of storage and suction tank if required. The maximum capacity required for the suction tank shall be one third of the daily demand.

6.0 Pumping Station and M & E Works

Contractor shall design and construct a pumping station complete with pump sets and instrumentation. The pumping system is to deliver water from suction tank to the storage tanks. The system shall have two (2) sets of pumps, one duty and one standby. Efficiency for pumps shall be higher than 80%. The prime mover shall be sized 10% larger than the maximum power required at the duty point. The pumping system ON/OFF shall be automatically controlled.

7.0 Instrument and Meter

The Contractor shall propose, supply, install, calibrate and commission all instruments and meters that are necessary to the highest standard of operation reliability and safety. The instrumentation panel shall be installed within the pump house.

The minimum instruments required shall be not limited to as following:-

a. Flow meters at suitable location in order to register water consumption. Separate meters shall be installed for fire-fighting, cafeteria/canteen and general building blocks.

b. Suction tank and elevated tank shall be installed with in-situ level indication.

EXTERNAL WATER SUPPLY SYSTEM

8.0 Location of Distribution Pipes

The distribution pipes shall not be laid under the road pavement except pipe crossing.

9.0 Ancillary Works

The Scope of Works shall cover all other ancillary work necessary for the completion of the project.

10.0 Testing and Commissioning

All piping, metering and instrumentation system including equipment after installation shall be tested and commissioned. The Contractor shall carry out tests on all individual sections of each system and the system as a whole to the required performance. The testing and commissioning shall be carried out by qualified and competent personnel and shall be witnessed by the Project Director or his representative.

If the whole or parts of the installation or equipment fail, the Contractor shall be required to carry out necessary modification or replacement of the same at his own cost.

All energy, water etc. consumed during the testing and commissioning shall be borne by the contractor. A complete record of the tests and results of such tests shall be submitted in two sets to the Project Director.

11.0 Operation and Maintenance

The Contractor shall provide two (2) sets of Manual of Operation & Maintenance of all facilities including pump-sets, instrumentation control, metering system and itemized list of equipment and spare parts which the manufacturers consider as essential to be kept in ready stock for operation and maintenance.

12.0 Defect and Liability Period

The defect liability period shall be as mentioned in the Pre-bid document. The Contractor shall be responsible for the maintenance of the completed Works through out the above said period. The Contractor shall repair or replace all defects and carry out scheduled and preventive maintenance works during the defect liability period.

13.0 Electricity Supply for Pumping Station

Normally, electricity supply is to be provided by Tenaga National Berhad (TNB). The Contractor shall be responsible for estimating power requirements for the pumping system for his work. The Contractor shall comply fully with the requirement of TNB/power authorities. Sufficient power points must be provided for all installations. Where power supply is not available, the Contractor shall provide alternative proposal.

14.0 Submissions

The Contractor shall submit his proposal together with all design report, design calculations and drawings for approval by the Project Director. Nevertheless, such approval does not in anyway relieve the responsibility of the Contractor.

SEWERAGE SYSTEM

B5. SEWERAGE PIPELINES

1.0 General

1.1 The Sewerage Works shall cover design, construction and installation of the external sewerage and waste water system.

The works shall cover design, construction and installation of the sewerage pipelines and a centralized sewage system for the site as described in the Scope of Work.

The design, construction, installation, testing and commissioning of the system shall comply with the Jabatan Perkhidmatan Pembetungan (JPP) and/or relevant authorities.

If there is an existing central sewage treatment plant system (STP) for the area, the sewerage pipelines within the sites shall be connected to the STP.

1.2 The Works to be carried out shall include the following:-

a. Sewerage pipelines including sewage treatment plant or all the pipeworks connecting to the public central sewage treatment system (if any).

b. Connection of building soil drainage system to the sewerage pipelines.

c. Servicing and maintaining the above works and equipment for a period stated in the Conditions of Contract.

d. Submission to JPP and/or relevant authorities for approval.

e. And all other associated works.

f. Testing and commissioning of the system.

2.0 Design Consideration

2.1 The design, construction, installation, testing and commissioning of the system shall comply with the Design and Installation of Sewerage Systems - MS 1228 and Guidelines for Developers on the Design and Installation of Sewerage Systems published by Jabatan Perkhidmatan Pembetungan and relevant authorities.

2.2 The Contractor's design proposal for the Works shall include the following details and information:

a. Description on the Scope of Work.

b. Layout plan including detail section or components of the system.

c. Design Criteria and calculations.

d. Material and Component Specifications.

e. Works Specification. However, the JKR Standard Specification for Building Works 2005 shall be referred to as the minimum specification.

f. Original technical information for all proposed system.

2.3 The design for the sewage treatment plant should be of minimum maintenance requirements and easy to maintain. The System Provider for the sewage treatment plant approved by JKR and shall comply with the latest Surat Pekeliling Perbendaharaan.

3.0 Pipeworks

Pipe shall be laid in straight line, tightly jointed and at correct uniform gradient to ensure smooth flow of the effluent and prevent blockages or damages to the pipes.

Adequate cover shall be provided to all pipes to avoid damage due to external load. Backfilling shall be done after satisfactory leakage test.

All pipes materials shall conform to relevant Malaysian Standards and of type approved by JPP and the Local Authority. The minimum diameter of pipes used shall also meet the requirements set by Jabatan Perkhidmatan Pembetungan. The standards of some pipes are:-.

a. Verified Clay Pipe - BS65: 1981.
b. Cast iron Pipe - BS416.
c. Concrete Pipe - BS556: BS5911.
d. HDPE Pipe - DIN 16961.

The sewerage reticulation shall be designed to flow by gravity with manhole interconnected where ever possible.

The sewer pipes should not be laid under the road pavement except the pipe crossing.

4.0 Manholes

All manholes shall be pre-cast concrete and installed at not more than 60 meter apart and at all junction and turning points. The internal plastering shall be done using sulphate resistant cement.

Pre-cast concrete manholes shall conform to MS881 and BS5911. Manholes shall be constructed with pre-cast concrete sections surrounded by in-situ concrete.

Manholes cover to be water tight and capable of withstanding external loading and conforming to MS1228.

The location of manholes on roadways should be avoided.

5.0 Standard Of Effluent Discharge

The standards of effluent discharge from sewage and wastewater treatment plant shall comply with Standard A, Environmental Quality Act. The main parameters are as follow:

a. Suspended Solids - 50 mg/l.
b. BOD5 - 20 mg/l.
c. Temperature - < 40?.
d. pH - 6.0 \96 9.0.

6.0 Sewage and Wastewater Treatment Plant

In general the Sewage and Wastewater Treatment Plant shall be planned and designed to meet the following standard:-

a. The Sewage Treatment Plant shall be activated sludge system or equivalent and shall be approved by JPP and/or relevant authorities.

b. Compliance with effluent quality requirements.

c. Hydraulic provision to handle projected flows and characteristic, including anticipated variations in the flows and characteristic.

d. Optimized capital and operating costs of the plant.

e. Meeting local environmental and aesthetic requirements, including the proximity to the nearest habitable premise, direction of the prevailing winds, local zoning requirements, socio economic aspects and compatibility of the treatment processes with the present and future land and receiving waters.

f. Any proposal of proprietary system shall comply with 2.3 stated above.

7.0 Testing and Commissioning

The whole of the sewerage work shall be tested when laid and shall be retest if necessary until passed. Test shall be by means of water. The method of testing shall be generally as laid down in the latest Malaysian Standard Code of Practice for Design and Installation of Sewerage Systems - MS 1228 and Guidelines for Developers on the Design and Installation of Sewerage Systems by Jabatan Perkhidmatan Pembetungan.

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B6. WASTE DISPOSAL SYSTEM

1.0 General

1.1 Waste Management and Disposal.

1.1.1 Wastes are divided into two (2) main categories, i.e. clinical waste (hazardous) and domestic waste (non-hazardous).

1.1.2 Domestic and clinical wastes are to be segregated using the latest Ministry of Health's requirements. Infectious wastes which require sterilisation before incineration shall be sorted into a different coloured bag and of a different material used for storing other normal clinical wastes. Wastes with sharp edges are to be stored in specially designed containers and specially manufactured for that purpose.

1.1.3 Domestic wastes shall be disposed with arrangements with the Local Authority.

1.1.4 Disposal of clinical waste, solid clinical waste, solid medicines and injectables shall be carried out by incineration by a private contractor.

1.1.5 The disposal of liquid waste such as pharmaceutical and chemical waste must be properly design to abide with the Authority's requirement.

1.2 Scope of Works

1.2.1 A main waste collection centre for holding waste and clinical waste must be provided. Separate waste collection centre shall be provided for different areas of usages.

1.2.2 All waste collection centres are to be provided with washing facilities. Waste collection centres are to be provided with discharge drain connected to the main sewerage system.

1.2.3 Adequate bins and containers for domestic waste shall be provided at all waste collection centre provided. The design of the bins shall conform to the requirements of the Local Authority.

1.2.4 Litter bins shall also be provided at public waiting areas, bus stops, parking areas and other areas deemed suitable.

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B7. FENCING AND GATES

1.0 General

1.1 Fencing and gates shall be provided when required to function as a security barrier, perimeter enclosure, boundary marker, separator and aesthetics.

1.2 Decorative gates and fencing - refer to architectural need statement.

1.3 Fencing and gates shall be of appropriate type and fit to serve its intended purposes. The location and extent of fencing shall be as stated in scope of works, site plan or as indicated elsewhere in the pre-bid document.

1.4.0 Unless otherwise stated, fencing shall mean chain link fencing. However, when situation warrants, other type of fencing such as barbed wire fencing, steel mesh fencing and other appropriate type of fencing may be used.

1.4.1 For chain link fencing, maximum distance between steel posts shall be 3000 mm centre to centre. Where added protection required, barbed wire strands may be placed on top of chain link mesh. This shall be done by extending the top of steel posts with arms at 45o angle to hold 3 strands of barbed wires. If 6 strands of barbed wires are required, another arm shall be welded to the post to form 'Y' shape to hold the barbed wires. Where required, the bottom of chain link mesh shall be buried in continuous concrete curbs.

1.4.2 Chain link fencing shall be designed and constructed to at least the minimum requirement of Section N.3 of JKR Standard Specifications For Building Works 2005.

1.5 When used as fencing materials, steel must be protected against corrosion by means of painting, galvanizing and coatings (polyvinyl chloride (pvc), etcs). Care shall be taken when constructing curbs at the bottom of chain link mesh not to allow water collecting on the top surface and cause corrosion to the steel mesh and posts.

1.6 Gates shall be provided at approved access routes to the site. Type and size of gates shall be appropriate to meet their function and shall match the fencing attached to them. All gates shall have suitable opening and locking mechanism and easy to operate.

1.7 The boundary fence location shall be clear of vegetation and graded if necessary to ensure proper fencing alignment and construction. The location of the fence shall be surveyed and duly marked before commencing construction. Boundary fences and gates shall be constructed at least 150 mm inside the boundary to avoid encroachment (of pole's footing) to adjacent lands or properties.

1.8 Fencing designs and construction shall include all necessary elements and works to ensure strength, stability and functionality.

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SOIL INVESTIGATION REPORT

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SCHEDULE FOR WORKS SUBMISSION ITEMS B

ATTACHMENT B

Checklist for items to be submitted for the Works:

1.0 Strategy and Methodology.

1.1 Specifications.

1.2 Curriculum Vitae for Contractor and Consultant Staff.

1.3 Organisation Chart.

1.4 Lists of Plants.

2.0 Programme of Works.

2.1 Bar Chart.

2.2 Payment Schedule.

2.3 Staff Input Milestone Chart.
- Staff versus Time for Contractor and Consultant staff.

2.4 S-Curve.

2.5 Critical Path Method.

3.0 Other Associated Works (If Required).

3.1 Special requirements such as temporary works and special piling precautions to reduce vibrations.

4.0 Quality Assurance Plan.

4.1 General Quality Assurance Plan.

4.2 Quality Procedures for Design.

4.3 Quality Procedures for Construction.

4.4 Quality Procedures for Testing and Inspection.

5.0 Foundation.

5.1 Site Investigation such as experience, historical data and preliminary investigation.

5.2 Type of foundations such as whether the recommendation was made with backup data and includes economic evaluation.

5.3 Preliminary calculations.

5.4 Preliminary keyplan and detailed drawings with P.E endorsement for each type of building. Drawing size A1.

6.0 Civil Works.

6.1 Recommendations made must be backup with data and include economic evaluation.

6.2 Preliminary calculations.

6.3 Preliminary keyplan and detailed drawings with P.E endorsement for each type of building. Drawing size A1.

Notes :

* Concrete grade and cover must comply with the Need Statement (Structural Works).

THE ABOVE ITEMS TO BE INCLUDED IN THE ORIGINAL COPY OF THE PRE-BID DOCUMENT TO BE SUBMITTED