



Standard Specifications for Road and Bridge Works for South African Road Authorities

Draft Standard (DS)
CHAPTER 1: GENERAL
October 2020

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FOREWORD

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Existing publication:

The new COTO Standard Specifications for Road and Bridge Works for South African Road Authorities was approved by COTO on 18 August 2020 as a Draft Standard (DS) and will be replacing the COLTO Standard Specifications for Road and Bridge Works for State Road Authorities (1998 Edition).

Existing contracts and tenders in the design phases based on the COLTO Standard Specifications (1998 Edition) will remain unaffected but will be phased out during the next 6 months and the COTO Standard Specifications (2020 Edition) will be mandatory for use in procurement documents advertised as from 1 March 2021.

Document versions:

Draft Standard (DS). The Draft Standard will be implemented in industry for a period of two (2) years, during which written comments may be submitted to the COTO subcommittee. Draft Standards (DS) have full legal standing.

Final Standard (FS). After the two-year period, comments received are reviewed and where appropriate, incorporated by the COTO subcommittee. The document is converted to a Final Standard (FS) and submitted by the Roads Coordinating Body (RCB) to COTO for approval as a final standard. This Final Standard is implemented in industry for a period of five (5) years, after which it may again be reviewed. Final Standards (FS) have full legal standing.

Comments:

Comments on the Draft Standard Chapters should be provided in writing on the Excel spreadsheet provided on the websites mentioned below and e-mailed to cotorevision@nra.co.za.

Please note:

This document and its various Chapters will only be available in electronic format.

The Draft Standard (DS) Chapters will be made available for download on the South African National Roads Agency SOC Ltd (SANRAL) and Department of Transport websites.

August 2020 version replaced with October 2020 version due to amendments to Chapters.

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CHAPTER 1: GENERAL

1.1 GENERAL PREAMBLE

CONTENTS

PART A: SPECIFICATIONS

A1.1.1 SCOPE

A1.1.2 DEFINITIONS

PART B: LABOUR ENHANCEMENT

PART C: MEASUREMENT AND PAYMENT

PART D: GUARANTEES AND COMPLIANCE CERTIFICATES

A1.1 GENERAL PREAMBLE

PART A: SPECIFICATIONS

A1.1.1 SCOPE

The scope of each Section is given in Part A of each Section of every Chapter of this Standard Specification. Each Part A and Part B of each Section of every Chapter generally contain the following standard headings:

- Scope
- Definitions
- General
- Design by Contractor / Performance based systems
- Materials
- Construction equipment
- Execution of the works
- Workmanship

Part A of this Section A1.1 only contains definitions that are generic and which are relevant or applicable to the other Sections and Chapters of this Standard Specification.

The intention is that this Standard Specification should be compatible with the applicable Conditions of Contract. However, due to differences in the terminology and terms of the different standard contract conditions, there are instances where there may be conflict between the Conditions of Contract and the requirements given in this Standard Specification. In such instances the terminology and provisions given in the Conditions of Contract will prevail.

A1.1.2 DEFINITIONS

Definitions of various items are given in Part A of each Section of every Chapter of this Standard Specification where they are most applicable. Where relevant these definitions shall apply throughout this Standard Specification.

The definitions for the various contractual terms are given in the Conditions of Contract but as various contract conditions may be used the terminology used and the definitions of the terms may differ. The terms below are therefore defined for the purposes of interpreting this Standard Specification. In the event of any discrepancy, the terms given in the applicable Conditions of Contract shall be used. The meaning of any other contractual terms not defined below shall be as given in the applicable Conditions of Contract.

The meaning of any other words and phrases used in this Standard Specification shall be interpreted in accordance with the applicable definitions and/or descriptions given in the unabridged version of the Oxford English Dictionary.

Conditions of Contract - addresses the risks, liabilities and obligations of the contracting parties and the agreed procedures for the administration of the contract. The latest edition, or the applicable edition as defined in the Contract Documentation, of one of the following three standard conditions of contract, which have been recommended by the South African Construction Industry Development Board (CIDB) for road and bridge Works, shall apply as specified in the Contract Documentation:

- Conditions of Contract for Construction for Building and Engineering Works designed by the Employer as published by the International Federation of Consulting Engineers (FIDIC Red Book).
- General Conditions of Contract for Construction Works as published by the South African Institution of Civil Engineering (GCC).
- NEC Engineering and Construction Contract Documentation as published in the United Kingdom.

Contract - is a binding legal agreement between the Employer and the Contractor in terms of which the Works as defined in the Contract Documentation shall be carried out.

Contract Documentation - includes all the documents which define the content and terms of the Contract entered into by the Employer and the Contractor. The Contract Documentation usually consists of the following documents:

- Conditions of Contract.
- Contract Agreement.
- Drawings.
- Letter or Form of Tender.
- Letter or Form of Acceptance.
- Pricing Schedule.
- Project Specifications.
- Scope of the Works.
- Special (or Particular) Conditions of Contract.
- Standard Specification (this document) and
- any other documents forming part of the contract.

Contractor - is the person or firm named as the Contractor in the Contract Documentation and who is responsible for the construction of the Works in accordance with the applicable Contract Documentation.

Dayworks - are used to determine payment for work which cannot be quantified in specific units in the Pricing Schedule, or for additional work ordered by the Engineer during the construction period which was not foreseen at tender stage and for which no applicable rates exist in the Pricing Schedule.

Defects Notification Period - also referred to as the defects liability period or the maintenance period, or the defect correction period, is the period allowed for the discovery and notification of any defects in the Works that must be rectified by the Contractor as specified in the Contract Documentation.

Drawings - are the drawings of the Works included in the Contract Documentation and any additional or modified drawings signed and issued by (or on behalf of) the Employer in accordance with the Contract.

Employer - is the person, entity or firm named as the Employer in the Contract Documentation for whom the Works are to be carried out and who is responsible for the payment and acceptance of the Works.

Engineer - is the person, entity or firm appointed by the Employer, or another person who may be delegated to assist the Engineer in terms of the applicable Conditions of Contract, to manage aspects of the Contract and to supervise the construction of the Works in accordance with the applicable Contract Documentation. Depending on the applicable Conditions of Contract "Engineer" should be read as follows: FIDIC – Engineer GCC – Employer's Agent NEC – Project Manager or Supervisor

Guideline documents - are technical documents which contain specifications related to certain aspects of road construction. These documents may be included, or referred to, in the Contract Documentation, either as additional specifications to be adhered to if so specified in the Contract Documentation or as additional guidelines to best construction practice for the benefit of the Contractor should he choose to follow them.

Pricing Schedule - contains the payment items required for the Works, together with the estimated quantities and the agreed rates for each payment item. The Pricing Schedule is also sometimes referred to as the bill of quantities or the schedule of quantities.

Project Specifications - contain the additional project specific requirements applicable to the construction of the Works to the required quality and standard for a particular contract.

Road reserve - the entire area, as demarcated, proclaimed or due to be proclaimed, which is reserved for a road.

Site / Site of the Works - shall mean the entire road reserve, inclusive of road junctions and property accesses, required for construction of the Works as defined by the limits of construction given in the Contract Documentation. It shall also include areas within statutory building lines where work has to be carried out and any additional lengths of road required for the placement of advanced warning road signs and/or traffic accommodation measures beyond the limits of construction as shown on the drawings. Where the following places are provided by the Employer the Site shall also include areas outside of the road reserve required for construction camps, site offices, laboratories and housing, borrow areas, spoil areas and stockpile areas. The exact extent of the limits of the construction will be verified once the Site is handed over to the Contractor.

Site Agent / Contractor's Representative / Construction Manager - the person appointed by the Contractor to act on behalf of the Contractor on the site of the Works.

Special Conditions of Contract - (sometimes referred to as the Particular Conditions of Contract) are additional Conditions of Contract which apply specifically to a particular contract.

Standard Specification - contains the standard requirements applicable to the construction of the road and bridge Works to the required quality and standard.

Taking-over Certificate - is issued to indicate completion of the Works as defined in the relevant Conditions of Contract that are applicable to the particular contract. Depending on the applicable Conditions of Contract "Taking-over Certificate" should be read as follows: FIDIC – Taking-over Certificate GCC – Certificate of Completion NEC – Take over

Performance Certificate - this certificate is issued to indicate the end of the Defects Notification Period and it is also sometimes referred to the final approval certificate as defined in the relevant Conditions of Contract that are applicable to the particular contract.

Works - means all the temporary and permanent work required to be done as defined in the Contract Documentation.

Word gender interpretation - except where the context requires otherwise, words indicating one gender include both genders.

B1.1 GENERAL PREAMBLE

PART B: LABOUR ENHANCEMENT

CONTENTS

- B1.1.1 SCOPE**
- B1.1.2 DEFINITIONS**
- B1.1.3 GENERAL**
- B1.1.4 DESIGN BY CONTRACTOR / PERFORMANCE BASED SYSTEMS**
- B1.1.5 MATERIALS**
- B1.1.6 CONSTRUCTION EQUIPMENT**
- B1.1.7 EXECUTION OF THE WORKS**
- B1.1.8 WORKMANSHIP**

B1.1.1 SCOPE

The scope of any labour enhancement and the methods and specifications related to labour enhanced construction are contained in Part B of each of the relevant Sections of this Standard Specification. The requirement for the use of labour enhanced construction methods to satisfy any particular project goals will be set out in the Contract Documentation.

The specifications given in Part A of this Standard Specification will apply to all work carried out using labour enhanced construction methods unless some of the specifications in Part A are replaced with revised specifications in Part B that are specifically applicable to the specified labour enhanced construction methods.

B1.1.2 DEFINITIONS

Labour Enhancement – Labour enhancement is the process of improving the scope for the use of manual labour as an alternative to using machines to increase employment opportunities on a project.

Labour Intensive – Labour intensive operations are those operations which, by their basic nature, require a significant amount of manual labour and to a large extent exclude the use of machines.

Project Labour Goals – Project labour goals are the requirements specified for a project to enhance the use of labour in the normal construction operations and/or to use additional labour intensive methods to replace or augment traditional construction methods that usually involve lower levels of manual labour.

B1.1.3 GENERAL

Any activity specified in Part A, where hand work is given as an alternative, shall be executed in such a way as to maximise labour.

Clauses B1.1.4 to B1.1.8 are not applicable to this Section.

C1.1 GENERAL PREAMBLE

PART C: MEASUREMENT AND PAYMENT

CONTENTS

C1.1.1 PREAMBLE

C1.1.2 MEASUREMENT

C1.1.3 PAYMENT

C1.1.4 VARIATION FROM SPECIFIED NOMINAL RATES OF APPLICATION OR FROM NOMINAL MIX PROPORTIONS

C1.1.1 PREAMBLE

The general measurement and payment conditions which are applicable to all the Chapters of this Standard Specification as well as elsewhere in the Contract Documentation, unless specified differently, are given below.

The measurement and payment of the various items required for the Works is described in the payment items which are given in Part C of each separate Section contained in the different Chapters of this Standard Specification. Each Part C of each separate Section contains a list of items that are not measured separately as well as a list of items that are measured and paid for using items specified in other Sections or Chapters.

If additional payment items are required for a particular contract they will be specified in the Contract Documentation for that contract.

The following terms relating to payment shall be applicable as specified in the Conditions of Contract and shall have the meanings given below:

- **Lump sum** - a fixed sum tendered by the Contractor which covers all his costs, incidentals, overheads and profit for providing materials and supervising and carrying out the work and/or services that are specified under the relevant pay item.
- **Prime cost sum** - a sum to cover the actual cost of the supply of materials and/or work that will be provided by a supplier and/or subcontractor that will be nominated by the Employer or a sum to cover the costs of items and/or services provided by an outside provider where the cost is not known in advance.
- **Provisional sum** - a sum to cover the actual cost of materials and/or work that cannot be clearly defined before the Contract was awarded. The Contractor will usually be asked to obtain several quotations for the materials and/or work required and submit them to the Engineer who will approve one of the quotations and instruct the Contractor to appoint the selected service provider or subcontractor. Alternatively, the Contractor may be asked to submit a price for providing the materials and carrying the work out himself for approval by the Engineer.

If alternative meanings are given in the Conditions of Contract those meanings will apply instead of the meanings given above.

C1.1.2 MEASUREMENT

C1.1.2.1 Pricing Schedule

The quantities set out in the Pricing Schedule (sometimes referred to as the bill or schedule of quantities) are estimated quantities and are used for the comparison of tenders and for awarding the contract. It must be clearly understood that only the actual quantities of work done, or materials supplied, will be measured for payment and that the scheduled quantities may be increased or decreased as provided for in the Contract Documentation.

C1.1.2.2 Measurement of completed work

a) Units of measurement

All work shall be measured in accordance with the SI System of metric units.

b) Calculation of quantities

All distances along the centre line of the road as shown on the drawings are horizontal distances. These horizontal centre line distances will be used in calculating the quantities of fill and pavement layers, as well as other items of work where applicable, for purposes of payment. All cross-sections shall be taken in a vertical plane.

All materials which are specified to be measured in a vehicle shall be hauled in vehicles of such type and size that the actual volume may be readily and accurately determined. Unless all vehicles are of uniform capacity, each vehicle shall bear a plainly legible identification mark indicating its specific approved capacity.

The quantity of bituminous materials to be paid by volume shall be measured at the specified application temperature.

All quantities shall be measured to two decimal places.

c) Measurement of structures

Quantities shall be calculated from the dimensions shown on the drawings or as authorised by the Engineer.

No deduction in volume measured for payment shall be made for the volume of any individual, or closely grouped, reinforcing steel bars, inserts, pipes and conduits which have a cross-sectional area up to and including 20 000 mm² and which are embedded in the concrete.

d) Measurement of the depth of trenches and foundation excavations

Where trenches or foundation excavations are required below the level of mass excavations for the road prism, the depth of excavation of the trenches or foundations shall be measured along the centreline of the trench from the resultant ground level after completion of the mass excavation, unless the Engineer is satisfied that the excavation of the trenches or foundations from the original ground level or any lower level was unavoidable. Where trenches are excavated in accordance with the fill method in the completed or partly completed road prism, the depth

of excavation shall be measured along the centreline of the trench from the levels at which the Engineer instructed the Contractor to commence trench excavations.

e) Measurement of monthly paid items

All items of work which are paid per month shall be paid for the month, or part thereof, during which the item has to be provided in terms of the Contract Documentation and/or as ordered by the Engineer. Measurement of any monthly paid items which have not been completed by, or which still have to be provided after, the contractual time for completion of the Works, or of the relevant section of the Works, shall not be paid for unless otherwise approved by the Employer.

C1.1.3 PAYMENT

C1.1.3.1 Contract rates

a) Computation of payment and applicability of contract rates

In computing the final contract amount, payment shall be based on the actual quantity of authorised work done in accordance with the specifications, instructions and drawings. The contract rates shall apply, subject to the provisions of the Contract Documentation, irrespective of whether the actual quantities are more or less than the scheduled quantities.

b) No rate or price entered in the Pricing Schedule

Where no rate or price has been entered against a pay item in the Pricing Schedule by a Contractor, it shall be accepted that no compensation for such work is required, or will be paid, regardless of the final measured quantity of any work described in that pay item being required and carried out.

c) No pay item entered in the Pricing Schedule

Where, a pay item described in this Standard Specification does not appear in the Pricing Schedule for a specific contract it means that the pay item should not be required for that specific contract. However, if any item of work that is not included in the Pricing Schedule is required, and is approved by the Engineer, the Contractor shall receive reasonable compensation for such work unless anything to the contrary has been determined elsewhere. The compensation shall be determined in accordance with the provisions of the applicable Conditions of Contract with respect to additional work.

d) Prime cost and provisional sums

Any prime cost or provisional sums shall be paid in accordance with the provisions of the applicable Conditions of Contract.

C1.1.3.2 Rates to be inclusive

a) Inclusivity of rates

The contract rates in the Pricing Schedule shall include for all costs incurred for executing and completing the Works as specified, for procuring, furnishing, placing and installing all materials, for procuring and providing labour, supervision, construction equipment, tools, wastage, transport, loading and off-loading, handling, maintenance until the item of work is taken over by the Employer, temporary work, testing, quality control including process control, overheads, profit, risk and other obligations and for all other incidentals which may not be shown separately in the Pricing Schedule but are necessary for the completion of the Works.

b) Rates to include for work carried out under partial width construction conditions and in restricted areas

No additional compensation shall be made for any work that is carried out under partial width construction conditions or is constructed in restricted narrow, short and/or confined areas. Payment shall be made strictly in accordance with the applicable contract rates.

The Contractor shall take full cognisance of all the information given in the Contract Documentation, the nature of the Works and the conditions on the Site of the Works before submitting his contract rates and, in doing so, the Contractor shall ensure that all additional costs associated with partial width construction or construction in restricted narrow, short and/or confined areas, including all costs that are associated with any changes in construction methods or techniques, construction equipment, additional labour and supervision personnel, reduced productivity and increased inefficiencies, are included in the contract rates for the relevant applicable items of work.

This Clause shall apply in full to all pay items except where these requirements may be specifically amended in each case in the Contract Documentation.

C1.1.3.3 Procurement, furnishing and placing material

a) Procuring and furnishing ... (material)

Where any of the words "supply", "procure", "provide", "provision of" or "furnish (material)" are used in the description of a pay item, it shall mean the supply and delivery to the point of use of all materials of any kind required for the work covered by the particular pay item, including all tax, purchase costs, claims, damages, royalties and all loading and transport costs involved, except where specific pay items for loading and/or hauling the material are provided in the Pricing Schedule for that particular contract.

b) Placing material

The phrase "placing material" shall mean the off-loading, spreading, blending, processing / in-situ recycling, watering, mixing, shaping and compacting (where specified) of the material required to construct the Works, as well as the procuring, furnishing, and applying and admixing of water; the breaking-down of oversize material, the removing of oversize material which cannot be broken down, correcting irregular or uneven surfaces or layers, the thickness of which is not to specification, finishing-off within the specified tolerances and to the specified surface finish, the refilling of test / sampling holes and protecting and maintaining the completed work. In the case of asphalt layers and bituminous seals, it shall also mean the heating and spraying of binder, the spreading of aggregate or asphalt mixtures, rolling, compacting, finishing-off to within the specified tolerances, and protecting and maintaining the completed work.

The phrase "procuring, furnishing and placing" shall mean procuring and furnishing in addition to placing, all as defined above.

C1.1.3.4 Pay item descriptions

The descriptions under the pay items in the various Chapters of this Standard Specification, indicating the work for which allowance shall be made in the contract rates for such pay items, are for the guidance of the Contractor and do not necessarily include or repeat all the details of work and materials required by and/or described in the Standard Specification.

The pay item descriptions shall be read in conjunction with the relevant specifications and drawings, and the contract rates in the Pricing Schedule shall be inclusive as specified in Clause C1.1.3.2 above.

C1.1.3.5 Payment for materials on the site

Payment for materials on site shall be made as provided for in the Contract Documentation for procured materials on the site which have not yet been incorporated into the Works subject to the submission of acceptable proof of payment for the relevant materials. Proof of delivery to site shall not be acceptable as proof of payment for the materials. Where not specified in the Contract Documentation payment will be calculated at 80 % of the materials purchase price, or, in the case of crushed stone which has not been purchased but has been produced on the site, at 80 % of a fair evaluation of the cost of providing such crushed material on site.

The Employer may, at his sole discretion, allow payment under "materials on the site" in respect of articles manufactured and stored off site, subject to the submission of acceptable proof of payment for the relevant materials, subject to the submission of acceptable proof of their ownership as being that of the Contractor and subject to the articles being clearly marked with the Contractor's name, the contract number and other particulars in accordance with the Engineer's instruction.

Where payment of 80 % of the materials purchase price has been made by the Employer, the ownership of the material shall be transferred to the Employer.

C1.1.3.6 Rate-only items

An item in the Pricing Schedule against which no quantity is given but a rate only is required, the Contractor shall fill in a rate or amount which will constitute payment for work which may be done in terms of this item. Such a rate-only item is used where it is estimated that little or no work will be required under the item, or where the item is to be considered as an alternative for another item where a quantity is given, or for variations in rates of application or mix proportions in terms of Clause C1.1.4.

Work under rate-only items will be paid for only if the work has been executed in terms of a written instruction issued by the Engineer.

C1.1.3.7 Payment items from different Sections

In the Contract Documentation, whenever a payment item is specified in a particular Section and required to be used in another Section of the Pricing Schedule then the relevant payment item number will be preceded by a reference to the Section in which it is being used.

For example, the loading and hauling payment items from Section C1.7 may be inserted into the Pricing Schedule for the loading and hauling of the material required for the pavement layers which are paid for under the payment Section C5.3 as follows:

C5.3/1.7.1.1	Loading from stockpile	cubic metres (m ³)
C5.3/1.7.2.1	Hauling material for use in the Works and off-loading it on the site of the Works	cubic metre kilometres (m ³ -km)

C1.1.3.8 Reduced payments and penalty/damage amounts with respect to the contract price adjustment amount

Where provision for reduced payments, or for the deduction of penalty or damage amounts, is made in the Contract Documentation, such reduced payments shall not be deducted from the value of work done in calculating the contract price adjustment amount.

C1.1.4 VARIATION FROM SPECIFIED NOMINAL RATES OF APPLICATION OR FROM NOMINAL MIX PROPORTIONS

The various Sections of these specifications specify nominal rates of application or nominal mix proportions for materials such as bituminous materials, aggregates, fillers, stabilizing agents, paint and the like. The contract rates are based on these nominal rates of application and mix proportions.

Where such nominal rates of application or nominal mix proportions are specified, provision is made for deviations in the quantities of material in consequence of the rates of application or mix proportions specified by the Engineer in each particular case in consideration of the available materials and the conditions on the site.

Where the actual rates of application or nominal mix proportions used in the Works vary from the specified nominal rates and mix proportions, adjustment of compensation will be made either:

- as a payment to the Contractor in respect of any authorised increase in quantities which exceed those specified nominal rates of application or mix proportions (including tolerances), where such increase has been specified by the Engineer or
- as a refund to the Employer in respect of the decrease in quantities which are less than those specified nominal application rates or mix proportions (including tolerances), irrespective of whether such decrease results from an authorised decrease in the rates of application or mix proportions, or from unauthorised reductions on the part of the Contractor.

Payment for a prescribed rate of application or mix proportion shall be based on the actual rate of application or mix proportion used, provided that this does not exceed the prescribed rate of application or mix proportion, including any tolerance in the rate of application or mix proportion which is included in the Contract Documentation. If the actual rate of application or mix proportion exceeds the prescribed rate or proportion, no additional payment shall be made above the allowed tolerance limit. If the actual rate of application or mix proportion is below the prescribed rate of application or mix proportion payment shall be based on the actual rate of application or mix proportion regardless of any tolerance allowed. Notwithstanding the above, the Engineer shall be fully entitled to reject work which has not been constructed in accordance with the specifications or the rates of application or mix proportions prescribed in the Contract Documentation or by the Engineer.

The Employer shall be refunded for any decrease in the specified rates of application or mix proportions at the same rate per unit of measurement as the contract rate for additional materials required by an increase in the rates of application or mix proportions.

D1.1 GENERAL PREAMBLE

PART D: GUARANTEES AND COMPLIANCE CERTIFICATES

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D1.1.8 ADDITIONAL PROCEDURES TO BE ADOPTED IN THE EVENT OF FAILURE

D1.1.9 NOTIFICATION OF REMEDIAL WORK

D1.1.10 REMEDIAL WORKS

D1.1.1 PREAMBLE

The requirements for any performance guarantees and/or compliance certificates are specified in Part D of each Chapter where applicable.

All product quality / performance / safety certificates issued by the South African Bureau of Standards (SABS) and by Agrément South Africa (ASA) will be accepted.

Product quality / performance / safety certificates issued by testing authorities based in foreign countries will only be accepted if specified in the Contract Documentation or at the discretion of the Employer.

Clauses D1.1.2 to D1.1.10 are not applicable to this Section.

1.2 GENERAL REQUIREMENTS AND PROVISIONS

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A1.2 GENERAL REQUIREMENTS AND PROVISIONS

PART A: SPECIFICATIONS

A1.2.1 SCOPE

This Section covers matters which relate to this Standard Specification and/or the Contract Documentation as a whole. It establishes generic requirements that may also be applicable to other sections of this Standard Specification to avoid repetition in the other sections.

It includes payment items for general items that are not included elsewhere in this Chapter 1 or in the other Chapters and for dayworks that are applicable to all the Chapters.

A1.2.2 DEFINITIONS

Acceptance Quality Control - encompasses those actions carried out by the Employer and/or the Engineer to inspect, sample, test and measure each constructed part or section of the Works to determine whether the quality and workmanship is acceptable in terms of the Specifications.

Process Quality Control - encompasses those actions carried out by the Contractor to assess and control materials and construction processes to ensure that the quality of the final product/s meets all the specified requirements. It includes a quality plan with defined actions, inspections, sampling, testing and measurement for each construction process to ensure that the quality control process is carried out effectively.

Stakeholder liaison - the process whereby the Employer and the Contractor engage with interested and affected parties, in particular the local authorities, local residents, schools etc., in order to inform them how the Works will affect the local community, to discuss how any adverse effects of the Works on the local community and/or environment can be eliminated or alleviated and to provide any health and safety information that is relevant to the local community regarding construction of the Works.

A1.2.3 GENERAL

The following Clauses include specifications for various general items which are not included in any of the other specific Chapters and Sections.

A1.2.3.1 Contractor's activities in respect of property outside the road reserve provided by the Employer

The Contractor may occupy and make use of property outside the road reserve that is provided by the Employer for purposes of executing the contract, on condition that:

- The Contractor complies strictly with the requirements of such statutory provisions, particularly with respect to the matters relating to serving written notice to the owner before the Contractor enters the property.
- The Contractor shall provide the Engineer with a copy of the written notice and inform the Engineer of any further consultations that may have taken place, or additional agreements reached, with the property owner.
- The Contractor adheres to all the written agreements made by the Employer with owners of the property outside the road reserve in respect of the following matters:
 - The location, extent and use of borrow pits, haul roads, construction roads and bypasses outside the road reserve,

- any compensation paid by the Employer or the Contractor, if applicable, for land or materials taken or for land temporarily used or occupied,
- the reinstatement of property occupied, used, damaged or destroyed, or compensation therefor in lieu of reinstatement,
- the procedures for the moving of fencing, services and any other items and
- any similar matter directly related to the Contractor's activities on the property.

The Contractor shall comply with all the environmental requirements and all other current legislation and regulations which are applicable to the land outside the road reserve which is being used by the Contractor for carrying out the Works.

On completion of his operations the Contractor shall obtain from the owner concerned a written statement to the effect that:

- The Contractor has fulfilled his obligations under any written agreement that the Employer has made with the owner.
- The owner is satisfied that all property occupied, including borrow pits, haul roads and construction roads, has been properly restored and is in a satisfactory condition.
- With respect to fences, services or any other items moved, altered, damaged or affected in any way the owner is satisfied that everything has been handed back to him by the Contractor in a satisfactory condition.

All such statements shall be signed and dated and copies shall be delivered to the Engineer. The obtaining of any such written statements will not relieve the Contractor of the execution of any of his obligations to the satisfaction of the Employer or the owner or authority concerned.

A1.2.3.2 Contractor's activities in respect of property which is not provided by the Employer

Should the Contractor use property which is not provided by the Employer, for haul roads, site offices and workshops, the Engineer's offices and laboratory, or for storing of equipment or materials required for construction or disposal, it shall be subject to the following:

- The Engineer shall agree to the use of any property selected for this purpose.
- Such property shall be physically separated from any production plant or activities and suitably fenced in.
- The area used for the aforesaid purpose shall be surveyed, and, where the land does not belong to the Contractor, he shall sign a lease agreement with the owner of such property in respect of the full period for which such property shall be used for such purpose. The lease agreement shall stipulate that the property owner shall not have any right whatsoever to any material stockpiled on such property during the duration of the contractual lease agreement.
- A lease agreement shall be concluded by the Contractor with the owner or owners of such property for the full period that such property is required. The lease agreement shall provide for possible extensions to match the duration of the contract. The lease agreements shall also provide for the contract being terminated by Contractor's default or liquidation and the resulting possibility for the lease agreement to be taken over by a succeeding Contractor.
- Copies of all lease agreements shall be submitted to the Engineer for comment prior to signature by the signing parties and copies of the final signed agreements shall lodged with the Engineer. Notwithstanding the Engineer's comments on the conditions of a lease the Contractor shall be solely responsible for adhesion to the terms of the lease agreements.
- Suitable permanent reference beacons shall be placed next to any material storage area, at the cost of the Contractor, to demarcate the storage area and, if applicable, for use by the Engineer for taking cross-sections for determining quantities.
- Only material that is to be used for the Works shall be stored on such property.
- The Contractor shall comply with all the requirements of the environmental and any other legislation which is applicable to the property being used.

On completion of his operations, the Contractor shall obtain, from the owner concerned, a written statement to the effect that:

- The Contractor has fulfilled his obligations under any written agreement that he made with the owner.
- The owner has received all the compensation he is entitled to and is also satisfied that all property that was occupied, including borrow pits, haul roads and construction roads, has been properly restored and handed over to the owner in a satisfactory condition.
- With respect to fences, services or any other items moved, altered, damaged or affected in any way the owner is satisfied that everything that was affected has been handed back to him by the Contractor in a satisfactory condition.

All such statements shall be signed and dated and copies shall be delivered to the Engineer. The obtaining of any such written statements will not relieve the Contractor of the execution of any of his obligations to the satisfaction of the Employer or the owner or authority concerned.

A1.2.3.3 Environmental management

The Contractor shall ensure that the project complies with all the requirements that have been set out in the Environmental Authorisation (EA), the Environmental Management Plan (EMP), the Water Use Licenses (WUL) for the extraction of water as well as for working within a certain distance of watercourses and their associated specific conditions and permits.

Before any construction may commence the Contractor shall ensure that he has a copy of all licenses and permits required in terms of the EA, the EMP and for the WULs that were obtained by the Employer prior to the Contract being awarded. The Contractor shall also ensure that he obtains all other outstanding permits required to comply with the requirements of the EA, the EMP and the WULs, in particular the WUL for the extraction of the amount of water he requires from rivers and streams. The Contractor shall supply a copy of all required licenses and permits to the Engineer for his records.

Where specified the Contractor shall carry out a search and rescue of environmentally sensitive/endangered vegetation and prepare all necessary rehabilitation plans.

All Contractors are required to comply with all the applicable current rules, regulations, standards, policies and legislation, especially those contained in the following Acts and in any subsequent amendments thereto:

- The National Environmental Management Act No. 107 of 1998 (regulates duty of care principle).
- The National Water Act No. 36 of 1998 (guides the management of water and its associated resources in South Africa).
- The National Environmental Waste Act 59 of 2008.

The Contractor shall carry out all the work in accordance with the environmental legislation and authorisations which are applicable to the Contract. Permits are issued with stringent guidelines, monitoring procedures and other requirements and the Contractor shall ensure full compliance with all of them.

All waste material shall be disposed of in accordance with the applicable legislation and requirements. The Contractor shall confirm what the waste disposal requirements in the area are with the relevant provincial and local authorities before he commences his site establishment. The Contractor shall have a written waste management and disposal plan which classifies the types of unsuitable and waste material on the site to be disposed of and identifies the approved disposal sites. Hazardous waste must be collected and disposed of separately from general waste at an approved hazardous waste site.

If specified in the Contract Documentation, the Contractor shall also provide a dedicated, full time environmental officer who will be responsible for the environmental monitoring, compliance and reporting duties.

A1.2.3.4 Extension of time for delays caused by rainfall

This Clause specifies the conditions under which extensions of time for rainfall delays will be measured.

Any delays caused by rainfall shall be determined in terms of one of the three methods given below. The applicable method for a particular contract shall be specified in the Contract Documentation. The rainfall delay determined by using the specified method shall entitle the Contractor to an equivalent extension of the time for completion without the need for formal claim procedures. (If none of the methods given below are specified in the Contract Documentation then any claims for rainfall related extensions of time will be dealt with according to the applicable Conditions of Contract.)

Any other delays caused by exceptionally adverse weather conditions that have not already been taken into account as specified above shall be dealt with in accordance with the applicable Conditions of Contract.

The Contractor shall take cognisance of all the temperature, wind speed, moisture content and curing related limitations and/or restrictions that are applicable to some items of the Works as specified in the relevant clauses of this Standard Specification. No extensions of time will be measured or granted for any delays caused by the Contractor's compliance with these limitations and/or restrictions.

a) Method 1 (Rainfall formula)

If specified in the Contract Documentation the formula below shall be used to calculate separately the delay for each calendar month or part thereof due to rainfall. It shall be calculated each month during the period referred to in the Conditions of Contract as the time for completion of the Works (including any extension thereof that may have been granted), or until the issue date of the Taking-over Certificate, whichever is the shorter period. The delay calculated for a given month shall be used to determine the interim extension of time granted for that month. At the end of the applicable period referred to above, the aggregate of the monthly delays will be taken into account for the final determination of the total extension of time for the Contract. Such determination will not be subject to normal claim procedures.

$$V = (Nw - Nn) + [(Rw - Rn) \div X]$$

If any value of V is negative and its absolute value exceeds Nn, then V shall be taken as equal to minus Nn.

The delay for a part of a month shall be calculated by substituting pro rata values for the variables in the equation.

The symbols in the above rainfall formula shall have the following meanings:

V =	Delay due to rain in calendar days in respect of the calendar month under consideration.
Nw =	Actual number of days during the calendar month on which a rainfall of Y mm or more per day has been recorded.
Rw =	Actual rainfall in mm for the calendar month under consideration.
Nn =	Average number of days in the relevant calendar month, as derived from existing rainfall records provided in the Contract Documentation, on which a rainfall of Y mm or more per day has been recorded.
Rn =	Average total rainfall in mm for the calendar month, as derived from existing rainfall records supplied in the Contract Documentation.
X =	20, unless specified otherwise in the Contract Documentation.
Y =	10, unless specified otherwise in the Contract Documentation.

Extension of time for rainfall shall apply in addition to any other approved contract extension of time due to other causes. The total delay that will be taken into account for the determination of the total extension of time for the contract shall be the algebraic sum of the monthly totals for the period under consideration calculated to one decimal, and the delay shall be applied to the contract duration after any other caused and approved contract extensions of time have been applied. The total delay caused by rainfall shall not exceed the duration past the issue of the Taking-over Certificate. Should the grand total be negative, the time for completion shall not be reduced on account of rainfall.

The total extension of time for any calendar month shall not exceed (Nc - Nn) calendar days, where Nc = the number of calendar days in the month under consideration.

The factor (Nw - Nn) shall be considered to represent a fair allowance for variations from the average number of days during which rainfall equals or exceeds Y mm per day.

The factor [(Rw - Rn) ÷ X] shall be considered to represent a fair allowance for variations from the average for the number of days during which rainfall does not equal or exceed Y mm per day, but when wet conditions prevent or disrupt work.

This formula does not take into account any flood damage, which could cause further or concurrent delays and which should be treated separately in so far as extension of time is concerned. It also does not deal with other types of weather which may cause delays, for instance snowfalls, abnormally strong wind and extreme temperatures. All such delays shall be dealt with separately in accordance with the terms of the Conditions of Contract.

Accurate rainfall measurements shall be collected at a suitable point or various points on the site as approved by the Engineer and recorded each calendar day at 08h00 unless otherwise agreed to by the Engineer. The Contractor shall, at his own expense, take all necessary precautions to ensure that the rain gauges cannot be interfered with by unauthorised persons. Failure by the Contractor to submit and agree such records in good time may prejudice his entitlement to extension of time on account of rainfall.

Information regarding existing rainfall records, if available from a suitable rainfall station near the site, will be supplied in the Contract Documentation, together with calculations of rain delays for previous years in accordance with the above formula. The average of these delays will be regarded as predictable normal rain delays which the Contractor shall accommodate in his programme, and for which no extension of time will be considered.

If no suitable rainfall records are available, Method 1 will not apply.

b) Method 2 (Critical path method with consequential delays)

Where the critical path method with consequential delays is specified in the Contract Documentation for determining the extension of time resulting from rainfall, it shall be applied as follows:

A delay caused by rainfall conditions will be regarded as a delay only if all progress on an item or items of work on the critical path of the Contractor's programme has been brought to a halt for part of a day or a full day. Delays on programmed and actually planned working days only will be taken into account for the extension of time. Each day, or portion of a day so agreed will accrue as 'n' days of delay over the duration of the contract. The summary of accrued agreed 'n' delays shall be recorded at each site meeting.

The Contractor shall make provision in the programme of work for an expected delay of "N" working days caused by predictable normal rainy weather, for which the Contractor will not receive any extension of time. The value of "N" shall be given in the Contract Documentation.

Extension of time for rainfall delays which occurred during working days will be granted to the degree to which the agreed cumulative actual delays, in full or part of working days as defined above, exceed the cumulative number of "N" working days as mentioned in the Contract Documentation, during the contract period up to the issue of the Taking-over Certificate. Extension of time for rainfall shall apply in addition to any approved contract extension of time due to other causes.

This method does not take into account any flood damage, which could cause further or concurrent delays and which should be treated separately in so far as extension of time is concerned. It also does not deal with other types of weather which may cause delays, for instance snowfalls, abnormally strong wind and extreme temperatures. All such delays shall be dealt with separately in accordance with the terms of the Conditions of Contract.

If a delay due to wet conditions is caused by, or exacerbated by, the lack of adequate temporary drainage measures, such a delay shall not be taken into account in the calculation of any extension of time.

Any delay due to rainfall will only be recognized and granted to the extent that the delay could not be mitigated by changing work sequences. The delay shall be applied to the contract duration after any other caused and approved contract extensions of time have been applied. The total delay caused by rainfall shall not exceed the duration past the issue of the Taking-over Certificate.

c) Method 3 (Critical path method without consequential delays)

Where the critical path method without consequential delays is specified in the Contract Documentation for determining the extension of time resulting from rainfall, it shall be applied as follows:

Delays caused by rainfall may be considered as extension to the time for completion only if the Engineer agrees that the event (and not the consequence of the event) occurred during the working day within the contract period and caused all progress on an item or items of work on the critical path of the Contractor's programme brought to a halt. Each day, or portion of a day so agreed will accrue as 'n' days of delay over the duration of the contract. The summary of accrued agreed 'n' delays, which exclude any consequential delays as stated below, shall be recorded at each site meeting.

No limitation is placed on the quantity, severity or duration of the rainfall event as being the cause of delay. Expressly excluded from the measurement of 'n' days are consequential delays, which are taken to mean delays to critical path activities attributable to the rainfall event but occurring after (i.e. outside of and distinctly separate from) the duration of the rainfall event itself.

The Contractor shall make provision in the Contractor's programme of work for expected "N" working days caused by rainfall. This provision shall be shown as a terminal float on the Contractor's programme. The value of "N" shall be given in the Contract Documentation.

Any extension to the time for completion caused by rainfall delays will only be considered once the agreed cumulative 'n' delays during the contract period up to the issue of the Taking-over Certificate exceed "N" working days. Extension of time for rainfall shall apply in addition to any approved contract extension of time due to other causes.

This method does not take into account any flood damage, which could cause further or concurrent delays and which should be treated separately in so far as extension of time is concerned. It also does not deal with other types of weather which may cause delays, for instance snowfalls, abnormally strong wind and extreme temperatures. All such delays shall be dealt with separately in accordance with the terms of the Conditions of Contract.

The delay shall be applied to the contract duration after any other approved contract extensions of time have been applied. The total delay caused by rainfall shall not exceed the duration past the issue of the Taking-over Certificate.

A1.2.3.5 Handing-over of the Site of the Works

The Site of the Works will be handed over to the Contractor for construction purposes, subject to such conditions as may be specified in the Contract Documentation regarding matters such as:

- The sequence in which sections of the Works will be handed over and must be completed.
- The maximum total length of temporary deviations that will be allowed to be in operation at any time.
- The number of half or partial width construction sections that will be permitted on the Site of the Works at any one time.
- The minimum length of existing or newly completed full width, unrestricted road sections that must be open to traffic between any half or partial width construction sections.
- Any other matters relating to the Contractor's use and occupation of the road reserve.

A1.2.3.6 Health and safety

The Contractor shall always comply with the requirements of the health and safety plan, drawn up by the Contractor in compliance with all current and applicable health and safety legislation, the Employer's health and safety specification and the Contractor's own health and safety requirements to ensure that the Contractor complies fully with all current legislation and regulations as well as with any additional health and safety requirements that may be specified in the Contract Documentation. The Contractor's health and safety plan shall be developed to address all risks specific to the Works as identified in risk assessments carried out by the Contractor and/or by the Employer.

The Employer and /or his construction health and safety agent may also monitor the Contractor's compliance with the requirements stipulated in the Employer's health and safety specification as well as the requirements set out in the Contractor's health and safety plan.

A1.2.3.7 Legal and contractual requirements and responsibility to the public and the Employer

The Contractor shall comply with all the legislative and regulatory requirements of all the relevant statutory bodies pertaining to his site establishment and to the execution of the Works. The Contractor shall also comply with the requirements given in the Contract Documentation and with his legal and general obligations to the public, particularly with regard to obtaining and maintaining all the insurances and sureties required for the duration of the Contract and the Defects Notification Period.

A1.2.3.8 Tolerances

The work specified in all the chapters of this Standard Specification shall comply with the various dimensional and other tolerances specified in each case. No representation is made that the full specified tolerances will be available independently of each other, and the Contractor is cautioned that the liberal or full use of any one or more tolerances may deprive him of the full or any use of tolerances relating to other aspects of the work. The latter would apply particularly in respect of level tolerances on layer work and the related requirements regarding layer thicknesses.

Where no tolerances are specified, the standard of workmanship shall be in accordance with normal good practice.

A1.2.3.9 Monthly reports

The Contractor shall prepare monthly reports on progress, delays incurred, plant returns, OHS and EMP compliance, staff training, empowerment, capacity building, small Contractor development, labour and staff returns and any other information required by the Employer and/or the Engineer which is specified in the Contract Documentation.

The Contractor's monthly reports shall be submitted to the Engineer at least two working days prior to the applicable scheduled monthly site meetings.

A1.2.3.10 Notices, signs and advertisements

The Contractor shall not erect any signs, notices or advertisements on the Works or the site of the Works without the written approval of the Engineer.

Details of the official contract sign boards (if any) that should be erected will be given in the Contract Documentation or issued by the Engineer. These signs are to be erected in positions determined by the Engineer not later than one month after the Contractor has been given access to the site. They shall be maintained in a clean and legible condition throughout the contract and removed immediately upon completion of the Works.

No signboards other than those specified above will be permitted on or adjacent to the Works, except that the Contractor may permit each of his subcontractors to display one signboard, and one only, of less than 2 m² at the Works office. All advertisements, notices and temporary signs shall be removed by the Contractor immediately upon completion of the Works.

A1.2.3.11 Ordering of daywork

Daywork shall be undertaken strictly in accordance with the provisions of the Conditions of Contract. No daywork shall be undertaken unless specified by the Engineer. Such a written instruction shall include a full description of the work to be carried out. Before commencing any daywork the Contractor shall obtain the Engineer's agreement regarding the estimated duration of the dayworks, the numbers of each category of staff to be employed, the materials to be used and the construction equipment and vehicles that will be required to carry out the work.

The Contractor shall provide the Engineer with a daily report that records the actual duration, numbers of staff and materials, equipment and vehicles used each day for approval of the dayworks.

A1.2.3.12 Ownership of assets and disposal of non-useable assets

Unless otherwise stated in the Contract Documentation the Employer is the owner of all existing moveable and immoveable assets in the road reserve.

Non-useable assets are assets that have reached the end of their economic life, are no longer needed or need to be replaced. A disposal plan for these non-useable assets will be given in the Contract Documentation. The Contractor shall submit rates for the disposal of each of the identified non-useable assets listed in the Contract Documentation. The tendered rates could be positive or negative depending on the cost of disposing of them against the value that the Contractor may wish to place upon them.

A provisional sum may also be provided to cover the cost of the disposal of any non-useable assets that may be identified during the construction of the Works. A record must be kept of all such non-useable assets that are disposed of. Any income derived from the sale of these assets will be offset against the provisional sum.

A1.2.3.13 Prevention of damage to nearby properties and services

All buildings that could be affected by excessive ground vibrations generated during the construction operations will be identified in the Contract Documentation, or by the Engineer, and categorised in accordance with the descriptions given in Table A1.2.3-1 below.

Before commencing any construction work on the site of the Works which involves the use of vibratory or impact compaction equipment, pavement breakers, piling equipment, pneumatic drills and hammers and excavators or overhead cranes in the vicinity of any public or privately owned buildings the Contractor shall arrange with the property owner for an inspection, and, if permitted by such owner, a photographic survey, of all the items on the property that could be affected by the construction equipment and/or construction processes that the Contractor intends to use.

Written and photographic records must be made of any existing defects, cracks or any other potential weaknesses and the Contractor shall discuss with the property owner and record in writing what preventive and/or mitigation measures that will be taken to avoid or prevent any damage from occurring to the items on the property as a result of the construction work. The Contractor and the property owner should sign and date these records and a copy shall then be submitted to the Engineer for comments if required and for record purposes.

The Contractor shall prepare a written and photographic record of any overhead services or other obstructions on or near the property boundaries such as power lines, telephone lines, fences, walls, signage etc. that could be affected by the construction activities, in particular by cranes, excavators and similar construction equipment that could encroach on the property. These records shall be given to the Contractor's safety officer and the relevant safety plans shall be amended to include preventative measures for any damage to property or any injuries to the Contractor's personnel and members of the public that could occur.

The Contractor shall note the presence of any underground pipelines which may be affected by the construction activities, in particular jointed pipes. The Contractor shall comply with the provisions of Clause A2.3.1.2d)(ii) of Chapter 2 with respect to the location and protection of existing services. All vulnerable underground services shall be exposed by hand excavation so that their condition and potential vulnerability to heavy vibrations can be assessed. The Contractor shall discuss with the relevant service authority and record in writing what preventive and/or mitigation measures will be taken to prevent any damage to the vulnerable services that could occur due to the proposed compaction or blasting operations. The Contractor and the service authority owner should sign and date these proposed preventive and/or mitigation measures and a copy shall then be submitted to the Engineer for comments if required and for record purposes.

The Contractor shall use suitable construction equipment and/or modify the working methods to ensure that the maximum peak particle velocities generated by the construction equipment, as measured on the ground surface with a triaxial seismograph vibration monitor placed at the corner of the building closest to the source of the vibration, or directly above the pipeline, do not exceed the values given in Table A1.2.3-1 below:

Table A1.2.3-1: Peak particle velocity limits

STRUCTURE / PIPELINE TYPE AND CONDITION	MAXIMUM PEAK PARTICLE VELOCITY (PPV) (mm/sec measured at a frequency of 50 Hz)
Fragile buildings (old and / or poorly constructed)	2,5
Old or low quality houses	5,0
Well built houses	12,5
Concrete structures	12,5
Industrial buildings	12,5
Steel pipelines	15,0
uPVC pipelines	10,0
Asbestos cement / fibre cement pipelines	5,0

NOTE: The PPV values given in the above table are subject to review during the period that this Standard Specification is still published as a Draft Standard.

At the start of any work involving equipment that will generate ground vibrations all vulnerable structures must be monitored closely by the Contractor. If there are any signs that any damage is being caused by the ground vibrations the work shall be stopped immediately and the Engineer shall be informed. The level of the ground vibrations generated at the closest corner of the affected building shall then be measured and checked against the allowable limits given in Table A1.2.3-1 above. The Engineer shall then decide if work may continue if the Contractor must alter his working methods to reduce the ground vibration levels.

Any damage that may occur to buildings, structures, fencing, walls, services and anything else on the property that may be affected by the construction activities shall be repaired or rectified to the satisfaction of the owner at the Contractor's expense unless the Engineer is satisfied that all the necessary and specified precautions were taken by the Contractor and the damage was unavoidable.

A1.2.3.14 Remedial work

The Contractor shall replace, repair or make good any part of the Works or any equipment or material that is found not to conform to the specified requirements, or is damaged so that it no longer conforms to the specified requirements, in accordance with the Conditions of Contract before the Taking-over Certificate will be issued.

A1.2.3.15 Routine maintenance

In addition to the Contractor's maintenance responsibility stemming from his obligations under care of the Works, the Contractor shall also be responsible for all routine maintenance of the public roads within the site of the Works and other public roads being used as detours from the date of handing over of the site until the completion of the Works. This routine maintenance responsibility shall include all the maintenance of all existing roads, road furniture, fixtures and the like and shall typically comprise grass cutting, rubbish removal, the clearing and repair of existing drainage systems, repair of existing guardrails and signs, patching, assistance with clearance at accident scenes and attending to any structural damage caused by traffic during the contract period.

In circumstances where another Contractor has been appointed by the Employer to carry out routine maintenance activities over the same section of the road, the Contractor may be required to attend meetings with the routine maintenance contractor to co-ordinate maintenance activities.

The potential exists for an agreement to be reached whereby the routine maintenance contractor may continue to perform certain responsibilities such as the cutting of grass and the collection of rubbish, in which event the Contractor shall make allowance in his construction activities and Works programme to accommodate the routine maintenance contractor and to provide reasonable access to allow him to carry out such work.

A1.2.3.16 Site meetings

The Contractor shall attend regular (at least monthly) meetings on the site with the Employer and the Engineer, at dates and times to be determined by the Employer and/or the Engineer. Such meetings will be held for evaluating the progress of the Works, compliance with the environmental management and the health and safety regulations and for discussing matters pertaining to the contract which any of the parties represented may wish to raise. To this effect the Contractor will be obliged to compile a formal monthly report, drafted in consultation with the Engineer where necessary, and to submit these monthly reports to the Engineer at least two working days before each site meeting.

A1.2.3.17 Site security

The Contractor is responsible for keeping unauthorised persons off the Site of the Works in accordance with the requirements of the Conditions of Contract. The Contractor shall therefore carefully assess the security measures of whatever nature that may be required at the location of the Engineer's site office and laboratory, the Contractor's offices, stores and workshops, the Site of the Works including quarries, borrow pits, stockpile sites and manufacturing yards as well as any traffic accommodation site facilities and equipment which may be placed on the approaches to / exits from the Site of the Works.

The Contractor shall then make all necessary arrangements to provide adequate security measures which will prevent access to the Site of the Works and to the Contractor's and Engineer's site facilities by any unauthorised persons and will also prevent damage to, or theft of, any facilities, equipment, plant, materials and parts of the Works which have not yet been handed over to the Employer.

The security measures provided for the Engineer's site offices and laboratories, and for the Engineer's site accommodation situated on or adjacent to the Site of the Works, shall include security fencing and gates, security lights and burglar alarm systems linked to an armed response company and a night watchman.

The security measures provided for the Engineer's rented housing shall consist of an acceptable burglar alarm system linked to an armed response company.

A1.2.3.18 Stakeholder liaison

The initial stakeholder liaison required will normally be undertaken by the Employer and/or the Engineer. The outcomes and agreements resulting from all such stakeholder liaison will be taken into account and included in the Contract Documentation. This process may involve the establishment of a Project Liaison Committee (PLC) and the employment of a Project Liaison Officer (PLO) by the Employer.

When the Contract has been awarded the Contractor shall undertake further stakeholder liaison to develop and manage relationships with all stakeholders, communities and individuals who are, or who may be, impacted by the Works. The stakeholder and community liaison shall be carried out in accordance with the Employer's social facilitation principles and processes where provided.

The Contractor shall also identify all other potential stakeholders in addition to those already identified in the Contract Documentation. Stakeholders include the road users who will be affected by the Works, pedestrians and non-motorised traffic that may need to traverse or cross the site of the Works as well as some or all of the following persons, parties or entities:

- Relevant Provincial departments.
- Relevant Municipal departments.
- Traditional authorities.
- Community interest groups.
- Organised youth representation.
- Organised women representation.
- Organised disabled people representation.
- Organised labour representation.
- Other structured community groups such religion, education, farming, etc.
- Transport industry forums, e.g. Bus and taxi organisations.
- Business sector forums.
- Road user forums.
- Ratepayers organisations.
- Environmental interest groups.
- Road safety interest groups.
- Ward committees.
- Any other recognised relevant and representative structure.

As part of the stakeholder liaison process the Contractor shall:

- Listen to and record the stakeholder's concerns regarding how they may be affected by the Works and to inform them on what measures the Contractor can and will take to alleviate their concerns and mitigate any adverse effects of the Works that are identified.
- Inform and educate all affected parties about the safety risks associated with the Works in so far as the Works will impact on the local road users, residents and school children.

The Contractor shall analyse the influence of all stakeholders on the project and develop strategies to communicate with them and to manage competing expectations so that he can mitigate issues that would otherwise delay the project. All stakeholders shall be provided with relevant information about the Works via community meetings, newspaper advertisements, radio broadcasts, electronic communication media and information leaflets as appropriate.

Where a PLC has been established by the Employer, the Contractor shall use the PLC as the official communication channel, with the assistance of the PLO where one has been appointed by the Employer/Engineer. The Contractor shall delegate someone to participate in the PLC meetings and to assist and/or hold the PLC accountable for the organisation of community meetings and the effective dissemination of relevant information to all stakeholders and affected communities.

The stakeholder liaison process may also include issues related to the employment of local labourers and sub-contractors chosen by the Contractor and/or employed in accordance with any targeted labour recruitment and/or targeted enterprises selection requirements that may be specified in the Contract Documentation. All labour and sub-contractor related matters, and any associated risks, are and shall remain the responsibility of the Contractor irrespective of the Employer's and/or Engineer's role/assistance provided in establishing a PLC and/or providing a PLO.

A1.2.3.19 Temporary drainage and dewatering

The Contractor shall be responsible for the provision of temporary drainage works such as drains, open channels, banks etc., and for providing and operating temporary pumps and such other equipment as may be necessary for adequately protecting, draining and dewatering the Works and any temporary Works, deviations and detours on existing roads if required.

The Contractor shall ensure that any temporary drainage works and/or dewatering operations do not cause erosion or flooding of other parts of the Works or adversely affect the stability of any excavated trenches or slopes. If the Contractor becomes aware of any potential signs of slope / trench instability he shall immediately suspend the work and withdraw all personnel from the area and fence and/or barricade it to prevent access. The Contractor, who remains responsible for compliance with the OHS regulations, shall then propose, design and implement all measures required to rectify the situation.

Unless specifically reflected in the pricing schedule, all such measures shall be deemed to be included in the rates for the Works.

A1.2.3.20 Road safety audits

If stated in the Contract Documentation, two types of road safety audits shall be carried out on the Contract, namely a work zone traffic management audit before any construction work commences and a pre-opening stage road safety audit when the construction work is almost complete.

a) Work zone traffic management audit

Before any construction work commences the Contractor shall appoint an independent qualified road safety auditor to carry out an audit which shall be undertaken in terms of the requirements given in the latest version of the South African Road Safety Audit Manual (SARSAM) for a Stage 4 construction work zone traffic management audit.

The auditor / audit team shall, when carrying out this audit, recognise the guidance given to contractors in the South African Road Traffic Signs Manual, Volume 3, Chapter 13 as well as the traffic accommodation specifications given in Section A1.5 of this Chapter.

Particular attention shall be paid to the following aspects:

- The appropriateness of the proposed traffic management scheme, especially in transition areas.
- Adequacy of the advance warning arrangements.
- Proposed work zone speed limits.
- Conflicts between permanent and temporary road signs and any other road features.
- Any aspects of the proposed signage, barrier and detour layouts that could possibly be misread by / be confusing to road users or may violate normal driver expectancy.
- The likelihood of dust and/or mud obscuring safety signage.
- The appropriateness and adequacy of any proposed vehicle restraint systems / barriers, the installation thereof and the safety of the terminals.
- Adequate provision for pedestrians and public transport vehicles if applicable.
- Conflict points between construction vehicles and the public road users.
- The effect, and mitigation of, traffic congestion during peak periods.
- The effect of an accident if it occurs within the deviation areas.

b) Pre-opening stage road safety audit

Just before the construction work is completed the Contractor shall appoint an independent qualified road safety auditor to carry out an audit which shall be undertaken in terms of the requirements given in the latest version of the South African Road Safety Audit Manual (SARSAM) for a Stage 5 pre-opening stage road safety audit.

The auditor / audit team shall, when carrying out this audit, recognise the guidance given to contractors in the South African Road Traffic Signs Manual, as well as the construction specifications for road signs, guardrails and road markings given in Chapter 11 of this Standard Specification.

Particular attention shall be paid to the following aspects:

- Has sufficient provision been made for all the different users of the road project?
- Has adequate protection been provided for all potential roadside hazards?
- Are there any variations between the approved design and the constructed Works which may adversely influence the safety of the road users?
- Are all the road signs, road markings, road furniture and lighting arrangements, if applicable, correctly erected and positioned in accordance with the specified requirements and do they meet the required specified standards?
- Have all temporary traffic accommodation arrangements, construction equipment and construction materials / debris that may be a direct physical hazard or may cause any road user confusion been removed or safely repositioned?

A1.2.3.21 Water

The Contractor shall make his own arrangements for procuring, transporting, storing, distributing and applying the water needed for construction and other purposes, except where otherwise specified.

Obtaining water from streams, rivers, dams or boreholes shall be subject to the Contractor obtaining the required permit from the relevant authority.

Obtaining water from a municipal or other water supply authority shall be subject to the Contractor entering into a supply agreement with the relevant supply authority.

The suitability of water for construction purposes shall be determined in accordance with the acceptance parameters given in the following clauses of this Standard Specification:

- Water for backfilling trenches and for concrete required for services work – Clause A2.1.5.3 of Chapter 2.
- Water for testing pipelines – Clause A2.3.8.3b) of Chapter 2.
- Water for earthworks and pavement layers – Clause A4.1.5.18 of Chapter 4.
- Water for stabilisation of pavement layers – Clause A5.4.5.6 of Chapter 5.
- Water for concrete pavements – Clause A6.1.5.2 of Chapter 6.
- Water for diluting bitumen emulsion – Clause A10.1.5.6 of Chapter 10.
- Water for grout – Clause A12.3.5.1 of Chapter 12.
- Water for shotcrete – Clause A12.5.5.4 of Chapter 12.
- Water for concrete structures – Clause A13.4.5.3 of Chapter 13.
- Water for cementitious repair mortar or concrete – Clause A14.4.5.3 of Chapter 14.
- Water for sprayed concrete – Clause A14.6.5.3 of Chapter 14.

A1.2.3.22 Wayleaves/Agreements and Permits

a) Wayleaves/Agreements (Planning and Design Approvals)

The Employer will be responsible for obtaining the necessary planning and design approvals for the work described in the Contract Documentation or shown on the drawings. In terms of this Standard Specification such approval is deemed to be granted in accordance with the terms of what are referred to as "wayleaves". Before commencing any work the Contractor shall ask the Engineer to obtain all the applicable wayleaves from the Employer.

If specified in the Contract Documentation, the Contractor shall be responsible for applying for certain wayleaves and, if so specified, the Contractor shall determine and comply with the wayleave application processes specified by the road authority responsible for the road reserve and by any other service authority/provider whose services are known to exist in the road reserve.

The applications for such wayleaves shall be submitted timeously by the Contractor to ensure that wayleaves can be issued before the work is programmed to start. Applications for wayleaves shall be submitted with the relevant design drawings.

The Contractor shall pay all fees and charges for wayleaves to the road authority responsible for the road reserve or to any other service authority/provider whose services exist in the road reserve.

The Contractor shall comply with all conditions pertaining to the approval of wayleaves that may be imposed by the road authority or by the relevant service provider.

b) Permits and other approvals (Construction or Work Permits)

The Contractor shall be responsible for obtaining the necessary approvals, permissions or authorisations to carry out the work described in the Contract Documentation. In terms of this Standard Specification such approvals, permissions or authorisations are deemed to be granted in terms of what are referred to as "construction permits" or "work permits". The Contractor shall be responsible for obtaining the necessary construction or work permits from all the relevant road authorities or service authorities/providers whose services are known to exist in the road reserve.

The Contractor shall determine and comply with the construction permit application processes specified by the road authority responsible for the road reserve or by any relevant service authorities/providers.

The applications for construction and/or work permits shall be submitted to the relevant road authority or service authority/provider timeously to ensure that construction permits can be issued before the Works are programmed to start. Applications for construction and/or work permits shall be submitted with the relevant drawings.

The Contractor shall pay all fees and charges for construction and/or work permits to the road authority responsible for the road reserve or to the relevant service authority/provider.

The Contractor shall comply with all conditions included in the construction and/or work permits that may be imposed by the road authorities or by the service authorities/providers. Such conditions may include, but are not limited to:

- Giving adequate notice of commencement of work.
- Providing adequate supervision of the Works and compliance with health and safety regulations.
- Compliance with environmental and water use requirements.
- Providing access to and conducting progress inspections required by the road authority or service provider.
- Specific requirements for road and service crossings.
- Specific requirements for location of services and/or co-location of services for multiple service providers.
- Specific requirements for temporary and permanent reinstatement of services, road crossings etc. Provision of adequate notice of and carrying out of inspections on completion of the Works.
- Provision of record drawings and documentation to the relevant authorities, service authorities/providers and to the Employer if required.

The Contractor shall familiarize himself with, and comply with, all local by-laws applicable to work in the road reserve.

Only work described in a construction/work permit may be done and only at the locations covered by the permit. The work described in the permit shall commence and shall be completed within the period stipulated by the road authority or service authority/provider, failing which the construction/work permit may lapse and re-application for the permit will then be required.

A1.2.3.23 Work in restricted areas

The Contractor shall programme the work and select the working methods and equipment taking due cognizance of all restrictive conditions indicated in the Contract Documentation regarding the location, size and spacing of the various construction areas, any specific work sequences that may be required and any traffic accommodation or other factors that may affect the programme of work.

As stated in Clause C1.1.3.2 no additional compensation shall be made for work that could be considered as partial width construction or for construction in restricted narrow, short and/or confined areas unless otherwise specified in the Contract Documentation.

A1.2.4 DESIGN BY CONTRACTOR / PERFORMANCE BASED SYSTEMS

A1.2.4.1 Designs and drawings for the permanent Works provided by the Contractor

Where the Contractor is required to prepare any designs and/or drawings for the permanent Works they shall be prepared as specified below and in accordance with any further requirements that may be specified by the Engineer. The drawings shall comply in all respects with the requirements of the Employer. If provided by the Employer, the Contractor shall use the master standard drawing sheets and schedules as masters for all drawings prepared by him and submitted to the Engineer for consideration.

The Contractor shall submit to the Engineer for comment two A0 paper copies of each drawing and all relevant design calculations prepared by, or on behalf of, the Contractor and signed by a registered competent person. Electronic versions of the drawings and all relevant design calculations should also be provided in the specified format. The standard of detailing and quality of print shall be the same as those of the drawings supplied to the Contractor under the Contract Documentation.

Accepted designs and/or drawings shall form an integral part of the Contract Documentation. Any designs and/or drawings not accepted by the Engineer will not be permitted on the site of the Works for construction purposes and/or used for the manufacture of any item. Notwithstanding the acceptance and/or signing of the designs and/or drawings by the Engineer or the Employer, the Contractor shall take full responsibility for all details, discrepancies, omissions, errors, etc. in respect of the said designs and/or drawings as well as for all consequences arising therefrom.

The Contractor shall submit only fully completed and checked designs and/or drawings in accordance with this Standard Specification and shall not be entitled to claim for any delays resulting from the submission of incomplete or incorrect drawings. Unless already specified elsewhere in the Contract Documentation, the Contractor shall agree with the Engineer the amount of time required by the Engineer to consider and comment on the designs and/or drawings. The same time frame requirements will apply to any resubmissions of the designs and/or drawings that may be required.

A1.2.4.2 Designs and drawings for temporary works provided by the Contractor

The Contractor shall be responsible for the design and execution of all temporary work and structures that are required for the construction and completion of the Works. This includes all deviations, temporary drainage and flood diversion or control measures, drilling and blasting, excavations, scaffolding, shuttering, shoring, support structures and all other work that is necessary for the construction of the permanent Works.

The design of all such temporary work must be carried out by experienced persons who are suitably and, where required by legislation, professionally qualified to carry out such designs. The Contractor shall ensure that the design of all temporary works has been carried out in accordance with all relevant legislation and that the construction / erection of the temporary works is carried out by and supervised by competent, experienced persons.

All design calculations and drawings required for the temporary works shall be submitted to the Engineer for comment when the Contractor is requested to do so. Unless already specified elsewhere in the Contract Documentation, the Contractor shall agree with the Engineer the amount of time required by the Engineer to consider and comment on the designs and/or drawings. The same time frame requirements will apply to any resubmissions of the designs and/or drawings that may be required.

A1.2.4.3 Performance based systems

The specifications pertaining to the provision and implementation of performance based systems are given in Part D of the various Sections of each of the Chapters of this Standard Specification where applicable.

A1.2.5 MATERIALS

A1.2.5.1 General

The Contractor shall confirm the quantities of all manufactured items or materials required for the completion of the Works with the Engineer before finalizing any orders or production processes.

The Contractor, before using manufactured articles or materials that are required to comply with any specification, shall furnish the Engineer with certificates showing that the materials do comply with that specification. Where so specified, materials shall bear the official mark of the appropriate authority. All materials and products which should comply with a South African National Standard Specification (SANS) shall carry the certification mark of a SANAS accredited certification body.

Samples ordered or specified for inspection, comment and/or approval by the Engineer prior to the manufactured articles or materials being ordered, procured or used in the Works shall be delivered to the Engineer's site office at least seven calendar days, or such longer period that may be specified in the Contract Documentation, before such comment or approval is required.

Unless otherwise specified, all proprietary materials shall be used and placed in strict accordance with the relevant manufacturer's current published instructions. Agrément certified products shall be used and placed in accordance with their Agrément certification criteria.

All manufactured articles or materials supplied by the Contractor for the permanent Works shall be new and unused unless stated otherwise in the Contract Documentation. Manufactured articles and materials to be included in the Works shall not be damaged in any way and, should they be damaged during manufacture, delivery or by the Contractor during handling, transportation, storage, installation or testing they shall be replaced, or repaired to comply with the original specification, by the Contractor at his own cost.

All places where articles and materials are being manufactured or obtained for use in the Works, and all the processes in their entirety connected therewith, shall be open to inspection by the Engineer (or other persons authorised by the Engineer) at all reasonable times.

A1.2.5.2 Mix designs

Unless otherwise specified in the Contract Documentation, the Contractor shall be responsible for the design of all material mixes. The Contractor shall make allowance for the material mix design approval process in the Contractor's programme. Before commencing with the associated construction activities, the Contractor shall be responsible for the following procedures in connection with the design of material mixes:

- Sampling and testing of construction materials to determine their properties and suitability for use in materials mixes and in the Works, all according to relevant standard methods and procedures.
- Production of the required mix designs - in conjunction with the Engineer if required.
- Production of laboratory, production/plant and/or trial mixes.
- Adjustments to the mix designs and reproduction of the required laboratory, production/plant and/or trial mixes.
- Construction and testing of trial sections and/or other trials as required.
- Submission of duplicate samples and the proposed mix designs to the Engineer for review and comment, and approval if so specified in the Contract Documentation.
- Verification of the mix designs, trials and/or trial sections before commencing with the permanent Works.

The Contractor's mix designs shall be submitted to the Engineer using the Employer's standard forms where they are provided, or in any other format which includes all the relevant information and which is acceptable to the Engineer.

A1.2.6 CONSTRUCTION VEHICLES AND EQUIPMENT

The Contractor shall submit a list of the construction vehicles and equipment to be used on the site of the Works to the Engineer for review before the commencement of the Works.

The Contractor shall ensure that all construction vehicles and equipment used on the site of the Works and on public roads shall comply with all current legislation and regulations.

The Contractor shall also ensure that all construction vehicles and any equipment that may travel on roads used by the public are:

- Suitable for their intended purpose.
- Maintained in good working order.
- Inspected daily by the operator or driver - the inspection records shall be kept in the vehicle or item of equipment.
- Equipped with the following:
 - A flashing amber LED light / light bar of an approved design. The flashing light / light bar shall be mounted so that it is clearly visible in daylight from all directions. They shall be switched on continuously while the vehicles are on site, are manoeuvring in or out of traffic or are travelling or parked alongside roads open to public traffic.
 - A warning sign with the wording CONSTRUCTION VEHICLE in retro-reflective Class 3 red letters at least 200mm high on a retro-reflective Class 3 white background which shall be mounted in a visible position at the rear of every vehicle or any item of construction plant which may travel on roads used by the public.
 - An automatic acoustic reversing alarm.

The Contractor shall confirm to the Engineer in writing that all the construction vehicles and mobile equipment to be used on the site of the Works comply with all the legal and other specified requirements before any vehicles and construction equipment will be permitted to commence operating on the site of the Works.

A1.2.7 EXECUTION OF THE WORKS

A1.2.7.1 Programme of work

a) General

This Clause describes the requirements for the preparation, submittal, update and revision of the Contractor's programme. These requirements are in addition to, or expand upon, the requirements for programming the Works which are given in the Conditions of Contract or elsewhere in the Contract Documentation.

The Contractor's programme shall be used by the Contractor to plan and execute the Works. The programme will also be used by the Engineer to monitor progress and it may be used as the basis for the assessment of extensions of time and the effect of any delays on the progress of the Works.

The Contractor's original baseline programme shall be reviewed and updated monthly, or as required in the Contract Documentation, to ensure that the programme always reflects the actual progress of the Works.

Scheduling of work and monitoring of progress can be done to various degrees. Extensive scheduling has its benefits in controlling progress and in the evaluation of delay claims, but the amount of effort involved in this can be considerable and may not be required on all contracts, especially on relatively small Works. This specification makes provision for two schemes: Scheme 1 where the programme may be kept relatively simple, and Scheme 2 with more extensive requirements for complex or high value projects.

Whether a Scheme 1 or Scheme 2 programme is required will be indicated in the Contract Documentation. Scheme 1 will apply if nothing is indicated in the Contract Documentation. If only a Scheme 1 programme is indicated the Contractor shall still be able to incorporate some or all the requirements applicable to Scheme 2 in the programme if he so wishes.

b) Scheme 1

The Contractor's programme shall be in the form of a bar chart with logic links identifying critical activities forming the critical path. The Contractor is encouraged to prepare the programme using scheduling software but this is not a requirement.

All significant activities must be reflected on the programme. The degree to which these activities are broken down into sub-activities is left to the discretion of the Contractor, but it is pointed out that too little detail will impact on the degree to which the programme can be used to manage time on the project, and to assess the impact of any delays.

The equipment and labour resources which are compatible with the planned rates of production and activity durations should be allocated to all the major programmed activities.

c) Scheme 2

The initial / first programme to be submitted by the Contractor at the start of the contract, within the time limits specified in the Contract Documentation, shall include all the activities required for at least the first three months of work in detail, and need only show the major activities for the balance of the work. The Engineer will then comment on the Contractor's initial programme and the Contractor shall revise the programme if necessary.

Within six weeks of the commencement of the Works on site the Contractor shall submit a full programme which covers all the activities required to complete the full Works in the necessary detail (unless the initial programme already included all the work in detail). The Engineer will then comment on the Contractor's full programme and the Contractor shall revise the programme if necessary.

The initial and full programmes should be drawn up using the software specified in the Contract Documentation. If no such software is specified, the Contractor should use generally acceptable software intended for the creation of network diagrams and linked bar charts, and which can produce the schedules which may be required in the Contract Documentation. If required, a licenced copy of such software should be provided to the Engineer for the duration of the contract.

The full programme shall make provision for and show at least the following:

- Logic links identifying critical activities forming the critical path.
- The activities in all work packages including those by the Contractor's sub-contractors and suppliers, service owners, any sub-contractors and suppliers directly employed by the Employer and others.
- The equipment resources required for each activity and which are compatible with the planned rate of production.
- The labour resources required for each activity and which are compatible with the planned rate of production.
- The earliest and latest start and finish dates for every activity in each work package. Activities shall include all scope activities and any activities or time durations expected in addition to scope activities.
- Access dates required for each phase or section of the Works.
- The earliest and latest start and finish dates for each phase or section of the Works, including dates when the Contractor plans to complete work to allow any other sub-contractors, suppliers or service owners the necessary access to do their work.
- Programme milestones and other key dates.
- Allowances for rain delays, holiday periods and the Contractor's pay weekends.
- Dates by which designs and drawings for the temporary and permanent Works and the mix designs which are to be produced by the Contractor will be submitted to the Engineer for comment and dates by which comments on such design work, drawings and mix designs from the Engineer will be required by the Contractor, allowing time for submittals, re-submittals and reviews.
- Dates by which samples of manufactured articles or materials to be produced by the Contractor will be submitted for approval by the Engineer and dates by which approval of such samples will be required by the Contractor, allowing time for submittals, re-submittals and reviews.
- Procurement periods and delivery dates for the major items of plant and materials to be incorporated into the Works.;
- Occupation dates and re-commissioning dates of utilities and services affected by the Works.
- Dates by which major work items will be ready for testing by the Engineer or the Employer.
- Details and dates of any information required from the Engineer or the Employer.
- The work contained in all defined provisional sums.
- Activities representing the likely work content of undefined provisional sums, complete with logic links but with durations set to zero (unless specified otherwise or until the scope of the work is defined).
- Commissioning periods.
- Provisions for float, time risk allowances, quality control procedures, health and safety requirements and any other requirements that may be set out in the Contract Documentation.

The main activities, and all activities where any delay is likely to lead to a delay in the completion of the Works, shall be resourced. The resourcing input should contain details of the Contractor's resource requirements in terms of manpower, gang sizes, tradesmen, production rates, items of construction equipment and materials and quantities of work allowed for in sufficient detail to explain the Contractor's assumed rates of production and activity durations.

Details of schedules to be provided with the programme may be stipulated in the Contract Documentation. Typical schedules that may be requested include, inter alia, equipment and labour resource deployment schedules, cash flow schedules and schedules of critical activities.

d) Updating and revising the programme

The Contractor shall submit an updated programme at the end of every month which indicates the current status of the Works. The Contractor shall show the updated programmed completion date on this updated programme, compared with the completion date on the previous update.

When using a Scheme 2 programme the Contractor shall provide with each monthly programme update a schedule that compares the current float values on all key activities with the float values on corresponding items on the programme of the previous month. Brief reasons for substantial deviations should be provided on the schedule. The Contractor shall also submit a written report giving more detail for differences in progress and describing what actions will be taken to make up for any lost time.

The Contractor shall revise the programme when instructed to do so by the Engineer in accordance with the requirements of the Conditions of Contract or when the Contractor is aware that the programme no longer reflects the way in which the Contractor plans to execute the remaining work. Failure to do so will compromise the extent to which the programme may be used to evaluate any delays and any extension of time that may be due.

The revised programme shall introduce changes to the production rates if the production rates being achieved on site differ notably from the programmed production rates. The revised programme should reflect any actions, and any changes to the equipment and labour resources, that the Contractor intends to implement to address slippage on the programme. Such actions could include the provision of additional resources, a change in the sequence of work, a change to the work methods, etc.

A1.2.7.2 Setting out of the Works and the protection of beacons

The Contractor shall check the condition of all reference and level beacons provided and shall satisfy himself that they have not been displaced and that they are all correct with respect to both their position and level. If beacons have been destroyed, displaced or damaged before the site is handed over to the Contractor, the Engineer will arrange to have new beacons installed, unless such beacons are declared non-essential. A beacon which has been displaced shall not be used unless its true position and level have been re-established and the new values verified by the Engineer.

The Contractor shall take care that property beacons, trigonometrical survey beacons or setting-out beacons are not displaced or destroyed without the consent of the Engineer. Property beacons and trigonometrical survey beacons that have been displaced or destroyed during construction activities shall be replaced by a registered land surveyor, who shall certify such replacement, all at the Contractor's cost.

In cases where the displacement of or damage to property beacons or trigonometrical-survey beacons is unavoidable, the Contractor shall notify the Engineer in good time so that he may arrange to have such beacons suitably referenced and reinstated.

Where a beacon is likely to be displaced during construction operations, the Contractor shall establish suitable reference beacons at locations where they will not be displaced during construction. No beacon shall be covered over, displaced or destroyed before accurate reference beacons have been established and details of the position and levels of such beacons have been submitted to and accepted by the Engineer. The Contractor's reference beacons shall be of an acceptable quality and durability sufficient to ensure that they remain in the correct position and level for the duration of the work for which they are required.

To ensure beyond all doubt that the complex elements of the road, such as traffic interchanges, structures and other important features are located correctly, the Contractor shall check all setting-out by a second method. The Engineer may at any time request the Contractor to submit proof that his setting-out has been satisfactorily carried out and checked.

To protect beacons, the boundary fences of the road reserve shall be splayed at corners to avoid the use of corner posts in the same position as property or trigonometrical survey beacons.

Accurate control of line and level shall be provided by the Contractor at all stages of construction. In respect of the road itself, control shall be provided at 20 m intervals or at such closer intervals as may be required by the Contractor to meet the specified tolerances or as may be directed by the Engineer for horizontal and vertical curves. Wherever necessary, but particularly on completion of the fill and the base layer, the Contractor shall re-establish stake-line pegs at sufficiently close intervals to determine accurately the position of the edges of the base layer, surfacing and any kerbing, guardrails, road markings and other road elements that must be accurately placed.

The checking of any surveys, setting out, lines or levels by the Engineer shall not relieve the Contractor of his responsibility for the correct survey and setting out and for the construction of the Works to the lines and levels specified in the Contract Documentation.

A1.2.7.3 Services

The specifications relating to the location, identification, protection of and/or moving and reinstating of existing services that may be affected by the construction of the Works are given in Clause A2.1.3.2 b), c) & d) of Chapter 2.

A1.2.7.4 Work on, over, under or adjacent to utilities

All work carried out on, over, under or adjacent to utilities shall be carried out strictly in accordance with the latest edition of the official specifications of the utility owner, a copy of which will normally be included in the Contract Documentation. Where no such copy is included in the Contract Documentation, or where the copy included in the Contract Documentation is amended or superseded by another, the Contractor shall obtain the latest edition from the utility owner, which shall be kept on the site, before any work of this nature is commenced.

The Contractor's attention is drawn particularly to the requirements contained in the Contract Documentation, or provided by the statutory authority, regarding the approval that must be obtained from the utility owner for:

- Issuing a work permit.
- Allowing occupation of its property.
- All particulars of programmed activities during such occupation.
- Approval of the Contractor's work and/or construction methods.
- The design and/or specifications of any temporary Works that may be required.
- All measures required to protect the utilities that may be affected by the construction of the Works.

A1.2.7.5 Use of explosives – compliance with legislation and regulations

The Contractor shall ensure that he complies fully with all current legislation and regulations pertaining to the manufacture, purchasing, transport, storage and use of explosives, including:

- The latest version of the Explosives Regulations R 1604 dated 08th September 1972 issued under the Explosives Act (Act No. 26 of 1956 as amended in R 2371 dated 14th December 1973 and in any further subsequent amendments that have been issued up until the start date of the Contract.

- The latest version of the Explosives Regulations R 109 dated 17th January 2003 issued under Section 43 of the Occupational Health and Safety Act (Act No. 85 of 1993) as amended in any amendments that have been issued up until the start date of the Contract.
- The latest version of the Explosives Act No. 15 of 2003 and as amended in any amendments that have been issued up until the start date of the Contract.
- The latest versions of all other applicable national, provincial or municipal legislation, regulations and by-laws.

Specifications for blasting shall be in accordance with the requirements in Section A12.10 of Chapter 12.

A1.2.8 WORKMANSHIP

The quality of the workmanship, products, elements and goods provided by the Contractor shall be controlled by a process control system executed by the Contractor as well as by a system of acceptance control executed by the Employer, the Engineer or any other appointed agent as specified below. This quality assurance process, including the liability for the payment of the testing required, is specified in Chapter 20 of this Standard Specification.

A1.2.8.1 Process quality control

The onus rests with the Contractor to produce work and products which comply with the characteristics and requirements of the specifications and drawings in all respects. The Contractor shall institute a quality management system and provide experienced engineers, technicians, foremen, inspectors and other technical staff, under the control of a designated quality manager, to give effect to and manage the quality management system.

Where any performance based specifications apply, the Contractor shall institute a quality management system that will ensure and demonstrate that the required performance standards have been met and, where applicable, will continue to be met for any period which has been specified in the Contract Documentation.

The quality management system shall outline the minimum requirements and actions to be taken during the construction of all elements of the Works and shall include monitoring of the various properties of the elements of the Works using either a fully ISO certified quality assurance system or an appropriate quality management system based on recognised sampling and testing principles.

For continuous concrete and asphalt production using mixing plants the Contractor shall augment the quality management system by the use of appropriate automated equipment capable of producing continuous measurements and data printouts for the relevant mix parameters such as mass of mix components, production and storage temperatures, moisture contents etc. during the mixing / production process. All the measurement information shall be kept for the duration of the Contract and the Defects Notification Period and it shall be made available to the Engineer when requested.

The Contractor shall carry out testing and measurement in accordance with the requirements specified in the Contractor's quality management system to confirm the conformance of the Works with all the relevant requirements and specifications.

Although it is not a requirement for the Contractor to conduct regular tests and measurements on commercially produced products bearing the SANS, or any other internationally recognised, specification for products such as cement, road-lime, paint, bitumen, steel pipes, sealants and bridge bearings etc. the quality of such materials and products shall nevertheless be checked on a regular basis in liaison with the Engineer. The costs for any such sampling, tests and measurements shall be borne by the Employer in the event of compliance with the requirements and specifications. In the event of non-compliance with the requirements and specifications the costs for any such sampling, tests and measurements and subsequent corrective or remedial actions shall be borne by the Contractor.

All measurements and test results shall be submitted, without delay, to the Engineer on the completion of each element of the Works. Should the sampling, testing and measurements for any end product be carried out by the accredited combined laboratory, or any other accredited laboratory or institution, and prove compliance with the specifications, the Engineer may accept these results for acceptance control purposes at the cost of the Employer.

In the event of method specifications being applicable for the construction of certain layers, products or elements, the Contractor shall follow the proposed methodology given in a method statement that has been commented on and/or accepted by the Engineer. Where applicable the methodology to be used and the acceptability of the work / product shall be demonstrated by means of an appropriate trial section carried out by the Contractor. Any subsequent deviation from the proposed methodology shall be submitted to the Engineer for comment prior to implementation.

All completed elements of the Works shall be submitted to the Engineer for written acceptance and the Contractor shall not cover up any completed work prior to such acceptance being issued. The Contractor shall plan, and make arrangements for, the submission of work for acceptance control in a manner which will afford the Engineer a reasonable and timeous opportunity for inspection, testing and measurement of the Works.

The Contractor shall agree all the process control sampling, testing, measurement and approval processes with the Engineer for each element of the Works before commencing work. Regardless of the acceptance of any materials or products based on the Contractor's process control the Contractor shall remain fully responsible for any defective material, product or plant/equipment used in the temporary and permanent Works.

A1.2.8.2 Acceptance quality control

Acceptance quality control shall be conducted by the Employer and/or the Engineer and it shall consist of visual inspections, sampling, testing and measurements in terms of the methods and procedures specified in Chapter 20 of this Standard Specification and/or in the Contract Documentation in order to ensure that the Contractor complies with all his obligations prior to the acceptance of and payment for the Works.

The properties, characteristics and workmanship for each product or completed element of the Works shall be assessed for acceptance as specified in Chapter 20. Other properties, characteristics and requirements not prescribed in Chapter 20 shall be assessed and judged in terms of the specified requirements, permissible deviations and tolerances specified in the other chapters.

In the event of elements constructed using method specifications, the Engineer shall regularly monitor and inspect the process visually and ensure that the work is constructed in accordance with the approved method statement as well as with any applicable industry norms, standards and best practices. The Engineer may, however, request any sampling, tests and measurements of the final product to ensure conformance to the design requirements. The costs for any such sampling, tests and measurements shall be borne by the Employer in the event of compliance with the requirements and specifications. In the event of non-compliance with the requirements and specifications the costs for any such tests shall be borne by the Contractor.

Regardless of the Employer's quality control acceptance of any materials or products the Contractor shall remain fully responsible for any defective material, product or plant/equipment used in the temporary and permanent Works.

B1.2 GENERAL REQUIREMENTS AND PROVISIONS

PART B: LABOUR ENHANCEMENT

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B1.2.1 SCOPE

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B1.2.8 WORKMANSHIP

B1.2.1 SCOPE

Any requirements for the labour enhancement of some of the work activities will be stated in the Contract Documentation.

The Contractor shall indicate how these specified requirements will be met in his Works programme.

B1.2.2 DEFINITIONS

Definitions as provided in Clause A1.2.2 shall also apply.

B1.2.3 GENERAL

Any activity specified in PART A, where hand work is given as an alternative, shall be executed in such a way as to maximise labour.

B1.2.4 DESIGN BY CONTRACTOR/PERFORMANCE BASED SYSTEMS

Not required for Section A1.2.

B1.2.5 MATERIALS

The provisions of Part A shall apply.

B1.2.6 CONSTRUCTION EQUIPMENT

Where reference is made in Part A to appropriate equipment, the use of light/hand operated equipment shall be evaluated during trial sections.

The specifications in Part A shall be equally applicable.

B1.2.7 EXECUTION OF THE WORKS

As specified in Clause A1.2.7.1.1b) the labour force shall be allocated as a resource to each of the major activities shown in the Contractor's programme when a Scheme 1 programme is specified.

As specified in Clause A1.2.7.1.1c) the labour force shall be allocated as a resource to each of the activities shown in the Contractor's Works programme when a Scheme 2 programme is specified.

B1.2.8 WORKMANSHIP

The provisions of Part A shall apply.

C1.2 GENERAL REQUIREMENTS AND PROVISIONS

PART C: MEASUREMENT AND PAYMENT

(i) Preamble

The tendered rate for each item shall include full compensation for providing, operating, maintaining and decommissioning upon completion, of all the construction equipment, labour, tools, incidentals and supervision to carry out the activity or construct the works in the item, unless otherwise stated.

Any prime cost or provisional sums shall be paid in accordance with the provisions of the Conditions of Contract. The charge or mark-up tendered or allowed for is a percentage of the amount actually paid under the prime cost or provisional sum. This percentage shall cover all the Contractor's handling, supervision, profit and liability costs to provide the services in the prime cost or provisional sum item.

(ii) Items that will not be measured separately

The following required activities will not be measured or paid for separately and the Contractor shall include the cost thereof in other items as deemed appropriate:

1. Cleaning and removal to spoil of all spilt construction materials off public or privately owned roads which are used as haul roads, access roads and detours or trafficked areas which are adjacent to the construction area when partial or half width construction is carried out.
2. Compliance with the requirements related to the Contractor's activities on properties outside the road reserve.
3. Carrying out any remedial work required to defective or rejected work.
4. Attendance at site meetings.
5. The provision, transport and application of construction water.
6. All work in restricted areas unless provided for in the Contract Documentation.
7. The design of any permanent work that may be specified to be designed by the Contractor in the Contract Documentation.
8. The design and construction of all temporary work.
9. The preparation and submission of design calculations and drawings for temporary and permanent work designed by the Contractor.
10. Setting out of the Works and the protection of beacons.
11. Obtaining any outstanding permits required to comply with the requirements of the EA, the EMP and the WULs that were not obtained by the Employer and included with the Contract Documentation.
12. Compliance with the requirements relating to work on, over, under or adjacent to utilities.
13. The Contractor's process control testing.

(iii) Items to be measured and paid for using items specified elsewhere in the specifications

For activities in Table C1.2-1 payment items specified in other Chapters or Sections of the specifications, where they relate to work under this Section, will be listed in the Pricing Schedule.

Table C1.2-1: Payment items from other Chapters or Sections

Activity	Section 1.2 reference	Section item reference
Provision and later removal of the contract sign boards.	A1.2.3.12	C1.3.2 of Chapter 1
Provision of all site security measures for the Contractor's facilities and equipment and at the Site of the Works, quarries, borrow pits and traffic accommodation facilities and equipment.	A1.2.3.17	C1.3.1 of Chapter 1
Provision of security at the engineer's offices, laboratories, and site and rented accommodation.	A1.2.3.17	C1.4.8 of Chapter 1
Obtaining construction/work permits from service authorities	A1.2.3.22b)	C2.1.3 of Chapter 2
Identification, protection and relocation of existing services	A1.2.7.3	C2.1.1 & C2.1.2 of Chapter 2
Acceptance quality control – sampling and testing requested by the Engineer	A1.2.8.2	C20.1.2.2 of Chapter 20

(iv) Items specifically for this Section of the specifications

Item	Description	Unit
C1.2.1	Environmental Management	
C1.2.1.1	Monitoring of compliance with and reporting on the EMP	month
C1.2.1.2	Dedicated environmental officer (if specified in the Contract Documentation)	month

The unit of measurement for item C1.2.1.1 is the month or part thereof that the service is required and provided during the approved contract period. The contract rate shall include full compensation for the regular monitoring of compliance with and reporting on the EMP in accordance with the specified requirements.

The unit of measurement for item C1.2.1.2 is the month or part thereof that the service is provided during the approved contract period. The contract rate shall include full compensation for the provision of a dedicated environmental officer including all employment costs, accommodation and transport costs and all other associated overhead costs.

Item	Description	Unit
C1.2.2	Programming and Reporting	
C1.2.2.1	Submission of a Scheme 1 Programme	lump sum
C1.2.2.2	Reviewing and updating a Scheme 1 Programme	month
C1.2.2.3	Submission of a Scheme 2 Initial Programme	lump sum
C1.2.2.4	Submission of a Scheme 2 Full Programme	lump sum
C1.2.2.5	Reviewing and updating a Scheme 2 programme every month	month
C1.2.2.6	Preparation and submission of all information and reports specified in the Contract Documentation	month

The unit of measurement for item C1.2.2.1 shall be the lump sum. The lump sum shall include full compensation for preparing and submitting a Scheme 1 Programme, including providing software and tutorials to the Engineer if required.

The unit of measurement for item C1.2.2.2 shall be the month or part thereof that the service is provided during the approved contract period. The monthly rate shall include full compensation for reviewing and updating the Scheme 1 Programme as required and for submitting a copy of the current programme to the Engineer at the end of each month.

The unit of measurement for item C1.2.2.3 shall be the lump sum. The lump sum shall include full compensation for preparing and submitting a Scheme 2 Initial Programme, including providing software and tutorials to the Engineer if required

The unit of measurement for item C1.2.2.4 shall be the lump sum. The lump sum shall include full compensation for preparing and submitting a Scheme 2 Full Programme.

The unit of measurement for item C1.2.2.5 shall be the month or part thereof that the service is provided during the approved contract period. The monthly rate shall include full compensation for reviewing and updating the Scheme 2 Initial and Full Programmes as specified in the Contract Documentation and for submitting a copy of the current programme to the Engineer at the end of each month.

The unit of measurement for item C1.2.2.6 shall be the month or part thereof that the service is provided during the approved contract period. The monthly rate shall include full compensation for collecting and reporting on all data and information specified in the Contract Documentation and for submitting it to the Engineer at the specified times.

Item	Description	Unit
C1.2.3	Routine road maintenance of existing public roads within the Site of the Works or other public roads outside the Site of the Works which are used as detours	
C1.2.3.1	Grass cutting	hectare (ha)
C1.2.3.2	Drain cleaning	kilometre (km)
C1.2.3.3	Cleaning out culverts	cubic metre (m ³)
C1.2.3.4	Collection of rubbish / litter	kilometre (km)
C1.2.3.5	Base patching using crushed stone material stabilised with bitumen emulsion and cement	cubic metre (m ³)
C1.2.3.6	Base and/or surface patching using cold premixed asphalt	kilogram (kg)
C1.2.3.7	Base and/or surface patching using hot plant mixed asphalt	ton (t)
C1.2.3.8	Replacement of damaged guardrails including posts	metre (m)
C1.2.3.9	Grading of temporary gravel deviations and existing roads used as detours	kilometre (km)
C1.2.3.10	Watering of temporary gravel deviations and existing roads used as detours	kilolitre (kl)
C1.2.3.11	Other road maintenance work ordered by the Engineer	provisional sum
C1.2.3.12	Handling cost, profit and all other charges in respect of item C1.2.3.11	percentage (%)
C1.2.3.13	Liaison with the routine road maintenance contractor	month

Payment will only be made under items C1.2.3.1 to C1.2.3.13 when the relevant item of routine maintenance work has been ordered by the Engineer in writing and the Engineer has confirmed in writing the scope, quantity and/or frequency of work that is to be carried out.

The unit of measurement for item C1.2.3.1 shall be the hectare. The contract rate shall include full compensation for cutting and removing grass in restricted and steep access areas with hand tools in addition to mowing and removing grass in more accessible areas.

The unit of measurement for items C1.2.3.2 shall be the kilometre of side or median drain cleaned. Each drain shall be measured separately. The contract rate shall include full compensation for the removal of all silt, mud, gravel, rocks and any other obstructions in the drain as well as for loading and hauling the removed material to spoil regardless of the haul distance.

The unit of measurement for item C1.2.3.3 shall be the cubic metre. The contract rate shall include full compensation for the removal of all silt, mud, gravel, rocks and any other obstructions from inside the culvert or from the culvert entrance and exit as well as for loading and hauling the removed material to spoil regardless of the haul distance.

The unit of measurement for item C1.2.3.4 shall be the kilometre measured along the centreline of the road or along the median of a dual carriageway road. The contract rate shall include full compensation for collecting all the rubbish / litter within the road reserve boundary and carting it to an approved disposal site regardless of the haul distance.

The unit of measurement for items C1.2.3.5, C1.2.3.6 and C1.2.3.7 shall be the cubic metre, kilogramme and tonne respectively. The contract rates shall include full compensation for excavating the failed area of the road to the depth indicated by the Engineer, cleaning out and squaring off the excavation, priming the compacted crushed stone surface or the floor and sides of the excavation as applicable and then backfilling the excavation as specified in the Contract Documentation. The contract rates shall also include full compensation for all final site cleaning and removal to spoil of all surplus regardless of the haul distance.

The unit of measurement for item C1.2.3.8 shall be the linear metre of guardrail replaced. The contract rate shall include full compensation for removing the damaged guardrails and posts to spoil or storage as specified by the Engineer, reinstating or replacing any displaced or damaged guardrail posts and providing and installing a new guardrail in the correct position.

The unit of measurement for item C1.2.3.9 shall be the kilometre of temporary gravel deviation, or existing gravel road used as a detour, which is graded smooth with a motor grading to remove all corrugations and to redistribute the bladed gravel material evenly across the road surface as and when instructed by the Engineer in writing. The contract rate per kilometre shall include full compensation for providing and maintaining the motor grader and grading the road surface to restore the riding quality as specified in the Contract Documentation, regardless of any variations in the width of roadway being graded.

The unit of measurement for item C1.2.3.10 shall be the kilolitre of water sprayed on the surface of the existing temporary gravel deviation or existing gravel road being used as a detour as and when instructed by the Engineer in writing. The contract rate shall include full compensation for providing, transporting and spraying the water on the road surface.

The provisional sum allowed under item C1.2.3.11 shall provide for all other routine road maintenance work carried out by the Contractor that may be required as specified in the Contract Documentation or as ordered by the Engineer. The provisional sum shall be paid in accordance with the provisions of the Contract Documentation. Where applicable existing contract rates or accepted day work rates will be used.

The percentage under item C1.2.3.12 is a percentage of the amount spent under item C1.2.3.11 which shall include full compensation for all handling costs, profit and all other charges in connection with arranging and carrying out the maintenance work.

The unit of measurement for item C1.2.3.13 shall be the month or part thereof that the service is provided during the approved contract period. The contract rate shall include full compensation for all the Contractor's activities, meetings and correspondence related to liaising with and accommodating the activities of the Employer's routine road maintenance contractor. Payment under this item will only be applicable if some of or all of the routine maintenance work is carried out by a separate contractor appointed by the Employer.

Item	Description	Unit
C1.2.4	Stakeholder liaison	month

The unit of measurement for item C1.2.4 shall be the month or part thereof that the service is provided during the approved contract period. Part of a month shall be calculated to two decimal places. The contract rate shall include full compensation for all on-going stakeholder liaison that the Contractor is required to carry out after the contract has been awarded as specified in Section A1.2, Clause A1.2.3.18, including informing stakeholders of the Works procedures and of the accommodation arrangements for pedestrians and non-motorised traffic through or over the site of the Works, providing health and safety information to stakeholders, arranging and attending meetings, providing meeting facilities and sandwiches, tea, coffee or soft drinks. Payment of the monthly sum shall be made every month for the duration of the approved contract period regardless of the amount of stakeholder liaison required during that month.

Item	Description	Unit
C1.2.5	Safety	
C1.2.5.1	Health and safety plan	lump sum
C1.2.5.2	Implementation of health and safety plan	month

The unit of measurement for item C1.2.5.1 shall be the lump sum. The lump sum shall include full compensation for assessing the risks associated with the Works, reviewing and taking cognisance of the Employer's health and safety specifications and/or requirements, preparing the Contractor's health and safety plan and for the submission of a copy of the plan to the Engineer.

The unit of measurement for item C1.2.5.2 shall be the month, or part thereof for the duration of the approved contract period. Part of a month shall be calculated to two decimal places. The contract rate shall include full compensation for implementing the health and safety plan, including the provision of a dedicated, full time health and safety officer, carrying out all the required site health and safety training and briefings, staff medical evaluations, monitoring and administering the health and safety plan and for supplying all transport, personal protection safety items, other health and safety equipment, safety notices and any other health and safety related items that are required on site. The contract rate shall also include the provision of a monthly health and safety compliance report to the Engineer.

Item	Description	Unit
C1.2.6	Work adjacent to properties	
C1.2.6.1	Survey of adjacent properties	number (No.)

C1.2.6.2	Preventive and/or mitigation measures	provisional sum
C1.2.6.3	Handling cost, profit and all other charges in respect of item C1.2.6.2	percentage (%)

The unit of measurement for item C1.2.6.1 shall be the number of properties adjacent to the Works that need to be surveyed, as agreed in advance with the Engineer. The contract rate shall include full compensation for carrying out all the requirements given in clause A1.2.3.13.

The provisional sum allowed under item C1.2.6.2 shall provide for all additional preventive and/or mitigation measures required that are approved by the Engineer as being necessary after the Contractor has implemented all other reasonable measures to avoid and/or reduce the damaging effects relating to carrying out the Works adjacent to properties. The amount payable to the Contractor shall be calculated in accordance with the requirements given in the Contract Documentation or agreed to by the Engineer.

The percentage under item C1.2.6.3 is a percentage of the amount spent under item C1.2.6.2 which shall include full compensation for all handling costs, profit and all other charges in connection with arranging and carrying out the agreed preventive and/or mitigation measures.

Item	Description	Unit
C1.2.7	Road safety audits	
C1.2.7.1	Stage 4 work zone traffic management audit	provisional sum
C1.2.7.2	Handling cost, profit and all other charges in respect of item C1.2.6.1	percentage (%)
C1.2.7.3	Stage 5 pre-opening stage traffic safety audit	provisional sum
C1.2.7.4	Handling cost, profit and all other charges in respect of item C1.2.6.3	percentage (%)

The provisional sum allowed under item C1.2.7.1 shall be used to pay the actual cost of appointing an independent auditor and carrying out a Stage 4 work zone traffic management audit as prescribed in the SARSAM and in Clause A1.2.3.20 a) and for preparing the audit report and submitting two copies of the report to the Employer and the Engineer.

The percentage under item C1.2.7.2 is a percentage of the amount spent under item C1.2.7.1 which shall include full compensation for all handling costs, profit and all other charges in connection with arranging and carrying out the specified audit.

The provisional sum allowed under item C1.2.7.3 shall be used to pay the actual cost of appointing an independent auditor and carrying out a Stage 5 pre-opening stage traffic safety audit as prescribed in the SARSAM and in Clause A1.2.3.20 b) and for preparing the audit report and submitting two copies of the report to the Employer and the Engineer.

The percentage under item C1.2.7.4 is a percentage of the amount spent under item C1.2.7.2 which shall include full compensation for all handling costs, profit and all other charges in connection with arranging and carrying out the specified audit.

Item	Description	Unit
C1.2.8	Dayworks	
C1.2.8.1	Personnel	
(a)	Unskilled labourer	hour
(b)	Semi-skilled labourer	hour
(c)	Skilled labourer	hour
(d)	Gang leader	hour
(e)	Foreman	hour
(f)	Skilled Artisan	hour
C1.2.8.2	Construction equipment (specify size and/or model number)	hour
(a)	Motor grader	hour
(b)	Vibratory roller	hour
(c)	Pneumatic roller	hour
(d)	Front end loader	hour
(e)	Tractor loader backhoe	hour
(f)	Excavator	hour
(g)	Compressor	hour
(h)	Other equipment (specify)	hour
C1.2.8.3	Vehicles (specify size)	
(a)	Light delivery vehicle	km
(b)	Flatbed truck	km

(c)	Dump truck	km
(d)	Other vehicles (specify)	km
C1.2.8.4 Materials		
(a)	Procurement of materials	provisional sum
(b)	Contractor's handling costs, profit and all other charges in respect of item C1.2.8.4(a)	percentage (%)

The unit of measurement for items C1.2.8.1(a) to C1.2.8.1(f) shall be the hour that the personnel are engaged on the work inclusive of transport to and from the site. Non-working hours for meal breaks, rest periods, transport breakdowns, lack of construction equipment or materials or any other reason shall not be measured. The contract rates shall include full compensation for all overhead charges and profit, leave pay, bonuses, subsistence, allowances, Employer's contributions, additional payment for overtime where applicable, insurances, housing, site supervision, provision and use of small hand tools and appliances, non-mechanical plant and equipment and consumable stores as well as for all administrative, supervisory, operative and contingent costs related to the supply of personnel.

The unit of measurement for items C1.2.8.2(a) to C1.2.8.2(g) shall be the hour that the construction equipment is engaged on the work inclusive of transport to and from the site. Non-working hours for operator meal breaks and rest periods, equipment breakdowns and maintenance, lack of materials or any other idle time or reason shall not be measured. The contract rates shall be an all-inclusive hire charge for the use of the construction equipment and operator and shall include full compensation for all administrative, supervisory, fuel, maintenance, operational, transportation, depreciation and any other contingent costs and profit relating to the operation of the construction equipment. The contract rates shall be based on the type and size of equipment that the Contractor intends to provide for the construction of the main Works.

The unit of measurement for items C1.2.8.3(a) to C1.2.8.3(d) shall be the kilometre travelled by the vehicle while engaged on the dayworks. The contract rates shall be an all-inclusive hire charge for the use of the vehicle, the driver and the driver's assistant/s if required. The contract rates shall also include full compensation for all administrative, supervisory, fuel, maintenance, operational, transportation, depreciation and any other contingent costs and profit relating to the operation of the vehicle.

The provisional sum allowed under item C1.2.8.4(a) shall include full compensation for the cost of all materials (excluding value added tax) that are required for the dayworks as ordered by the Engineer. The provisional sum shall be paid in accordance with the provisions of the Contract Documentation.

The percentage under item C1.2.8.4(b) is a percentage of the amount spent under item C1.2.8.4(a) which shall include full compensation for all handling costs, profit and all other charges for ordering, providing, transporting and handling the materials.

Item	Description	Unit
C1.2.9	Disposal of non-useable assets	
C1.2.9.1	Disposal of non-useable assets identified in the Contract Documentation at time of tender (list items and quantity)	rate (per asset)
C1.2.9.2	Disposal of non-useable assets not identified at time of tender	provisional sum
C1.2.9.3	Handling cost, profit and all other charges in respect of item C1.2.9.2	percentage (%)

The unit of measurement for item C1.2.9.1 shall be the lump sum tendered by the Contractor to dispose of the listed non-useable assets that are described in the Contract Documentation and listed under this item. The rate tendered by the Contractor can be positive or negative depending on the cost of disposing of the assets against the value that the Contractor may wish to place upon them.

The provisional sum allowed under item C1.2.9.2 shall provide for the disposal of any non-useable assets that were not already identified in the Contract Documentation under item C1.2.9.1. The amount payable to the Contractor shall be calculated in accordance with the requirements given in the Contract Documentation or agreed to by the Engineer. The provisional sum may be positive or negative depending on the cost of disposing of them against the value that the Contractor may wish to place upon them.

The percentage tendered under item C1.2.9.3 is a percentage of the amount spent under item C1.2.9.2 which shall include full compensation for all handling costs, profit and all other charges in connection with arranging and disposing of the non-useable or not required road furniture assets. If the provisional sum agreed under item C1.2.9.2 is a negative amount, then this item C1.2.9.3 will not be applicable.

D1.2 GENERAL REQUIREMENTS AND PROVISIONS

PART D: GUARANTEES AND COMPLIANCE CERTIFICATES

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- D1.2.5 VISUALLY ASSESSED PROPERTIES**
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- D1.2.7 EVALUATION FOR ACCEPTANCE**
- D1.2.8 ADDITIONAL PROCEDURES TO BE ADOPTED IN THE EVENT OF FAILURE**
- D1.2.9 NOTIFICATION OF REMEDIAL WORK**
- D1.2.10 REMEDIAL WORKS**

Clauses D1.2.1 to D1.2.10 are not applicable to this Section.

1.3 CONTRACTOR'S SITE ESTABLISHMENT AND GENERAL OBLIGATIONS

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A1.3 CONTRACTOR'S SITE ESTABLISHMENT AND GENERAL OBLIGATIONS

PART A: SPECIFICATIONS

A1.3.1 SCOPE

This Section covers the establishment of the Contractor's organization, construction camps and constructional plant and their removal on completion of the contract.

It also includes payment items to cover certain general obligations, risks and liabilities and general items of cost that are included in, but not covered directly by the payment items in the other chapters.

A1.3.2 DEFINITIONS

Construction camps - are all areas used for erecting offices, stores, workshops, testing facilities, plant parking areas, and equipment and material storage areas.

General Obligations - the Contractor's General Obligations shall include the following:

- Setting up, providing, insuring and maintaining the personnel, construction camps, staff accommodation, furniture, office equipment and stationery, other temporary structures, fencing and construction equipment on the site and their removal on completion of the contract.
- Providing transport to, from and on the Site of the Works for all permanent and temporary staff and local labour, including transporting local employees to and from their places of residence when or where necessary.
- Compliance with the requirements of the Conditions of Contract and with all the general requirements included in this Chapter 1.
- Compliance with all legislative and regulatory requirements.
- Assessing, dealing with and/or insuring all risks associated with the Contractor's General Obligations and with the construction, maintenance and protection of the Works.
- The protection and/or safeguarding of private property and livestock.
- The provision of security for all the Contractor's personnel, facilities and equipment on the Site of the Works, including quarries, borrow pits, stockpile areas and storage yards as well as for any traffic accommodation facilities and equipment that may be placed on the approaches to, or the exit from, the Site of the Works.
- All other general obligations, overhead costs, financing charges, insurance costs and all other general items which are not specifically included in, or covered by, this Standard Specification.
- The preparation and submission of all designs and drawings prepared by the Contractor for the temporary works or any alternative design proposals.

A1.3.3 GENERAL

A1.3.3.1 Construction camps

The Contractor shall establish the construction camps either at the specific sites and borrow areas identified in the Contract Documentation or at locations chosen by the Contractor. The exact location of these facilities shall be subject to the approval of the Engineer and such approval will not be unreasonably withheld.

The Contractor shall make his own arrangements for the use of any property outside the road reserve for erection of the construction camp/s, as well as for the provision of adequate means of access, security and the installation and supply of water, electricity and telephone services required by the Contractor.

Before commencing with the construction of any camps the Contractor shall comply with all the requirements specified in Clauses A1.2.3.2 and/or A1.2.3.3.

If Employer-owned land can be made available for the use of the Contractor for the construction camps, the use of such land will not be treated as a lease but will form part of the contract. In this regard the Contractor shall complete the prescribed agreement and comply with all the conditions thereof as if it is part of the Contract. The availability of any Employer owned land will be indicated in the Contract Documentation.

On completion of the Works, all constructional plant, buildings, fencing and other temporary structures erected by the Contractor shall be removed and the construction camp site shall be restored to its original condition and left neat and tidy. The Contractor shall also comply with all the requirements related to the completion of the operations specified in Clause A1.2.3.2 and/or Clause A1.2.3.3.

A1.3.3.2 Housing

The Contractor shall not erect any housing or other accommodation facilities on the site in urban areas and shall make all the necessary arrangements for accommodation of his personnel and site staff off the site, unless otherwise stated in the Contract Documentation.

The Contractor shall not erect any housing or other accommodation facilities on the site before he has obtained the written permission of the Employer and, where applicable, the land owner and has complied fully with all applicable legislative and regulatory requirements.

A1.3.3.3 Maintenance of the Contractor's facilities

The Contractor shall maintain the construction camps and all the Contractor's other facilities in a clean, neat and tidy condition for the duration of the Contract. The Contractor shall also maintain all the access roads to the Contractor's site facilities including any publicly or privately owned roads that the Contractor is making use of. Depending on the initial condition of the access roads this may entail repairing any potholes and edge breaks of surfaced roads or the re-gravelling of the road and subsequently the regular watering, blading and rolling of the surface to maintain a firm surface without excessive corrugations and loose materials. The Contractor shall ensure that the access roads to the Contractor's facilities are always in a safe and passable condition for normal cars under all weather conditions.

A1.3.3.4 Contractor's own security arrangements

The Contractor shall provide all the security measures required for the Contractor's own facilities and equipment on the Site of the Works, including quarries, borrow pits, and for the traffic accommodation site facilities and equipment, as he deems necessary. The provision of security measures for the duration of the Works shall be included in the Contractor's General Obligations as defined in Clause A1.3.2.

A1.3.4 DESIGN BY CONTRACTOR / PERFORMANCE BASED SYSTEMS

The Contractor shall be responsible for the design of the site facilities. All applicable legislative and regulatory requirements related to building standards and health and safety shall be complied with.

A1.3.5 MATERIALS

The Contractor shall be responsible for the selection and purchase of all materials required to construct the site facilities. All applicable legislative and regulatory requirements with regard to building standards and health and safety shall be complied with.

A1.3.6 CONSTRUCTION EQUIPMENT

Not applicable for Section A1.3.

A1.3.7 EXECUTION OF THE WORKS

All work required for the Contractor's site facilities and for the Contractor's site establishment of personnel, vehicles, plant and equipment shall be carried out in compliance with all applicable legislative and regulatory requirements and with the requirements of the Contractor's environmental management and health and safety plans.

A1.3.8 WORKMANSHIP

The Contractor shall control the quality of materials and workmanship used for the construction and fitting out of the construction camps to ensure that the applicable legislative and regulatory requirements related to building standards and to health and safety are adhered to.

B1.3 CONTRACTOR'S SITE ESTABLISHMENT AND GENERAL OBLIGATIONS

PART B: LABOUR ENHANCEMENT

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B1.3.6 CONSTRUCTION EQUIPMENT

B1.3.7 EXECUTION OF THE WORKS

B1.3.8 WORKMANSHIP

B1.3.1 SCOPE

There are no additional labour enhancement requirements for Section A1.3.

B1.3.2 DEFINITIONS

Definitions as provided in Clause A1.3.2 shall also apply.

Clauses B1.3.3 to B1.3.8 are not applicable to this Section.

C1.3 CONTRACTOR'S SITE ESTABLISHMENT AND GENERAL OBLIGATIONS

PART C: MEASUREMENT AND PAYMENT

(i) Preamble

The tendered rate for each item shall include full compensation for providing, operating, maintaining and decommissioning upon completion, of all the construction equipment, labour, tools, incidentals and supervision to carry out the activity or construct the works in the item, unless otherwise stated.

Any prime cost or provisional sums shall be paid in accordance with the provisions of the Conditions of Contract. The charge or mark-up tendered or allowed for is a percentage of the amount actually paid under the prime cost or provisional sum. This percentage shall cover all the Contractor's handling, supervision, profit and liability costs to provide the services in the prime cost or provisional sum item.

(ii) Items that will not be measured separately

There are no activities mentioned in this section that are not measured in this Section.

(iii) Items to be measured and paid for using items specified elsewhere in the specifications

There are no payment related items mentioned in this Section that are measured in other Sections of the specifications.

(iv) Items specifically for this Section of the specifications

Item	Description	Unit
C1.3.1	The Contractor's general obligations	
C1.3.1.1	Fixed obligations	lump sum
C1.3.1.2	Value-related obligations	lump sum
C1.3.1.3	Time-related obligations	month

The lump sums under items C1.3.1.1 and C1.3.1.2 and the contract rate per month for item C1.3.1.3 shall together include full compensation for all the Contractor's costs, charges, overheads and profits in respect of all the Contractor's General Obligations as specified in Clause A1.3.2.

Item C1.3.1.1

The unit of measurement for item C1.3.1.1 is the lump sum. The lump sum shall include full compensation for the fixed part of the Contractor's general obligations, i.e. that part which is substantially fixed and is not a function of the value of the Works or of the time required for the completion of the Contract.

Payment of this lump sum will be made in three instalments, as follows:

- The first instalment, 50 % of the lump sum, will be paid after the Contractor has completed the establishment of the construction camps, site offices, laboratories and housing, has provided the personnel, staff and equipment required to commence the Works in accordance with all the specified requirements and has made a substantial start with construction of the Works in accordance with the approved programme.
- The second instalment, 35 % of the lump sum, will be paid when the value of the Work done reaches one half of the Contract Amount, excluding contingencies and price adjustments in terms of the Contract Documentation.
- The third and final instalment, 15 % of the lump sum, will be paid when the Works have been completed and taken over by the Employer.

Item C1.3.1.2

The unit of measurement for item C1.3.1.2 is the lump sum. The lump sum shall include full compensation for that part of the Contractor's general obligations which is a function of only the value of the Works, but not of the period of completion of the Works.

Should the final value of the Works (excluding any contract price and special material adjustment payments made in terms of the Contract Documentation) increase or decrease in relation to the tendered contract price (less any allowances, if any, in the tendered contract price for contract price adjustment and special material adjustment payments), the lump sum for payment item C1.3.1.2 will be increased or decreased accordingly pro rata. The adjusted lump sum will be the full settlement of any difference in value-related general obligations resulting from an increased or decreased value of the work.

Payment of this lump sum will be made in instalments in each payment certificate (usually issued monthly). The value of each instalment will be in proportion to the value of Work done up to the date that the payment certificate is prepared (excluding the value of any price adjustments made in terms of the Contract Documentation).

Item C1.3.1.3

The unit of measurement for item C1.3.1.3 is the month or part thereof that the services are provided for the approved duration of the contract. Part of a month shall be calculated to two decimal places.

The contract rate shall include full compensation for that part of the Contractor's general obligations which are mainly a function of construction time. The contract rate will be paid monthly, pro rata for parts of a month, from the date of commencement in terms of the Contract Documentation until the end of the original Contract Period specified for completion of the Works.

If the original Contract Period for completion has been extended in terms of the Contract Documentation, then time-related obligations for the extensions shall be compensated for as stipulated by the Contract Documentation.

The following conditions also apply to the time related payment made under item C1.3.1.3:

- Should the Works be certified as having been completed before the original contractual date for completion of the Works the Contractor will then be entitled to payments of the monthly time related amount for the unexpired original Contract Period specified for completion of the Works.
- Should the progress of the Contractor, calculated in terms of the value of the work done to date, be in arrears by more than 10 % relative to the accepted cash flow estimate (suitably adjusted for any change in the scope of work and/or extension of time granted) then the payments in respect of this item may be limited to a total payment to date which is in the same ratio as the actual value of Work done relative to the estimated total value of all the Work that has to be done.

Item	Description	Unit
C1.3.2	Contract sign boards	square metre (m ²)

The unit of measurement for item C1.3.2 is the total square metre (m²) area of the approved contract sign boards (usually two) provided and erected by the Contractor in the positions on site indicated by the Engineer. The contract rate for item C1.3.2 shall include full compensation for all costs associated with providing, erecting and for the later removal of the contract signboards as soon as the Works have been completed.

D1.3 CONTRACTOR'S SITE ESTABLISHMENT AND GENERAL OBLIGATIONS

PART D: GUARANTEES AND COMPLIANCE CERTIFICATES

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- D1.3.3 PERFORMANCE GUARANTEE REQUIREMENTS**
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- D1.3.5 VISUALLY ASSESSED PROPERTIES**
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- D1.3.7 EVALUATION FOR ACCEPTANCE**
- D1.3.8 ADDITIONAL PROCEDURES TO BE ADOPTED IN THE EVENT OF FAILURE**
- D1.3.9 NOTIFICATION OF REMEDIAL WORK**
- D1.3.10 REMEDIAL WORKS**

Clauses D1.3.1 to D1.3.10 are not applicable to this Section.

1.4 FACILITIES FOR THE ENGINEER

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A1.4.8 WORKMANSHIP

PART B: LABOUR ENHANCEMENT

PART C: MEASUREMENT AND PAYMENT

PART D: GUARANTEES AND COMPLIANCE CERTIFICATES

A1.4 FACILITIES FOR THE ENGINEER

PART A: SPECIFICATIONS

A1.4.1 SCOPE

This Section covers the provision by the Contractor of facilities for the Engineer and the Engineer's staff. These facilities shall include the necessary site accommodation, laboratories and offices, all the necessary furnishings and services, as well as all the arrangements in connection with the property, buildings and/or land, on which the Engineer's facilities will be provided.

The specifications for the site accommodation and the site laboratory and office buildings, together with all the fittings and furnishing required, are specified in this section. If necessary, additional details and requirements will be specified in the Contract Documentation or provided by the Engineer.

A1.4.2 DEFINITIONS

Engineer's site facilities - the Engineer's site accommodation, laboratories and offices are temporary buildings provided on site, or existing buildings on or near the site. Together with the required water, sewage, telecommunication, internet and electricity services these shall be known as the Engineer's site facilities. (The Engineer's site facilities shall be provided by the Contractor for the duration of the Contract to house the Engineer's site personnel, accommodate all the materials testing equipment required to carry out the Engineer's acceptance control testing and to provide office space for the Engineer's site personnel.)

A1.4.3 GENERAL

Where not already provided in the Contract Documentation, the Engineer shall furnish the Contractor with full details, in writing, regarding the number, type, layouts and furnishing of all site accommodation, laboratories and offices required for the use of the Engineer's site personnel.

The Contractor shall not order or make any arrangements for the provision of any buildings, materials, equipment or fittings on the basis of what is specified or scheduled without written confirmation by the Engineer. No buildings shall be rented, purchased, erected, refurbished or altered without the Engineer's written approval of the exact position, layout and orientation of the buildings.

Buildings for staff accommodation, laboratories and offices may comprise one or more of the following:

- Rented existing permanent structures in residential, business, industrial or farming areas.
- Temporary structures erected on property rented by the Contractor or on property provided by the Employer.
- Mobile structures parked on property rented by the Contractor or on property provided by the Employer.
- Permanent structures provided by the Employer.

Existing permanent structures may require refurbishment and partitioning to suit the requirements of the Engineer.

All buildings provided for the Engineer's staff accommodation, laboratories and offices shall where possible be located in an area where landline and/or cellular telecommunication and internet connectivity is available. If any of these services are not available dedicated services to that effect shall be provided.

Unless otherwise specified in the Contract Documentation, or agreed to by the Employer, the buildings provided for the use of the Engineer's personnel shall be erected near the Contractor's construction camp. Should the Contractor decide to move the construction camp to a new site during the construction of the Works, the buildings erected for the use of the Engineer shall be moved to the new site and re-erected if required

by the Engineer, or alternative buildings which meet the specified and the Engineer's requirements shall be provided by the Contractor. No additional costs related to moving the Engineer's site facilities, or providing new site facilities, shall be incurred by the Employer or by the Engineer and all such costs shall be borne by the Contractor.

The Contractor may not proceed with the permanent Works before the specified site accommodation, laboratory and office buildings required by the Engineer have been provided, serviced and furnished by the Contractor. All the site accommodation, laboratory and office buildings shall be provided as soon as possible after the Contractor has been given possession of the site of the Works and not later than six weeks after the Contract commencement date.

If any additional site facilities are required by the Engineer during the construction of the Works, the Engineer shall inform the Contractor of the additional requirements at least 30 calendar days before such additional facilities are required.

The Contractor shall be responsible for servicing the Engineer's site facilities and for maintaining the facilities in a serviceable condition for the duration of the contract.

The ownership of all offices, laboratories, housing, sanitary facilities, laboratory equipment, furniture, office equipment and other items provided by the Contractor shall revert to the Contractor when the Engineer confirms in writing that he no longer requires them. The Contractor shall then remove them from the site or terminate the rental lease for any rented buildings.

As specified in Clause A1.2.3.17 the Contractor shall provide adequate security measures to prevent unauthorised entry to the Engineer's offices, laboratories, site accommodation and any rented accommodation.

The Contractor shall ensure that all the site facilities and services provided comply with the applicable statutory and regulatory provisions, building standards and health and safety requirements.

A1.4.4 DESIGN BY CONTRACTOR / PERFORMANCE BASED SYSTEMS

Where no specific designs for the Engineer's site facilities are provided in the Contract Documentation or are provided by the Engineer, the Contractor shall be responsible for the design of the Engineer's site facilities. All the specified requirements shall be met and all applicable legislative and regulatory requirements, building standards and health and safety requirements shall be complied with.

A1.4.5 MATERIALS

The Contractor shall be responsible for the selection and purchase of all materials required to provide the Engineer's site facilities. The Contractor shall ensure that the specified standards are met and that all applicable legislative and regulatory requirements, building standards and health and safety requirements are complied with.

A1.4.6 CONSTRUCTION EQUIPMENT

Not applicable to this Section.

A1.4.7 EXECUTION OF THE WORKS

A1.4.7.1 Offices and laboratories

a) General

The provision of new structures, and/or the refurbishment and alteration of existing permanent structures, shall be done with approved materials in a manner which will provide adequate lighting, ventilation, insulation, noise damping and fire protection.

Temporary and mobile structures shall be constructed from approved materials. The buildings shall have double walls filled with insulating material and lined on the inside with timber or other approved material. Ceilings shall be provided for all office and laboratory buildings. The clear height of all offices between floor and ceiling shall be 2,4 m minimum.

Office buildings shall have timber floors or concrete floors covered with vinyl or ceramic floor tiles. Laboratory buildings shall have smooth, hard concrete floors. Each building shall be provided with a roofed veranda on one side, running for the full length of the building. The verandas shall be at least 1,5 m wide and shall have a 100 mm thick concrete floor.

Window areas of all buildings shall be at least equal to 25 % of the floor area and at least 40 % of the window area shall be able to be opened. All windows for the offices and laboratories shall be provided with approved burglar proofing and with adjustable venetian blinds or similar approved.

Each door shall be provided with a lock and two keys. All exterior doors shall be security doors of adequate strength fitted with a five-lever security lock and/or a secure padlock.

Portable firefighting equipment shall be provided for all site offices and laboratory facilities in accordance with the requirements of the latest statutory regulations and specifically with the requirements specified in SANS 10400-T:2011 Part T: Fire Protection. Fire extinguishers shall be the all-purpose dry powder type manufactured in accordance with the requirements given in SANS 1910:2009 and shall be suitable for types A, B and C fires. The extinguishers shall contain not less than 9,0 kg of extinguishing chemical and shall be installed, maintained and serviced by competent persons in accordance with the requirements specified in SANS 1475-1 and SANS 10105-1.

Office and laboratory buildings shall be painted with an approved paint after erection. The paintwork shall be maintained during the Contract Period.

All facilities shall include the provision of a single-phase electricity supply and, if specified in the Contract Documentation, a three-phase electricity supply for the site laboratory.

Suitable description, designation or name boards with lettering 35 mm in height shall be affixed to each of the Engineer's site offices and laboratory buildings as directed by the Engineer.

All furniture, equipment and fittings provided by the Contractor shall be new unless otherwise agreed beforehand with the Engineer.

b) Offices

The various types of offices required shall be as instructed by the Engineer. Unless otherwise specified in the Contract Documentation, the fittings, furniture and equipment shall conform to the following requirements:

- Office desks shall have a surface area of at least 1,5 m² and shall be provided with at least three drawers, one of which can be locked.
- General-purpose steel cabinets shall have at least 1,5 m² shelf area and a volume of 0,7 m³ each. Each cabinet shall have a lock with two keys.
- Steel filing cabinets shall each be fitted with four drawers on runners. Each cabinet shall be fitted with a lock and shall be 1,3 m high, 460 mm wide and 600 mm from front to back.
- Shelves shall be suitable for storing all the contract files and documents.
- Electric power plug points shall be provided. Each office shall have at least two 15 ampere plug points.
- Lights shall be 1 500 mm, 58W fluorescent tubes or 1 500 mm, 22W LED tubes.
- Drawing tables shall have either an inclined or a horizontal drawing surface as may be required and a smooth top built to the dimensions instructed by the Engineer.
- Draughtsman's stools shall be fitted with a padded seat with an adjustable seat height.
- The conference table shall be large enough to seat twelve persons and shall have a surface area of at least 4m².
- Chairs shall be robust and comfortable.
- A complete telecommunication and electronic data transfer service with uncapped Wi-Fi connectivity to the internet shall be provided for the use of all the Engineer's site staff. Where landlines are available the Engineer shall be provided with a direct independent telephone line that is not connected to the Contractor's telephone exchange and which can accommodate the number of extensions requested by the Engineer.
- The colour combination printer, copier, scanner machines shall be capable of printing on either A3 & A4 sized paper or only on A4 sized paper as provided for in the Pricing Schedule.
- Blinds shall be either adjustable venetian blinds to permit light to enter the room or opaque roller blinds as specified and/or requested by the Engineer.
- Notice boards and white boards shall be provided as specified or as required by the Engineer.
- Bookcases shall have at least three shelves, each with a minimum length of 0,9 m.
- Wall mounted pivot plan filing systems shall be complete with wall rack and pivot brackets to accommodate ten plan clamps where each plan clamp can hold at least ten A0 size drawings.
- Where required by the Engineer, the Contractor shall provide and install air-conditioning units and heaters. Air-conditioning units shall be of the wall mounted split unit inverter type capable of either cooling or heating a room. The capacity of the air-conditioning units shall be adequate for the room area as recommended by the supplier thereof. Heaters shall be of a space-heating type without exposed elements and shall have a capacity of not less than 1.5 kW each.

Where required by the Engineer, the following items shall be provided by the Contractor for his use:

- A rain gauge securely mounted on a pole in a position as indicated by the Engineer.
- A minimum and maximum atmospheric temperature gauge.
- An approved digital thermometer capable of measuring surface temperatures from -10°C up to +350°C.
- Mobile weather stations capable of measuring temperature, wind, chill, barometric pressure, UV levels, rainfall, wind direction and speed. The device shall also have on-board storage capabilities for at least 7 (seven) days and shall include a USB PC connection with software, allowing data to be downloaded electronically.
- A three metre aluminium straight edge complete with two wedges 200 mm long, tapering from 0 to 20 mm, calibrated in mm.
- A measuring wheel with a circumference of 1,0 m and equipped with a distance recording device.
- Approved first aid kits to be kept at the site office and/or laboratories and in the site staff vehicles.

c) Laboratories

All or any of four types of laboratories may be required - soils laboratories, bituminous materials laboratories, chemical laboratories and concrete testing laboratories.

The actual sizes, layout and other details of the individual laboratory types shall be provided in the Contract Documentation or provided by the Engineer.

Storerooms shall be provided, installed and furnished in the laboratory building. The sides of the storerooms shall be fenced off from floor level to the ceiling with 50 mm diamond-mesh wire. Each store shall have a security door or gate of adequate strength fitted with a five-lever security lock and/or a secure padlock.

The requirements for the laboratory fittings, furniture and equipment shall be as follows:

- The requirements for the laboratory furniture, the telecommunication and electronic data transfer service, printers, electricity plug points, window blinds, air-conditioners, heaters and lights provided for the laboratories shall be the same as those specified for the Engineer's offices.
- Shelf space provided against walls shall be of robust construction capable of carrying the weight of material test samples and material testing equipment.

- All work-benches shall be robust and their upper surfaces shall be 900 mm above floor level and shall include a robust timber shelf, 700 mm wide, capable of holding material samples, installed 400 mm above floor level. Work-bench surfaces shall be either of hard, smooth wood that is free from warping or other defects or of concrete with a smooth, steel-trowelled finish.
- High stools for use at work-benches shall be robust and, if of fixed height, shall be 700 mm high.
- Where required, a 380 volt 3-phase electric power supply and three phase power points shall be positioned 1,2 m above floor level.
- Lights shall be 1 500 mm, 58W fluorescent tubes or 1 500 mm, 22W LED tubes.
- Gas installations shall include all the necessary gas cylinders, regulators, tubing and taps.
- Concrete working floors shall be at least 125 mm thick and provided with a hard, smooth finish. The working areas shall be either entirely open or under a roof as may be required.
- Wash basins shall be as prescribed either of stainless steel or precast concrete with an area of at least 0,3 m² and a minimum depth of 0,3 m. They shall be provided with swan-neck type laboratory taps and drain pipes.
- A supply of fresh clean potable water at a constant head of not less than 3 m at the taps shall be provided. Storage capacity in respect of the laboratory water supply shall be not less than 5 000 litres. In addition to the taps at the laboratory sinks, a standpipe shall be installed outside the laboratory on the concrete working floor, supplied with a tap fitted with a 30 m length of heavy duty, 20 mm internal diameter, reinforced plastic hose pipe.
- Extractor fans, where required, shall be so mounted as to operate noiselessly. They shall have a capacity of at least 0.15kW each. Extractor fans shall be spark proof.
- Fume cupboards shall be constructed in accordance with the details instructed by the Engineer.
- Where required, concrete footings and pedestals shall be constructed to the dimensions indicated by the Engineer for installing certain testing equipment.
- When required, watertight baths for curing concrete test cubes, beams and cylinders shall be provided. The baths shall be rectangular and located such that they are accessible from both longitudinal sides. The width shall not exceed 1,0 m and the depth shall not exceed 0,6 m. The baths shall be fitted with a circulating pump, a tap, a plug, a drain capable of completely emptying the tank and a thermostatically controlled heating device to control the water temperature.

d) Car ports

Car ports shall be so constructed as to protect vehicles parked in them at all times against the direct rays of the sun. The car ports shall have either a concrete floor or a layer of broken stone to alleviate dusty and muddy conditions. Each car port shall be at least 3,0 m wide, 6,0 m long and 2,5 m high. The roofs of all car ports shall be water proof.

e) Areas around offices and laboratories

The access roads and parking areas at the offices and laboratories shall be treated to make them dust free, either with a layer of crushed stone or with an approved bituminous surfacing. They shall be well drained and kept trafficable and free from mud at all times. Footpaths shall be paved with concrete, interlocking blocks or paving slabs to provide convenient, all weather access to all buildings.

f) Ablution unit

An abluion unit with a clean potable hot and cold water supply and a water-borne sewerage system, including septic tanks if necessary, shall be provided for the Engineer's facilities. The abluion unit shall be established in a position that is easily accessible to both the Engineer's offices and the laboratory buildings. The abluion unit shall have separate rooms for males and females and each room shall have a floor area of at least 6m² with a lockable door and shall be equipped with:

- A 1 500 mm, 58W fluorescent tube or 1 500 mm, 22W LED tube.
- An opening window fitted with a blind,
- A vitreous enamel WC pan with a PVC seat and covers, a flush cistern and a toilet roll holder. The WC must be separate from the entrance/basin area and it shall also have a lockable door.
- A vitreous enamel urinal with flush cistern in the male unit.
- A vitreous enamel wash basin.
- A mirror and a paper towel dispenser.
- A covered wastepaper bin next to the WC and another bin next to the towel dispenser.

Where specified in the Contract Documentation a separate shower and change room complete with shower, hot and cold running water and drains shall also be provided.

g) Kitchen unit

The Contractor shall supply a kitchen unit with a clean potable hot and cold water supply for the Engineer's offices with a minimum floor area of 6 m² and connected to the Engineer's offices. The kitchen shall be equipped with:

- A 1 500 mm, 58W fluorescent tube or 1 500 mm, 22W LED tube.
- A single-bowl stainless steel basin with draining board, mounted on a cupboard unit.
- A hot and cold water supply, taps, a plug and a waste drain.
- A kitchen cupboard 1 m³ in volume with a melamine or similar counter top.
- A fridge with a capacity of at least 0,3 m³ with a separate freezer compartment with a capacity of at least a further 0,1 m³.
- A microwave cooker, a kettle and a toaster.

- A cutlery set consisting of six knives, forks, dessert spoons and teaspoons, two kitchen knives, a cutting board, a can opener and a bottle opener.
- A crockery set consisting of six dinner plates, six side plates, six bowls and six coffee mugs.

A1.4.7.2 Housing

a) Prefabricated houses

If prefabricated houses are scheduled to be provided by the Contractor the minimum requirements for the different types of houses that may be required are as specified below, unless specified otherwise in the Contract Documentation.

The general requirements for all prefabricated house types shall be as follows:

- All rooms shall have concrete floors covered with vinyl or ceramic tiles in the bathroom and in the kitchen and with durable, wall to wall carpets or carpet tiles in all the other rooms.
- The window area in each room shall be equivalent to at least 25 % of the floor area and at least 40 % of the total window area shall be openable. All windows shall be provided with approved burglar proofing and adjustable venetian blinds or similar approved.
- All houses shall have a 220 volt single phase electricity supply and every room, except the bathroom, shall be provided with two 15 ampere electric plug sockets.
- Lights shall be 11 W compact fluorescent bulbs or 7W LED bulbs.
- The clear height of all rooms between floor and ceiling shall be at least 2,4 m. Every room shall have a ceiling with approved insulation material installed above the ceiling.
- Each door shall be provided with a lock and two keys and all exterior doors shall be fitted with security doors of adequate strength with a 5-lever lock and/or a secure padlock.
- Portable firefighting equipment shall be provided for all site accommodation/housing in accordance with the requirements of the latest statutory regulations and specifically with the requirements specified in SANS 10400-T:2011 Part T: Fire Protection. Fire extinguishers shall be the all-purpose dry powder type manufactured in accordance with the requirements given in SANS 1910:2009 and shall be suitable for types A, B and C fires. The extinguishers shall contain not less than 9,0 kg of extinguishing chemical and shall be installed, maintained and serviced by competent persons in accordance with the requirements specified in SANS 1475-1 and SANS 10105-1.
- Each kitchen shall be equipped with:
 - A single-bowl stainless steel basin with draining board, mounted on a cupboard unit with a clean potable hot and cold water supply, taps, a plug and a waste drain,
 - a kitchen cupboard 1,0 m³ in volume with a melamine or similar counter top,
 - a fridge/freezer with a capacity of at least 0,5 m³ / 0,2 m³ for the fridge and freezer compartments respectively,
 - a stove with an oven and four hot plates,
 - a microwave cooker, a kettle and a toaster,
 - a cutlery set consisting of six knives, forks, dessert spoons and teaspoons, two kitchen knives, two serving spoons, cheese grater, cutting board, can opener and bottle opener,
 - three cooking pots with lids and a frying pan and
 - a crockery set consisting of six dinner plates, six side plates, six dessert bowls and six coffee mugs.
- Each bathroom shall be equipped with:
 - A water borne sewage system with a septic tank if required,
 - one vitreous enamel WC pan with a PVC seat and cover, a flush cistern and a toilet roll holder,
 - one vitreous enamel bath with a clean potable hot and cold water supply, taps, a plug and a drain,
 - one vitreous enamel wash basin with a clean potable hot and cold water supply, taps, a plug and a drain,
 - a shower with a clean potable hot and cold water supply and a drain,
 - a mirror and a towel rail and
 - one covered wastepaper bin.
- Each bedroom shall be furnished with:
 - Two three quarter sized beds - each bed supplied with a good quality sprung mattress, two fitted sheets, a duvet with two duvet covers and two pillows with four pillowcases,
 - a cupboard with a capacity of 1,5 m³, divided equally into a shelved section and a hanging section, and
 - a chest of drawers with at least three drawers,
 - Each lounge shall be furnished with a comfortable lounge suite consisting of a sofa and two lounge chairs and a coffee table.
 - Each dining room shall be furnished with a dining room table and six dining chairs.

The houses shall be painted with an approved paint after erection. The paintwork shall be maintained in good condition for the duration of the Contract.

The various house types that may be specified in the Contract Documentation shall have the number of rooms with their respective minimum floor areas as shown in Table A1.4.7-1 overleaf. If other house types and/or size and/or furnishing requirements are required they will be

specified in the Contract Documentation. The Contractor shall submit details of the building type and quality and the proposed floor / room layouts for the prefabricated houses to the Engineer for approval before any houses and furnishings are ordered and erected.

Table A1.4.7-1: House types

Rooms required and minimum floor areas (m ²)	House type A	House type B	House type C
	Number of rooms	Number of rooms	Number of rooms
Main bedroom (20 m ²)	1	1	1
Second bedroom (12 m ²)	2	1	0
Lounge (20 m ²)	1	1	1
Dining room (12 m ²)	1	1	0
Kitchen (12 m ²)	1	1	1
Bathroom (9 m ²)	1	1	1
Covered veranda (12 m ²)	1	1	1
Lockable storeroom (6 m ²)	1	0	0
Covered car port (20 m ²)	1	1	0
Total floor area (m²)	135	117	73

b) Rented accommodation

The Engineer shall usually be responsible for providing suitable accommodation for his site staff in a hotel, guesthouse, rented house or a rented apartment in the nearest town or on a nearby farm.

The Engineer may instruct the Contractor to pay for any hotel or other accommodation or leased houses required. If so instructed by the Engineer the Contractor shall enter into the necessary contracts for the lease of such accommodation as may be required and shall not unreasonably object to the terms and conditions of such leases to be negotiated by the Engineer.

Where appropriate, and in the case where the rented accommodation is not deemed to be the primary residence of the site staff member, the lease agreement shall include full compensation for a periodic garden service.

A1.4.7.3 Services

a) Sanitary arrangements

The Contractor shall be responsible for providing all sanitary services necessary for keeping latrines in a clean, neat and hygienic condition.

When no municipal sewage treatment is available, the Contractor shall provide the necessary septic tanks for all latrines. Waste water and septic-tank effluent shall be taken into properly designed French drains. The Contractor shall also make provision for the removal of all rubbish.

Where the construction of septic tanks or a water-borne sewerage scheme is unfeasible, the Contractor shall provide conservancy tanks and make arrangements for the removal and disposal of sewage.

b) Water, electricity and gas

The Contractor shall provide a constant supply of clean potable water suitable for human consumption as well as the necessary electric power together with the required electrical network to the offices, laboratories and any site housing.

The power source shall be suitable for office and laboratory use with an anticipated large variance in load factor. Single phase power shall be supplied at a nominal 220/250 volts and a nominal frequency of 50Hz to the offices and any site accommodation. If specified, three-phase power shall be supplied at a nominal voltage of 400/231 volts and a nominal frequency of 50Hz to the site laboratory. The source of power shall be either from a recognized power supply authority or by an onsite generator.

The electrical load shall be determined by an appropriate diversity factor being applied to the sum of the connected load, due allowance being had for the starting load, efficiency and power factor of motors, or shall be estimated on the basis of 1.2kVA per m² of laboratory floor area (three phase) and 0.35kVA per m² of office or site accommodation area. Allowance shall be made for a spare capacity of 15 % with a minimum of 15kVA. A detailed load estimate shall be submitted to the Engineer for approval prior to any final arrangements being made for a source of power.

The power supply shall be regulated by a suitable voltage regulator in order to maintain a constant current and voltage level at all times to prevent damage to the office and laboratory equipment and related machinery during power surges. In the event of damage to the office and laboratory equipment and related machinery because of a faulty voltage regulator, the Contractor shall be liable for payment of all repair or replacement costs of such damaged items.

If specified in the Contract Documentation, a generator shall be provided on site to supply electricity if a constant, reliable source of electricity from a power supply authority is not available on site. In the event of electricity being generated by the Contractor, the generator shall be suitable to maintain the voltage so that it will not deviate by more than ± 5 % from the nominal voltage, and to maintain the frequency so that it will not deviate from the nominal frequency by more than ± 2 Hz over the entire load range from 0 % to 100 % of full load, also in the event of switching on and off all normal loads connected to the supply. Power shall be available to the offices, any site accommodation and the laboratory 24 hours per day every day of the year.

Should the Contractor require a stand-by generator to supply electricity for his own use when the power supply from the power supply authority is interrupted it shall be supplied at his own cost.

Power shall be distributed by means of enclosed distribution boards with adequate weather and tamper protection, suitably rated circuit breakers, earth-leakage units or fuses, and by means of adequately sized underground cables and earth conductors. Sizing of cables and rating of protective and control devices shall take into account the load and fault currents that can occur on the system.

The reticulation network and the wiring installation of all buildings and structures shall be installed and maintained to ensure absolute safety and a high standard of reliability, with particular reference to the earthing installation and the safety and protective devices. A certified, qualified electrician shall provide a separate certificate of compliance for the electrical installation in each office, laboratory and site accommodation building.

The Contractor shall at all times maintain the power supply, the distribution network and the wiring installation of all buildings and structures at the highest standard of safety and usability.

The Contractor shall also supply liquid petroleum gas for the burners used in the laboratories and in the site office / site accommodation kitchens if gas appliances have been provided.

A1.4.7.4 Maintenance of the Engineer's site facilities and accommodation

The Contractor shall maintain the Engineer's office, laboratory and site accommodation facilities in a clean, neat and tidy condition for the duration of the Contract. The Contractor shall also maintain all the access roads to the Engineer's site facilities including any publicly or privately owned roads that the Engineer is making use of. Depending on the initial condition of the access roads this may entail repairing any potholes and edge breaks of surfaced roads or the re-gravelling of the road and subsequently the regular watering, blading and rolling of the surface to maintain a firm surface without excessive corrugations and loose materials. The Contractor shall ensure that the access roads to the Engineer's facilities are always in a safe and passable condition for normal cars under all weather conditions.

The Contractor shall provide all labour, equipment and material which may be necessary for keeping all the buildings in a neat and clean condition. To this end the Contractor shall provide cleaners and sanitary personnel and shall supply all soap, toilet paper, linen roller towels, cleaning aids and a refuse removal service.

The Engineer's offices, laboratory buildings, kitchen, ablution units and any accommodation on site shall be cleaned daily.

Any repairs required shall be made immediately following a request from the Engineer.

A1.4.7.5 Office staff

If specified in the Contract Documentation the Contractor, in consultation with the Engineer, shall appoint an office secretary/receptionist and the requested number of technical assistants to provide a continuous service to the Engineer's site personnel.

These staff shall be paid by the Contractor including the provision of transport and other all other costs and benefits to the same extent as the Contractor provides for his own employees of a similar grade.

The person selected as secretary/receptionist may have limited experience but must have the potential and be willing to receive training (both formal and informal) to develop into a competent secretary / receptionist within a successful probation period of two months after appointment, failing which the person shall be substituted.

The technical assistant/s shall be suitably educated with sufficient mathematical ability to perform the duties of a survey assistant, assistant laboratory technician or an assistant quantity surveyor. Where available the technical assistant/s shall be student technicians who need to fulfil their practical training requirements.

The Engineer shall be at liberty to accept or reject the staff offered.

A1.4.7.6 Site inspection transport

The Contractor shall provide a bus, mini-bus or combi van as and when required by the Engineer for site inspections and other technical meetings for the use by him, the Employer, the Engineer and other invited persons.

The vehicle provided shall be in a mechanically sound condition, clean inside and outside, provided with a dedicated driver with the required licence and PDP papers. It shall have all the necessary safety equipment and sufficient fuel to transport the passengers across the site and surrounding areas as required by the Engineer.

A1.4.8 WORKMANSHIP

The applicable legislative and regulatory requirements regarding building standards and health and safety shall be complied with.

B1.4 FACILITIES FOR THE ENGINEER

PART B: LABOUR ENHANCEMENT

CONTENTS

B1.4.1 SCOPE

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B1.4.1 SCOPE

There are no additional labour enhancement requirements for Section A1.4.

B1.4.2 DEFINITIONS

Definitions as provided in Clause A1.4.2 shall also apply.

Clauses B1.4.3 to B1.4.8 are not applicable to this Section.

C1.4 FACILITIES FOR THE ENGINEER

PART C: MEASUREMENT AND PAYMENT

(i) Preamble

The tendered rate for each item shall include full compensation for providing, operating, maintaining and decommissioning upon completion, of all the construction equipment, labour, tools, incidentals and supervision to carry out the activity or construct the works in the item, unless otherwise stated.

Any prime cost or provisional sums shall be paid in accordance with the provisions of the conditions of contract. The charge or mark-up tendered or allowed for is a percentage of the amount actually paid under the prime cost or provisional sum. This percentage shall cover all the Contractor's handling, supervision, profit and liability costs to provide the services in the prime cost or provisional sum item.

(ii) Items that will not be measured separately

Dismantling, moving and re-erecting any or all of the Engineer's facilities that may become necessary due to the Contractor's decision to relocate his own facilities will not be measured separately. The Engineer's facilities will only be paid for once unless otherwise specified in the Contract Documentation or if the Engineer specifically requests that they be moved for reasons other than relocation of the Contractor's own facilities.

(iii) Items to be measured and paid for using items specified elsewhere in the specifications

There are no payment related items mentioned in this Section that are measured in other Sections of the specifications.

(iv) Items specifically for this Section of the specifications

The Contractor shall confirm the Engineer's exact requirements before making arrangements for, ordering or supplying any of the items listed in the pricing schedule for this Section.

With respect to payment items listed under payment item section numbers C1.4.1, C1.4.2 and C1.4.3 the following method of payment shall apply to these items:

- 80 % of the amount due will be paid when the item is provided and erected, fitted or installed and taken over by the Engineer.
- A further 10 % will be paid when the value of all permanent work done, excluding escalation, exceeds one-half of the tendered amount.
- The remaining 10 % will be payable when the items have been removed from the site.

Item	Description	Unit
C1.4.1	Site accommodation	
C1.4.1.1	Offices and conference room	square metre (m ²)
C1.4.1.2	Laboratories	square metre (m ²)
C1.4.1.3	Open concrete working floors and verandas	square metre (m ²)
C1.4.1.4	Roofs over open concrete working floors and verandas	square metre (m ²)
C1.4.1.5	Store rooms inside the laboratory	square metre (m ²)
C1.4.1.6	Car ports	number (No)
C1.4.1.7	Ablution unit (equipped as specified)	number (No)
C1.4.1.8	Change room with a shower	number (No)
C1.4.1.9	Kitchen unit (equipped as specified)	number (No)
C1.4.1.10	Type A prefabricated house (equipped as specified)	number (No)
C1.4.1.11	Type B prefabricated house (equipped as specified)	number (No)
C1.4.1.12	Type C prefabricated house (equipped as specified)	number (No)
C1.4.1.13	Rented housing paid for by the Contractor	provisional sum
C1.4.1.14	Contractor's handling costs, profit and all other charges in respect of item C1.4.1.13	percentage (%)

The unit of measurement for items C1.4.1.1 to C1.4.1.5 shall be the square metre (m²) of each facility, measured according to the internal floor area. The contract rates shall include full compensation for the construction or provision of these Engineer's facilities all complete in accordance with the specifications given in the Contract Documentation. Where offices are provided in existing buildings the passageways, hallways and any other office space in excess of the Engineer's requirements shall not be measured for payment.

The unit of measurement for items C1.4.1.6 to C1.4.1.12 shall be the number of units provided. The contract rates shall include full compensation for the construction or provision of these Engineer's facilities all complete in accordance with the specifications given in the Contract Documentation.

The contract rates for items C1.4.1.1, C1.4.1.2, C1.4.1.3, C1.4.1.6, C1.4.1.7, C1.4.1.8, C1.4.1.9, C1.4.1.10, C1.4.1.11 and C1.4.1.12 shall also include full compensation for clearing and grubbing the areas under and around the buildings, the excavation and backfilling of any foundations required, the loading and hauling of the excavated material to spoil if required, regardless of haul distance, and the provision and maintenance of a trafficable surface to provide all weather mud and dust free access for vehicles and pedestrians to and around the buildings.

The provisional sum allowed under item C1.4.1.13 shall provide for the cost of arranging and paying for rented accommodation for the Engineer's site staff and for providing services at the rented accommodation as instructed by the Engineer. The provisional sum shall be paid in accordance with the provisions of the Contract Documentation.

The percentage under item C1.4.1.14 is a percentage of the amount spent under item C14.1.13 which shall include full compensation for all handling costs, profit and all other charges in connection with arranging and paying for the rented accommodation.

Item	Description	Unit
C1.4.2	Items measured by area	
C1.4.2.1	Shelving as specified, complete with brackets	square metre (m ²)
C1.4.2.2	Work benches with a concrete slab top	square metre (m ²)
C1.4.2.3	Work-benches with a wooden top	square metre (m ²)
C1.4.2.4	Constant-temperature baths of concrete and/or plastered brick	square metre (m ²)
C1.4.2.5	Concrete footings and pedestals for laboratory equipment	square metre (m ²)
C1.4.2.6	Roller blinds, opaque type	square metre (m ²)
C1.4.2.7	Venetian blinds	square metre (m ²)
C1.4.2.8	Notice boards	square metre (m ²)
C1.4.2.9	White boards	square metre (m ²)
C1.4.2.10	Galvanised wire mesh fencing for store rooms	square metre (m ²)
C1.4.2.11	Galvanised wire mesh store room gate with a padlock	square metre (m ²)

The unit of measurement for items C1.4.2.1 to C1.4.2.11 shall be the square metre (m²) of the item supplied and installed as specified. The area shall be determined from the authorised outside dimensions in plan. The contract rates shall include full compensation for the construction or provision of these items all complete in accordance with the specifications given in the Contract Documentation.

Item	Description	Unit
C1.4.3	Items measured by number	
C1.4.3.1	Office swivel chair	number (No)
C1.4.3.2	Office chair	number (No)
C1.4.3.3	Draughtsman's stool	number (No)
C1.4.3.4	Laboratory high chair	number (No)
C1.4.3.5	Office desk with 3 drawers (at least one lockable drawer)	number (No)
C1.4.3.6	Typist desk (L-shaped)	number (No)
C1.4.3.7	Drawing table	number (No)
C1.4.3.8	Conference table	number (No)
C1.4.3.9	Bookcase	number (No)
C1.4.3.10	Filing cabinet	number (No)
C1.4.3.11	General purpose steel cabinet with shelves	number (No)
C1.4.3.12	Wall mounted pivot plan filing system	number (No)
C1.4.3.13	220/250 volt power outlet plug point	number (No)
C1.4.3.14	400/231 volt 3-phase power outlet plug point	number (No)
C1.4.3.15	Single 1 500 m, 58 watt fluorescent tube ceiling light	number (No)
C1.4.3.16	Single 1 500 mm, 22 watt LED tube ceiling light	number (No)
C1.4.3.17	11 watt compact fluorescent bulb ceiling light	number (No)
C1.4.3.18	7 watt LED bulb ceiling light	number (No)
C1.4.3.19	Wash-hand basin	number (No)
C1.4.3.20	Laboratory basin	number (No)
C1.4.3.21	Extractor fan	number (No)

C1.4.3.22	Fume cupboard	number (No)
C1.4.3.23	Fire extinguisher 9,0 kg, dry powder type	number (No)
C1.4.3.24	Air-conditioning unit	number (No)
C1.4.3.25	Heater	number (No)
C1.4.3.26	Concrete specimen curing bath	number (No)
C1.4.3.27	Waste paper basket	number (No)
C1.4.3.28	UPS / Voltage stabiliser	number (No)
C1.4.3.29	A3 / A4 colour printer, copier, scanner	number (No)
C1.4.3.30	A4 colour printer, copier, scanner	number (No)
C1.4.3.31	Rain gauge	number (No)
C1.4.3.32	Minimum/maximum atmospheric temperature gauge	number (No)
C1.4.3.33	Digital thermometer	number (No)
C1.4.3.34	Mobile outdoor weather station	number (No)
C1.4.3.35	3,0 m aluminium straight edge complete with two measuring wedges	number (No)
C1.4.3.36	Measuring wheel	number (No)
C1.4.3.37	First aid kit	number (No)
C1.4.3.38	Standpipe complete with 30 m of 19 mm dia. heavy duty hose pipe	number (No)

The unit of measurement for items C1.4.3.1 to C1.4.3.38 shall be the number of each item supplied and installed as specified. The contract rates shall include full compensation for the provision and installation of these Engineer's facilities all complete in accordance with the specifications given in the Contract Documentation. On completion of the contract these items will be returned to the Contractor and the contract rates shall make allowance for any depreciation in value over the duration of the contract period.

Item	Description	Unit
C1.4.4	Prime cost items	
C1.4.4.1	Cell phones costs, including pro-rata rentals, for calls made in connection with contract administration	prime cost sum
C1.4.4.2	Handling costs and profit in respect of item C1.4.4.1	percentage (%)
C1.4.4.3	The provision of a direct independent telephone line for the Engineer, including the monthly rental charges and the cost of business calls	prime cost sum
C1.4.4.4	Handling costs and profit in respect of item C1.4.4.3	percentage (%)
C1.4.4.5	The provision of internet connectivity and WiFi data for Engineer's site staff	prime cost sum
C1.4.4.6	Handling costs and profit in respect of item C1.4.4.5	percentage (%)
C1.4.4.7	The provision of paper and ink for a combination colour printer/copier/scanner	prime cost sum
C1.4.4.8	Handling costs and profit in respect of item C1.4.4.7	percentage (%)
C1.4.4.9	The provision of a complete 220/250 volt single phase electrical power installation, including all poles, insulators, wiring, switchboards, mains connections, meters etc.	prime cost sum
C1.4.4.10	Handling costs and profit in respect of item C1.4.4.9	percentage (%)
C1.4.4.11	The provision of a complete 440/231 volt three phase electrical power installation, including all poles, insulators, wiring, switchboards, mains connections, meters etc.	prime cost sum
C1.4.4.12	Handling costs and profit in respect of item C1.4.4.11	percentage (%)
C1.4.4.13	Provision of a 440/231 volt three phase electricity generator if electricity from a power supply authority is not available on site	prime cost sum
C1.4.4.14	Handling costs and profit in respect of item C1.4.4.13	percentage (%)
C1.4.4.15	The provision of all gas installations required at the site offices, laboratories and at the Engineer's staff accommodation (if required), including gas storage cylinders, tubing, regulators, gas burners and shut-off cocks	prime cost sum
C1.4.4.16	Handling costs and profit in respect of item C1.4.4.15	percentage (%)

The unit of measurement for items C1.4.4.1, C1.4.4.3, C1.4.4.5, C1.4.4.7, C1.4.4.9, C1.4.4.11, C1.4.4.13 and C1.4.4.15 is the prime cost sum which shall be the invoiced cost of these items.

The percentage for items C1.4.4.2, C1.4.4.4, C1.4.4.6, C1.4.4.8, C1.4.4.10, C1.4.4.12, C1.4.4.14 and C1.4.4.16 is a percentage of the amount spent under the relevant prime cost item. It shall include full compensation for the handling costs of the Contractor and the profit for providing the specified service.

Item	Description	Unit
C1.4.5	Services at site offices, laboratories and site accommodation	
C1.4.5.1	Fixed costs	lump sum
C1.4.5.2	Running costs	month

The unit of measurement for item C1.4.5 shall be the lump sum. The lump sum shall include full compensation for all costs, administration charges and other general costs related to providing the specified services for the Engineer's site facilities. These services include the provision of a potable water supply, a sewerage system, septic tanks, conservancy tanks, refuse containers etc. as well as the excavation and backfilling of any service trenches required and the loading and hauling of the excavated material to spoil if required, regardless of haul distance.

The unit of measurement for item C1.4.5.2 shall be the month or part thereof for the duration of the approved contract period. The contract rate shall include full compensation for the provision of electricity and gas, sewage removal, refuse and rubbish removal, cleaning services, maintenance and repairs as specified and required. The contract rate shall also include the partial cost, proportional to the amount of electricity supplied to the Engineer's offices, laboratory and site accommodation, of running a generator only when electricity from a power supply authority is not available on site.

Item	Description	Unit
C1.4.6	Office staff	
C1.4.6.1	Secretary / receptionist	month
C1.4.6.2	Technical assistant	month

The unit of measurement for items C1.4.6.1 and C1.4.6.2 is the month or part thereof for the duration of the approved contract period. The contract rate shall include full compensation for providing the specified staff member and for all wages, Employer contributions, accommodation, transport and other staff related costs incurred by the Contractor.

Item	Description	Unit
C1.4.7	Site inspection transport	
C1.4.7.1	Provision of a bus, mini-bus or combi van for site inspection purposes (specify type and size of vehicle)	per day
C1.4.7.2	Travel on site	kilometre (km)

The unit of measurement for item C1.4.7.1 is a day regardless of the number of hours that the vehicle is used during that day. The contract rate shall cover all the costs of providing the specified vehicle with an experienced licensed driver when required by the Engineer.

The unit of measurement for item C1.4.7.2 is the total kilometres travelled during the site inspection by the vehicle, as instructed by the Engineer. The contract rate shall include full compensation for all fuel, maintenance and depreciation costs. Any kilometres covered in delivering and removing the vehicle from site will not be measured for payment.

Item	Description	Unit
C1.4.8	Site security measures for the Engineer's facilities	
C1.4.8.1	Supply and installation of all required security measures at the Engineer's site offices and laboratories	lump sum
C1.4.8.2	Provision of security guards / watchmen and an armed response service at the Engineer's site offices and laboratories	month
C1.4.8.3	Supply and installation of all required security measures at the Engineer's site accommodation	lump sum
C1.4.8.4	Provision of security guards / watchmen and an armed response service at the Engineer's site accommodation	month
C1.4.8.5	Supply and installation of an alarm system at the Engineer's rented accommodation (No. of houses stated)	lump sum
C1.4.8.6	Provision of an armed response service at the Engineer's rented accommodation (No. of houses stated)	month

The unit of measurement for items C1.4.8.1 and C1.4.8.3 is the lump sum. The lump sum shall include full compensation for the provision of all security measures required at the at the Engineer's site office, site laboratory and site accommodation as specified in Clause A1.2.3.17.

The unit of measurement for items C1.4.8.2 and C1.4.8.4 is the month or part thereof that the services are provided at the engineer's site office, site laboratory and site accommodation as specified in Clause A1.2.3.17. Part of a month shall be calculated to two decimal places.

The unit of measurement for item C1.4.8.5 is the lump sum per house. The lump sum shall include full compensation for the provision of an alarm system at the Engineer's rented accommodation as specified in Clause A1.2.3.17.

The unit of measurement for item C1.4.8.6 is the month or part thereof per house that an armed response service is provided at the engineer's rented accommodation as specified in Clause A1.2.3.17. Part of a month shall be calculated to two decimal places.

D1.4 FACILITIES FOR THE ENGINEER

PART D: GUARANTEES AND COMPLIANCE CERTIFICATES

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- D1.4.9 NOTIFICATION OF REMEDIAL WORK**
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D1.4.1 SCOPE

Certificates showing compliance with the applicable SANS Specifications referred to in Clause A1.4.7 in this Section shall be provided by the Contractor if requested by the Employer or the Engineer.

Regulatory compliance certificates for the electrical wiring and gas supply installations at the site accommodation, laboratories and offices shall be submitted to the Engineer upon completion of the various facilities and before any payment is made for these facilities.

Clauses D1.4.2 to D1.4.10 are not applicable to this Section.

1.5 ACCOMMODATION OF TRAFFIC

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A1.5 ACCOMMODATION OF TRAFFIC

PART A: SPECIFICATIONS

A1.5.1 SCOPE

This Section covers the accommodation of vehicular and non-motorised traffic and pedestrians on, over or through the site of the Works. This involves:

- The construction, maintenance and eventual removal of temporary deviations and detours.
- The construction and eventual removal, if required, of temporary gates, fences, drainage works and other incidental items that may be required.
- The provision, erection, relocation, maintenance and removal of traffic control facilities and traffic safety items.
- Painting and removal, if required, of temporary road markings and placing of temporary road studs.
- The issuing of public notices.
- Liaison with the relevant traffic authorities, motorists and other affected persons.
- The removal and reinstatement/landscaping of temporary deviations when they become redundant.

The purpose of providing the traffic accommodation measures discussed in this Section is to ensure the safety of road users, pedestrians and the Contractor's and Engineer's employees who are engaged on the Works.

A1.5.2 DEFINITIONS

Barriers - consist of concrete, plastic or steel sections which are placed across or along the road to stop or divert the traffic or alongside / around the work area to separate the traffic and pedestrians from the work area. Barriers may be used either as channelization devices or as vehicle restraining systems depending on their type and on their fixing arrangements.

Channelization devices - moveable channelization devices used for diverting and/or separating vehicles, non-motorised traffic and pedestrians from the work areas include barriers, delineators and traffic cones. These moveable channelization devices may be supplemented by additional temporary road markings and road studs.

Delineators - are rectangular warning signs with a directional chevron on one or both sides which indicates which side of the roadway is open for use by the vehicles, non-motorised traffic and/or pedestrians.

Detour - a detour is any section of another existing road onto which traffic is diverted around the work areas.

Road markings - include all the regulatory road markings painted on the surface of existing or newly constructed roads as well as temporary road markings painted on the surface of deviations and detours.

Partial width or half width construction - this is a construction strategy wherein part of a roadway is constructed or reconstructed/rehabilitated as a phase without encroaching on the remaining width of the roadway in order to accommodate traffic. (Typically, a two-lane two-way road will usually be constructed in two half width phases whereas a multi-lane road will be constructed in several partial width phases.)

Road signs - include all the regulatory road signs erected along existing or newly constructed roads as well as the temporary road signs erected along temporary deviations and detours.

Road restraint systems - temporary road restraint systems used for preventing vehicles from leaving the permitted lanes, or for separating two opposing streams of traffic, during the construction of the Works may consist of either movable precast concrete or steel barriers or steel guardrails that comply with the specifications given in Chapter 11.

Temporary deviation - a temporary deviation can be partial width, single or multi-lane roads that are used to accommodate vehicular and non-motorised traffic while the Works are in progress. They are either a portion (part width) of the road that is under construction or they are newly constructed roads (with a gravel or a bituminous surface) constructed alongside or in close proximity to the Works.

Traffic - means all vehicles, non-motorised vehicles and pedestrians that need to pass around, alongside or through the work areas.

Traffic control facilities - include flagmen, portable STOP and GO signs, portable barriers, temporary road signs and traffic signals.

Traffic calming devices - are used to reduce vehicle speeds and they generally consist of temporary or permanent rumble strips, humps or circular bumps placed in an overlapping strip pattern across the width of the traffic lane/s.

Traffic safety devices - include flashing warning lights, illuminated and/or flashing traffic arrows and signs, electronic variable message boards, vehicle restraint systems, impact attenuation devices and guardrails.

A1.5.3 GENERAL

A1.5.3.1 Access to properties

The Contractor shall provide and maintain access to all public and private properties which fall within or adjoin the Works at all times, unless alternate provision is specified in the Contract Documentation.

A1.5.3.2 General requirements

The Contractor may not commence any part of the Works until adequate provision has been made for the accommodation of vehicular, non-motorised and pedestrian traffic. Traffic shall be accommodated in accordance with the requirements given in the Contract Documentation unless the Contractor has submitted an alternative incorporating an amended method of traffic accommodation and this alternate method has been accepted by the Employer.

The Contractor shall ensure that all employees and all visitors to the site are equipped with approved safety vests / jackets utilizing retro-reflective and/or fluorescent panels in red, yellow, white and/or silver and that the safety vests/ jackets are worn whenever his personnel and visitors are on the site of the Works. Any person found not wearing a safety vest/jacket while on the site of the Works, including any of the Engineer's or the Employer's staff, shall be instructed to leave the site until they are in possession of and wearing a safety vest/jacket. All safety vests/jackets shall be kept clean and in good condition and any safety vests/jackets that are, in the opinion of the Contractor's safety officer and/or the Engineer, ineffective shall be immediately replaced by the Contractor, Engineer or Employer, as applicable.

The Contractor shall be responsible for maintaining all existing or temporary road surfaces within, and on the approaches to, the Works area in a safe and trafficable condition at all times of the day or night for the duration of the contract. Any construction material that is driven onto or spilt on temporary roads, public roads or privately-owned roads during the haul of material, or while any construction operations are being carried out, shall be cleaned off the road surface as soon as practically possible and removed to an approved spoil site.

During non-working hours, or when construction work is not taking place on a certain section of road, all superfluous obstructions to the traffic shall be removed and all signs no longer applicable to the situation shall be removed to an approved safe location or effectively covered with an opaque, weather proof material bag made from durable material that is firmly fixed over the sign.

The overnight parking of construction vehicles and/or equipment within the road reserve may be permitted in areas alongside the road carriageway, in consultation with the Engineer. The minimum clearance between the parked vehicles and/or equipment and the edge of the nearest traffic lane shall be 6,0 m. The parked equipment and vehicles shall be placed behind reflective chevron delineators which are placed to face the traffic at a maximum spacing of 10m between each delineator.

If the construction vehicles and/or equipment need to be parked overnight closer than 6,0 m from the nearest traffic lane, then they shall be separated from the lane by guardrails correctly installed on guardrail posts or by vehicle restraining systems which consist of concrete or steel barriers correctly placed, assembled and fastened together in a sufficient length to create an effective vehicle restraint system. The guardrails or vehicle restraining systems shall be fitted with red reflectors or reflective chevron signs which are fixed to face the traffic at a maximum spacing of 10 m between each reflector or reflective chevron sign. The use of drums, lightweight plastic barriers, concrete or steel barriers that are not correctly placed and fastened together or guardrails that are not attached to correctly installed guardrail posts will not be permitted.

When requested by the Engineer, the Contractor shall provide lane closures for road inspections and testing. This must be done in advance of the actual time programmed for the inspection and testing work.

A1.5.3.3 Lane width

The clear width of any traffic lane which is provided along any section of a detour, a temporary deviation or any partial / half width construction area shall not be less than 3,5 m unless a narrower width is specified in the Contract Documentation or approved by the Engineer in writing. If a lane width less than 3,5 m is specified or approved by the Engineer then temporary width restriction warning signs shall be erected at approved locations along the narrow section of the detour, temporary deviation or partial / half width construction areas.

A1.5.3.4 Late occupation of traffic lanes, interchange ramps and cross roads

If specified in the Contract Documentation the Contractor shall be charged a lane occupation levy for any occupation of traffic lanes, interchange ramps and any cross roads beyond the completion dates and times agreed with the Employer. The lane occupation levies shall be specified in the Contract Documentation and they shall be deducted from payments due on the relevant interim payment certificates. If specified in the Contract Documentation the Contractor shall also be charged a lane occupation levy for traffic lanes, interchange ramps and cross roads occupied by the Contractor for the purpose of carrying out remedial work during or after completion of the Works.

A1.5.3.5 Legal requirements

In addition to the specifications given in the Contract Documentation all traffic accommodation arrangements shall also conform to the specifications and provisions given in the latest edition of the South African Road Traffic Signs Manual (SARTSM) and all other current legislation and regulations.

The Contractor shall make use of approved methods to control the movement of his equipment and vehicles so as not to constitute a hazard on the road. His staff and operators shall obey the permanent and temporary road traffic signs at all times and shall not consider themselves exempt from the road traffic laws and regulations because the Contractor has been given occupation of the site of the Works.

The Contractor shall indemnify the Employer against all proceedings, claims, actions, damages to vehicles or property, injury or death of persons and all costs which may arise from, or be related to:

- The absence, improper functioning or incorrect placement of road traffic signs, barriers, channelization devices, road markings, traffic control facilities, traffic safety devices and vehicle restraint systems.
- Any construction related items, materials or surfacing aggregates that were dropped, deposited, spilt, left or come loose from any access roads, haul roads, detours, temporary deviations and newly opened sections of completed roads.

The Contractor shall submit written confirmation that his insurance cover complies with the requirements specified in the Contract Documentation and shall supply a copy of the relevant insurance policy/policies to the Engineer for his records.

The Contractor shall within seven calendar days after receipt of a third-party claim acknowledge receipt to the claimant and submit the claim to his insurance company for processing. The Contractor shall then follow up the processing of the claim and inform the claimant of the outcome as soon as the matter has been dealt with by the Contractor's insurance company. The Engineer shall be copied on all correspondence regarding third party claims. The Contractor shall report on the latest status and outcome of all the third-party claims at every site meeting.

A1.5.3.6 Other traffic control measures ordered by the Engineer

The Engineer may instruct the Contractor to provide any other road sign, reflective tape, etc. not measured in standard payment items. Such road signs shall conform to the requirements given in Volume 2 of the SARTSM and/or specified in the Contract Documentation or by the Engineer in writing. To ensure that the travelling public is kept fully informed and warned on matters relating to the accommodation of traffic, construction sign posting and the effect of the construction on the free flow of traffic through the site, the Engineer may instruct the Contractor to arrange for advertising in the press, on the local radio stations and/or for other forms of publicity.

A1.5.3.7 Penalty events

Whenever the Contractor fails or refuses to take the necessary steps to ensure the safety and convenience of the public and/or to accommodate the traffic, pedestrians and non-motorised traffic and maintain the temporary detours, deviations, traffic accommodation facilities and traffic safety devices correctly in accordance with all the requirements and specifications given in the Contract Documentation, the Contractor shall be subject to the following penalty conditions:

- A fixed penalty amount as stated in the Contract Documentation per occurrence shall be deducted for each and every occurrence of non-compliance.
- A time-related penalty amount as stated in the Contract Documentation per hour over and above the fixed penalty shall also be deducted for non-compliance to rectify any defects in the accommodation of traffic requirements within the allowable time after the Engineer has given an instruction to this effect. The Engineer's instruction shall state the allowable time, which shall be the time in hours for reinstatement of the defects. Should the Contractor fail to adhere to this instruction, the time-related penalty shall be applied from the time the instruction was issued.

A1.5.3.8 Property pegs and survey beacons

Temporary deviations shall be constructed so as not to damage or displace existing cadastral beacons or trigonometrical-survey beacons. In exceptional cases where this is not possible, the Contractor shall notify the Engineer in good time so that the Engineer can arrange to have them suitably referenced before they are displaced. Cadastral beacons shall be replaced at the cost of the Contractor, unless removal is specified by the Engineer.

A1.5.3.9 Right of way

The travelling public shall have the right of way on public roads, existing roads used as detours and on all temporary deviations for the entire contract period. The Contractor shall make use of approved methods to control the movement of the construction equipment and vehicles so as not to constitute a hazard on the road or impede the public right of way.

A1.5.3.10 Safety of the travelling public and the Contractor's employees

The safety of the travelling public, and of the Contractor's and the Engineer's employees is of paramount importance and shall take priority over all aspects of the Works. The Contractor shall be responsible for the safe and easy passage of all vehicular, non-motorised and pedestrian traffic past and/or over the Works in a manner which will protect the road users, pedestrians, the Contractor's employees and the Engineer's employees.

A1.5.3.11 Services

Services affected by temporary deviations shall be located, protected and relocated in a similar manner as services affected by the permanent Works as specified in Clause A2.1.3.2 of Chapter 2. The requirements given in the Contract Documentation shall also be applicable to any services affected by the construction of temporary deviations.

A1.5.3.12 The use of public roads by the Contractor

The Contractor shall have the right to use public roads, including any detours and temporary deviations open to public traffic, subject to the provisions and restrictions specified in Clause A4.1.7.1 of Chapter 4 and in the Contract Documentation.

A1.5.3.13 Traffic over completed pavement layers and structures

Traffic over the completed pavement layers and structures on an uncompleted road shall be restricted to the vehicles and equipment required for the construction of the remaining Works. All construction vehicles will be restricted to the maximum axle loads permitted on public roads by the statutory provisions.

If it is necessary to temporarily accommodate public traffic over the completed pavement layers and structures on an uncompleted road this shall only be done if agreed to by the Engineer.

The Contractor shall be responsible for protecting and maintaining the pavement layers. Any damage to the layers shall be repaired or rectified at the Contractor's own cost unless the Engineer agrees in writing to pay for some or all of these costs.

A1.5.3.14 Vertical clearance

The minimum vertical clearance over any section of a temporary deviation shall be 5,2 m. If the minimum vertical clearance is less than 5,2 m then approved warning signage shall be erected at approved locations on the overhead obstruction itself as well as in advance of the obstruction. The advance warning signs shall be erected at distances of 1,0 km, 400 m and 200 m in advance of the overhead obstruction.

The warning signs shall show the actual clearance height in metres (to 2 decimal places) less a safety allowance of at least 75 mm.

Where the overhead obstruction or its support structure is likely to collapse if it is struck by a vehicle or by its load, and thereby represent a danger to the public or to the persons working on the site, then such an obstruction shall, in addition to the warning signs, have an approved height restriction warning gantry erected at least 200 m in advance of the overhead construction, or at the distance specified in the Contract Documentation or specified on site by the Engineer. The lower edge of the warning gantry shall be at least 5,2 m above the road surface and reflective chevron plates, spaced not more than 0,3 m apart, shall be suspended beneath the gantry to the same height above the road surface as the overhead obstruction less a safety allowance of 75 mm. The warning gantry shall be fitted with a beam triggered alarm that is audible to all employees working on the obstruction over the road. A properly trained flagman shall also be placed on the side of the road 50 m after the warning gantry to wave down and stop any vehicles whose loads touch any of the chevron warning plates.

Where the temporary deviation passes under a high voltage electric powerline the minimum vertical clearance height specified by the service owner shall be provided.

A1.5.4 DESIGN BY CONTRACTOR / PERFORMANCE BASED SYSTEMS

If, during the Contract, the Contractor would like to amend any of the specified traffic accommodation arrangements he shall provide his reasons for doing so in writing and obtain the Engineer's prior written approval. If the Engineer's prior written approval has been obtained, the Contractor will be remunerated for the revised traffic accommodation arrangements in accordance with the contract rates only up to an amount that does not exceed the tendered amount for the specified traffic accommodation arrangements that have been replaced.

A1.5.5 MATERIALS

A1.5.5.1 Material used for construction of temporary deviations

All material required for the construction of temporary deviations, which includes the earthworks, pavement layers, stabilised layers, asphalt and bituminous surfacing layers shall comply with the specifications for these materials given in Chapters 4, 9 and 10 respectively.

A1.5.5.2 Temporary culverts

Temporary culverts of the type and size required shall comply with the specifications given in Section A3.2 of Chapter 3 as well as with any additional specifications that may be given in the Contract Documentation.

A1.5.5.3 Temporary road restraint systems

Where specified in the Contract Documentation or instructed by the Engineer, the Contractor shall provide, install, move and re-install and subsequently remove temporary road restraint systems, if so required for the construction of temporary deviations.

All work shall be carried out in accordance with the specifications given in Section A11.4 of Chapter 11.

A1.5.5.4 Temporary fencing and gates

Where specified in the Contract Documentation or instructed by the Engineer, the Contractor shall provide either new fencing and gates, or move and subsequently reinstate existing fencing and gates, if so required for the construction of temporary deviations.

All work shall be carried out in accordance with the specifications given in Section A11.5 of Chapter 11.

A1.5.5.5 Temporary road signs

Temporary road signs shall comply with the specifications given for road signs given in Section A11.6 of Chapter 11.

A1.5.5.6 Temporary road markings and road studs

Temporary road markings and road studs shall comply with the specifications given for permanent road markings and road studs given in Section A11.7 of Chapter 11.

A1.5.5.7 Traffic accommodation facilities and safety devices

All road signs, barriers, channelization devices, guardrails, reflectors and other traffic safety devices shall be manufactured with materials that comply with the specifications given in the latest current edition of Volume 2 of the SARTSM, or any applicable international design standards that may be given in the Contract Documentation, and in accordance with the specifications given in Sections A11.4.5 and A11.6. of Chapter 11 as well as any additional specifications that are given in the Contract Documentation.

A1.5.6 CONSTRUCTION EQUIPMENT

Specifications for the traffic control facilities and traffic safety items are given in the following Clauses A1.5.6.1 to A1.5.6.4.

A1.5.6.1 Traffic control facilities

a) Barriers

Barriers manufactured from plastic and ballasted with sand or water, shall only be used to barricade work areas to close off sections of the Works from members of the public and non-motorised traffic. They shall not be used to prevent vehicular traffic from encroaching on or entering the work zone except at stop/go points where they may be used to supplement the stop/go sign or traffic signal which is operated by the traffic controller.

Where specified in the Contract Documentation, steel guardrails may be used as channelization devices provided they comply with the specified requirements and are installed as specified in Clauses A11.4.4, A11.4.5 and A11.4.7.2 of Chapter 11. They may not be affixed to drums or other moveable objects. Guardrails shall not be used for the purpose of preventing heavy vehicles from leaving the permitted lanes or deviations and the Contractor shall use approved vehicle restraining systems for this purpose.

Temporary road restraint systems which are erected for the purpose of preventing vehicles from leaving the permitted lanes or deviations shall be movable barriers manufactured from steel or concrete with an approved safety shape design (e.g. New Jersey, F-shape or single slope). The movable barriers shall be obtained from approved suppliers and placed between the trafficked lane/s and/or the construction areas. They shall comply with the specified requirements and be installed as specified in Section A11.4 of Chapter 11 which refers to either of the following specifications:

- i. The European Specification EN 1317 with a minimum containment level H1 or as indicated in the Contract Documentation
or
- ii. The American Federal Highways Administration Specification AASHTO MASH, or NCHRP 350 where no MASH compliant device is available, with a minimum containment level TL4 or as indicated in the Contract Documentation.

The terminal sections of the moveable barriers may be a proprietary type, or may be Contractor designed, to attenuate head-on impacts of at least Test Level TL2 (70 km/hr) in accordance with AASHTO MASH, or NCHRP 350 where no MASH compliant device is available, or at least EN1317 Containment Level P2 for End Terminals or 80/1 for Crash Cushions or as specified in the Contract Documentation.

Where specified in the Contract Documentation, the temporary road restraint restraining system selected shall have removable sections to permit crossing points for emergency vehicles. These sections shall be fully integrated with the restraining system and provide a continuous restraint without compromising on the specified containment level or working width when closed. These sections shall be easy to open with minimal personnel in under 10 minutes without the need for special tools and plant. The removable sections shall be located at a maximum spacing of 2 kilometres or as specified in the Contract Documentation.

b) Delineators

Delineators shall comply with the manufacturing and reflective requirements of SANS 1555. In addition, they shall also:

- Have blades that are reversible with dimensions as specified in the SARTSM and/or as indicated in the Contract Documentation.
- Be manufactured from durable, impact resistant plastic material.
- Be designed such that they, together with their mounting base, will collapse in a safe manner under traffic impact.
- Have the lower edge of the reflective part of the delineator mounted at least 100 mm above the road surface.
- Be capable of withstanding the movement of passing heavy vehicles travelling at speeds of up to 80 km/hr and gusting winds with a wind speed of up to 60 km/h without falling over. The base area shall be at least 0,18 m² and ballasted by its own weight or with durable sandbags filled with fine, clean sand of adequate mass. (The sand bags shall be partially filled to ensure a flattish surface without bulging and they shall not be filled with anything other than fine, clean sand).

c) Temporary signs

All temporary signs shall be manufactured to the sizes and in accordance with the specifications given in Volume 2 of the SARSTM and in Section A11.6 of Chapter 11 as well as with any additional specifications that are given in the Contract Documentation.

d) Traffic cones

Traffic cones shall be manufactured in a fluorescent red-orange or red impact resistant plastic material. The minimum height of traffic cones shall be 750 mm. The design and weight of the traffic cone shall be such that it will not be displaced or blown over by passing heavy vehicles travelling at speeds of up to 80 km/hr and gusting winds with a wind speed of up to 60 km/h.

e) Traffic signals

Temporary traffic signals shall conform with the requirements of traffic signals and conform to the size and visibility requirements specified for permanent traffic signals in Volume 3 of the SARTSM. The traffic signals shall be provided with either a permanent electricity supply or with a generator and/or batteries that are capable of powering the signals continuously for the full duration that they are required to be operational. Temporary traffic signals used for manual control of vehicles in alternate directions shall be actuated to turn green for adjustable green phases and thereafter automatically default to red to ensure that two directional green is avoided should operators be absent or in-attentive.

f) Traffic control stations

Traffic control stations shall be provided at each traffic control point that is in operation during hours of darkness. They shall have the following:

- A trained traffic controller.
- An effective communication system that allows the controllers at each end of the deviation to communicate effectively with each other.
- An all-weather shelter with at least three square metres floor area fitted with a clear window facing the oncoming traffic that can be opened if required and a stable door.
- A portable chemical toilet that shall be regularly maintained.
- A red/green stop/go electric traffic signal system consisting of two No. 200 mm diameter LED cluster lights mounted in circular light shields on a backing board attached to 3,0 m high steel poles complete with all electrical wiring.
- A 400W metal halide or a 100W LED floodlight mounted on a 9,0 m high steel pole to illuminate the traffic control point as well as the approach to the traffic control station where the traffic will start to queue. The light must shine downwards and shall be positioned so that it does not shine towards oncoming vehicles.
- Additional 400W metal halide or 100W LED floodlights mounted on 9,0 m high steel poles to adequately illuminate the full length of the vehicle queuing area (number and spacing to be discussed with the Engineer and amended to suit varying traffic conditions whenever necessary). The lights must shine downwards and shall be positioned so that they do not shine towards oncoming vehicles.
- An electrical power supply to operate the traffic signal lights and the floodlights at each traffic control point that is capable of continuously powering the lights for the full duration that they are required to operate.

- A moveable yellow or orange barrier fitted with a STOP sign facing the oncoming traffic to prevent vehicles from utilising the closed road lanes. The barrier shall be moved by the traffic controller to open and close the relevant lanes for road users as required.

A1.5.6.2 Illuminated traffic signs and safety devices

a) Flashing illuminated arrow board

The illuminated arrow board shall be made up of LED light sources powered by battery or other suitable means, mounted on a backing board. A single shaft arrow will be required that can be used for both left and right directions. This illuminated flashing arrow board shall be used at lane drops on multi-lane highways or at other locations as directed by the Engineer.

b) Illuminated road signs

The illuminated road signs shall be made up of LED light sources powered by battery or other suitable means, mounted on a backing board. The illuminated colours must match the regulation sign colours specified in the SARTSM. If specified in the Contract Documentation, these illuminated road signs shall be used on multi-lane and/or heavily trafficked highways during night time hours.

c) Mobile Variable Message Sign

The Variable Message Sign (VMS) shall be mounted on a trailer and located in a safe position where it is easily seen by the travelling public. It is used to provide information regarding the road and/or traffic conditions ahead or to inform a motorist of his actual travelling speed.

The mobile VMS system must be equipped with solar panels combined with deep cycle batteries to provide an output of at least 600W. It shall be capable of withstanding shocks up to 3G and wind speeds up to 120 km/h.

The sign face shall not be less than 3,0 m² to provide a full matrix LED with at least 2050 pixels per square metre. Each pixel shall have a LED and the pixel spacing shall not be less than 25 mm. The sign shall be able to display any configuration which contains letters, symbols, icons etc. The cone of vision is to be 30° and the light intensity must be automatically controlled by a daylight sensor; the light intensity shall also be capable of being controlled manually.

The lower edge of the sign face shall be at least 1,5 m above ground level.

The information displayed on the VMS sign face shall be controllable remotely from a computer via an internet connection.

d) Sign mounted flashing lights

Sign mounted flashing lights shall consist of two rectangular amber flashing lights, each at least 120 mm wide x 45 mm high using 10W LED's. The lights shall be visible from a distance of at least 800 m.

Depending on the width of the advance warning signs, the two flashing lights shall be mounted either 900 mm apart centre to centre on a 1 200 mm wide x 200 mm high white non-reflective sign board or mounted 600 mm apart centre to centre on a 900 mm wide x 150 mm high white non-reflective sign board.

The sign board with the two flashing lights shall be mounted on top of each of the first advance warning signs positioned before the start of temporary deviations, lane closures, stop/go points for one-way traffic zones, vertical height restrictions and at any other potentially hazardous positions. They shall be placed where specified in the Contract Documentation or by the Engineer.

The lights shall have a separate solar panel power source with batteries that are mounted in a lockable steel box mounted on the back of the sign board. The power supply shall be sufficient to power the lights for at least 12 hours and the batteries shall be replaced or recharged as necessary to ensure that the flashing lights are always operating when required.

The lights shall be operated during all the hours of darkness and also during daylight hours if specified in the Contract Documentation or by the Engineer.

e) Warning flags

Flags shall be made from durable, bright red material and shall be square with a minimum side length of 600 mm. The flag shall be attached to a flagpole staff at least 1,0 m in length. The warning flags shall be replaced whenever they become dirty or worn to the point where they are no longer easily visible and effective.

f) LED strobe light wands

LED strobe light wands shall be hand held, battery powered LED wands with an amber lamp tube at least 200 mm in length which can be operated in continuous or flashing mode.

A1.5.6.3 Traffic safety vehicle

The traffic safety vehicle to be used for transporting, placing, relocating and removing the traffic accommodation facilities and the traffic safety devices shall be a truck with a load capacity of at least 5 tons fitted with:

- A high visibility rear panel in accordance with the requirements specified in the SARTSM.
- A rear mounted impact attenuation device which is capable of attenuating head-on impacts of at least Test Level TL2 (70 km/hr) in accordance with AASHTO MASH, or NCHRP 350 where no MASH compliant product is available.
- An amber-coloured flashing LED light or light bar mounted on top of the roof of the cab, or on top of the rear canopy whichever is the highest, which shall be clearly visible in daylight in all directions for a distance of at least 800 m. It shall be switched on continuously while the vehicle is on site, is manoeuvring in or out of traffic or is travelling or parked alongside roads open to public traffic within the work areas.
- A warning sign with the wording TRAFFIC CONTROL in retro-reflective Class 3 red letters at least 200 mm high on a retro-reflective Class 3 white background, mounted in a visible position at the rear of the vehicle.

A1.5.6.4 Traffic safety officer's vehicle

The traffic safety officer's vehicle shall be provided for his sole use to enable him to carry out his supervisory duties.

The traffic safety officer's vehicle shall both be equipped with the following:

- An amber-coloured flashing LED light or light bar mounted on top of the roof of the cab, or on top of the rear canopy whichever is the highest, which shall be clearly visible in daylight in all directions for a distance of at least 800 m and it shall be switched on continuously while the vehicle is on site, is manoeuvring in or out of traffic or is travelling or parked alongside roads open to public traffic within the work areas.
- A warning sign with the wording TRAFFIC CONTROL in retro-reflective Class 3 red letters at least 200 mm high on a retro-reflective Class 3 white background, mounted in a visible position at the rear of the vehicle.

A1.5.7 EXECUTION OF THE WORKS

A1.5.7.1 Accommodation of pedestrian traffic

The Contractor shall pay specific attention to the accommodation of pedestrian traffic wherever the safety of pedestrians could be compromised. Safe, correctly marked and signposted pedestrian crossing points shall be provided at locations agreed to by the local community and the Engineer to ensure that the pedestrians are safeguarded and shall be able to cross the site without being endangered. The pedestrians should not be able to enter areas where Works are taking place.

Should a walkway be required, it shall have a clear opening of at least 1,2 m wide and 2,1 m high and shall be uniformly illuminated during hours of darkness. The surface of the walkway shall be free from obstructions and shall be clearly signposted to guide the pedestrians towards the walkway. If steps are required to reach the level of the walkway, these shall comply with the occupational health and safety requirements and have proper handrails. No ramps shall be steeper than 1 (vertical) to 8 (horizontal).

Where specified by the Engineer a traffic safety meeting shall be organised to inform persons living in the local community about the safe use of the designated pedestrian crossing points and to highlight all dangers associated with getting too close to the construction vehicles and equipment.

A1.5.7.2 Accommodation of non-motorised traffic

In areas where non-motorised traffic is present, the Contractor shall ensure that there is sufficient width available to permit vehicles to pass the slow moving non-motorised traffic safely. If this is not possible then the Contractor shall provide separate temporary deviations or alternative detours to accommodate the non-motorised traffic.

A1.5.7.3 Accommodation of traffic where the road is constructed in half or partial widths

Where, for reasons related to traffic, geometric or other restraints, the provision of a detour, or the construction of a temporary deviation alongside or in close proximity to the roadworks, is not possible or impracticable, the Contractor shall construct the Works on a half or partial width of the existing road so as to allow public and construction traffic to use that remainder of the road surface which is currently not under construction.

Half or partial width traffic accommodation shall be carried out in accordance with the requirements of this Section, any additional requirements given in the Contract Documentation and any further written instructions issued by the Engineer. The specifications given in this section shall also apply to a road that is being constructed in half or partial widths.

The length of the half or partial width construction sections where the traffic can only pass in one direction at a time shall not exceed the length specified in the Contract Documentation. The number of one-ways sections under construction at any one time shall not exceed the number permitted in the Contract Documentation and two-way traffic sections of at least 2.0 km in length shall be provided between each of the one-way construction sections.

The start and end points of the half or partial width construction sections shall be as specified in the Contract Documentation or as decided on site by the Engineer and confirmed to the Contractor in writing. All start and end points shall be positioned to ensure that there is sufficient traffic queueing length before the traffic control point to ensure that oncoming traffic has a sufficient stopping sight distance as specified in Figure 13.25 given in Chapter 13 of Volume 2 of the SARTSM before the traffic queueing area.

The work zone and the one-way traffic lane shall be separated from each other by delineators and/or temporary barriers as specified in Volume 2 of the SARTSM and/or in the Contract Documentation and by the Engineer where applicable.

The Contractor shall maintain the portion of the road which is being used to accommodate the traffic in a safe, clean and trafficable condition at all times.

The one-way traffic shall be controlled by a STOP / GO system manned by an adequate number of traffic controllers, flagmen and/or traffic signals, signs, barricades, lights and the necessary supervisory staff to ensure a reasonably free flow of traffic alternately in each direction throughout the entire period when the roadway is open to one-way traffic only.

Whenever the one-way STOP / GO system is operation during hours of darkness the use of traffic signals to control the traffic in addition to the traffic controllers shall be compulsory. Flashing amber lights shall be mounted on top of the initial advance warning signs (usually positioned 1,0 km before the control point) and the traffic stopping and queueing length areas shall be illuminated with pole mounted floodlights.

The Contractor shall programme the Works in such a way to ensure that there are no STOP / GO one-way traffic sections in operation and that two-way traffic can be accommodated safely within the contract limits during the Contractor's annual shutdown period between December and January or during any other shutdown periods which may be specified in the Contract Documentation. The Contractor shall endeavour to ensure that there is no vertical step between two opposing traffic lanes during a shutdown period. If a step between opposing traffic lanes is unavoidable then delineators or barriers shall be erected between the opposing traffic lanes as specified in the Contract Documentation or as instructed by the Engineer. These traffic accommodation measures must be maintained by the traffic safety personnel for the full duration of the shutdown period.

The Contractor shall programme his work taking due cognizance of all restrictive conditions associated with accommodating the traffic in half or partial width construction sections.

A1.5.7.4 Crossing the median or the road centreline

All entry, exit and turning points on a single or dual carriageway road should be at existing intersections wherever possible. Where not possible all access points shall be located at safe points which have been planned in advance and agreed with the Engineer. They shall only be located at points where there is sufficient sight distance at least 300 m in a 60 km/hr construction zone or temporary detour, 400 m on a road with an 80

km/hr posted speed limit, 500 m on a road with a 100 km/hr posted speed limit and 600 m on a road with a 120 km/hr posted speed limit. They shall be well signposted with advance heavy vehicle turning warning signs and speed limit restriction signs in accordance with the requirements given in the South African Road Traffic Signs Manual.

No vehicles belonging to the Contractor or the Engineer's staff and no construction equipment shall be allowed to cross the median of a dual carriageway road. Approved access points shall always be used by all vehicles and construction equipment.

No vehicles belonging to the Contractor or the Engineer's staff and no construction equipment shall be allowed to cross the centreline of a single carriageway road unless the traffic accommodation arrangements, road markings and signage specifically allows for this.

A1.5.7.5 Display of existing permanent signs

The Contractor shall adhere strictly to the sign layout and spacing specified in Chapter 13 of Volume 2 of the SARTSM, specified in the Contract Documentation or as directed by the Engineer. Any sign not required, or which is in contradiction with the prevailing situation, shall be removed to storage or covered with a non-transparent, weather proof and durable cover without delay.

The covers shall be in the form of a sack made from a durable, opaque material with a drawstring or ties at the open end so that the cover may be placed over the sign and fastened in position. The use of thin plastic bags or a single layer of material taped over the front of the sign will not be permitted.

The Contractor shall be responsible for the care and maintenance of all existing permanent signs and take the necessary precautions to prevent them from being scratched or damaged in any way. Any permanent signs that are scratched or damaged by the Contractor's staff and/or vehicles or equipment shall be replaced by the Contractor as his own cost.

A1.5.7.6 Maintenance of existing roads used as detours

Where specified in the Contract Documentation, all existing roads used as detours by public traffic, and/or by the Contractor's vehicles, for bypassing the Site of the Works shall be maintained by the Contractor in a good and safe trafficable condition for the entire period during which such roads are used as detours.

Maintenance of these roads used as detours shall include grass cutting, removal of rubbish, cleaning of all drains and culverts and repair of potholes and surface failures as instructed by the Engineer. Unless otherwise specified in the Contract Documentation the maintenance work shall also include the care and maintenance of all road markings, road signs, delineators and guardrails.

A1.5.7.7 Liaison with traffic authorities

The Contractor shall liaise with the relevant provincial and/or municipal traffic authority, and with the Employer's traffic management centre if applicable, at the start of the contract period and as often as required thereafter to keep them continually informed in advance about the expected Works being carried out and the detour and deviation and lane closure arrangements that will be in place.

A daily report covering the expected work and traffic control arrangements for the following day shall be submitted to the relevant traffic authorities or to the traffic management centre not later than 10h00.

For exceptional traffic accommodation impacts, such as lane closures in peak hours, short term contra flow conditions, lane closures over weekend peak periods etc., the relevant traffic authorities, and the Employer's traffic management centre if applicable, shall be informed seven days prior to the event.

The Contractor shall inform the relevant traffic authorities, and the Employer's traffic management centre if applicable, about all traffic related incidents as soon as he becomes aware of the incident. The Contractor's site agent and his traffic safety officer must always have the relevant telephone numbers and email addresses with them so that contact can be made as soon as any traffic related incidents occur.

The Contractor shall, in appropriate circumstances that have been agreed with the relevant provincial and/or municipal traffic authorities, be responsible for acquiring the services of a provincial or municipal traffic officer and traffic vehicle (equipped with a blue light) to assist in the accommodation of traffic. The traffic officer and traffic vehicle will be required when lanes are to be closed, or where directed by the Engineer.

If the road under construction forms part of an abnormal load route the Contractor shall liaise with the relevant provincial abnormal load office that issues permits to ensure that permits are not issued when horizontal and/or vertical restrictions do not allow passage of the abnormal load.

A1.5.7.8 Informing the road users

The Contractor shall on a continual basis, and at least one week prior to a major event, inform the road users of the intended road Works, construction period and accommodation of traffic arrangements through press releases in local and provincial newspapers and via local radio channels.

Any temporary road closures required for blasting operations, or for any other reason, shall also be advertised on sign boards erected in appropriate positions along the section of road to be closed at least fourteen calendar days prior to each closure.

A1.5.7.9 Lighting of construction access points during night work

Where work is required to be done during the night the Contractor shall make adequate provision for additional lighting to ensure that all vehicle and equipment entry and exit points are adequately lighted. The Contractor shall provide floodlights to ensure that a minimum 200 lux lighting level is provided at all these areas.

The floodlights must be mounted on masts at least 9m high to ensure that they illuminate the required areas without being directed into the vision of oncoming drivers.

A1.5.7.10 Construction of temporary deviations

a) General

Unless otherwise specified in the Contract Documentation, or instructed by the Engineer in writing, the construction of temporary deviations shall be done in conformance with the requirements and specifications given in this section as well as in other relevant chapters of this Standard Specification as follows:

- Clearing and grubbing – Chapter 1, Section A1.6
- Drainage – Chapter 3.

- Earthworks and pavement layers – Chapters 4 and 5.
- Asphalt surfacing – Chapter 9.
- Bituminous surfacing – Chapter 10.
- Ancillary road works – Chapter 11.

The proposed location and layout of all temporary deviations, including the signage required, shall be agreed with the Engineer before construction of the temporary deviation commences.

b) Drainage works for temporary deviations

The Contractor shall construct the necessary temporary drainage works such as side drains, catch-water drains, mitre drains, culverts, etc., to deal adequately with any storm water and surface water run-off.

Temporary culverts of the type and size specified by the Engineer shall be installed on existing drainage channels. Any suitable prefabricated culverts salvaged from an existing road or an abandoned temporary deviation may be re-used if they are in a good condition and are accepted by the Engineer.

All drainage works shall be maintained in a clean condition and in good working order.

Any flood damage caused to a temporary deviation shall be repaired by the Contractor as soon as the flood water has subsided.

c) Earthworks for temporary deviations

The Contractor shall perform the necessary clearing and grubbing, including the removal of all trees and stumps. The Contractor shall then shape and grade the temporary deviation and prepare the roadbed.

The Contractor shall make full use of all suitable material that can be obtained from alongside the temporary deviation, from side cuts or from the immediate vicinity for the construction of any fills that are required. If an adequate quantity of acceptable fill material cannot be obtained in this manner it shall be imported from other approved sources. Where necessary, cuttings shall be made to obtain additional fill material and/or to achieve a satisfactory vertical alignment.

The earthworks across stream crossings shall be constructed from rock fill or coarse material so as to limit, in so far as is possible, damage caused by flood water.

d) Earthworks and pavement layers for temporary deviations

The Contractor shall provide the fill and pavement layers required for the temporary deviations in accordance with the requirements specified in the Contract Documentation or as instructed by the Engineer.

The cross fall shall be maintained between 3 % and 4 % on gravel deviations and between 2 % and 3 % on surfaced deviations.

If existing gravel shoulders are to be used for the accommodation of traffic and they are unsafe and/or not wide enough, the shoulders shall be reconstructed. All grass and unsuitable material shall be bladed from the surface and, where necessary, roadbed preparation shall be done. Additional wearing course gravel material shall be imported from the road reserve or from borrow pits as required to provide a layer of wearing course gravel at least 150 mm thick after compaction. The gravel shall then be placed and compacted as specified in the Contract Documentation.

e) Surfacing of temporary deviations

The Contractor shall surface the temporary deviations in accordance with the requirements specified in the Contract Documentation or as instructed by the Engineer.

Unless otherwise specified in the Contract Documentation, or instructed by the Engineer, the surfaced width of a temporary deviation accommodating two-way traffic shall be 8,5 m to provide two 3,5 m wide traffic lanes with a 0,75 m wide surfaced shoulder on each side. A further 0,75 m wide gravel shoulder shall also be provided on each side to provide a minimum total roadway width of 10,0 m. Where temporary deviations consist of two separate one-way lanes, the minimum surfaced width of each lane shall be 3,5 m. A further 0,5 m wide gravel or surfaced shoulder shall also be provided on each side to provide a minimum total roadway width of 4,5 m in each direction.

f) Maintenance of temporary deviations

All temporary deviations shall be maintained by the Contractor in a safe trafficable condition at all times.

All potholes and surface failures shall be repaired as soon as possible. The Engineer may also instruct the Contractor to resurface the temporary deviation or existing road being used as a detour if it becomes necessary.

Whenever required by the Engineer, temporary gravel deviations shall be bladed by means of self-propelled road graders to provide a smooth riding surface free from corrugations. The Engineer may also instruct the Contractor to water the temporary gravel deviations to keep down dust or to facilitate the proper blading of the surface.

g) Removal of temporary deviations

After traffic is rerouted permanently onto the new road, and on the written instructions of the Engineer, the Contractor shall remove temporary deviations. All roadwork materials, drainage structures, temporary signage, barricades and guardrails etc. will be removed either to spoil or to temporary storage for re-use elsewhere in the Works.

All temporary signage and road markings on the approaches to the temporary deviations shall also be removed.

A1.5.7.11 Temporary traffic control facilities

a) General

The Contractor shall provide, erect and maintain the necessary temporary traffic-control facilities, which are comprised of traffic control devices, road signs, channelization devices, barricades, warning devices and road markings, in accordance with the specifications given in Chapter 13 of Volume 2 of the SARTSM, in this Section or as specified in the Contract Documentation. The details shown for spacing and placement of traffic-control facilities may also be revised by the Engineer in writing where deemed necessary to accommodate local site geometry and traffic conditions.

The Contractor shall ensure that all the temporary traffic control facilities devices are present where required at all times and are always functioning properly.

Traffic control facilities no longer required at a particular site shall be moved and stored safely for re-use.

All traffic control facilities which are scratched, bent, broken or otherwise damaged by the Contractor's staff and/or vehicles, construction equipment or by any other road users to the point where the Engineer considers them to be no longer usable or compliant shall be replaced by the Contractor at his own cost if they were not:

- Carefully stored, handled or transported.
- Correctly attached to their support bases, poles or frames.
- Correctly erected or ballasted.
- Erected in the correct position and/or not maintained in their correct position which made them likely to be damaged by passing vehicles.

If, due to poor storage, handling, transportation or old age, the co-efficient of retro-reflection of any of the signs fall below 80% of the value specified in the current edition of SANS 1519-1 for the grade and colour of the material used, the sign shall be considered defective and it shall be replaced at the Contractor's own cost.

All correctly erected, ballasted and positioned temporary traffic control facilities which are damaged by public road users shall be replaced and paid for under the relevant payment item.

All lost or damaged items shall be replaced as soon as possible within a maximum period of two hours of the Contractor becoming aware of it or of receiving instructions from the Engineer.

b) Channelization devices

Channelization devices may consist of either delineators or traffic cones or a combination of both as specified in the Contract Documentation. The use of drums as channelization devices shall not be permitted.

Delineators shall be placed at the spacing specified in the Contract Documentation. They shall be positioned with the reflective chevron facing the oncoming traffic to indicate the side of the road or deviation on which the vehicles should travel.

Traffic cones may only be used only at short deviations where both ends of the deviation are visible to the drivers of the approaching vehicles. They may only be used in conjunction with flagmen stationed at each end of the deviation. If the length of the deviation exceeds 100 m then cones shall not be used on their own but shall be interspersed with delineators at a ratio not exceeding 3:1 and, if considered necessary by the traffic safety officer and/or the Engineer, additional flagmen shall be stationed where the work is taking place.

Traffic cones may only be used during daylight hours. Deviations and lane closures which are still in place at sunset shall be demarcated with reflective delineators only.

Where traffic is being accommodated on new sections of road where no road markings have yet been painted, double sided reflective delineators shall be erected along the centre line of two way roads at a spacing not exceeding 20m. Delineators shall also be placed along the outer edges of the surfaced roadway at a spacing not exceeding 80 m on straight sections of the road and 40m around curves in the road. Alternatively, the Engineer may request or permit the use of temporary road studs where appropriate.

c) Erection of temporary vehicle restraint systems

Before ordering and erecting any temporary vehicle restraint systems the Contractor shall first take cognisance of his liabilities relating to the installation of temporary works to provide protection to the permanent Works and to ensure the safety to his personnel before he selects a vehicle restraint system appropriate to his chosen work methodology. Particularly pertinent is the working width rating of the vehicle restraint system as the displacement width of the system shall not exceed the available safe width to the nearest edge of the construction area. All vehicle restraint systems shall be installed and connected in accordance with the manufacturer's instructions and shall be submitted to the Engineer for review and comment.

If the Employer makes his own temporary vehicle restraint system available for the Contractor to use, no transfer of responsibility for use of that system shall pass to the Employer. The Contractor shall retain the responsibility for ensuring that the barrier system provided by the Employer provides an adequate and appropriate level of protection. Before deciding to make use of the Employer's vehicle restraint system the Contractor shall obtain full details of the system and the approved connecting system to confirm and satisfy himself that the system is compliant with one or both of the two international specifications specified in Clause A1.5.6.1a) and to confirm that the working safe working width classifications behind the barriers for the various vehicle classes and impact characteristics are compliant with the requirements of the construction section where the vehicle restraint system will be installed.

d) Cleaning of traffic control facilities

All road signs, delineators, traffic cones, flashing arrow boards, illuminated signs, variable message boards and the reflectors on vehicle restraint systems and guardrails shall be cleaned at least once a week or more often if they are in a position where they are splashed with dirt by passing traffic and/or construction vehicles. All dust, mud, concrete, bituminous or other foreign material shall be cleaned off.

e) Flagmen and traffic controllers

Flagmen shall be provided at the positions specified in the Volume 2 of the SARTSM or specified in the Contract Documentation. These positions may be varied to suit local geographic or traffic conditions if so instructed by the Engineer. Flagmen shall also be positioned in advance of all work zone construction vehicle exit points to control construction vehicles re-entering the trafficked lane/s.

During the daytime, at least one flagmen shall be provided at each traffic control point in addition to the STOP/GO sign and/or traffic signal operator. One flagman shall also be positioned at the first speed reduction sign and a second roving flagman shall be positioned at least a 100m behind the last vehicle in the queue at STOP/GO points to warn the oncoming traffic to stop. Additional flagmen shall be positioned at least 100m in advance of any possible traffic conflict points such as lane closures and lane drops.

The number of flagmen and traffic controllers to be employed each day shall be agreed with the Engineer at the commencement of the Works and thereafter whenever the numbers required on site change. Flagmen and traffic controllers shall not work for periods exceeding four hours without being given a rest period of at least one hour and sufficient additional flagmen and traffic controllers shall be available to relieve them as required.

All flagmen and traffic controllers shall be provided with conspicuous orange or bright yellow clothing as well as approved safety vests/jackets utilizing retro-reflective and/or fluorescent panels in red, yellow, white and/or silver. The clothing and/or the safety vests/ jackets must be kept clean and they shall be replaced by the Contractor at his own cost when they are no longer in good condition.

During hours of daylight all flagmen and traffic controllers shall be equipped with a red warning flag as specified in Clause A1.5.6.2e).

During hours of darkness all flagmen and traffic controllers shall be equipped with an amber LED strobe light wand as specified in Clause A1.5.6.2f).

No flagman or traffic controller shall work on site longer than one 8 hour shift per day. Including transport to and from work no flagman or traffic controller should be on duty for a period of more than 10 hours per day.

Flagmen shall be adequately trained in the standard flagging techniques as described in Volume 2 of the SARTSM. Flagmen shall have in their possession at all times a certificate showing that they have attended training provided by an accredited training company.

In terms of lateral clearance and safety, flagmen and traffic controllers shall stand on the shoulder of the lane of traffic that is being controlled and shall not be permitted to stand within the traffic lane.

The traffic controllers and any flagmen acting as STOP / GO controllers shall have an approved two-way communication system if they are not within an easily visible signalling distance of each other.

f) Temporary road markings and road studs

Temporary road markings may be required on bituminous and concrete surfaces. The road markings shall normally be applied using retro-reflective road marking paint in accordance with the specifications given in Section A11.7 of Chapter 11. However, in some instances, the temporary road markings may consist only of, or a combination of, heavy pre-marking, temporary road studs and reflective road marking tape. as directed by the Engineer.

Temporary road studs shall be fixed to the road surface with a flexible bitumen rubber sealant material, as opposed to an epoxy adhesive, for easy removal by application of low heat.

Temporary road markings shall not be painted onto to the final, new road surface except where instructed by the Engineer. Where possible, reflective road marking tape, capable of being easily removed from the road surface by the application of low heat, shall be used for any temporary road markings required on a new road surface. Should temporary road marking be approved but require removal, they shall be removed, when no longer required, only by means of sandblasting or water jetting. Covering existing road marking with black paint will not be allowed under any circumstances.

g) Temporary road signs

All temporary road signs that are required to remain in position for some time shall be pole mounted as for permanent signs in the positions shown on the drawings. All temporary road signs that need to be moved more often shall be mounted on portable support frames which are designed to support the signs in a stable, upright position. The signs may not be displayed with their sign faces more than 20° off the vertical plane. (i.e. a maximum slope of 1 horizontal to 3 vertical will be permitted).

The only permitted method of ballasting the temporary road sign support frames shall consist of durable sandbags filled with clean, fine sand of adequate mass to prevent the signs from being blown over by passing heavy vehicles travelling at speeds of up to 80 km/hr or by gusting wind with wind speeds of up to 60 km/hr. The filling of sandbags with stone of size greater than 2mm shall not be permitted.

h) Traffic calming devices

Traffic calming devices will be installed in positions as specified in the Contract Documentation or as instructed by the Engineer. These devices may include rumble strips, rumble humps or speed reduction humps / bumps that shall conform to the dimensions and specifications given in the Contract Documentation.

If any of these traffic calming devices are used, then temporary advance warning signs shall be erected in accordance with the specifications of the SARTSM. If the Engineer considers it necessary, the warning signs shall be supplemented with flagmen to warn motorists of the presence of the temporary traffic calming devices.

Movable variable message signs warning the traffic of the required speed limit, the actual speed being travelled and/or a message telling the driver to slow down may also be used as traffic calming devices if specified in the Contract Documentation or instructed by the Engineer.

i) Traffic control measures

Traffic control measures shall be provided at either end of all deviations and at all side roads within the deviation. The traffic control points may comprise any of the following and shall be provided / used as specified below.

Day time traffic control for short deviations

Flagmen with STOP/GO signs may be used to control traffic over short deviations where both ends of the deviation are visible to the drivers of the approaching vehicles. The flagmen operating the STOP/GO signs must have an effective communication system if they are not within an easily visible signalling distance of each other they shall be equipped with an effective communication system.

No such day time closures shall be permitted during hours of darkness and the Contractor shall ensure that he completes the required work and reopens the road to traffic before nightfall.

Day time traffic control for long deviations

On long deviations where both ends of the deviation are not visible to the drivers of the approaching vehicles moveable barriers, fitted with a STOP sign facing the oncoming traffic, shall be provided at the traffic control point to prevent vehicles from utilising the closed road lanes. These barriers shall be moved by the traffic controller to open and close the relevant lanes for road users as required.

Each traffic controller shall be provided with an effective communication system that allows the controllers to communicate with each other in order to coordinate and control the one-way traffic safely and efficiently. Records of the time period and the number of vehicles going through shall be kept at each traffic control point and submitted daily to the traffic safety officer who shall submit a copy of these records to the Engineer.

Night time traffic control

The Contractor shall provide traffic control stations manned by trained traffic controllers as specified in Clause A1.5.6.1f) for all deviations which are used during the hours of darkness.

Records of the number of vehicles going through during each shift period shall be kept at each traffic control point and submitted daily to the traffic safety officer who shall submit a copy of these records to the Engineer.

Traffic control on side roads

The Contractor shall provide a traffic controller equipped with a STOP/GO sign at the intersection of all side roads that fall within a one-way deviation. The traffic controller shall have an effective method of communication with the traffic controllers at either end of the deviation to enable him to control any vehicles entering from the side roads to ensure that they do not travel against any oncoming traffic.

A1.5.7.12 Traffic safety officer

The Contractor shall appoint a knowledgeable, experienced and conscientious person as his traffic safety officer who shall be responsible for the arrangements and maintenance of all accommodation of traffic measures required for the duration of the contract. The Contractor shall submit details of the person's qualifications, training and experience to the Engineer for comment before appointing him.

The traffic safety officer shall be able to communicate in the languages of the area and shall be a dedicated official who shall have no other responsibilities on site unless permitted otherwise on small projects in the Contract Documentation or by the Engineer.

The traffic safety officer shall be equipped with a dedicated vehicle and a cellular telephone and shall have sufficient labour and a Traffic Safety Vehicle, as specified in Clause A1.5.6.2, at his disposal 24 hours a day.

The traffic safety officer shall always have a direct line of communication with the police and traffic officers responsible for the area within limits of the contract and shall be responsible for maintaining liaison with them in accordance with the requirements given in Clause A1.5.7.7.

The traffic safety officer will be required to perform the following duties and this list shall not be deemed to be comprehensive. He shall:

- Ensure that all the Contractor's personnel, all the Engineer's site staff and all visitors are wearing approved, clean safety jackets utilizing retro-reflective and/or fluorescent panels in red, yellow and/or white when they are on the site of the Works.
- Make himself available to discuss road safety and traffic accommodation matters whenever required by the Engineer and shall be responsible for keeping the temporary traffic accommodation requirements up to specification 24 hours a day 7 days a week.
- Set out and record the position of each sign, barricade, delineator, cone, amber flicker light, guardrail and permanent or temporary painted road marking feature and every other traffic control facility for each closure or temporary deviation as specified on the drawings and Contract Documentation. The position of each facility shall be adequately referenced from the marker boards or other surveyed points on the site of the Works. These records shall also show the date and time at which the recorded traffic accommodation features are certified as correctly positioned and erected by the Traffic Safety Officer, and shall be signed by him before being submitted to the Engineer.
- Take digital photographs and/or video footage covering the full extent of the temporary traffic accommodation arrangements on the site of the Works whenever any new arrangements are made. The digital photographs / video footage shall be submitted to the Engineer in electronic format for his records.
- Inspect the position and condition of each traffic accommodation feature on the whole site of Works twice per work shift, once before the start of the morning and evening peak traffic periods and again during the middle of the work shift if both day and night shifts are in operation.
- Record all irregularities discovered and the remedial action taken and then date and sign the record sheets off as correct and submit copies to the Engineer by 10h00 the following working day. The above inspections must at least take place before the commencement of peak traffic periods.
- Collate and submit the daily labour returns of flagmen, stop/go, and traffic signal control personnel employed and the open/close periods and traffic count data recorded at each traffic control point to the Engineer each morning.
- Exercise control in terms of traffic safety over the safe movement of personnel, visitors and plant on site including the wearing of high visibility clothing, safety jackets, the operation of amber flashing lights and the display and cleanliness of "Construction Vehicle" signs, all as specified.
- Ensure that all road signs, delineators, barrier reflectors and traffic cones are always kept clean and visible as specified in Clause A1.5.7.11d).
- Attend to the training and performance of flagmen and all other personnel involved in the control of traffic.
- Attend to all complaints and claims from the public with respect to traffic safety and report on such matters to the Engineer.
- Ensure that all obstructions that are caused by Contractor's vehicles, equipment, materials and tools or other objects related to the work activities are removed out of and away from the trafficked area, or suitably barricaded off as specified, so that the roads are safe to use by the travelling public.
- Arrange for the removal of stationary or broken down vehicles off the roadway in conjunction with the traffic authorities.

In the event of an accident within the Site of the Works, the traffic safety officer shall implement any actions requested by the traffic authorities with respect to the work to be carried out and he shall be responsible for the erection and maintenance of all traffic signs necessary for the accommodation of traffic. He shall record in a written report the details of the accident and record the position of all temporary road signs, barricades, delineators, flagmen and any other devices used for traffic accommodation. The report shall include a neat, accurate dimensional sketch, photographs and notes about any identifiable permanent features related to the accident, together with any other relevant information. As soon as it is available he shall obtain the accident case number from the traffic authorities and attach it to the report before submitting a copy of the report to the Engineer for his records.

A1.5.7.13 Towing of public vehicles

If specified in the Contract Documentation, the Contractor shall arrange for tow trucks to be on call for removing broken down light and/or heavy vehicles for the duration specified in the Contract Documentation.

Payment for towing trucks off the road and/or on to a storage or repair facility will not be made as this cost is to be recouped from the owner of the towed vehicle.

A1.5.8 WORKMANSHIP

The Contractor shall implement a process control system which shall ensure that all traffic control facilities and signs are erected in the correct position and are regularly maintained and kept clean.

The Contractor's process control system shall also ensure that all safety personnel are correctly trained and that they are carrying out their duties correctly.

B1.5 ACCOMMODATION OF TRAFFIC

PART B: LABOUR ENHANCEMENT

CONTENTS

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B1.5.8 WORKMANSHIP

B1.5.1 SCOPE

The nature of the work required to accommodate the traffic is labour intensive and no additional labour enhancement requirements are specified for Section A1.5.

B1.5.2 DEFINITIONS

Definitions as provided in Clause A1.5.2 shall also apply.

Clauses B1.5.3.to B1.5.8 are not applicable to this Section.

C1.5 ACCOMMODATION OF TRAFFIC

PART C: MEASUREMENT AND PAYMENT

(i) Preamble

The tendered rate for each item shall include full compensation for providing, operating, maintaining and decommissioning upon completion, of all the construction equipment, labour, tools, incidentals and supervision to carry out the activity or construct the works in the item, unless otherwise stated.

Any prime cost or provisional sums shall be paid in accordance with the provisions of the conditions of contract. The charge or mark-up tendered or allowed for is a percentage of the amount actually paid under the prime cost or provisional sum. This percentage shall cover all the Contractor's handling, supervision, profit and liability costs to provide the services in the prime cost or provisional sum item.

(ii) Items that will not be measured separately

The following required activities will not be measured or paid for separately and the Contractor shall include the cost thereof in other items as deemed appropriate:

1. Removal of any material that is driven onto or spilt on any temporary roads, public roads or privately owned roads that are being used to accommodate traffic during the haul of material or while any construction operations are being carried out.
2. The provision of lighting for construction access and exit points during night work. All costs related to illuminating the area of the access and exit points at night, as specified in Clause A1.5.7.9, shall be included in the relevant payment items applicable to the work being carried out at night.
3. The provision of the flashing amber lights / light bars and "Construction Vehicle" warning boards which shall be fitted to the Contractor's vehicles and construction equipment. All costs related to the provision of these warning devices shall be included in the relevant payment items applicable to the work being carried out.
4. The provision of safety clothing, warning flags and amber LED strobe light wands for traffic safety officers, flagmen and traffic controllers; the cost of these shall be included in the rate for providing these personnel.
5. The cleaning, repair or replacement of any traffic control facilities damaged by the Contractor's staff and/or vehicles and construction equipment or were dirtied / damaged because they were:
 - not correctly stored, handled or transported,
 - not correctly attached to their support bases, poles or frames,
 - not correctly erected or ballasted OR
 - erected in the incorrect position and/or not maintained in their correct position which made them likely to be damaged by passing vehicles.
6. The replacement of any traffic control facilities that are stolen from the Site of the Works. (All traffic control facilities provided on the Site of the Works shall be covered by the Contractor's insurances or by the Contractor should he elect not to insure them.)

(iii) Items to be measured and paid for using items specified elsewhere in the specifications

For activities shown in Table C1.5-1 payment items specified in other Chapters or Sections of the specifications, where they relate to work under this Section, will be listed in the Pricing Schedule.

Table C1.5-1: Payment items from other Chapters or Sections

Activity	Section 1.5 reference	Section item reference
Identification, protection and relocation of existing services	A1.5.3.11	C2.1.1 & C2.1.2 of Chapter 2
Temporary deviations	A1.5.5.1	Chapters 1, 3, 4, 5, 9 & 10 - All relevant pay items as applicable
Temporary culverts	A1.5.5.2	C3.2.1 to C3.2.24 of Chapter 3 as applicable
Temporary road restraint systems	A1.5.5.3 & A1.5.6.1(a)	C11.4.1 to C11.4.15 of Chapter 11 as applicable
Temporary fencing and gates	A1.5.5.4	C11.5.1 to C11.5.10 of Chapter 11 as applicable
Temporary road signs and removal, storage, covering and re-erection of existing road signs	A1.5.5.5 & A1.5.6.1(c)	C11.6.1.8, C11.6.1.10, C11.6.1.12, C11.6.2, C11.6.3, C11.6.5, C11.6.6, C11.6.7 & C11.6.10 of Chapter 11 as applicable
Temporary road markings and road studs	A1.5.5.6	C11.7.1 to C11.7.10 of Chapter 11 as applicable

(iv) **Items specifically for this section of the Specifications**

Item	Description	Unit
C1.5.1	Accommodation of pedestrian and non-motorised traffic	
C1.5.1.1	Accommodation of pedestrian and non-motorised traffic	month
C1.5.1.2	Construction of temporary pedestrian walkways and/or cycle paths:	
(a)	Gravel surfaced pedestrian walkways / cycle paths	square metre (m ²)
(b)	Bitumen surfaced pedestrian walkways / cycle paths	square metre (m ²)
(c)	60 mm concrete block paved pedestrian walkways / cycle paths	square metre (m ²)

The unit of measurement for item C1.5.1.1 shall be the month or part thereof that the accommodation of pedestrian and/or non-motorised traffic is required on site during the approved Contract Period. No distinction will be made with respect to the type and/or number of pedestrian crossings, walkways and cycle paths required.

The contract rate for item C1.5.1.1 shall include full compensation for the costs of complying with all the general obligations of the Contractor, including keeping pedestrians and non-motorised traffic informed of the accommodation arrangements and facilities, for the costs of placing, maintaining and relocating temporary signage and all other traffic control facilities as often as required and for any other related costs that are not covered by, or included in, the other items given below.

The unit of measurement for items C1.5.1.2(a), (b) and (c) shall be the square metre of temporary pedestrian walkways and/or cycle paths constructed as specified in the Contract Documentation. The contract rate shall include full compensation for all design and supervision costs together with any other general costs associated with providing the temporary pedestrian walkways and/or cycle paths. It shall also include full compensation for the cost of constructing and later removing the walkways and/or cycle paths when they are no longer required.

All loading and hauling of material required, for the construction of walkways and cycle paths shall be included in the contract rates.

Item	Description	Unit
C1.5.2	Accommodation of vehicular traffic	month

The unit of measurement for item C1.5.2 shall be the month or part thereof that the accommodation of vehicular traffic is required on site during the approved Contract Period. No distinction will be made with respect to the type and/or number of detours, deviations or partial / half width road sections used to accommodate the traffic. The contract rate for item C1.5.2 shall include full compensation for complying with all the general obligations of the Contractor, including keeping motorists informed of the traffic accommodation arrangements and facilities, for the costs of placing, maintaining, relocating and protecting from damage all temporary and permanent signage and all other traffic control facilities as often as required for constructing the Works and for carrying out testing and inspections and for any other related costs that are not covered by, or included in, the other items given below.

Item	Description	Unit
C1.5.3	Liaison with traffic authorities	month

The unit of measurement shall be the month or part thereof that the liaison with the traffic authorities, or the Employer's traffic control centre, is required on site, regardless of the frequency of liaison that is required during each month during the approved Contract Period.

The contract rate for item C1.5.4 shall include full compensation for all the Contractor's costs incurred while complying with all the requirements specified in Clause C1.5.7.7.

Item	Description	Unit
C1.5.4	Construction of temporary deviations	

The applicable payment items required for the construction of temporary deviations shall be taken from the relevant chapters and sections in Chapters 1, 3, 5, 9 and 10 and inserted into the Pricing Schedule here. Each payment item for the construction of temporary deviations shall be preceded by the main payment item number C1.5.4 / followed by the payment number for the applicable payment item.

The unit of measurement for each item shall be as specified in the relevant payment item given in the applicable section of the pricing schedule. The contract rates for these items shall include full compensation for the construction of temporary deviations or the repair / upgrading of detours as specified in the relevant section of these Specifications.

Item	Description	Unit
C1.5.5	Maintenance of temporary deviations	
C1.5.5.1	Grass cutting	hectare (ha)
C1.5.5.2	Drain cleaning	kilometre (km)
C1.5.5.3	Cleaning out culverts	cubic metre (m ³)
C1.5.5.4	Collection of rubbish / litter	kilometre (km)
C1.5.5.5	Base patching using crushed stone material stabilised with bitumen emulsion and cement	cubic metre (m ³)
C1.5.5.6	Base and/or surface patching using cold premixed asphalt	kilogram (kg)
C1.5.5.7	Base and/or surface patching using hot plant mixed asphalt	tonne (t)

C1.5.5.8	Replacement of damaged guardrails	metre (m)
C1.5.5.9	Grading of temporary deviations and existing roads used as detours	kilometre (km)
C1.5.5.10	Watering of temporary deviations and existing roads used as detours	kilolitre (kl)
C1.5.5.11	Other road maintenance work ordered by the Engineer	provisional sum
C1.5.5.12	Handling cost, profit and all other charges in respect of item C1.5.6.11	percentage (%)

Payment will only be made under items C1.5.5.1 to C1.5.5.12 when the relevant item of maintenance work has been ordered by the Engineer in writing and the Engineer has confirmed in writing the scope, quantity and/or frequency of work that is to be carried out.

The unit of measurement for item C1.5.5.1 shall be the hectare. The contract rate shall include full compensation for cutting grass in restricted and steep access areas with hand tools in addition to mowing grass in more accessible areas.

The unit of measurement for items C1.5.5.2 shall be the kilometre of side or median drain cleaned. Each drain shall be measured separately. The contract rate shall include full compensation for the removal of all silt, mud, gravel, rocks and any other obstructions in the drain as well as for loading and hauling the removed material to spoil regardless of the haul distance.

The unit of measurement for item C1.5.5.3 shall be the cubic metre. The contract rate shall include full compensation for the removal of all silt, mud, gravel, rocks and any other obstructions from inside the culvert or from the culvert entrance and exit as well as for loading and hauling the removed material to spoil regardless of the haul distance.

The unit of measurement for item C1.5.5.4 shall be the kilometre measured along the centreline of the temporary deviation. The contract rate shall include full compensation for collecting all the rubbish / litter alongside the temporary deviation and carting it to an approved disposal site regardless of the haul distance.

The unit of measurement for items C1.5.5.5, C1.5.5.6 and C1.5.5.7 shall be the cubic metre, kilogramme and tonne respectively. The contract rates shall include full compensation for excavating the failed area of the temporary deviation to the depth indicated by the Engineer, cleaning out and squaring off the excavation, priming the compacted surface or the floor of the excavation, and the sides of the excavation as applicable, and then backfilling the excavation as specified in the Contract Documentation. The contract rates shall also include full compensation for all final site cleaning and removal to spoil of all surplus material regardless of the haul distance.

The unit of measurement for item C1.5.5.8 shall be the linear metre of guardrail replaced. The contract rate shall include full compensation for removing the damaged guardrails to spoil or storage as specified by the Engineer, reinstating or replacing any displaced or damaged guardrail posts and providing and installing a new guardrail in the correct position.

The unit of measurement for item C1.5.5.9 shall be the kilometre of gravel surfaced temporary deviation which is graded smooth with a motor grading to remove all corrugations and to redistribute the bladed gravel material evenly across the road surface. The contract rate per kilometre shall include full compensation for providing and maintaining the motor grader and grading the road surface to restore the riding quality as specified in the Contract Documentation, regardless of any variations in the width of roadway being graded.

The unit of measurement for item C1.5.5.10 shall be the kilolitre of water sprayed on the surface of temporary deviations as and when instructed by the Engineer in writing. The contract rate shall include full compensation for providing, transporting and spraying the water on the road surface.

The provisional sum allowed under item C1.5.5.11 shall provide for all other maintenance work carried out by the Contractor on the temporary deviations that may be required as specified in the Contract Documentation or as ordered by the Engineer. The provisional sum shall be paid in accordance with the provisions given in the Contract Documentation. Where applicable existing contract rates or accepted day work rates will be used.

The percentage under item C1.5.5.12 is a percentage of the amount spent under item C1.5.5.11 which shall include full compensation for all handling costs, profit and all other charges in connection with arranging and carrying out the maintenance works.

Item	Description	Unit
C1.5.6	Removal of temporary deviations	kilometre (km)

The unit of measurement for item C1.5.6 shall be the kilometre. The contract rate shall include full compensation for removing temporary deviations as specified in Clause A1.5.7.10g). The contract rate shall include for all removal, loading and hauling operations required regardless of the haul distance.

Item	Description	Unit
C1.5.7	Temporary traffic control facilities	
C1.5.7.1	Delineators including mounting bases and ballast:	
(a)	Single sided, reversible left or right (size indicated)	number (No)
(b)	Double sided, reversible left or right (size indicated)	number (No)
C1.5.7.2	Traffic cones, minimum height 750 mm	number (No)
C1.5.7.3	Flagmen	man-shift
C1.5.7.4	Traffic controllers	man-shift
C1.5.7.5	Provision of illuminated traffic signs:	
(a)	Sign mounted flashing amber lights (2 lights with the specified power supply) mounted on a backing board which is:	number (No)
(i)	900 mm wide x 150 mm high	number (No)
(ii)	1 200 mm wide x 200 mm high	number (No)
(b)	Flashing LED illuminated arrow board	number (No)

(c)	Illuminated road sign – R & TR series (diameter indicated)	number (No)
(d)	Illuminated road sign – TW series (length of sides indicated)	number (No)
(e)	Mobile variable message sign	number (No)
(f)	Mobile variable message sign with a speed measuring and display capability	month
C1.5.7.6	Maintenance of illuminated traffic signs:	
(a)	Sign mounted flashing amber lights (a pair of two lights mounted on a separate backing board)	month
(b)	Flashing LED illuminated arrow board	month
(c)	Illuminated road sign – R & TR series (diameter indicated)	month
(d)	Illuminated road sign – TW series (length of sides indicated)	month
(e)	Mobile variable message sign	month
(f)	Mobile variable message sign with a speed measuring and display capability	month
C1.5.7.7	Traffic calming devices:	
(a)	25 mm high x 100 mm wide asphalt rumble strips	metre (m)
(b)	50 mm high x 500 m wide asphalt rumble strips	metre (m)
(c)	150 mm high x 3 m wide asphalt speed control humps	metre (m)
C1.5.7.8	Traffic control stations	month
C1.5.7.9	Cleaning of traffic control facilities	month

The unit of measurement for items C1.5.7.1(a), C1.5.7.1(b) and C1.5.7.2 shall be the number of delineators or traffic cones used on site. The contract rates shall include full compensation for the provision, placing and relocation of delineators and traffic cones as often as required. Payment for these items shall only be made once when they are first provided on site regardless of how many times they are repositioned and reused during the construction of the Works.

The unit of measurement for items C1.5.7.3 and C1.5.7.4 shall be the number of flagmen and traffic controllers respectively employed for a working shift in accordance with the requirements specified in Clause A1.5.7.11(e). The contract rate shall include full compensation for the provision of trained flagmen and traffic controllers and for all wages, Employer contributions, accommodation, transport and other staff related costs incurred by the Contractor, including their recruitment and training costs.

The contract rate shall also include full compensation for providing all flagmen and traffic controllers with conspicuous orange or bright yellow clothing and safety boots, safety jackets utilizing retro-reflective and/or fluorescent panels in red, yellow and/or white as well as a red warning flag or an amber LED strobe wand during hours of darkness as specified in Clauses A1.5.6.2e) and f).

The unit of measurement for items C1.5.7.5(a) to C1.5.7.5(f) shall be the number of illuminated traffic signs that are supplied and delivered to site as specified in the Contract Documentation and/or as specified by the Engineer. The contract rates shall include full compensation for the provision of the illuminated traffic signs, including poles and brackets, portable mounting frames and ballast and portable trailers where applicable, and for removing them from site when they are no longer required.

The unit of measurement for items C1.5.7.6(a) to C1.5.7.6(f) shall be the month or part thereof during the approved Contract Period that these traffic safety devices are erected / positioned on site as specified. The contract rates shall include full compensation for maintaining the warning signs, providing a suitable electricity power supply and relocating the warning signs as often as required during the construction period and for removing them from site when they are no longer required.

The unit of measurement for items C1.5.7.7(a), C1.5.7.7(b) and C1.5.7.7(c) shall be the metre of rumble strip or speed control hump installed on the road. The contract rates shall include full compensation for the provision and construction of the traffic calming devices.

The unit of measurement for item C1.5.7.8 shall be the month or part thereof during the approved Contract Period that each traffic control station is in operation on the site of the Works. The contract rate shall include full compensation for the provision and construction/erection of the traffic control shelter complete as specified in clause A1.5.6.1f) including the provision of the specified traffic signals, communication devices, flood lighting and the cost of supplying electricity. The contract rates shall also include full compensation for moving the traffic control points to new locations as often as required and for removing them from site when they are no longer required.

The unit of measurement for item C1.5.7.9. shall be the month or part thereof during the approved Contract Period that the traffic signs and delineators on the Site of the Works are kept clean. The contract rate shall include full compensation for the cleaning of all the delineators and signs on site at least once a week and more often if required as specified in Clause A1.5.7.11d).

Item	Description	Unit
C1.5.8	Traffic safety officer	Man-month

The unit of measurement for item C1.5.8 shall be the months or part thereof during the approved Contract Period that each traffic safety officer is deployed on the site of the Works. The contract rate shall include full compensation for the provision of a trained and experienced traffic safety officer and for all wages, Employer contributions, accommodation, transport and other staff related costs incurred by the Contractor, including their recruitment and training costs.

The contract rate shall also include full compensation for the provision of a safety jacket utilizing retro-reflective and/or fluorescent panels in red, yellow and/or white, a cell-phone and anything else the traffic safety officer requires to fulfil his duties and obligations as specified in Clause A1.5.7.12.

The contract rate shall also include full compensation for the provision, operation and maintenance of a vehicle provided for the sole use of the

traffic safety officer as specified in Clause A1.5.6.4, including the provision of an amber flashing roof light or light bar and a "TRAFFIC CONTROL" warning sign.

Item	Description	Unit
C1.5.9	Traffic safety vehicle	month

The unit of measurement for item C1.5.9 shall be the month or part thereof during the approved Contract Period that the traffic safety vehicle is deployed on the site of the Works.

The contract rate shall include full compensation for the provision, operation and maintenance of a traffic safety vehicle, including the driver and any assistants required, as specified in Clause A1.5.6.3, including the provision of an amber flashing roof light or light bar, a "TRAFFIC CONTROL" warning sign, a high visibility reflective rear chevron panel and an approved proprietary rear mounted impact attenuator device.

Item	Description	Unit
C1.5.10	Tow trucks	

C1.5.10.1	Provision of a tow truck on call for light vehicles weighing less than two tonnes	month
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C1.5.10.2	Provision of a tow truck on call for heavy vehicles weighing two tonnes or more	month
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The unit of measurement for items C1.5.10.1 and C1.5.10.2 shall be the month or part thereof during the approved Contract Period that the tow trucks are ordered by the Engineer to be on call for use on the site of the Works whenever they are required.

The contract rate shall include full compensation for the provision when required, the operation and the maintenance of the tow trucks.

Payment for towing vehicles off the road and/or on to a storage or repair facility will not be made as this cost is to be recouped from the owner of the towed vehicle by the Contractor or the tow truck operator.

Item	Description	Unit
C1.5.11	Provision of safety equipment for visitors	
C1.5.11.1	Provision of reflective safety vests for visitors	number (No.)
C1.5.11.2	Provision of hard hats for visitors	number (No.)

The unit of measurement for items C1.5.11.1 and C1.5.11.2 shall be the number of each item provided as specified, and approved by the Engineer. The contract rates for the various safety items shall include full compensation for provision thereof and maintenance in good working order.

Item	Description	Unit
C1.5.12	Additional traffic accommodation facilities ordered by the Engineer:	
C1.5.12.1	Provision of additional traffic accommodation facilities	prov sum
C1.5.12.2	Handling cost, profit and all other charges in respect of item C1.5.12.1	percentage (%)

The provisional sum allowed under item C1.5.12.1 shall cover for the provision, erection and later removal of all additional traffic accommodation items that may be ordered by the Engineer. The provisional sum shall be paid in accordance with the provisions of the Contract Documentation.

The percentage under item C1.5.12.2 is a percentage of the amount spent under item C1.5.12.1 which shall include full compensation for all handling costs, profit and all other charges for the provision, erection and later removal of the additional traffic accommodation facilities.

D1.5 ACCOMMODATION OF TRAFFIC

PART D: GUARANTEES AND COMPLIANCE CERTIFICATES

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- D1.5.3 PERFORMANCE GUARANTEE REQUIREMENTS**
- D1.5.4 FUNCTIONAL PERFORMANCE ASSESSMENTS**
- D1.5.5 VISUALLY ASSESSED PROPERTIES**
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- D1.5.9 NOTIFICATION OF REMEDIAL WORK**
- D1.5.10 REMEDIAL WORKS**

D1.5.1 SCOPE

The product quality and safety compliance certificates mentioned in Clauses A1.5.5 and A1.5.6 shall be provided if requested by the Employer or the Engineer.

Clauses D1.5.2 to D1.5.10 are not applicable to this Section.

1.6 CLEARING AND GRUBBING

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PART B: LABOUR ENHANCEMENT

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A1.6 CLEARING AND GRUBBING

PART A: SPECIFICATIONS

A1.6.1 SCOPE

This Section covers the clearing of the site and the grubbing necessary for construction of the Works. This includes the following:

- Clearing and grubbing in watercourses and for hydraulic structures.
- Removal of rubbish, unsuitable or waste material, weeds and other vegetation in urban road/street reserve areas.
- Clearing and grubbing of service trench and designated excavation areas.
- Clearing and grubbing of borrow pits and quarries.
- Clearing and grubbing of the road prism.
- Clearing outside the road prism to improve sight distances.
- Clearing and grubbing of fence lines and other ancillary work areas.
- Preparation of topsoil stockpile areas.
- Stockpiling of topsoil and windrowing of topsoil.

The clearing and grubbing of areas required for site offices, laboratories and the Engineer's site accommodation shall be included in the work required to erect these facilities.

A1.6.2 DEFINITIONS

Clearing - is the removal, loading and disposal of all trees (including designated and protected trees if approved for removal), grass, brush, shrubs, other vegetation, rubbish/litter, rocks and boulders of up to 0,15 m³ in size which are exposed or lying on the surface and all other unsuitable or waste material on or above ground level.

Clearing shall also include the removal of existing buildings, walls and other structures which encroach on or obstruct the Works and which can be broken down and removed with a medium sized bulldozer. (Breaking down of reinforced concrete shall be specified separately in the Contract Documentation if required.)

Removal of temporary works installed by the Contractor shall not be measured or paid for as clearing.

The removal, loading, transport, offloading and stacking (or disposal if specified in the Contract Documentation or by the Engineer) of existing fences, road signs, guardrails, kerbing, channelling etc. shall be carried out as specified in the relevant sections of this Standard Specification.

Designated trees - are indigenous trees or heritage trees that may not be removed without the approval of the relevant local authority.

Designated spoil areas - are spoil or dump sites identified by the Employer in the Contract Documentation or identified by the Engineer on site and those identified by the Contractor in the Contractor's materials management and utilisation plan, as prepared in accordance with the environmental regulations and the environmental management plan.

There are two types of designated spoil areas:

- Unsuitable material spoil areas identified on or near the site of the Works and which have been agreed to by the Engineer. In urban or peri-urban areas the use of the spoil areas shall be approved by the local municipal authority in writing before any general unsuitable material is deposited there.
- Hazardous waste spoil areas which shall be commercial or municipal waste sites that are registered to receive and dispose of hazardous waste material.

Grubbing - is the removal and loading of all stumps and roots in areas where clearing has been carried out and the Engineer has confirmed in writing that grubbing is also required. Grubbing also includes the removal and loading of all non-reinforced building foundations and floor slabs, buried rubbish and other unsuitable or waste material.

Hazardous waste material - material that is cleared and grubbed shall be classified as hazardous waste material if it falls into the hazardous waste categories identified in SANS 10228.

Protected trees - are trees as listed in the Schedule of Protected Trees given in the Government Gazette dated 8th September 2017 (or any later amendments) issued in terms of Clause 15.3 in Chapter 3, Part 3 of the National Forests Act No. 84 of 1988. In terms of this Act protected trees may not be pruned or removed without the permission of the Minister of Agriculture, Fisheries and Forestry.

Stockpile - is a pile of material pushed into a large heaped pile or off-loaded onto a heaped pile so that the material can be temporarily stored for later re-use in the Works. Where specified the material to be placed in a stockpile shall be placed in evenly spread layers of a specified layer thickness, up to the specified maximum height and to the specified shape.

Stockpile site - is a designated site that shall be prepared as specified in Chapter 4, Clause A4.1.7.3a).

Topsoil - is fertile, loamy soil obtained from areas with good soil coverage of natural vegetation, preferably grasses. It shall be free of deleterious matter, such as stiff/heavy clays, large stones, large roots, refuse, rubble and construction material or waste, which will adversely affect its suitability for the planting of grass.

Windrow - is a pile of material which has been excavated and pushed a relatively short distance to a prepared area alongside the borrow pit, quarry, cutting or roadbed area so that the material can be temporarily stored for re-use, usually close to where it is windrowed.

A1.6.3 GENERAL

Not required for Section A1.6.

A1.6.4 DESIGN BY CONTRACTOR / PERFORMANCE BASED SYSTEMS

Not required for Section A1.6.

A1.6.5 MATERIALS

Not required for Section A1.6.

A1.6.6 CONSTRUCTION EQUIPMENT

The provisions of Clause A1.2.6 of Section A1.2 shall apply to this Section A1.6.

A1.6.7 EXECUTION OF THE WORKS

A1.6.7.1 Areas to be cleared and grubbed

The portions of the road or street reserve falling within the limits of the road prism or site limits as well as borrow areas shall be cleared and grubbed as specified in the Contract Documentation or as specified by the Engineer. Areas designated to be cleared and grubbed may also include existing water courses, inlets and outlets of hydraulic structures, sidewalks, service trenches, designated excavations as defined in Clause A4.2.2 of Chapter 4, fence lines and other ancillary road works which may fall outside the limits of the road prism. The Contractor shall note that the presence of subsurface and / or surface water may prohibit the use of conventional machines for this work and the contract rates should make allowance for alternative working methods and equipment where required.

Grubbing of part or all of the previously cleared areas may not always be necessary. Before commencing the grubbing operation, the Contractor shall ask for a written instruction from the Engineer to confirm the position and extent of the cleared area/s that also need to be grubbed. Only these area/s so confirmed in writing shall be grubbed and measured for payment.

Clearing, and grubbing where necessary, of new fence lines shall be done over a 2,0 m wide strip, 1,0 m either side of the staked fence line, as described in Clause A11.5.7.3 of Chapter 11.

Clearing, and grubbing for new service trenches shall be carried out as specified in Clause A2.1.7.1e) of Chapter 2.

Where existing roads are to be widened the area to be cleared and grubbed shall also include the slope of the existing embankment where the widening will take place.

Existing road lanes, whether surfaced or not, as well as existing sidewalks shall not be regarded as areas to be cleared and grubbed.

The Contractor shall identify all designated and protected trees, as defined in Clause A1.6.2, in consultation with the relevant authority. The Contractor shall submit the details to the Engineer so that the Engineer can confirm in writing all the trees which must be left standing and uninjured. Where the relevant permission has not been obtained to remove any designated and/or protected trees these trees shall be marked for protection with plastic danger tape or other suitable means.

As stated in the Government Gazette dated 8th September 2017 (or in any later amendments that may be published) issued in terms of Clause 15.3 in Chapter 3, Part 3 of the National Forests Act No. 84 of 1988, the Contractor will be liable for a fine or a period of imprisonment of up to three years for every protected tree which is unnecessarily removed or damaged.

All trees that are to be removed and that are equal to or greater than 1,0 m in girth shall be marked and counted. The tree count shall be agreed with the Engineer for additional payment over the tendered clearing rate before the trees are cut down. All trees with a girth of less than 1,0 m shall not be counted and shall be removed as part of the main clearing operation. The tree girth shall be measured at a height of 1,5 m above the highest point where the tree trunk emerges from the ground. Where the tree is divided into two or more trunks, or has several trunks

growing from one stump or root base, the total girth for payment purposes shall be the sum of the individual girths of each trunk measured at a height of 1,5 m above the highest point where each of the tree trunks emerge from the ground.

The Contractor shall be responsible for keeping the cleared and grubbed areas free of weeds and alien vegetation until the Works have been completed and have been taken over by the Employer.

A1.6.7.2 Clearing

Clearing, as defined in Clause A1.6.2, shall be done with equipment which suits the type of material and terrain to be cleared and in a manner which will result in minimal loss of topsoil. The cleared material shall be separated into re-usable material, unsuitable material and hazardous waste and it shall be loaded and removed from the site immediately and transported to a designated stacking area, a designated spoil area or an approved hazardous waste site as appropriate.

All undesignated trees, together with those protected trees or designated (indigenous or heritage) trees where the required permission to remove them has been obtained, shall be cut down unless instructions have been given to retain any particular trees in the Contract Documentation or by the Engineer.

The Contractor shall take the necessary precautions to prevent damage to structures and other private or public property. If necessary, the trees shall be cut in sections from the top downwards.

The branches of any trees outside the roadbed area that are designated to be left standing shall be trimmed to provide a 7,0 m clearance above the finished road level. The trimming of branches shall be done neatly by saw cutting as near as possible to the base of the branches.

Where clearing and grubbing would involve the cutting down of indigenous forest or commercial plantations the Contractor shall inform the relevant authority or owner at least two months in advance before commencing with clearing and grubbing of such areas to allow them time to salvage any usable timber before the trees are removed.

Where specified by the Engineer or in the Contract Documentation, clearing of hydraulic structures, where such work requires working to prescribed levels or working without damaging existing structures, shall be carried out as specified in Chapter 3.

The removal, breaking up and disposal of existing kerbing, channelling, down-chutes etc. shall be carried out as specified in Chapter 3.

All re-usable fencing wire shall be neatly wound into reels and all such wire, together with all fence posts and other usable material shall be removed as specified in Clause A11.5.7.9 of Chapter 11 and neatly stacked at sites indicated by the Engineer.

All re-usable road furniture such as road signs, guardrails, down-chutes etc. shall also be removed as specified in Clauses A11.4.7.3 and A11.6.7.7 of Chapter 11 and neatly stacked at sites indicated by the Engineer.

All existing buildings and structures which encroach on or obstruct the Works shall be removed. All buildings and structures that must be removed will be identified in the Contract Documentation and shall be confirmed with the Engineer in writing before the Contractor demolishes and/or removes any structures or buildings.

A1.6.7.3 Conservation of vegetation

Prior to any clearing, any shrubs and trees encountered in the road reserve and borrow areas that have been designated for preservation in the Contract Documentation, or in the environmental approval process, shall be carefully removed, correctly stored and maintained in a temporary nursery until they are replanted within the road reserve as specified in Clause A11.8.7.5 of Chapter 11 or as specified by the Engineer.

A1.6.7.4 Grubbing

All stumps and roots, including matted roots, in the roadbed area shall be removed to a depth of at least 1,0 m below the cleared roadbed surface.

Outside the roadbed area only stumps and roots, including matted roots, exceeding 75 mm in diameter shall be removed to a depth of at least 75 mm below the original ground level. The grubbed material shall be loaded and removed from the site immediately and disposed of at a designated spoil area.

The foundations of any buildings or structures, buried rubbish, old rubbish tips, rubble or other unsuitable material shall be removed unless otherwise instructed by the Engineer. The building material and unsuitable or waste material shall be loaded and removed from the site immediately and disposed of at a designated spoil area.

Except in borrow areas, all cavities resulting from the grubbing shall be backfilled with approved material and compacted to a density of at least the density of the surrounding ground.

A1.6.7.5 Clearing and grubbing in water courses and hydraulic structures

Clearing out existing culverts and bridges shall be carried out by hand to avoid damaging the structure apron slabs or headwalls. All sand and silt cleaned out from the hydraulic structures may be disposed of by spreading it out inside the road reserve in suitable areas where the spoil material does not block up the outlet drain. The spoil material shall not be deposited upstream of the structure where it can be washed back into the structure by storm water run-off.

All unsuitable material cleaned out of the hydraulic structures shall be loaded and removed from the site immediately and taken to a designated spoil area. It shall not be left buried in the spoil material near the structure.

While working in or near a water course the Contractor shall take care not to unduly disturb the vegetation which is preventing erosion or to contaminate the water course with any hazardous material such as oil or fuel from his vehicles and equipment. The Contractor shall also ensure that none of his clearing and grubbing operations block any waterways, thereby causing the water to dam up.

After the clearing of the hydraulic structures has been completed the Contractor shall be responsible for maintaining them in a clean condition for the duration of the contract as part of the routine maintenance operations.

A1.6.7.6 Conservation of topsoil

Where suitable topsoil occurs within the limits of the areas to be cleared and grubbed, the Contractor shall do the clearing and grubbing without removing any more topsoil than is absolutely necessary.

At the commencement of the Works the Contractor shall confirm with the Engineer the quantity of topsoil that is required and from where the topsoil shall be selected and removed by the Contractor. All suitable topsoil available from the roadbed areas and cuttings on site, as well as

from areas that are to be cleared for borrow pits and quarries, shall then be removed as specified in the Contract Documentation and/or by the Engineer. If the Contractor fails to conserve all the available topsoil he shall obtain suitable substitute topsoil from other sources at his own cost.

The depth of topsoil excavation or removal shall be controlled to suit the thickness of suitable material available and shall not exceed a maximum depth of 400 mm.

The topsoil shall either be bladed to windrow or excavated, loaded, hauled, off-loaded and stockpiled in loose heaps as off-loaded from the haul vehicles or in neatly shaped stockpiles that do not exceed 2,0 m in height. Care must be taken to ensure that no topsoil is compacted by vehicles driving over the windrows or stockpiles of topsoil.

Any deleterious material, such as stiff/heavy clays, large stones, large roots, refuse, rubble and construction material or waste, which will adversely affect its suitability for the planting of grass shall be removed before the topsoil is excavated.

Before removing any topsoil to stockpile, designated topsoil stockpile sites shall be prepared as specified in Clause A4.1.7.3a) of Chapter 4. The topsoil stockpile sites shall either be situated immediately alongside the borrow pits and quarries or situated as close as possible to the cuttings and roadbed preparation areas, unless otherwise specified by the Engineer.

Topsoil infested with weeds shall be stockpiled or windrowed separately so that the weeds can be removed. All the topsoil stockpiles and windrows, as well as the area immediately surrounding the stockpiles and windrows, shall be kept free of weeds and shall not be contaminated with any spoil material or construction material, especially gravel, crushed stone and bitumen.

When no longer required the topsoil stockpile sites shall then be reinstated as specified in Clause A4.1.7.3c) of Chapter 4.

Where the existing in-situ topsoil is intended to be re-used nearby, such as for reinstating borrow pits and quarries for example, the Engineer may specify that the topsoil should be pushed directly into windrows alongside the area from which it is excavated.

A1.6.7.7 Disposal of material

Material obtained from clearing and grubbing shall be separated into organic material, reusable material, unsuitable material and hazardous waste material and immediately disposed of as follows:

- Organic matter shall be disposed of in designated spoil areas or in borrow pit excavations prior to their rehabilitation, as instructed by the Engineer. The organic matter shall be spread evenly over the designated dumping area and covered up with soil to a depth of at least 150 mm, unless otherwise instructed by the Engineer. The burning of organic matter will not normally be permitted and may be done only with the prior written approval of the Engineer and the local fire control authority and strictly in accordance with the environmental management plan. All statutory provisions regarding air pollution shall be carefully observed. If specified in the Contract Documentation, selected organic matter obtained from clearing and grubbing shall be mulched.
- Reusable material shall be transported to a designated storage site and neatly stacked.
- Non-hazardous unsuitable material such as building rubble etc. shall be disposed of in designated spoil areas or placed in temporary stockpiles for use elsewhere in the Works, as instructed by the Engineer.
- Hazardous waste shall be disposed of in commercial or municipal waste sites that are registered to receive and dispose of hazardous waste material.

A1.6.7.8 Re-clearing vegetation

The Contractor shall carry out the clearing and grubbing at the last practicable stage before each part of the construction work commences. All re-clearing that is required because the initial clearing was carried out too soon shall not be measured for payment.

When portions of the road reserve, borrow or other areas have been cleared in accordance with the specifications but vegetation grows again during the construction period, the Engineer may, if he considers it necessary, order that the area be re-cleared.

A1.6.8 WORKMANSHIP

Reserved for future use.

B1.6 CLEARING AND GRUBBING

PART B: LABOUR ENHANCEMENT

CONTENTS

B1.6.1 SCOPE

B1.6.2 DEFINITIONS

B1.6.3 GENERAL

B1.6.4 DESIGN BY CONTRACTOR / PERFORMANCE BASED SYSTEMS

B1.6.5 MATERIALS

B1.6.6 CONSTRUCTION EQUIPMENT

B1.6.7 EXECUTION OF THE WORKS

B1.6.8 WORKMANSHIP

B1.6.1 SCOPE

Where specified in the Contract Documentation labour enhancement methods shall be used to carry out the applicable clearing and grubbing operations or parts of these operations.

B1.6.2 DEFINITIONS

Definitions as provided in Clause A1.6.2 shall also apply.

B1.6.3 GENERAL

Any activity specified in PART A, where hand work is given as an alternative, shall be executed in such a way as to maximise labour.

B1.6.4 DESIGN BY CONTRACTOR/PERFORMANCE BASED SYSTEMS

Not required for Section A1.6.

B1.6.5 MATERIALS

Not required for Section A1.6.

B1.6.6 CONSTRUCTION EQUIPMENT

Where reference is made in PART A to appropriate equipment, the use of light equipment shall be evaluated during trial sections.

The specifications in Part A shall be equally applicable.

B1.6.7 EXECUTION OF THE WORKS

Operations such as the clearing of hydraulic structures, cutting down of trees and removal of fencing, road signs, guardrails etc. are all classed as labour enhancement operations.

B1.6.8 WORKMANSHIP

Not required for Section A1.6.

C1.6 CLEARING AND GRUBBING

PART C: MEASUREMENT AND PAYMENT

(i) Preamble

The tendered rate for each item shall include full compensation for providing, operating, maintaining and decommissioning upon completion, of all the construction equipment, labour, tools, incidentals and supervision to carry out the activity or construct the works in the item, unless otherwise stated.

Any prime cost or provisional sums shall be paid in accordance with the provisions of the conditions of contract. The charge or mark-up tendered or allowed for is a percentage of the amount actually paid under the prime cost or provisional sum. This percentage shall cover all the Contractor's handling, supervision, profit and liability costs to provide the services in the prime cost or provisional sum item.

(ii) Items that will not be measured separately

The following required activities will not be measured or paid for separately and the Contractor shall include the cost thereof in other items as deemed appropriate:

1. Loading and offloading of cleared material and grubbed material.
2. Keeping the cleared and grubbed areas free of weeds and alien vegetation until the Works have been completed and have been taken over by the Employer, as specified in Clause A1.6.7.1.
3. Removing deleterious or unsuitable material that was not properly removed during the clearing and grubbing operation from areas where topsoil is to be stockpiled or windrowed, as specified in Clause A1.6.7.6.
4. Keeping topsoil stockpiles and windrows free of weeds, as specified in Clause A1.6.7.6.
5. Re-clearing areas that were cleared and grubbed too far in advance of the Works, as specified in clause A1.6.7.8.

(iii) Items to be measured and paid for using items specified elsewhere in the specifications

For activities shown in Table C1.6-1 payment items specified in other chapters or sections of the specifications, where they relate to work under this section, will be listed in the Pricing Schedule.

Table C1.6-1: Payment items from other Chapters or Sections

Activity	Section 1.6 reference	Section item reference
Clearing and grubbing for site offices, laboratories and site accommodation	A1.6.1	Included in item C1.4.1 of Chapter 1
Hauling of cleared and grubbed material to designated spoil areas	A1.6.7.2, A1.6.7.4, A1.6.7.5	C1.7.2 of Chapter 1
Clearing and shaping accumulated sediment in existing unlined open drains	A1.6.7.2	C3.1.2 of Chapter 3
Excavating and clearing accumulated sediment in existing lined drains and drainage systems	A1.6.7.2	C3.1.3 of Chapter 3
Removal, breaking up, loading, transporting and disposal of concrete kerbing, channelling, down-chutes etc.	A1.6.7.2	C3.3.16 of Chapter 3
Removal, loading, transporting, offloading and stacking of guardrails	A1.6.7.2	C11.4.7 of Chapter 11
Moving or removal and loading, transporting, offloading and stacking of fencing and gates	A1.6.7.2	C11.5.3 & C11.5.4 of Chapter 11
Removal, loading, transporting, offloading and storage of road signs	A1.6.7.2	C11.6.6, C11.6.7 & C11.6.10 of Chapter 11
Replanting of shrubs and trees from a site nursery	A1.6.7.3	C11.8.9.2 of Chapter 11
Preparation of topsoil stockpile sites	A1.6.7.6	C4.1.10 & C4.1.11 of Chapter 11
Reinstatement of topsoil stockpile sites	A1.6.7.6	C4.1.13, C4.1.14 and C4.1.15.1(c) / C4.1.15.2(c) of Chapter 4 as applicable
Hauling topsoil to stockpile	A1.6.7.6	C1.7.2.1(a) of Chapter 1

(iv) **Items specifically for this Section of the Specifications**

Item	Description	Unit
C1.6.1	Clearing	
C1.6.1.1	Clearing with machines and some hand labour where necessary	hectare (ha)
C1.6.1.2	Clearing with hand labour only when labour enhanced work is specified	hectare (ha)
C1.6.1.3	Clearing for new fence lines (over a width of 2,0 m)	kilometre (km)
C1.6.1.4	Clearing for service trenches (over the agreed width required)	square metre (m ²)

The unit of measurement for items C1.6.1.1 and C1.6.1.2 is the hectare. The quantity shall be taken as the area (to the nearest 0,01 ha) designated by the Engineer and cleared in accordance with this Standard Specification.

The unit of measurement for item C1.6.1.3 is the kilometre of 2,0 m wide cleared fence line strip.

The unit of measurement for item C1.6.1.4 is the square metre of cleared area along the service trench. The area to be measured shall be calculated by multiplying the length cleared by the agreed width required to excavate the trench, temporarily stockpile the excavated material alongside and place the service materials alongside the trench prior to installation.

The contract rate shall include full compensation for all work necessary for the clearing of the surface, the removal of rocks and boulders up to 0,15 m³ each in size, the removal of grass, bushes, shrubs, any other vegetation, all trees with a girth of less than 1,0 m, cutting of branches, demolishing of structures or parts of structures (except those structures specifically listed in the Contract Documentation and measured separately under item C1.6.4.) and the loading of the cleared material.

Hauling of the cleared material to a designated spoil area will be measured from the point of loading to the centroid of the designated spoil area following the shortest practical route. Payment for haulage will be made under item C1.7.2.

No additional payment will be made for the removal of a certain amount of sand, soil or gravel material which may be inherent in, or unavoidable, during the process of clearing, regardless of the quantity removed.

Where topsoil can be removed without the necessity of first doing clearing, no payment will be made for clearing.

Item	Description	Unit
C1.6.2	Grubbing	
C1.6.2.1	Grubbing with machines and some hand labour where necessary	hectare (ha)
C1.6.2.2	Grubbing with hand labour when labour enhancement work is specified or it is not practical to use a machine	hectare (ha)
C1.6.2.3	Grubbing by hand for new fence lines (over a width of 2,0 m)	kilometre (km)
C1.6.2.4	Grubbing by hand for service trenches (over the agreed width required)	square metre (m ²)

The unit of measurement for items C1.6.2.1 and C1.6.2.2 is the hectare. The quantity shall be taken as the area measured in hectares (to the nearest 0,01 ha) as designated by the Engineer in writing and grubbed in accordance with these specifications.

The unit of measurement for item C1.6.2.3 is the kilometre of 2,0 m wide cleared fence line strip.

The unit of measurement for item C1.6.2.4 is the square metre of cleared area along the service trench. The area to be measured shall be calculated by multiplying the length cleared by the agreed width required to excavate the trench, temporarily stockpile the excavated material alongside and place the service materials alongside the trench prior to installation.

The contract rate shall include full compensation for all work necessary for the grubbing the area, removing all tree roots larger than 75 mm in diameter and all tree stumps, backfilling of cavities, demolishing and disposal of foundations of buildings and structures, the removal of rubbish, rubble or other unsuitable or waste material and the loading and offloading of the grubbed material. Hauling of the grubbed material to a designated spoil area will be measured from the centroid of the loading area to the centroid of the designated spoil area following the shortest practical route. Payment for haulage will be made under item C1.7.2.

No additional payment will be made for the moving of a certain amount of soil or gravel material which may be inherent in, or unavoidable, during the process of grubbing, regardless of the quantity removed.

Only the areas confirmed in writing by the Engineer to be grubbed shall be measured for payment.

Item	Description	Unit
C1.6.3	Removal and grubbing of large trees and tree stumps:	
C1.6.3.1	Girth equal to or exceeding 1,0 m up to and including 2,0 m	number (No)
C1.6.3.2	Girth exceeding 2,0 m up to and including 3,0 m	number (No)
C1.6.3.3	Girth exceeding 3,0 m	number (No)
C1.6.3.4	Removal of trees in forests and plantations	hectare (ha)

The unit of measurement for items C1.6.3.1 to C1.6.3.3 shall be the number of trees of each size removed. The girth of trees and stumps shall be measured as specified in Clause A1.6.7.1. Trees and stumps with a girth exceeding 1,0 m shall be measured individually and classified in size increments exceeding 1,0 m up to 2,0 m, exceeding 2,0 m up to 3,0 m and exceeding 3,0 m, as indicated in the items above. (Trees with a girth of less than and up to 1,0 m shall not be paid for individually and the cost of removing all small trees and bushes with a girth of less than and up to 1,0 m shall be included in the contract rates for item C1.6.1 and item C1.6.2.)

The contract rates shall include full compensation for all work necessary for the removal and grubbing of trees and stumps of all sizes, including removal of the roots, the backfilling and compaction of the cavities left after the stump and roots have been removed with approved material,

and the loading and offloading of the cut timber and grubbed root material. Hauling of the grubbed material to a designated spoil area will be measured from the centroid of loading area to the centroid of the designated spoil area following the shortest practical route. Payment for haulage will be made under item C1.7.2.

Where construction is carried out through forests or plantations, or where the number of trees with a girth exceeding 1,0 m renders individual measurement impracticable, the removal and grubbing of trees in such areas shall be measured under item C1.6.3.4. The quantity shall be taken as the area measured in hectares (to the nearest 0,01 ha) as designated by the Engineer in writing. If this method of measurement is used, the areas where it applies will be shown on the drawings, stated in the Contract Documentation and/or indicated to contractors during the site inspection. The contract rate per hectare shall include full compensation for all work as described for the removal of individual trees above.

Item	Description	Unit
C1.6.4	Removal of buildings and structures	
C1.6.4.1	(Identify type and location of each building or structure with a separate sub-item)	lump sum

The unit of measurement for each building or structure that is removed shall be the lump sum. The lump sum shall include full compensation for all work necessary for demolishing and removing the buildings or structures, including removal of the foundations and the loading and offloading of all the material. Hauling of the removed building or structural material to a designated spoil area will be measured from the point of loading to the centroid of the designated spoil area following the shortest practical route. Payment for haulage will be made under item C1.7.2.

Item	Description	Unit
C1.6.5	Spreading organic matter and covering with soil	cubic metre (m³)

The unit of measurement for item C1.6.5 shall be the cubic metre of organic matter, measured as 50% of the measured load volume of the haul vehicle being used, spread out at the designated spoil site or in the borrow pit, as instructed by the Engineer, and covered with enough soft material to fill the voids and provide a covering layer at least 150 mm thick over all the spread material.

Item	Description	Unit
C1.6.6	Mulching selected organic matter	cubic metre (m³)

The unit of measurement for item C1.6.5 shall be the cubic metre of organic matter that is selected from the cleared and grubbed material, cut and shredded to make a mulch and stockpiled or spread out at the designated area, as instructed by the Engineer.

The volume shall be measured loose in stockpile or calculated from an agreed estimate of the area covered by the mulch multiplied by the agreed average spread depth.

Item	Description	Unit
C1.6.7	Re-clearing of previously cleared areas	hectare (ha)

The unit of measurement for item C1.6.7 shall be the hectare. The quantity shall be taken as the area in hectares (to the nearest 0,01 ha) agreed to by the Engineer for re-clearing in accordance with these specifications.

The contract rate shall include full compensation for all work necessary for the clearing of the surface, grubbing if necessary, backfilling of holes and for loading the material, all as described in this section. Hauling of the re-cleared material to a designated spoil area will be measured from the point of loading to the centroid of the designated spoil area following the shortest practical route. Payment for haulage will be made under item C1.7.2.

(Re-clearing required because the Contractor cleared and grubbed an area too soon, as well as keeping cleared areas free from weeds and alien vegetation, is the Contractor's responsibility and will not be measured and paid for under this item.)

Item	Description	Unit
C1.6.8	Conservation of vegetation:	
C1.6.8.1	Establishment of a temporary nursery	number (No)
C1.6.8.2	Removal, storage and maintenance of shrubs	number (No)
C1.6.8.3	Removal, storage and maintenance of trees, girth up to and including 1,0 m	number (No)
C1.6.8.4	Removal, storage and maintenance of trees, girth exceeding 1,0 m up to and including 2,0 m	number (No)
C1.6.8.5	Removal, storage and maintenance of trees, girth exceeding 2,0 m up to and including 3,0 m	number (No)
C1.6.8.6	Removal, storage and maintenance of trees, girth exceeding 3,0 m	number (No)

The unit of measurement for item C1.6.8.1 shall be the number of temporary nurseries established on site as agreed with the Engineer. The contract rate shall include full compensation for clearing and levelling the nursery site, installing fencing, shade netting and wind breaks, for providing plant containers where necessary and for installing a water supply system.

The unit of measurement for items C1.6.8.2 to C1.6.8.6 shall be the number of shrubs or trees of each size removed from site and replanted/stored and maintained in a temporary nursery. The contract rate shall include full compensation for all work necessary for carefully removing the shrubs and trees with their root systems intact and for correctly replanting, storing, watering and maintaining them in a temporary nursery until they are removed for replanting.

Item	Description	Unit
C1.6.9	Conservation of topsoil:	
C1.6.9.1	Stockpiling topsoil	cubic metre (m ³)
C1.6.9.2	Windrowing topsoil	cubic metre (m ³)

The unit of measurement for item C1.6.9.1 shall be the cubic metre of topsoil stockpiled. The contract rate shall include full compensation for excavating, loading, off-loading and stockpiling the topsoil at the designated stockpile site. Hauling of the topsoil to a designated stockpile site will be measured from the centroid of the loading area to the centroid of the designated stockpile site following the shortest practical route. Payment for haulage will be made under item C1.7.2.

The unit of measurement for item C1.6.9.2 shall be the cubic metre of topsoil excavated and placed into windrows. The contract rate shall include full compensation for excavating and moving the material into windrows in the designated storage area.

Item	Description	Unit
C1.6.10	Disposal of hazardous waste material:	
C1.6.10.1	Disposal of hazardous waste material at an approved hazardous waste material facility.	provisional sum
C1.6.10.2	Handling cost, profit and all other charges in respect of item C1.6.10.1	percentage (%)

The provisional sum allowed under item C1.6.10.1 shall cover the cost of disposing hazardous waste material at an approved hazardous waste facility, extra over the cost of clearing and/or grubbing the hazardous waste material which is paid for under items C1.6.1 and/or C1.6.2. The provisional sum shall be paid in accordance with the provisions of the Contract Documentation.

The percentage under item C1.6.10.2 is a percentage of the amount spent under item C1.6.10.1 which shall include full compensation for all handling costs, profit and all other charges for the disposal of the hazardous waste material.

D1.6 CLEARING AND GRUBBING

PART D: GUARANTEES AND COMPLIANCE CERTIFICATES

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- D1.6.2 GENERAL**
- D1.6.3 PERFORMANCE GUARANTEE REQUIREMENTS**
- D1.6.4 FUNCTIONAL PERFORMANCE ASSESSMENTS**
- D1.6.5 VISUALLY ASSESSED PROPERTIES**
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- D1.6.8 ADDITIONAL PROCEDURES TO BE ADOPTED IN THE EVENT OF FAILURE**
- D1.6.9 NOTIFICATION OF REMEDIAL WORK**
- D1.6.10 REMEDIAL WORKS**

No specific items in this Section.

Where applicable, details must be provided in the Contract Documentation.

1.7 LOADING AND HAULING

CONTENTS

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PART C: MEASUREMENT AND PAYMENT

PART D: GUARANTEES AND COMPLIANCE CERTIFICATES

A1.7 LOADING AND HAULING

PART A: SPECIFICATIONS

A1.7.1 SCOPE

This Section covers the loading and hauling of construction materials on the site of the Works.

A1.7.2 DEFINITIONS

Hauling - is the moving of loaded construction material from the point of excavation, or from a stockpile or windrow, to the point of use on the site or to designated spoil areas. The hauling operation shall include the off-loading of the material at the point of use on site, at the temporary stockpiles or at the designated spoil sites as applicable.

Haul roads - are temporary roads constructed by the Contractor, or existing public or privately owned roads, or any part or section of the road under construction, used for the purposes of hauling construction materials or for carting material to spoil.

Loading - is the operation of picking up the material from an excavation, stockpile or windrow and placing it in a haul vehicle.

A1.7.3 GENERAL

A1.7.3.1 Measurement of haul distance

The haul distance shall usually be measured from the centre of volume (centroid) of the excavation in the cutting (or part of a cutting), trench or borrow pit, or from the centre of the stockpile position where applicable, to the centroid of the fill (or part of a fill), to the mid-point along the road centreline of the section of the road layer where the material is placed, to the centre of the temporary stockpile position in a borrow pit, quarry or on site or to the centre of the designated spoil area where the material is off loaded as applicable. The haul distance will be measured to the nearest 0,1 km.

For those operations where the material is usually disposed of, and/or reused, near the source of the material the relevant pay item may state that the cost of hauling the material for the first 1,0 km shall be included in the contract rate for that pay item. For these operations the hauling of the material shall only be measured if the actual haul distance exceeds 1,0 km and the haul distance to be measured for payment shall be measured from a point starting 1,0 km from the centre of volume (centroid) of the excavation in the trench or borrow pit, or from the centre of the stockpile position where applicable, up to the centroid of the fill (or part of a fill), up to the mid-point along the road centreline of the section of the road layer where the material is placed or up to the centre of the designated spoil area where the material is off loaded as applicable. The haul distance will be measured to the nearest 0,1 km.

The haul distance shall be measured along the shortest route as instructed by the Engineer as being safe and practical. The haul distance shall include any distance that the haul vehicle must travel to make use of a safe turning point or the next off ramp before making the return trip. Should the Contractor choose to haul material over some other longer route, computations for payment shall nevertheless be based on the haul distance measured along the shortest route instructed by the Engineer.

A1.7.3.2 Haul and construction access roads

The construction, use and later closure / reinstatement of any haul roads and construction access roads that are required by the Contractor shall be carried out in accordance with the requirements given in Clause A4.1.7.1 of Chapter 4.

The requirements for the use of any existing public roads by the Contractor to haul material are given in Clause A4.1.7.1a) of Chapter 4.

The requirements for the use of haul roads not on existing public roads are given in Clause A1.2.3.2.

A1.7.4 DESIGN BY CONTRACTOR / PERFORMANCE BASED SYSTEMS

Not required for Section A1.7.

A1.7.5 MATERIALS

Not required for Section A1.7.

A1.7.6 CONSTRUCTION EQUIPMENT

The provisions of Clause A1.2.6 in Section A1.2 shall apply to this Section.

A1.7.7 EXECUTION OF THE WORKS

The loading, hauling, off-loading and spreading of all material shall be carried out in any suitable manner chosen by the Contractor provided no excessive segregation or contamination of the material occurs during any of these operations. If any segregation or contamination that the Engineer determines to be excessive does occur the Contractor shall change his methods of operation to eliminate the excessive segregation or contamination.

In addition to the material origin and destination records, a daily record of the registration numbers, measured level load volumes and the number of trips made by haul vehicles taking material to spoil shall also be kept by the Contractor for all volumes that are measured by loose volume in the haul vehicle. All the daily records shall be submitted to the Engineer no later than 10h00 the following working day. Failure on the part of the Contractor to do so will entitle the Engineer to make his own calculations regarding the volume of material moved as well as the haul distance and the Engineer's calculations will then be final and binding for measurement and payment purposes.

The Contractor shall ensure that the vehicles used to haul construction materials are not overloaded and the legal axle loads are not exceeded. Where specified in the Contract Documentation, the Contractor must provide the Engineer with the certified carrying capacity of each vehicle before any construction materials can be transported.

Unless otherwise specified in the Contract Documentation any truck that is overloaded shall not be allowed to discharge/off-load its load and the overloaded truck shall return to the borrow pit/quarry/depot/batching plant for adjustment of the load. In addition, a penalty shall be applied for the overload. The penalty amount per tonne of overload stated in the Contract Documentation multiplied by the distance that the load was hauled will be deducted on the front page of the payment certificate. Such penalty shall not be deducted from the value of work done in calculating contract price adjustment value.

A1.7.8 WORKMANSHIP

Reserved for future use.

B1.7 LOADING AND HAULING

PART B: LABOUR ENHANCEMENT

CONTENTS

- B1.7.1 SCOPE**
- B1.7.2 DEFINITIONS**
- B1.7.3 GENERAL**
- B1.7.4 DESIGN BY CONTRACTOR / PERFORMANCE BASED SYSTEMS**
- B1.7.5 MATERIALS**
- B1.7.6 CONSTRUCTION EQUIPMENT**
- B1.7.7 EXECUTION OF THE WORKS**
- B1.7.8 WORKMANSHIP**

B1.7.1 SCOPE

Where specified in the Contract Documentation, or where it is more practical to do so, the loading operations shall be carried out using hand labour instead of construction equipment.

B1.7.2 DEFINITIONS

Definitions as provided in Clause A1.7.2 shall also apply.

B1.7.3 GENERAL

Any activity specified in PART A, where hand work is given as an alternative, shall be executed in such a way as to maximise labour.

B1.7.4 DESIGN BY CONTRACTOR/PERFORMANCE BASED SYSTEMS

Not required for Section A1.7.

B1.7.5 MATERIALS

Not required for Section A1.7.

B1.7.6 CONSTRUCTION EQUIPMENT

Where reference is made in PART A to appropriate equipment, the use of light equipment shall be evaluated during trial sections. The specifications in Part A shall be equally applicable.

B1.7.7 EXECUTION OF THE WORKS

The loading of small volumes of material obtained from the excavation for services, clearing of hydraulic structures, loading of spoil from minor works operations and final clearing and grubbing operations are suitable components for labour enhancement.

B1.7.8 WORKMANSHIP

Not required for Section A1.7.

C1.7 LOADING AND HAULING

PART C: MEASUREMENT AND PAYMENT

(i) Preamble

The tendered rate for each item shall include full compensation for providing, operating, maintaining and decommissioning upon completion, of all the construction equipment, labour, tools, incidentals and supervision to carry out the activity or construct the works in the item, unless otherwise stated.

Any prime cost or provisional sums shall be paid in accordance with the provisions of the conditions of contract. The charge or mark-up tendered or allowed for is a percentage of the amount actually paid under the prime cost or provisional sum. This percentage shall cover all the Contractor's handling, supervision, profit and liability costs to provide the services in the prime cost or provisional sum item.

(ii) Items that will not be measured separately

The following required activities will not be measured or paid for separately and the Contractor shall include the cost of these activities in other pay items as already specified for the appropriate pay item or as deemed appropriate by the Contractor:

1. The loading and hauling of commercial materials from either Employer or Contractor identified suppliers/sources shall not be measured for payment.
2. The loading of materials on site will not be measured and paid for separately except for loading already stockpiled material and for loading material that has been placed in heaps or windrows where the relevant payment item in other Chapters specifically states that the loading will be paid for separately.
3. The hauling of materials on site will not be measured and paid for separately where the relevant payment item specifically states that the hauling operation is included in that payment item.
4. The hauling of materials on site over a localised distance of up to 1,0 km will not be measured and paid for separately where the relevant payment item specifically states that the initial haul of the material over a distance of up to 1,0 km is included in the pay item.

(iii) Items to be measured and paid for using items specified elsewhere in the specifications

There are no items mentioned in this section that are measured and paid for elsewhere in this Standard Specification.

(iv) Items specifically for this Section of the specifications

The following payment items will be inserted in the Pricing Schedule under the relevant payment section where loading and/or hauling of materials is applicable. The payment item shall commence with the relevant section number followed by / and then by the applicable loading and hauling payment item numbers given here.

Item	Description	Unit
C1.7.1	Loading	
C1.7.1.1	Loading from stockpile using machines and some hand labour where necessary	cubic metre (m ³)
C1.7.1.2	Loading from heaps or windrows using machines and/some hand labour where necessary	cubic metre (m ³)
C1.7.1.3	Loading by hand only from stockpile or heaps when labour enhancement work is specified or it is not possible to use machines	cubic metre (m ³)

Loading is generally considered to be part of the operation that produced the material which is being loaded, such as excavation, grubbing, cleaning, demolition etc., and it is therefore not usually measured separately for payment. Loading shall only be measured separately for payment for loading stockpiled material and for loading material that has been placed in heaps or windrows where the relevant payment item specifically states that the loading will be paid for separately.

The unit of measurement for items C1.7.1.1 to C1.7.1.3 shall be the cubic metre of material loaded into the hauling vehicles. These pay items shall only apply for those activities where the relevant pay item does not specify that the loading is included in the contract rate for that pay item.

The quantity of all soil and gravel materials loaded for hauling for use on the site of the Works shall be the compacted volume of material measured in its final position in the Works calculated using the dimensions given in the Contract Documentation or specified in writing by the Engineer.

The quantity of all materials loaded for hauling to temporary stockpile for later use in the Works, to borrow pits for backfilling purposes or for disposal at designated spoil areas shall be taken as 70% of the measured load volume of the haul vehicle being used to transport soil and gravel material and 50% of the measured load volume of the haul vehicle being used to transport hard material and/or boulders.

The contract rate for item C1.7.1.1 shall include full compensation for loading material from a stockpile and loading it into the hauling vehicles.

The contract rate for item C1.7.1.2 shall include full compensation for loading excavated material from heaps or windrows at the point of collection, including any windrowing and/or localised sorting / stockpiling that may be required, and loading it into the hauling vehicles.

The contract rate for item C1.7.1.3 shall include full compensation for loading excavated material at the point of collection on site or loading it from stockpile by hand and loading it by hand into the hauling vehicles. This item is only applicable when the Contractor has been instructed to load the material by hand in the Contract Documentation or by the Engineer to enhance the labour component of the Works or if it is not practical to use machines due to the restricted nature of the work.

Item	Description	Unit
C1.7.2	Hauling	
C1.7.2.1	Hauling material for use in the Works and off-loading it on the site of the Works:	
(a)	Soil, gravel, crushed stone and pavement layer material	cubic metre - kilometre (m ³ - km)
(b)	Boulders and hard material	cubic metre - kilometre (m ³ - km)
C1.7.2.2	Hauling material to spoil and off-loading it at a designated spoil or stockpile area:	
(a)	Cleared and grubbed material (organic matter and all other unsuitable or waste material)	cubic metre - kilometre (m ³ - km)
(b)	Soil and gravel material	cubic metre - kilometre (m ³ - km)
(c)	Boulders, hard material and concrete	cubic metre - kilometre (m ³ - km)

The unit of measurement for items C1.7.2.1 and C1.7.2.2 shall be the cubic metre – kilometre (m³ - km) which is calculated as the product of the quantity of material loaded, as measured in items C1.7.1.1, C1.7.1.2 or C1.7.1.3, multiplied by the applicable haul distance which shall be calculated as defined in Clause A1.7.3.1.

These pay items shall only apply for those activities where the relevant pay item does not specify that all the hauling is included in the contract rate for that pay item.

The quantity of all soil and gravel materials hauled for use on the site of the Works shall be the compacted volume of material measured in its final position in the Works calculated using the dimensions given in the Contract Documentation or specified in writing by the Engineer.

The quantity of all materials hauled to temporary stockpile for later use in the Works, to borrow pits for backfilling purposes or to designated spoil areas shall be taken as 70 % of the measured load volume of the haul vehicle being used to transport soil and gravel material and 50 % of the measured load volume of the haul vehicle being used to transport hard material and boulders.

The quantity of all organic matter hauled to borrow pits or to designated spoil areas shall be taken as 50 % of the measured load volume of the haul vehicle being used.

The contract rate shall include full compensation for hauling the material and off-loading it at the required or designated position.

D1.7 LOADING AND HAULING

PART D: GUARANTEES AND COMPLIANCE CERTIFICATES

CONTENTS

- D1.7.1 SCOPE**
- D1.7.2 GENERAL**
- D1.7.3 PERFORMANCE GUARANTEE REQUIREMENTS**
- D1.7.4 FUNCTIONAL PERFORMANCE ASSESSMENTS**
- D1.7.5 VISUALLY ASSESSED PROPERTIES**
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- D1.7.7 EVALUATION FOR ACCEPTANCE**
- D1.7.8 ADDITIONAL PROCEDURES TO BE ADOPTED IN THE EVENT OF FAILURE**
- D1.7.9 NOTIFICATION OF REMEDIAL WORK**
- D1.7.10 REMEDIAL WORKS**

Clauses D1.7.1 to D1.7.10 are not applicable to this Section.