THE DEVELOPMENT OF A CIVIL ENGINEERING STANDARD METHOD OF MEASUREMENT SYSTEM FOR AFRICA

L.C. CARROLL

Thesis submitted in partial fulfilment of the requirements for the degree of

MASTER OF SCIENCE IN QUANTITY SURVEYING

In the Faculty of Engineering, Built Environment and Information Technology

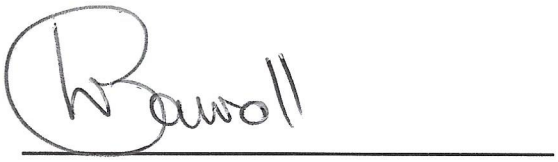
University of Pretoria

Supervisor: Dr J.H.H. Cruywagen

June 2016

Declaration by student

I, the undersigned, hereby confirm that the attached thesis is my own work, and that all other sources are adequately acknowledged in the text and listed in the bibliography.



Signature of acceptance and confirmation by student

ABSTRACT

Title of treatise	**:**	The Development of a Civil Engineering Standard System of Measuring for Africa
Name of author	:	L.C. Carroll
Name of study leader	:	Dr J.H.H. Cruywagen
Institution	**:**	University of Pretoria, Faculty of Engineering, the Built Environment and Information Technology
Date	**:**	November 2015

Different Engineering standard methods of measurement, developed in Africa throughout the last 30 years, are currently being used throughout the continent. Personal participation in various Civil Engineering projects in Africa have led to the belief that using different standard measuring systems leads to the loss of project time (all parties need to learn, understand and apply the system), differences in interpretation and opinions regarding the systems could leading to conflict between the parties, as well as the inflation of rates – due to the contractor's unfamiliarity with the system, and therefore covering himself for all eventualities.

The research findings suggest firstly that quantity surveyors in Africa agree that one concise civil engineering standard method of measurement for Africa should be developed; secondly that they would use the system; and thirdly, that such a system should be incorporated into the Tertiary Institutions' curriculum.

The following six measuring systems are currently being used in Africa; and they form the basis of this study:

- The Nigerian Institute of Quantity Surveyors – 2008: Building and Engineering Standard Method of Measurement
- The Surveyors' Institute of Zambia – 2010: Standard Method of Measurement of Building Works in Zambia

- The Architectural Association of Kenya, Quantity Surveyors' Chapter – 2008: Standard Method of Measurement of the Building and Associated Civil Works for Eastern Africa
- The South African Bureau of Standards – 1986: South African Bureau of Standards Standardized Specifications for Civil Engineering Construction
- The South African Bureau of Standards and Anglo-American – 2004: South African Bureau of Standards Standardized Specifications for Civil Engineering Construction with Anglo-American Amendments
- Joint Division of the Institution of Civil Engineers and the South African Institution of Civil Engineering – 2011: Civil Engineering Standard Method of Measurement – Southern African Edition.

The study resulted in a fully integrated and comprehensive Civil Engineering Standard System of Measuring for Africa, confined to the following trades:

- Preliminary and General
- Site Clearance
- Earthworks
- Concrete/Civil Works
- Steelworks
- Long-Length Pipe-works
- Road-works

Once all the trades are developed, the system can be used by all levels of professionals in Africa.

ACKNOWLEDGEMENTS

I dedicate this thesis to the following people:

- Dr Hoffie Cruywagen for his guidance in this study
- Dr P.J.S Goldstone for the language-editing of the thesis
- Mr Fritz Bossert, Mr Bert van den Heever, Mr Dries Willemse and Mr Bryan Westcott for commenting on the second draft of the measuring system
- My husband Mark, and my two children, Domonique and Kénan for their support, love and encouragement
- To the Highest Power of all

Jude 1: 24 & 25: *"To him who is able to keep you from stumbling and to present you before his glorious presence without fault and with great joy – to the only God our Saviour, be glory, majesty, power and authority, through Jesus Christ our Lord, before all ages, now and forevermore"*

INDEX

LIST OF TABLES

LIST OF FIGURES

LIST OF ACRONYMS

AAQS:	African Association of Quantity Surveyors
ASAQS:	Association of South African Quantity Surveyors
AIQS:	Australian Institute of Quantity Surveyors
BESMM3:	Nigerian Institute of Quantity Surveyors – 2008: Building and Engineering Standard Method of Measurement
CESMM3:	Joint Division of the Institution of Civil Engineers and South African Institution of Civil Engineering – 2011: Civil Engineering Standard Method of Measurement – Southern African Edition
CESMMS:	Civil Engineering Standard Method of Measurement System
CESMMSs:	Civil Engineering Standard Method of Measurement Systems
CESMMSA:	Civil Engineering Standard Method of Measurement System for Africa
CIDB:	Construction Industry Development Board
ICE:	Institution of Civil Engineers
ICE-SA:	Institution of Civil Engineers of South Africa
MMBZ:	Surveyors' Institute of Zambia – 2010: Standard Method of Measurement of Building Works in Zambia
RICS:	Royal Institute of Chartered Surveyors
SABS1200:	South African Bureau of Standards – 1986: South African Bureau of Standards Standardized Specification for Civil Engineering Construction
SABS1200AAC:	South African Bureau of Standards and Anglo American – 2004: South African Bureau of Standards Standardized Specification for Civil Engineering Construction with Anglo-American Amendments
SAICE:	South African Institution of Civil Engineering
SMM:	Standard Method of Measurement published by the Royal Institute of Chartered Surveyors (RICS)
SMM2:	Architectural Association of Kenya, Quantity Surveyors Chapter – 2008: Standard Method of Measurement of Building and Associated Civil Works for Eastern Africa
SMOM:	Standard Method of Measurement

SMOMs:	Standard Method of Measurements
SMOMS:	Standard Method of Measurement System
SMOMSs:	Standard Method of Measurement Systems

CHAPTER 1

INTRODUCTION, BACKGROUND AND PROBLEM STATEMENT TO THE STUDY

1.1 INTRODUCTION AND BACKGROUND

1.1.1 Introduction

The main objective of this chapter is to explain the rationale for the study. The chapter contains the following headings:

- Introduction and background
- Theory and research review
- Research-problem statement and research objectives
- Research approach and process
- Summary

1.1.2 Background

Throughout the last 30 years, different Civil Engineering Standard Methods of Measurement Systems (CESMMSs) were developed for Africa; and these are currently being used throughout the continent. Different countries are using different CESMMSs; and some countries do not even have a standard Civil Engineering Standard Method of Measurement System (CESMMS). Professionals in countries without a CESMMS have either developed their own system; or they use systems not necessarily developed for their country's specific unique culture and business ethics.

Working throughout the continent, it is difficult for project teams to firstly assess which system to use; and secondly to obtain a specific system previously being used in any specific country. This makes the process of measuring for and compiling bills of quantities difficult

and longer than it should be. It is, furthermore, complicated when contractors and professionals work in a country, which is not their home country. They are used to a certain system adopted in their home country; however, the place of construction may use another system; and the rest of the professional team may want to implement yet another system.

Experiencing the above-mentioned problems personally for more than twenty years, it is clear to the researcher that professional teams need one common CESMMS for the whole continent. A system that the whole project team knows and has the confidence to use.

By analyzing and comparing different CESMMSs currently being used in Africa; and by suggesting one system would contribute significantly to the Civil Engineering Industry in Africa. With this Standard Method of Measurement System (SMOMS), problems experienced during construction projects could be avoided in the future.

Currently, there are numerous CESMMSs being used all over the world. Some examples are: the "Australian Standard AS 1181 – 1982: Method of measurement of engineering works and associated building works" per CSAA (1982); the "Royal Institution of Chartered Surveyors – 1998: SMM7 Standard method of measurement of building works" per RICS (1998); the "Bureau of Indian Standards IS 1200 – 2003: Indian standard method of measurement of building and civil engineering works" per Bureau of Indian Standards (2003); the "Government of the Hong Kong Special Administrative Region – 1992: Standard method of measurement for civil engineering works" per Government of the Hong Kong Special Administrative Region (1992), and more suchlike standards.

The above-mentioned list is endless; and it is simply impossible to use all the published systems, and to to create one integrated Civil Engineering Standard Method of Measurement System for Africa (CESMMSA). Based on the researcher working only on projects in Africa, and on no other continents; and therefore, the conditions in Africa are fully understood, the decision was made to investigate only CESMMSs currently being used in Africa.

Members of the African Association of Quantity Surveyors (AAQS) working in different parts of Africa, such as Ghana, Zambia, DRC, Zimbabwe, Kenya, Nigeria, Botswana, Namibia and

Mozambique were approached and asked, which CESMMSs they are currently using in these countries. The first four systems of the following list were supplied by the members. The last two systems were added; because they are currently being used in South Africa.

- Nigerian Institute of Quantity Surveyors – 2008: Building and Engineering Standard Method of Measurement (BESMM3)
- Surveyor's Institute of Zambia – 2010: Standard Method of Measurement of Building Works in Zambia (MMBZ)
- Architectural Association of Kenya, Quantity Surveyors Chapter – 2008: Standard Method of Measurement of Building and Associated Civil Works for Eastern Africa (SMM2)
- South African Bureau of Standards – 1986: South African Bureau of Standards Standardised Specifications for Civil Engineering Construction (SABS1200)
- South African Bureau of Standards and Anglo-American – 2004: South African Bureau of Standards Standardised Specification for Civil Engineering Construction with Anglo-American Amendments (SABS1200AAC)
- Joint Division of the Institution of Civil Engineers and the South African Institution of Civil Engineering – 2011: Civil Engineering Standard Method of Measurement – Southern African Edition (CESMM3)

The above list of systems are utilized for the purpose of this study.

1.1.3 Rationale

Personal participation in various Civil engineering projects in Africa has led to the belief that using different CESMMSs leads to the loss of project time (all parties need to learn, understand and apply the system), differences in interpretation and opinions on the system, leading to conflict between the parties, inflation of rates – due to the contractor's unfamiliarity with the system – and therefore covering himself for all eventualities.

Currently, the Association of South African Quantity Surveyors (ASAQS) is looking at all the building standard measuring systems being used in Africa; and they are in the process of compiling a combined building system. However, nobody's looking at the civil engineering field for work on Mines, Power Plants, Process Plants, Roads and Bridges, Earth Dams, Pipelines, etc. Therefore, this research is worthwhile, in order to enhance control systems in the civil engineering field: and to create one integrated system for the whole continent.

1.2 THEORY AND RESEARCH REVIEW

During this study, as explained previously, the following CESMMSs will be reviewed and analyzed:

- MESMM3
- MMBZ
- SMM2
- SABS1200
- SABS1200AAC
- CESMM3.

The initial analysis of the above-mentioned CESMMSs will involve summarizing different trades for all the different systems, in order to produce an overall comparison summary sheet. A further stage involves reviewing, analyzing, comparing and commenting on each trade – and to start proposing a fully integrated and comprehensive system for each trade.

Each system has its own shortcomings. These shortcomings would have to be identified and investigated further, in more detail. Shortcomings can be:

- Items not sufficiently covered in the system
- Items not covered at all in the system
- Measuring rules not sufficiently covered in the system
- Measuring rules not covered at all in the system

- Trades not sufficiently covered in the system
- Trades not covered at all in the system

The above-mentioned shortcomings may be sufficiently covered by one of the systems; however, new items, rules and/or trades would have to be created; and they would all need to be integrated into the proposed comprehensive system.

The next stage involves developing an integrated, comprehensive CESMMSA. The aim of this stage is to integrate what has been done by the different systems, and to incorporate it all into a meaningful and coherent system.

The last two stages will be to validate the proposed system, by firstly distributing a relevant questionnaire to various stakeholders in Africa, such as members of the AAQS, ASAQS, RICS, etc. – and to incorporate the findings, if valid and value-added changes, into the proposed system. Through the questionnaire, it will also be assessed whether an improved system is needed, what the knowledge of existing systems comprises, what the system's layout should be, what needs to be included in a new system, who would use such a system for future projects, and so forth.

Secondly, the proposed system will be distributed to members of the ASAQS and South African engineering fraternity to comment on the system. Valid findings and changes would then have to be made; and a final proposed CESMMSA will be published with this study.

The ultimate goal is to develop a fully integrated and comprehensive system for all levels of professionals to use in Africa.

1.3 RESEARCH PROBLEM STATEMENT AND RESEARCH OBJECTIVES

1.3.1 Problem statement

The research seeks to answer the question: "Would a developed, integrated and comprehensive CESMMSA be an improvement over the current different existing Standard Methods of Measurements (SMOMs) being used in Africa?"

1.3.2 Purpose of the Study

The first purpose of the study is to investigate the chosen existing CESMMSs used in Africa; and then to identify, which current systems are known to quantity surveyors. Secondly, the study will create a comprehensive, fully integrated CESMMSA. Thirdly, it would be necessary to test the opinion of quantity surveyors regarding their use of this created CESMMSA in the future.

1.3.3 Research hypotheses

A hypothesis is defined as, "…..a supposition or explanation (theory) that is provisionally accepted, in order to interpret certain events or phenomena, and to provide guidance for further investigation. A hypothesis may be proven correct or wrong; and it must be capable of refutation. If it remains irrrefutable by the facts, it is said to be verified or corroborated." (Business Dictionary, 2015). In simple terms, a hypothesis is an assumption.

1.3.3.1 Hypothesis One

Quantity Surveyors believe that a CESMMSA should be developed.

1.3.3.2 Hypothesis Two

Quantity Surveyors would use a developed CESMMSA for work in Africa.

1.3.3.3 Hypothesis Three

Quantity Surveyors believe that a developed CESMMSA should be taught in Tertiary Institutions.

1.3.4 Research Questions

There are three research questions, namely:

- What is a CESMMS, and where do CESMMSs come from?
- Which current CESMMSs used in Africa are known to Quantity Surveyors?
- What would Quantity Surveyors do with a newly developed CESMMA?

1.3.5 Significance of the study

Currently, confusion and disunity between the professional team and the contractor on projects in Africa are created; because SMOMs not known and fully understood by all parties are being used. Numerous arguments on what should be, and should not be, included in items in the bills of quantities are generated in this way.

One way in which tenderers cover added risks in their tender is by pricing for it. Therefore, if the Standard Method of Measurement System (SMOMS) is unknown to the tenderers, they would cover their risks by increasing their tender amounts. This results in a higher overall tender amount; and Clients would have to pay more for the use of such unknown systems. Another way for tenderers to cover added risks is to allow additional time in their tender programmes for a longer period to agree on monthly payment certificates and final accounts. This would result in an extended construction programme, which would result in the Client paying for additional time-related preliminary and general costs.

Given the fact that money and time can be saved by using a standard developed CESMMSA, the need for the study cannot be over-emphasized.

Lastly, no data relating to quantity surveyor's knowledge of existing CESMMSs used in Africa could be found. This study will add to the knowledge on which systems are known to quantity surveyors, and to what extent does their knowledge go. Therefore, it is imperative to see the outcome of the questionnaire sent out to quantity surveyors during this study.

1.3.6 Limitations and assumptions of the study

The first limitation of the study is that due to time constraints, the study is limited to only seven trades in the civil engineering construction industry. The decision to cover only these seven trades was based on investigating four completed civil-engineering construction projects, namely:

- Crusher Project. De Beers (2006)
- Slimes Dam Project. De Beers (2006)
- Thickener Project. De Beers (2002)
- Water-Treatment Project. Optimum (2013).

As a baseline, it would be necessary to assess which trades would cover at least 70% of the project costs (excluding mechanical equipment). The above-mentioned projects were completed by CES Group Pty Ltd. from 2002 to 2014; and permission was granted to use the information for this study.

The result was as follows:

Table 1: Comparison of trade costs over total project costs as a percentage

Description	Primary Crusher Project			Slimes Dam Project			Thickener Project			Water Treatment Plant		
	Costs	%	% excl Mech	Costs	%	% excl Mech	Costs	%	% excl Mech	Costs	%	% excl Mech
PRELIMINARY & GENERAL	incl in civils			8 391 552.32	0.11	0.11	3 646 384.56	0.19	0.24	38 876 277.45	0.16	0.23
EARTHWORKS	incl in civils			incl in civils			829 136.72	0.04	0.05	40 431 969.62	0.17	0.24
CIVIL WORKS	54 056 755.58	0.37	0.46	64 441 402.74	0.82	0.82	3 635 243.68	0.19	0.24	18 485 694.47	0.08	0.11
STRUCTURAL STEEL	17 088 014.92	0.12	0.15		-	-	2 000 856.00	0.11	0.13	8 920 466.89	0.04	0.05
PLATEWORK & LINERS	5 780 632.96	0.04	0.05		-	-	incl in steelwork				-	-
MECHANICAL EQUIPMENT	29 687 037.55	0.20			-	-	3 681 388.44	0.19		68 029 214.81	0.29	
PIPING	5 608 396.35	0.04	0.05		-	-	1 341 883.00	0.07	0.09	18 010 517.19	0.08	0.11
TRANSPORT, SPARES & VENDORS	5 930 180.69	0.04	0.05		-	-		-	-		-	-
ELECTRICAL WORKS	19 802 750.48	0.14	0.17	5 973 456.12	0.08	0.08	2 472 359.00	0.13	0.16	39 216 083.00	0.17	0.23
INSTRUMENTATION WORKS	8 010 593.97	0.05	0.07		-	-	1 381 139.00	0.07	0.09		-	-
ROADWORKS			-			-		-	-	2 764 274.66	0.01	0.02
BUILDING WORKS	-	-	-		-	-		-	-	2 314 663.09	0.01	0.01
TOTAL	145 964 362.50	1.00	1.00	78 806 411.18	1.00	1.00	18 988 390.40	1.00	1.00	237 049 161.18	1.00	1.00
Total P&G, Earth-, Civil-, Steel-, Plate-, Pipe- and Roadworks		0.57			0.92			0.60			0.54	
Ditto, excluding Mechanical Equipment		0.71			0.92			0.75			0.75	

Table 1 shows that for the Primary Crusher Project P&G's (Preliminary and General), earthworks, civil works, structural steel works, platework & liners and piping trades constitute 71% of the contract. It further shows that for the Slimes Dam Project trades P&G's, earth works and civil works trades constitute 92% of the contract, for the Thickener Project P&G's, earth works, civil works, structural steel works, platework & liners and piping trades constitute 75% of the contract, and lastly for the Water Treatment Plant Project P&G's, earthworks, civil works, structural steel works, piping and roadworks trades constitute 75% of the contract.

An average of 66% of the work will be covered by using the above-mentioned trades. If Mechanical Equipment is taken out of the equation, this percentage rises to 78% of the work. This means that if bills of quantities are drawn up for only the above-mentioned trades, almost 80% of the complete projects would be covered, which would suffice for the purpose of this study.

Based on the above data extracted from Table 1, only the following trades will be taken into consideration:

- Preliminary and General
- Site Clearance
- Earthworks
- Concrete/Civil Works
- Steelworks
- Long-Length Pipe-works
- Road-works

Only the above-mentioned seven trades will be covered in the CESMMSA.

The second limitation of the study is that only the following six existing systems, as previously discussed, currently being used in Africa, will be investigated in this study:

- MESMM3

- MMBZ
- SMM2
- SABS1200
- SABS1200AAC
- CESMM3

The third limitation of the study is that the quantity surveyors responding to the questionnaire will be mostly from South Africa, which could result in incorrect data.

1.4 RESEARCH APPROACH AND PROCESS

The research approach will consist of a comprehensive review of the existing CESMMSs, with substantiated field research in the form of a questionnaire.

The proposed flow-chart of the process is shown in Figure 1.

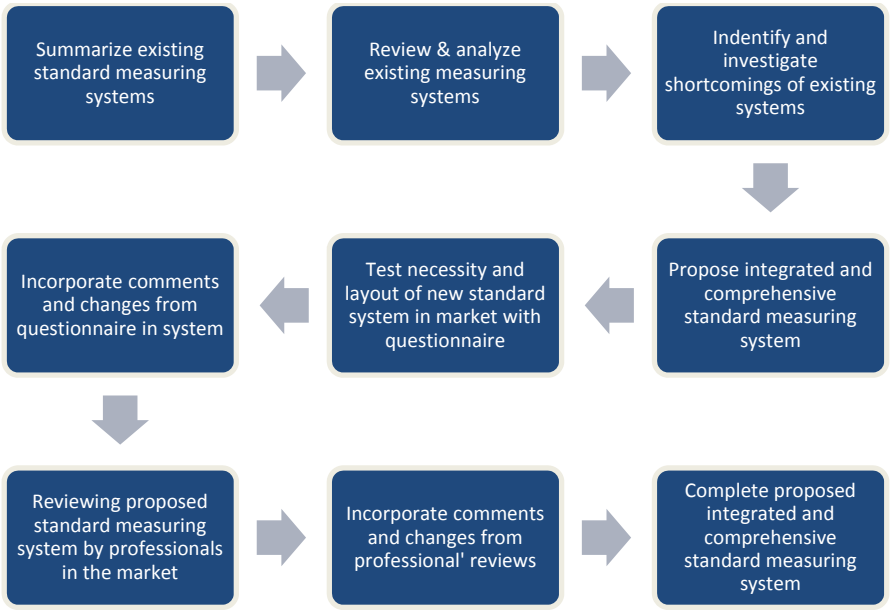


Figure 1: Process flow-chart of the research study

1.5 SUMMARY

The ASAQS is currently spending time and money to develop a Building Standard Method of a Measurement System for Africa per ASAQS (2015), in order to avoid additional cost and time on building projects due to lack of knowledge of the applied measuring system. For the same reasons, a CESMMSA should be developed; and quantity surveyors should improve their knowledge, education and skills in preparation for using such a system.

The next chapter will cover the literature review undertaken. It is extremely important to know where the existing systems used in this study come from; and what their shortcomings are. Also what is written about existing systems and what the opinion of other people is regarding the existing SMOMSs.

CHAPTER 2

LITERATURE SURVEY

2.1 INTRODUCTION

This chapter focuses on a review of the literature on existing SMOMs. The literature reviewed was obtained from numerous sources including:

- Websites
- Theses and dissertations
- Surveys
- Existing published SMOMs
- Publications
- Dictionaries

2.2 THE LITERATURE REVIEW

Verster (2005) states the following regarding effective project management: "In future, the pro-active and effective management of costs, contracts, communication and claims – the four Cs – will consistently become more important to developers and facilitators involved in physical structures and property".

To manage costs, contracts and claims, an agreed on SMOM must be in place and adhered to during the whole project. The agreed method must be clear, without any ambiguities, and acceptable to all parties working on the project.

What does it mean to have an SMOM?

Measurement:

According to Collins English Dictionary (2003), measurement is "the act or process of measuring, or an amount, extent, or size determined by measuring, or a system of measures

based on a particular standard. Measurement is the cornerstone of most of the natural sciences, technology, economics and quantitative research in other social sciences. Any measurement can be judged by the level of measurement (which includes magnitude), dimensions (units) and uncertainty. They enable comparisons to be done between different measurements, and [make it possible to] reduce confusion. The science of measurement is called metrology."

From the above, it is clear that all measurements done during the project's different phases should be done in such a way that they could always be compared with each other, and thus make it possible to reduce confusion, and establish certainties, such as quantifying all changes in design, site conditions, scope, etc.

The Royal Institution of Chartered Surveyors (RICS) (1998) set out the requirements and criteria for the assessment of professional competence by listing the competencies required of quantity surveyors/chartered surveyors in three categories: basic-, core- and optional competencies. One of the basic competencies is "measurement", thus making this one of the basic skills required for being a professional quantity surveyor/chartered surveyor. Being such an important skill, the need for an SMOM to provide the basis for any measurement is, therefore, critical to any project.

Furthermore, the accuracy of measurements is essential for the success of any project. If there is no confidence in the accuracy of the bills of quantities, the basis for the project costs would be lost; and both the contractor and the employer would look for other means to define claims and the subsequent payment thereof. This could lead to unnecessary arguments and long-drawn out discussions in agreeing on the final account.

Measurements should, therefore, be done in such a way that they can be clear; they can be compared to previous measurements; they must be accurate, and always on the same basis.

Standards:

The benefits of having standards in any project, organization, profession, business, etc. are listed by the South African Bureau of Standards (2014), as follows:

- Lowering installation and start-up costs
- Inspiring added trust in the business
- Assisting to meet mandatory regulations
- Ensuring improved quality and reliability
- Creating a competitive advantage, by improving the quality of goods and services
- Opening new markets, by assuring new customers of meeting quality requirements
- Attracting new customers
- Reducing costs in the way the business is done.

They further state that standards have become such integral components of our economic, social and legal systems that they are frequently taken for granted; and their crucial role in a modern society is frequently overlooked.

To use standards in a construction project, and to remove all uncertainties; it is necessary that best-practice qualities are applied. An SMOMS should set the standard to be used in a project for producing the bill of quantities, and agreeing on final accounts; and furthermore, the professional team should not deviate therefrom – in order to ensure confidence in the system for all the parties concerned.

Method:

The Free Dictionary (2014) defines method as "a means or manner of procedure, especially a regular and systematic way of accomplishing something; an orderly arrangement of parts or steps to accomplish an end; the procedures and techniques characteristic of a particular discipline or field of knowledge."

When the methods used in a construction project are clearly defined and agreed on, they simply need to be applied during the whole construction period; and the costs, time and effort would be reduced accordingly.

Summary:

From the above definitions, it is evident that SMOMs are critical for a successful project; and they are a part of the fundamental needs in our modern society.

SMOMs are used for measurement of all construction work; and they give guidelines as to what should be measured in the various parts of the construction process. They also give guidelines to what should be included in the various items; and how the items should be measured. Any exclusions are also given. The main purpose of a SMOM is to provide a uniform basis for measuring construction work. When the bills of quantities are then prepared, based on a particular SMOM, all parties concerned are aware of what is included, assumed, or not included.

According to the article, "The adoption of CESMM3 as SMOM of civil engineering quantities in South Africa", published in the Civil Engineering Journal, Civil Engineering Publication (2008), the use of bills of quantities on construction contracts permits three important objectives to be achieved:

- Tenderers are provided with adequate information regarding the extent of the work required to enable them to accurately and confidently prepare tenders, which may readily be compared with other tenders;
- Employers can pre-determine, with a high degree of accuracy, the costs of contracts and the impact of possible variations to the works; and
- A sound basis is provided for the evaluation of work carried out at any stage of the contract.

Therefore, bills of quantities need to be underpinned by a system of measurement, and preferably a standard one.

2.3 HISTORY OF RELEVANT SMOMS CURRENTLY BEING USED IN AFRICA

According to Designing Buildings (Wiki, 2014), in 1922, the first edition of the "Standard Method of Measurement (SMM 1)" was published in Britain. Subsequently, revisions were

made; and other editions were published; the most important for the measurement of building works being the 7th edition (SMM 7) published in 1988, and revised in 1998, RICS (1998). In April 2012, the "New Rules of Measurement volume 2 (NRM2)" was published; and it replaces the SMM 7. In 1991, the 3rd edition for the "Civil Engineering Standard Method of Measurement (CESMM3)" for use in the measurement of civil engineering works was produced by a committee under the guidance of the Institute of Civil Engineers and the Federation of Civil Engineering Contractors of Britain.

In Africa, the Transvaal Society of Quantity Surveyors published the first "Standard System for the Measurement of Building Work in South Africa" in 1906, according to the Standard System Joint Committee, (1991). The most current version is the 6th edition (second version) published in 2013, by the Association of South African Quantity Surveyors.

2.3.1 History of systems utilized in this study

The third edition of the "Building and Engineering Standard Method of Measurement 3" was printed in 2008 by The Nigerian Institute of Quantity Surveyors, according to the Nigerian Institute of Quantity Surveyors (2008). This system is based on the Standard Method of Measurement (SSM 7), the Standard Method of Measurement for Industrial Engineering Construction (SMMIEC), and the Civil Engineering Standard of Measurement (CESMM). The first edition was published in 1988.

The first edition of the "Standard Method of Measurement of Building Works in Zambia" was printed in 1975 by the Surveyor's Institute of Zambia jointly with the Association of Building and Civil Engineering Contractors, according to Simushi (2010). The latest edition was printed in 2008.

According to the Architectural Association of Kenya, Quantity Surveyors' Chapter (2008), the first edition of the "Standard Method of Measurement of Building Works for the Republic of Kenya" was published in 1968, using the "Standard Method of Measurement of Building Works" published by the RICS and the National Federation of Building Trade Employers, London, as the basis. Civil works were added to this system; and the name was changed to

"The Standard Method of Measurement of Building an Associated Civil Works for Eastern Africa" in the 2nd edition, published in 2008, which is the latest edition.

In 1979, the first edition of the "Standardized Specification for Civil Engineering Construction (SABS 1200)" was published by the South African Bureau of Standards, according to the South African Bureau of Standards (1986). Up to 1996, some of the sections, such as Earthworks, Earthworks – small works, Structural Steelwork, Gabions and Pitching, Roads – General and Base Light Pavement Structures, were all revised.

The specification part of this document was revised and published in 2005 onwards, as the South African National Standard 1200 (SANS1200). According to Watermeyer *et al*. (2012), all references to the responsibilities of the Engineer and the Contractor were removed from the text. However, no measurement and payment clauses were included in these publications. Therefore, previously published SABS 1200 measurement and payment clauses still apply when measuring civil engineering works.

In 2011, the "Civil Engineering Standard Method of Measurement South African Edition (CESMM3)" was published by a joint division of the Institute of Civil Engineers and the South African Institute of Civil Engineering, as per ICE-SA (2011). This system is based on the 3rd edition for the "Civil Engineering Standard Method of Measurement (CESMM3)" produced by a committee under the Institution of Civil Engineers and the Federation of Civil Engineering Contractors of Britain.

2.4 CURRENT STANDARD MEASURING SYSTEMS

Unfortunately, not much has been published on the different civil engineering SMOMSs, currently being used in Africa; however, in-depth discussion regarding the methods used in this research is necessary.

2.4.1 Systems based on Standard Method of Measurement (SMM) published by the Royal Institute of Chartered Surveyors (RICS)

Some of the systems currently used in Africa, which form part of this study, are based on the SMM; therefore, the origin and development of these systems is important.

According to Nani *et al*. (2008), "SMM" (Standard Method of Measurement of Building Work) and "CESMM" (Civil Engineering Standard Method of Measurement) type systems are found in most British Commonwealth countries. Early and Gould (2004) described the SMM as "a formal document setting out conventions for defining the nature of construction works, how the work is measured, or taken off and quantified". An examination of the function of the SMM indicates that it is similar to a language, which provides meaning (what is included or excluded) to quantified information that is prepared, in accordance with its rules.

The use of SMM is widespread; and a global survey by the Building Cost Information Service (BCIS) (2004) on behalf of the RICS identified 32 SMMs in existence; while Mills *et al*. (2006) identified 44 documents spread over 32 countries. Many SMMs are updated editions or amended versions of the UK's SMM5 and SMM7 editions, published by the RICS. Nani *et al*. (2008) furthermore, state that the following factors drive the development and revision of SMMs in the construction industry:

- The quest for uniformity in measurement;
- The need to match standard methods of measurement with the development of new techniques in the construction industry;
- The need to clarify and simplify standard rules of measurement;
- The need to satisfy certain construction industry stakeholders (e.g. contractor's need for approximate quantities);
- The need to conform to national specifications and prevailing conditions of contract, and international conventions (e.g. the introduction of SI metric system in the 1960s);
- The requirement to conform to national classification systems, such as 'common arrangement of work sections', which affect the format of tender documents, such as bills of quantities.

Nani *et al*. (2008) also state that it can be deduced that the development of SMMs is motivated by factors, such as: technology change; the strength and influence of professional institutions; local, national and international professional practice and cultures; commercial industry requirements; and legal precedence/requirements in building procurement.

SMMs have been criticised for their excessive complexity, the lack of consideration for construction practice, the failure to meet pricing and stakeholder requirements, and for inadequate industry consultation during their development stage, according to Goh and Chu (2002).

Comments in the survey done by the BCIS in 2004 indicate a lack of confidence in the suitability of SMM7 for its purpose. Dissatisfactions identified by the survey included:

- Misinterpretation of SMM7 Rules, resulting in frequent misunderstanding between contracting parties. Simplification of the measurement rules was suggested;
- The unnecessary complexity of SMM7;
- Lack of focus in SMM7 on important factors that influence price, such as methods of construction, or local estimating conventions;
- Confusion about the classification structure of SMM7, which respondents thought was inadequate. They believed that classification, according to trade sections was better than the SMM7 common arrangement of works sections. The significance of this complexity is that it results in difficulties in locating measurement rules in SMM7 – especially for particular work items or combinations of items.

Jagger *et al*. (2001) also criticised SMM7 for paying little attention to the contractors' needs in terms of following the processes of construction. Mills *et al.* (2006) recommend the South African SMM to the Australian Institute of Quantity Surveyors (AIQS) and RICS as a guide for subsequent revision of respective SMMs, because of the simplified nature of the South African System of Measurement – In an attempt to satisfy the many stakeholders in the construction industry.

Taking the above into consideration, it is critical to simplify SMM systems, in order to avoid confusion or misinterpretations; and it will always be a challenge to create one system that satisfies all the different construction industries, national specifications and work ethics.

By classifying the system into trade sections, and by simplifying the measurement rules, a simplified CESMMSA can be created; and this will be one of the main aims of this study.

The biggest challenge will be to create a uniform system for Africa, which will satisfy most of the stakeholders in the construction industry. Reference to specific industry specifications and professional institutions will have to be avoided; and legal precedence/requirements cannot be prescribed; but they will rather be left to be covered in the contract conditions.

The following systems used in this study are based on one of the RICS SMM published systems:

- BESMM3
- MMBZ
- SMM2

2.4.2 Building and Engineering Standard Method of Measurement 3, Third Edition, drawn up by the Nigerian Institute of Quantity Surveyors *(BESMM3)*

According to the Nigerian Institute of Quantity Surveyors, www.niqs.org.ng (2014), the Nigerian Institute of Quantity Surveyors was founded in 1969 by a group of Nigerians who trained, qualified and practised in the United Kingdom; but who, upon returning to Nigeria, sensed the urgent need to develop the profession of Quantity Surveying in Nigeria by establishing a parallel body to the RICS of the United Kingdom. One of the organization's fundamental objectives was to "undertake research, study and collate information from any Quantity Surveying bodies, from any part of the world, on the latest developments and technologies in the practice of the profession, and to make such information available to its registered members". Therefore, drawing up the standard Building and Engineering Standard Method of Measurement 3 (BESMM3) falls well into the scope of this objective.

The system consists of two parts: Part 1 containing the rules for measurement for building and the like; and Part 2 contains the rules for the measurement of civil and industrial engineering installations and the like. The rules of measurement are practically the same in both Part 1 and Part 2.

As mentioned before, this system is based on the Standard Method of Measurement (SMM 7), the Standard Method of Measurement for Industrial Engineering Construction (SMMIEC) and the Civil Engineering Standard of Measurement (CESMM).

This system is published in a tabular format with a "General Rules" section in the beginning of the system. All the sections are given under the following headings:

- Classification table
- Measurement rules
- Definition rules
- Coverage rules
- Supplementary information

The classification table consist of five columns:

Column 1 – lists work items or processes commonly found in construction works
Column 2 – contains subdivisions of the items in column 1
Column 3 – gives further breakdown of the individual items contained in column 2
Column 4 – states unit of measurement appropriate for each item or unit of work
Column 5 – contains more descriptive features to enhance the quality of descriptions

The supplementary rules consist of four columns:

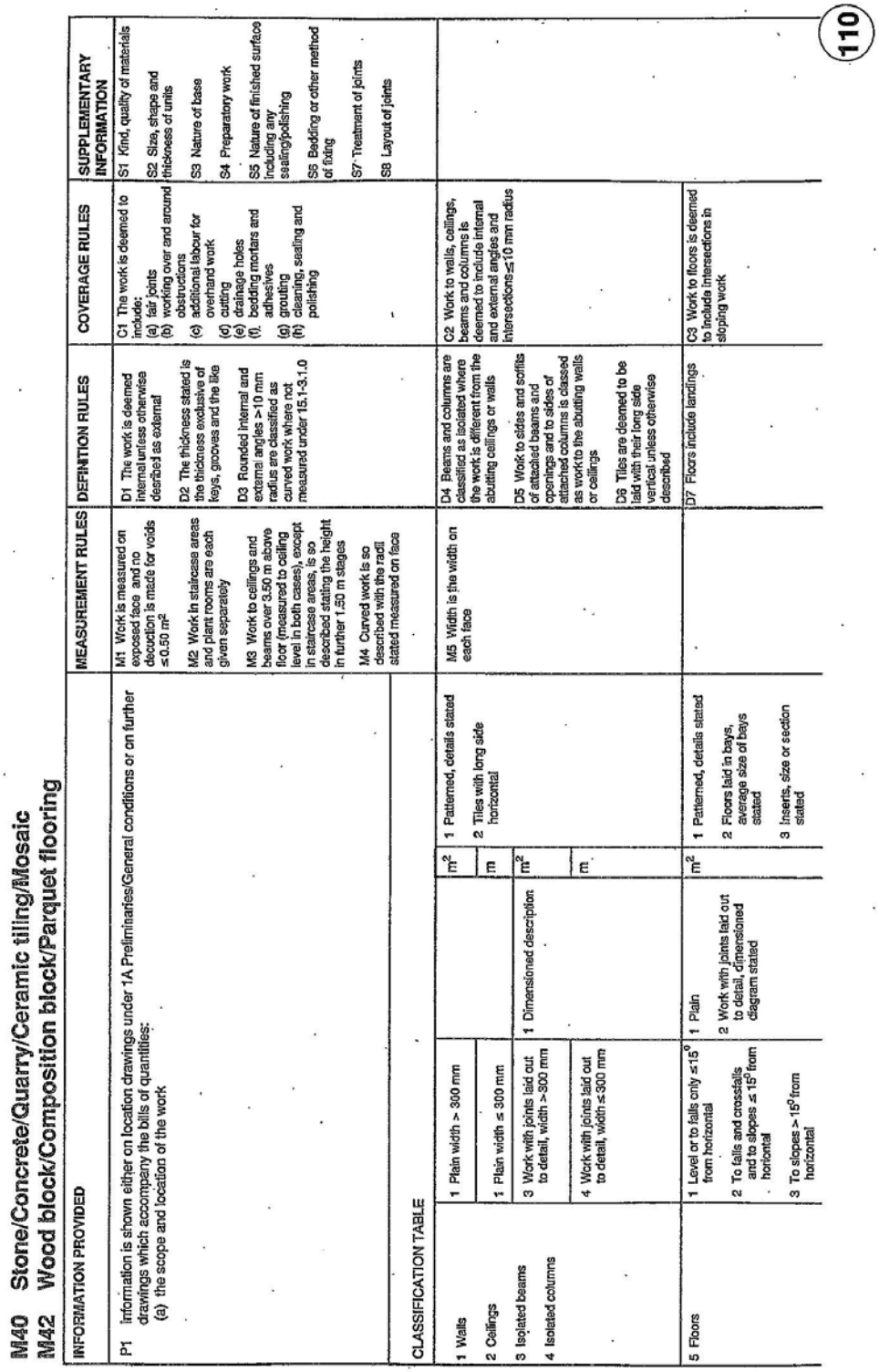
Column 6 – Measurement rules: Set out when work is to be measured, and how the quantities are to be calculated

Column 7 – Definition rules: Define the extent and the limits of work represented by a word or expression used in the rules

Column 8 – Coverage rules: Draw attention to incidental items, which are deemed to be included or excluded from the item of work being measured

Column 9 – Supplementary information: These rules govern the information to be given, in addition to the information given, in accordance with the classification rules.

To fully understand the above description of this system, Figure 2 shows a typical page layout of this system.



M40 Stone/Concrete/Quarry/Ceramic tiling/Mosaic
M42 Wood block/Composition block/Parquet flooring

INFORMATION PROVIDED	MEASUREMENT RULES	DEFINITION RULES	COVERAGE RULES	SUPPLEMENTARY INFORMATION
P1 Information is shown either on location drawings under 1A Preliminaries/General conditions or on further drawings which accompany the bills of quantities: (a) the scope and location of the work	M1 Work is measured on exposed face and no deduction is made for voids ≤0.50 m² M2 Work in staircase areas and plant rooms are each given separately M3 Work to ceilings and beams over 3.50 m above floor (measured to ceiling level in both cases), except in staircase areas, is so described stating the height in further 1.50 m stages M4 Curved work is so described with the radii stated measured on face	D1 The work is deemed internal unless otherwise described as external D2 The thickness stated is the thickness exclusive of keys, grooves and the like D3 Rounded internal and external angles >10 mm radius are classified as curved work where not measured under 15.1-3.1.0	C1 The work is deemed to include: (a) fair joints (b) working over and around obstructions (c) additional labour for overhand work (d) cutting (e) drainage holes (f) bedding mortars and adhesives (g) grouting (h) cleaning, sealing and polishing	S1 Kind, quality of materials S2 Size, shape and thickness of units S3 Nature of base S4 Preparatory work S5 Nature of finished surface including any sealing/polishing S6 Bedding or other method of fixing S7 Treatment of joints S8 Layout of joints

CLASSIFICATION TABLE

1 Walls	1 Plain width > 300 mm		m²	1 Patterned, details stated	D4 Beams and columns are classified as isolated where the work is different from the abutting ceilings or walls D5 Work to sides and soffits of attached beams and openings and to sides of attached columns is classed as work to the abutting walls or ceilings D6 Tiles are deemed to be laid with their long side vertical unless otherwise described	C2 Work to walls, ceilings, beams and columns is deemed to include internal and external angles and intersections ≤10 mm radius
2 Ceilings	1 Plain width ≤ 300 mm		m	2 Tiles with long side horizontal		
3 Isolated beams	3 Work with joints laid out to detail, width >300 mm	1 Dimensioned description	m²			
4 Isolated columns	4 Work with joints laid out to detail, width ≤300 mm		m			
5 Floors	1 Level or to falls only ≤15° from horizontal	1 Plain	m²	1 Patterned, details stated	D7 Floors include landings	C3 Work to floors is deemed to include intersections in sloping work
	2 To falls and crossfalls and to slopes ≤ 15° from horizontal	2 Work with joints laid out to detail, dimensioned diagram stated		2 Floors laid in bays, average size of bays stated		
	3 To slopes > 15° from horizontal			3 Inserts, size or section stated		

110

Figure 2: BESMM3 example page

All information is clear and easy to understand; however, unnecessary information, such as project particulars, site specifics, works description, general conditions, etc. are required; and

these should be included in the contract conditions/data/information – and not as an item in the bills of quantities. Therefore, an SMOM should not allow for this.

Items relating to building work, such as mortise concrete fillings, and suchlike are also included in this system, which should be excluded; as they do not apply to civil engineering work.

Essential items such as pipe-work and road earthworks, pre-stressed concrete, screening material for road filling, short pipes, etc. are not provided for in the system. These items should be added.

Overall, this is one of the easiest-to-read systems; because of the tabular format; and with the above-mentioned adjustments, it could be a good standard system for measuring civil-engineering works.

2.4.3 Standard Method of Measurement of Building Works in Zambia, drawn up by the Surveyor's Institute of Zambia *(MMBZ)*

The Surveyors' Institute of Zambia does not have a website with the relevant information regarding the institute. However, this system was drawn up with the permission of the institute. According to Simushi (2010), it was carried out for two main reasons, namely: to provide the students of building science, quantity surveying and construction in Zambia with an SMOM, and to provide a template in soft copy – to form the basis of planned future revision of methods of measurement.

This system is published in a book format, with a "General Rules" section in the beginning of the system. Each section has a "General to Section" part, which lists the general items applicable to the whole section. Because of the format, all the information is not always clear and easy to understand.

To show the book format, Figure 3 is a copy of a typical page.

SECTION D

EXCAVATION AND EARTHWORK

For General Rules See Section A

THE UNIT OF BILLING SHALL BE THE METRE

Generally to Section D

D1 (a) Any information available concerning the nature of the ground and strata shall be given. Particulars of any trial holes or trial bores on site shall be given stating their location. The water level in the ground and the date when it was measured shall be stated but, where this information is not available, it shall be ascertained before pumping operations are started on site. The water- level so established (by either method) shall be deemed to be the normal water-level in the ground throughout the course of the works notwithstanding any subsequent changes.

(b) Work in existing buildings shall be so described. Handling materials and getting them in or out of such buildings shall be deemed to be included with the items.

(c) For work in underpinning see section H hereof.

Site Preparation

Site preparation generally — D2 (a) Anti-termite treatment to sub-soil or filling shall be given in square metres.

(b) The removal of termites' nests shall be given as an item and the method of destruction of the termites shall be stated. Alternatively, this item may be given in the description of excavations.

Preserving vegetable soil — D3 Excavating vegetable soil which is to be preserved shall be given in square metres stating the average depth. Soil deposited on site in permanent soil heaps or spread on site shall be so described stating the location of such deposits or the average distances from the excavation in linear metres or kilometres.

Removing trees and hedges — D4 (a) Cutting down trees and grubbing up their roots shall be enumerated. Trees not exceeding 600 millimetres girth (measured at a height of 1 metre above ground) shall be grouped together and described as Small trees; those over 600 millimetres girth shall be classified and given in further stages of 300 millimetres.

10

Figure 3: MMBZ example page

Unnecessary information, such as the names of parties, a description of the site, a description of works, contingencies, etc. are required; and these should be included in the contract

conditions/data/information – and not just as an item in the bills of quantities. Therefore, an SMOM should make provision for this.

This is the only measurement system that makes allowance for items, such as excavations and foundation-trench excavations that are not measured as nett; but allowances for working space, and minimum trench widths are given to be included in measuring the applicable quantities. Contractors use different methods of construction, which could result in different trench widths, different battered excavation edges, etc. According to this system, the quantity surveyor needs to allow for additional material excavated to accommodate the construction method, which could be different from the actual excavation method. This could lead to endless negotiations on the final account quantities.

Items relating to building work, such as anti-termite treatment, concrete filling to hollow wall cavities, connecting flue pipes to stone chimneys, etc. are also included in this system, which should be excluded; since they do not apply to civil engineering work.

Essential trades should be added for work, such as road earthworks, pipe beddings, short pipes, roadworks, etc. Currently, these trades are not covered in this system.

Clear descriptions of precisely what work is covered in each item should be included in this system; as this is not always clear. Insufficient measuring rules are given; and these should be added and properly described.

Overall, this system is difficult to read due to the book format. Because this system is mostly used for building works with minor civil engineering works, not enough information is given for civil engineering works; and substantial adjustments would have to be made for this system to be a good standard system of measuring civil engineering works.

2.4.4 Standard Method of Measurement of Buildings and Associated Civil Works for Eastern Africa, drawn up by the Architectural Association of Kenya *(SMM2)*

This system and the previous system discussed under 2.4.3: Standard Method of Measurement of Building Works in Zambia, are very similar; and it is very clear that the root of these systems is the same.

The Architectural Association of Kenya was established in 1967; and it is a leading association for professionals in the built and natural environment in Kenya, incorporating Architects, Quantity Surveyors, Town Planners, Landscape Architects and Environmental Design Consultants and Construction Project Managers, according to the Architectural Association of Kenya, www.aak.or.ke (2014).

The second edition of the Standard Method of Measurement of Building and Associated Civil Works for Eastern Africa has introduced four new sections in the civil works, namely:

- External drainage
- Water reticulation
- Landscaping
- Road works

This system is published in a book format, with a “General Rules” section in the beginning of the system. Each section has a “General to Section” part, which lists the general items applicable to the whole particular section. Because of the format; all the information is not always clear and easy to understand.

Figure 4 shows a typical page format of this system.

SECTION D

EXCAVATION AND EARTHWORK

The Unit of Billing shall be the Metre

GENERALLY TO SECTION D

	D1	(a)	Any information available concerning the nature of the ground and strata shall be given. Attention shall be drawn to any open trial holes on site.
		(b)	Work in existing buildings shall be so described. Handling materials and getting them in or out of such buildings shall be deemed to be included with the items.

SITE PREPARATION

Site preparation	D2	(a)	Anti termite treatment to sub-soil or filling shall be given in square generally metres.
		(b)	The removal of termites nests shall be given as an item and the method of destruction of the termites shall be stated. Alternatively, this item may be given in the description of excavations.
Preserving vegetable soil	D3		Excavating vegetable soil which is to be preserved shall be given in square metres stating the average depth. Soil deposited on site in permanent spoil heaps or spread on site shall be so described stating the location of such deposits or the average distances from the excavation in linear metres or kilometres.
Removing trees and hedges	D4	(a)	Cutting down tress and grubbing up their roots shall be enumerated. Trees exceeding 600 millimetres girth (measured at a height of 1 metre above ground) shall be grouped together and described as small trees, those over 600 millimetres girth shall be classified and given in further stages of 300 millimetres, giving the type of tree and approximate height.
		(b)	Cutting down hedges and grubbing up their roots shall be given in linear metres stating the nature, type and height of each hedge or its location.
		(c)	Clearing site of bushes, scrub, undergrowth and the like and grubbing up their roots shall be given in square metres or hectares. Alternatively, this may be given as an item stating the approximate area. Cutting down trees not exceeding 600 millimetres girth within such areas and grubbing up their roots may be given in the description, but cutting down larger trees shall be dealt with in accordance with paragraph (a) of this clause.
		(d)	Grubbing uproots of stamps shall be enumerated starring girth of stump at top.
		(e)	Where trees have already been cut leaving tree stumps which are to be removed from site, grubbing up the tree stumps shall be enumerated stating the girth of the stump at the highest point of the stump.

EXCAVATION

Excavation generally	D5	(a)	The quantities given for excavating and subsequent disposal shall be deemed to be the bulk before excavating and no allowance shall be made for any sub sequent variations in bulk. No allowance shall be made for any extra space required to accommodate planking and strutting.
		(b)	Getting out excavated materials by any means necessary shall be deemed to be included with the items of excavation. Subsequent disposal of excavated material shall be given in accordance with Clause D15 hereof (except as otherwise provided in Clause D11)

9

Figure 4: SMM2 example page

Unnecessary information, such as the names of parties, description of the site, description of works, contingencies, etc. are required, which should be included in the contract conditions and not just as an item in the bills of quantities. Therefore, a SMOM should not allow for this.

Items relating to building work, such as anti-termite treatment, concrete filling to hollow wall cavities, connecting flue pipes to stone chimneys, etc. are also included in this system, which should be excluded; since it does not apply to civil engineering work.

Essential trades should be added for work, such as road earthworks, pipe beddings, short pipes, etc. Currently, these trades are not covered in this system.

Roadworks are included in this system; however, these are not to the required standard for an SMOM; and they would have to be adjusted accordingly.

Clear descriptions of precisely what work is covered in each item should be included in this system; as this is not always clear. Insufficient measuring rules are given; and these should be added and properly described.

Overall, this system is difficult to read due to the book format. This system is essentially for building works with adaptations for civil works; however, it does not give enough information to completely cover all civil engineering works; and substantial adjustments would have to be made, in order for this system to be a good standard system of measuring civil engineering works.

2.4.5 South African Bureau of Standards Standardized Specification for Civil Engineering Construction, drawn up by the South African Bureau of Standards *(SABS1200)*

The South African Bureau of Standards (SABS) (2014) states that it provides the platform for quality services and products, which are the key differentiators in an increasingly competitive environment. The SABS strategic objective contributes to the efficient functioning of the economy by developing standards to advance the socio-economic well-being of South Africa in the global economy.

SABS 1200 was developed by the SABS, as a standardized specification for the civil engineering construction profession. It is a combination of a specification document and a SMOM

document. It is published in a book format, with numerous cross-references in each clause, which makes it hard to read.

According to Watermeyer *et al*. (2012), no specifications for civil engineering works existed in South Africa prior to the publication of the SABS 1200. Each part of the SABS 1200 was drafted around the standard set of headings contained in SABS 0120-1, SABS 1200-A (General) or SABS 1200 AA (General (Small Works)). These parts establish the following general principles, which apply to all parts of the specification:

- "The rate or price tendered by the Contractor for a scheduled item shall be deemed to cover the Contractor's profit plus costs to him of all labour, materials, plant, equipment and facilities required by him to carry out the operations or activities stated in the relevant sub clause of Clause 8 of the applicable standardized specification, in addition to the cost to the Contractor for carrying out such ancillary and associated activities as the Contractor deems necessary for the completion of the Works, in accordance with the said specification, the conditions of the contract and the drawings."
- "The Contractor's charges for completing an item scheduled in the preliminary and general section of the schedule shall be interpreted to be his rate or price to cover his direct cost plus overheads, and to include his profit, and all costs and expenses that he requires for the item specified and for all general risks, liabilities and obligations set forth or implied in the documents on which the tender is based."
- "Except where otherwise specified in Clause 8.1 of a standard specification, or in the project specifications, or in the preamble, all items in the schedule shall be measured and shall cover the operations, as recommended in the standard system of measurement of civil engineering quantities for South Africa and South West Africa under the title Civil Engineering Quantities, as approved and recommended for general use by the South African Institution of Civil Engineers....."

Watermeyer *et al.* (2012) further maintain that the clauses on Measurement and Payment are divided into Principles and Scheduled Items. Scheduled items create standard text, which may be readily included in a schedule of quantities. What is covered in the rate or sum for a

scheduled item is specified in detail. Accordingly, any change to what is usually included in a scheduled item needs to be stated in the Project Specifications. This requires clause 8 (Measurement and Payment) to be read, together with the Project Specification.

Each section in this specification is divided into the following clauses:

1. Scope
2. Interpretations
3. Materials
4. Plant
5. Construction
6. Tolerances
7. Testing
8. Measurement and Payment

Clause 8 in each section can be seen as the SMOM system. Figure 5 shows the layout of a typical page, including Clause 8 items.

his preparedness to accept the cross-sections provided by the Engineer for the purpose of measurement and payment of cut and fill quantities and, in the event of such failure, no subsequent claim in this regard will be considered.

8.3 SCHEDULED ITEMS[a)]

8.3.1 Site Preparation (See also SABS 1200 C, if applicable.)

8.3.1.1 Clear and strip site ..... Unit: m²
The rate shall cover the cost of clearing and stripping from designated areas of surface soil to a depth not exceeding 150 mm as specified in 5.2.1.1(b).

8.3.1.2 Remove topsoil to nominal depth 150 mm (or other stated depth), stockpile and maintain ..... Unit: m²
The rate shall cover the cost of removing topsoil to a nominal depth of 150 mm (or other stated depth) from designated areas, stockpiling, and preventing dust nuisance, all as specified in 5.1.4.1 and 5.2.1.2.
Where removal to greater depths is ordered, the area measured for payment will, unless otherwise scheduled, be increased pro rata to the average increase in depth.

8.3.2 Bulk Excavation

a) Excavate in all materials and use for embankment or backfill or dispose, as ordered ..... Unit: m³
Separate items will be scheduled for each type of excavation or each structure and for each class (see Drawing D-1) or manner of disposal of excavated material.
The rate shall cover the cost of complying with all precautions required in terms of 5.1 in addition to the cost of excavation, basic selection, loading, transportation within freehaul distance, offloading, spreading or backfilling, watering, compacting, final grading, complying with the requirements for tolerances, providing for testing, and disposal of spoil, all in accordance with the requirements of the specification.

b) Extra-over for
1) intermediate excavation ..... Unit: m³
2) hard rock excavation ..... Unit: m³
3) boulder excavation, Class A ..... Unit: m³
4) boulder excavation, Class B ..... Unit: m³
The rate shall cover the additional cost of the operations enumerated in (a) above for any portion of the excavation that is classified as intermediate, hard rock, boulder Class A or boulder Class B, as applicable (see Drawing D-1).

8.3.3 Restricted Excavation (see Drawing D-2)

a) Excavate for restricted foundations, footings and pipe trenches in all materials and use for backfill or embankment or dispose ..... Unit: m³
Separate items will be scheduled for separate structures and, in the case of pipe trenches, to different depths in 1 m increments.
All restricted excavations will be measured by volume. The volume of short pipe trenches will be computed from the minimum base width of the trench (see SABS 1200 DB).
The rate shall cover the cost of complying with all the precautions required in terms of 5.1 in addition to the cost of excavating, selecting, and keeping selected material separate (where relevant), temporary stockpiling (unless, in exceptional circumstances, specifically authorized for separate payment), loading, transportation within freehaul distance, offloading, backfilling, watering, compacting, testing, and disposal of spoil and as more fully specified in 5.2.2.1-5.2.2.3 (inclusive) and 5.2.3.

b) Extra-over for
1) intermediate excavation ..... Unit: m³
2) hard rock excavation ..... Unit: m³
3) boulder excavation, Class A ..... Unit: m³
4) boulder excavation, Class B ..... Unit: m³
The rate shall cover the additional cost of complying with the requirements of (a) above for any portion of the excavated material that is classified as intermediate, hard rock, boulder Class A or boulder Class B, as applicable.

8.3.4 Importing of Materials

a) Extra-over for importation of materials from commercial sources or from borrow pits ..... Unit: m³
Importation from different sources will be scheduled separately for each designated source of supply and for each different area of use.
The rate for importing from commercial sources and borrow pits selected by the Contractor shall cover the cost, additional to 8.3.2 or 8.3.3, of royalties if applicable, and acquiring suitable material, including the applicable of forming access, removal of overburden, loading, transportation (see 5.2.5.1), offloading at point of placing, removal of access and replacing of overburden.

---

a)Until SABS 1200 DB, SABS 1200 DM, SABS 1200 ME and SABS 1200 MF are amended, those specifications should be amended in the project specification to align their overhaul measurement with that of this specification.

Figure 5: SABS1200 example page

A set of typical drawings is also provided after each clause 8, in order to give further explanations regarding the items in clause 8. Figure 6 show an example of a typical drawing.

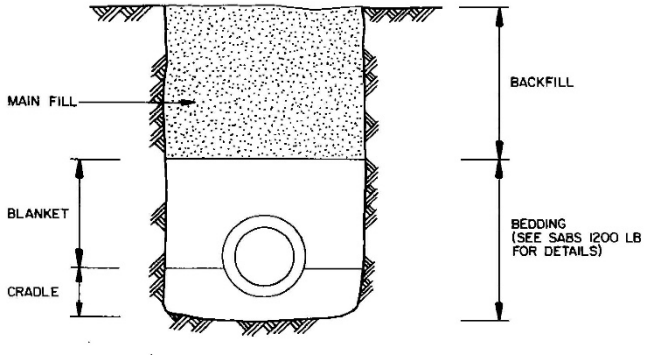


Figure 6: SABS1200 typical drawing example

SABS 1200 was developed around the design by Employer strategy; thus, the contractor undertakes only the construction on the basis of full designs issued by the Employer. Currently, there is much diversity in contract strategies, such as design by the Contractor contracts, Turnkey contracts, Target production contracts, etc. Therefore, a SMOM should not be bound to one type of contract; but it should be flexible enough to be used in all scenarios of contracts.

Because this document includes all the relevant specifications, it is comprehensive; and it includes provision for most possibilities under each item; however, contract specifications and a SMOM should not be combined. This could lead to ambiguities, and even confusion, because of all the clauses referring to each other. A SMOM document should be easy to read, and concise in terms of those items to be measured.

SABS 1200' general rules are not separate; but they are embedded in each section, which makes it very difficult to read. Measuring rules are also embedded in each item, which is not ideal; and they should rather be shown separately.

Items, such as nominated sub-contractors, cuttings, casings to steelwork, forming channels and chases, labour on pipes, etc. are not included in this system; and they should be provided for.

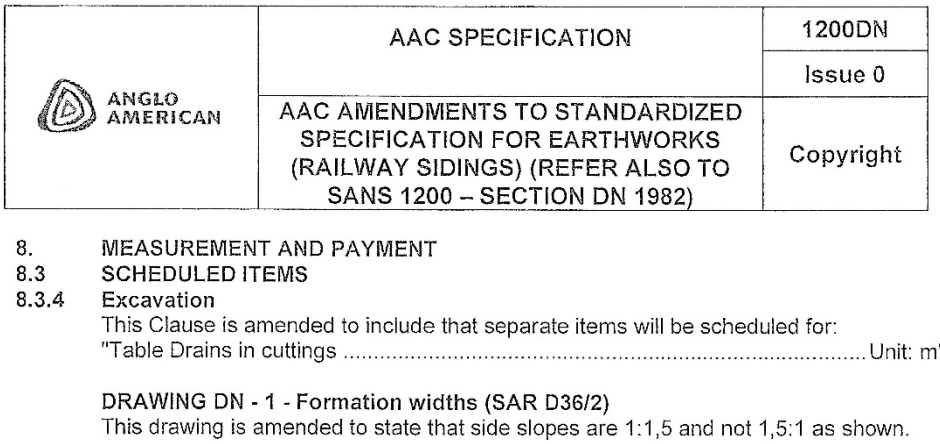
Overall, this specification/system is difficult to read – due to the clause format referring to each other; however, clause 8, measurement and payment, is written in a clear and easy-to-read manner, which leaves little room for confusion. This system is only for engineering works; and with some of the above-mentioned adjustments, it could be a good standard system for measuring civil engineering works.

2.4.6 SABS1200, including Anglo-American Amendments, drawn up by the South African Bureau of Standards and amendments by the Anglo-American Technical Solutions *(SABS1200AAC)*

Anglo-American Technical Solutions (AATS) (2014) focuses on delivering and implementing sustainable multidisciplinary techno-economic solutions across the e-value chain, such as research for improvement, asset optimization, technology research, and development programmes, etc.

To standardize the specifications and measurements on all Anglo-American mines; from 2004 to 2006, AATS amended the SABS 1200 specification to suit their specific requirements. Many clauses were improved; and, where necessary, more information was given in these amendments.

All these amendments are published in a memorandum type of format, which makes it clear and easy to read, as shown in Figure 7.



ANGLO AMERICAN	AAC SPECIFICATION	1200DN
		Issue 0
	AAC AMENDMENTS TO STANDARDIZED SPECIFICATION FOR EARTHWORKS (RAILWAY SIDINGS) (REFER ALSO TO SANS 1200 – SECTION DN 1982)	Copyright

8. MEASUREMENT AND PAYMENT
8.3 SCHEDULED ITEMS
8.3.4 Excavation
This Clause is amended to include that separate items will be scheduled for:
"Table Drains in cuttings .....Unit: m"

DRAWING DN - 1 - Formation widths (SAR D36/2)
This drawing is amended to state that side slopes are 1:1,5 and not 1,5:1 as shown.

Figure 7: SABS1200AAC example page

Overall, most changes were to the actual specification part of SABS1200; however, changes were made to clause 8, measurement and payment, such as changing the free-haul distance to 2km, changing increments of excavations, changing definitions of hard-rock excavations, changing items to 'extra-over' items, changing units of measurements, adding items, such as testing of dump rock, etc.

Because this is not a newly developed system, but mostly an improved SABS1200 system, the same comments made in 2.4.5, apply here.

2.4.7 Civil Engineering Standard Method of Measurement - Southern African Edition, drawn up by a joint division of the Institution of Civil Engineers and South African Institution of Civil Engineering *(CESMM3)*

The Institution of Civil Engineers (ICE) (2014) states that they are a centre of excellence for civil engineering knowledge; whilst the South African Institute of Civil Engineering (SAICE) (2014) states that they strive to be a learned society for all those associated with civil engineering. Thus, developing a civil engineering SMOM falls within their mission.

According to Watermeyer *et al*. (2012), CESMM3 is based on the philosophy that bills of quantities are no more than a price list for the permanent works. Items should be described in sufficient detail for it to be possible to distinguish between the different types of work and between work of the same nature carried out in different locations, or in any other circumstances, which could give rise to different pricing considerations. At the same time, all work that is required should be covered in the bills of quantities.

The Southern African version of CESMM3 (SA CESMM3) is a modified version of the third edition of the CESMM3 produced by ICE; and it reflects the specific practices and culture of the local industry, according to its writers. The principal differences between the third edition of CESMM3 and the Southern African edition are:

- No reference is made in SA CESMM3 to any standard form of contract as the terms and text are aligned with standard forms of contract commonly in use in the region.
- The terminology in SA CESMM3 is aligned with the provision of ISO 10845-2, *Construction procurement – Part 2: Formatting and compilation of procurement documentatio*n, and South African national standards or international standards.
- Adjustments have been made to items and terminology to reflect Southern African Practices.
- There is a requirement for the fabrication of structural metalwork items to be supported by separate bills of quantities developed, in accordance with another system of measurement.

Becker (2014) states in the home page of the Joint Division of the Institute of Civil Engineers and the South African Institute of Civil Engineering that this system's terminology is also aligned with the provisions of the Construction Industry Development Board's (CIDB's) Standard for Uniformity in Construction Procurement and the South African national standards or international standards.

According to the foreword in this system, the logical approach to dealing with civil engineering quantities in the current changed environment is to have one stand-alone document that deals with the standard system of measurement for civil engineering works. This system must be sufficiently flexible to be used with any of the standard forms of contract that are included in the CIDB's Standard for Uniformity in Construction Procurement, and the range of standard specifications that are currently in use in South Africa.

Ideally, such a document should be compatible with international practice. CESMM3 is a logical choice; as it is a document founded on the same thinking and philosophy, as the system that has evolved in South Africa. It is widely used in Africa; and it is well-understood by the international community. It is a well-tried and tested document that is adequately supported by a range of comprehensive handbooks and texts.

However, because this system is so geared towards South Africa's terminology and standard specifications, such as "Department of Transport", "SANS 1024 and other specifications", contrary to the foreword; it cannot easily be applied to southern Africa; and therefore, also not to the whole of Africa. Country-specific terminologies should rather be included in the project specification/works information/scope of work/project data for each specific project, and not in a standard system applied to a range of countries and standard contract conditions.

This system is published in a tabular format over two pages wide, with sections for "Definitions", "General Principles", "Application of the Work Classification", "Coding and Numbering of Items", "Preparation of the Bill of Quantities", "Completion, Pricing and use of the Bill of Quantities" and "Method-related Charges" sections in the beginning of the system.

All "Work Classification" sections are given under the following headings:

- First division
- Second division
- Third division
- Measurement rules
- Definition rules
- Coverage rules
- Additional description rules

Figures 8 and 9 show the typical page outlay of this system, with Figure 8 as the left page and Figure 9 the right page. Thus, each item is read over the width of two pages; and therefore, the reader must make sure that all the rules are covered in each item.

Class F: In Situ Concrete

FIRST DIVISION	SECOND DIVISION	THIRD DIVISION
Placing of concrete **5** Mass m^3 **6** Reinforced m^3 **7** Prestressed m^3	**1** Blinding **2** Bases, footings, pile caps and ground slabs **3** Suspended slabs **4** Walls	**1** Thickness: not exceeding 150 mm **2** 150-300 mm **3** 300-500 mm **4** exceeding 500 mm
	5 Columns and piers **6** Beams **7** Casing to metal sections	**1** Cross-sectional area: not exceeding 0.03 m^2 **2** 0.03-0.1 m^2 **3** 0.1-0.25 m^2 **4** 0.25-1 m^2 **5** exceeding 1 m^2 **6** Special beam sections
	8 Other concrete forms	

Figure 8: CESMM3 example left-hand page

Class F: In Situ Concrete

See rule at head of class on Sheet F1

MEASUREMENT RULES	DEFINITION RULES	COVERAGE RULES	ADDITIONAL DESCRIPTION RULES
M3 *Columns and piers* integral with a wall shall be measured as part of the wall, except where expressly required to be cast separately. **M4** *Beams* integral with a slab shall be measured as part of the slab, except where expressly required to be cast separately.	**D4** Prestressed concrete which is also reinforced shall be classed as *prestressed concrete* . **D5** The thickness used for classification of *blinding* shall be the minimum thickness. **D6** The thickness used for classification of *ground slabs*, *suspended slabs* and *walls* shall exclude the additional thickness of integral beams, columns, piers and other projections. **D7** Concrete in *suspended slabs* and *walls* less than 1 m wide or long shall be classed as concrete in *beams* and *columns* respectively. **D8** Beams shall be classed as *special beam sections* where their cross-section profiles are rectangular or approximately rectangular over less than 4/5 of their length or where they are of box or other composite section.		**A2** Item descriptions for *placing of concrete* which is expressly required to be placed against an excavated surface (other than blinding) shall so state. **A3** The cross-sectional dimensions of *special beam sections* shall be stated in item descriptions, except where a beam type or mark number is stated for which dimensions are given on the Drawings. **A4** Item descriptions for components classed as *other concrete forms* shall identify the component and include one of the following: (a) the principal dimensions of the concrete component (b) a type or mark number of a concrete component for which principal dimensions are given on the Drawings (c) a statement locating a concrete component for which principal dimensions are given on the Drawings.

NOTE:
In accordance with paragraph 5.11 the location of concrete members in the Works may be stated in item descriptions for *placing of concrete* where special characteristics may affect the method and rate of placing concrete

Figure 9: CESMM3 example right-hand page

Items, such as clearing hedges or fences, working space, casings to steelwork, casting in of rails, guardrails, short-pipe runs, labour on pipes, etc. are not included in this system; and they should be provided for.

Overall, this system should be easy to read; because it is in a tabular format; however, sometimes too much information is given in random order in the different rules columns, making it excessively complex; and the reader might find it confusing and hard to fully understand the intent of each rule.

Simplification of measurement rules by giving clear concise descriptions of the exact work to be covered in each item and under each rule should be done, in order to avert any misunderstanding and confusion. Only important factors that influence the price, such as method of construction, or local estimating conventions, should be included.

This system is only for engineering works, and with the above-mentioned adjustments, it could be a good standard system for measuring civil engineering works.

2.5 SUMMARY

All six systems used as reference in this study have been used by the construction industry for a number of years in different African countries. Each system has pros and cons and certain restrictions, as stated previously, which will be used in developing a fully integrated and comprehensive standard civil engineering measurement system for Africa in this study.

CHAPTER 3

DESIGN, MODELS AND METHODS OF THE RESEARCH

3.1 INTRODUCTION

The main objective of this chapter is to explain the rationale for the theory, model, methods and design employed for the research; and these will therefore be explained under the following headings:

- Theories used in study;
- Models and methods used in study;
- Instruments of measurement;
- Data-collection procedures;
- Data-capturing and data-editing;
- Data analysis;
- Shortcomings and sources of error.

3.2 THEORIES USED IN THIS STUDY

The theory of this study is according to The Free Dictionary (2014) definition of theory: “a system of rules, procedures and assumptions used to produce a result, using abstract knowledge or reasoning”.

Two types of data were collected, namely: quantitative data from six existing SMOMSs, which are combined in a list (Annexure A) for comparative reasons, and qualitative data from a questionnaire (Annexure B) distributed to active professionals, who are currently using the SMOM systems in the industry.

By applying years of abstract knowledge and reason, the quantitative data were analyzed, in a systematic process to ascertain which items, and in what details, would need to be included in the new concise CESMMSA provided with this study.

3.3 MODELS AND METHODS USED IN THIS STUDY

In this study, no earlier model was used as the basis of the study; because the object of this study differs from all previously studied objects. According to Routio (2007), exploratory research means that hardly anything is known about the matter at the outset of the project; and that one has to begin with a rather vague impression of what you should study; and this is also impossible; since it is difficult to make a detailed work-plan in advance.

The above-stated definition is not totally applicable to this study; as the existing measurement systems were available at inception; however, only two of them were well-known to the researcher at the beginning of the study. Gradually accumulating intelligence on the different systems during the study meant that it was difficult to define the whole model at the start of the study; however, during the exploratory research, provisional concepts then gradually began to gain precision.

In the beginning of the study, a holistic look at the systems was taken; and during the study, as much information on the systems as possible was gained.

Each object (in this study each item in the different systems) was looked at from different viewpoints: either from the angles of various established sciences, or just from miscellaneous practical points-of-view, according to Routio (2007). For this study, the items were firstly viewed from the researcher's point of view; and then they were assessed from other professionals' perspectives.

All the point of views were based on the individuals' instincts, drives and experiences. This is called the "method of alternating point of view" according to Routio (2007); and they are illustrated in Figure 10:

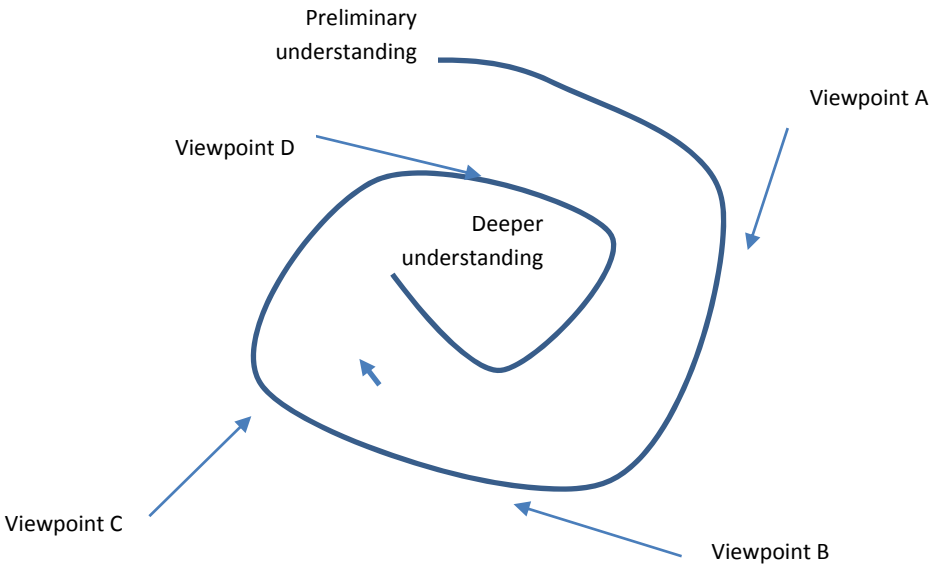


Figure 10: Method of alternating point of view (Routio, 2007)

To combine the two types of data collected and analyzed from the existing SMOMs and from the questionnaires, the triangulation mixed-method, according to the Laerd Dissertation (2014), was used in this study:

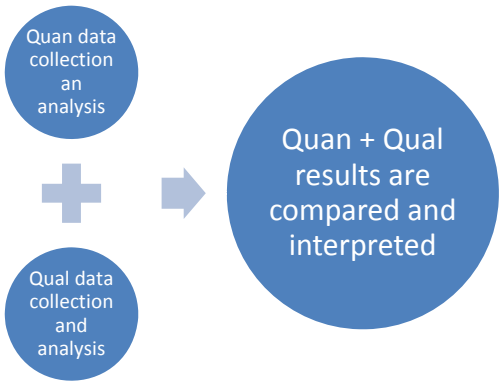


Figure 11: Triangulation mixed-methods design (Laerd Dissertation, 2014)

Creswell *et al.* (2003) state that this method is most suitable, when a researcher wants to collect both types of data at the same time about a single phenomenon, in order to compare and contrast the different findings, and to produce well-validated conclusions. In this study, the qualitative data was collected by devising a questionnaire sent out to different

professionals currently using different SMOMSs in Africa; and the researcher would have the job of trying to make sense of the multiple interpretations of the data. Quantitative data were collected from six different SMOMSs currently being used in Africa; and they were then analyzed, in order to ultimately produce a new proposed CESMMSA.

3.4 INSTRUMENTS OF MEASUREMENT

3.4.1 CESMMSA drafting design

The general goal of this study was to develop a fully integrated and comprehensive CESMMSA for the following trades:

- Preliminary and General;
- Site Clearance;
- Earthworks;
- Concrete Works;
- Steelworks;
- Long-Length Pipe-works; and
- Roadworks.

The data were collected from six existing different SMOMSs used in Africa, and from a distributed questionnaire.

Both the datasets were separately summarised, and then analyzed, to ascertain the overall look of the system, whether such a system was necessary, which items had to be included in the system, etc.

Once the analysis of the data had been completed, a CESMMSA was drawn up. This suggested system was tested by other quantity surveyors and Engineers. All comments from the testing were incorporated into the final draft of the system provided in this study.

3.4.1.1 Advantages of CESMMSA drafting design

The main advantage of the drafting design is that the majority of items for the CESMMSA were generated from existing proven SMOMSs used in the construction industry for a substantial number of years. A further advantage is that expert professional experience was also utilized by getting three professional quantity surveyors and one engineer's opinions, as well as any helpful comments during the drafting process of the CESMMSA.

3.4.1.2 Disadvantages of CESMMSA drafting design

One major limitation of the drafting design of a CESMMSA is that the initial sifting and scrutinizing of all the possible items in all the chosen SMOMSs was done only by the researcher. A further limitation is that not all the trades were covered in the CESMMSA drafted in this study; and this resulted in the drafted CESMMSA not being fully tested in the industry.

3.4.1.3 Selection of existing SMOM systems used for study

As previously stated, the decision was made to investigate only those CESMMSs currently being used in Africa. Based on the recommendation of members of the AAQS, the following four systems were used for this study:

- BESMM3
- MMBZ
- SMM2
- SABS1200.

The following two systems were added to the list; because they are currently being used in South Africa:

- SABS1200AAC

- CESMM3.

3.4.2 Online survey

To investigate the opinions of quantity surveyors regarding creating a CESMMSA, an online survey was undertaken. The research questionnaire was developed by the researcher.

Four types of questions, based on the level of measurement, were used in the questionnaire, namely: nominal questions; ordinal questions; interval questions; and cumulative or Guttman-scale questions defined, according to the Social Research Methods (2015). Dichotomous questions were also asked, which only required a "yes" or "no", or a "male" or "female" type of response.

The questionnaire started with a statement about the focus and aims of the research study, and how the data would be used. Also, that confidentiality would be maintained; and, if so required by the participants, the questionnaire could be completed anonymously. The ASAQS offered their members a half-an-hour Continuous Professional Development (CPD) Category 2, to complete the questionnaire; and for this reason, ASAQS members did provide their full details to the researcher. Sufficient time to answer the questions was also provided.

The questionnaire was distributed to quantity surveyors via emails sent out by the ASAQS and RICS. The questionnaire sought to highlight the following information:

- Background information;
- Level of knowledge of existing SMOM systems;
- Expectation of SMOM systems; and
- Possible solutions to improve current projects in Africa.

The survey was distributed in a pdf format; and the recipient could only fill in those fields required under each item. Completed questionnaires were then emailed to the researcher.

A copy of the online survey is included in Appendix B.

3.4.2.1 Advantages of online surveys

The researcher decided to use an online survey, due to the following advantages:

- It is easier for people to understand any routing to the next questions
- It can be easily accessed and distributed;
- There are no postage or printing costs;
- The method is user-friendly;
- Potential participants can be reached over longer distances;
- The responses are in electronic format, instead of handwriting.

3.4.2.2 Disadvantages of online surveys

The disadvantages of using an online survey are:

- People easily ignore the request;
- A low percentage of responses might be experienced;
- The participants might have misgivings regarding the anonymity of the survey;
- One can obtain multiple responses from one respondent.

To overcome the low response rate, the surveys were emailed via ASAQS and RICS to all of their African members. The statement sent with the survey clearly addressed the issue of anonymity; and because the recipients emailed their responses directly to the researcher, multiple responses were picked up; and they could be disregarded.

3.5 DATA-COLLECTION PROCEDURES

3.5.1 Data-collection procedure for the CESMMSA drafting design

This study was based on firstly collecting the data from six different SMOMSs, currently being used in Africa in a Microsoft Excel spreadsheet, included as Appendix A. All items and rules in the different trades included in this study were listed in a chronological way, keeping similar items grouped together. Each system's name was abbreviated as follows:

- **BESMM3:** Nigerian Institute of Quantity Surveyors – 2008: Building and Engineering Standard Method of Measurement
- **SMM2:** Surveyor's Institute of Zambia – 2010: Standard Method of Measurement of Building Works in Zambia
- **MMBZ:** Architectural Association of Kenya, Quantity Surveyors Chapter – 2008: Standard Method of Measurement of Building and Associated Civil Works for Eastern Africa
- **SABS1200:** South African Bureau of Standards – 1986: South African Bureau of Standards Standardized Specification for Civil Engineering Construction
- **SABS1200AAC:** South African Bureau of Standards and Anglo-American – 2004: South African Bureau of Standards Standardized Specification for Civil Engineering Construction with Anglo-American Amendments
- **CESMM3:** Joint Division of the Institute of Civil Engineers and South African Institute of Civil Engineering – 2011: Civil Engineering Standard Method of Measurement – Southern African Edition.

Each system was colour-coded in the spreadsheet, as follows, to make overall reading easier and the same sequence was used throughout the listing of the data:

- BESMM3
- SMM2
- MMBZ
- SABS1200
- SABS1200AAC
- CESMM3

The trades were kept separately in different spreadsheets, to make analyzing of the data easier, as follows:

- General Rules;
- Preliminaries and General;
- Site Clearance;
- Earthworks;
- Pipe Earthworks;
- Road Earthworks;
- Concrete;
- Formwork;
- Reinforcement;
- Worked Finishes;
- Accessories;
- Joints;
- Pre-cast Concrete;
- Pre-stressed Concrete;
- Steelwork;
- Roadwork;
- Pipework.

In each trade spreadsheet, the general rules of each system were listed at the top; because these rules apply to the whole trade. Figure 12 gives an example of the general rule section.

	WORKED FINISHES	
GENERAL RULES	BESMM3	Information shown either on location drawings under Preliminaries/General conditions Curved work is so described
	MMBZ	Hacking faces of concrete to provide key shall be deemed to be included with the items of finishings. Hacking by special mechanical means shall be so described
	SABS1200	Where a special smooth finish is specified and scheduled such that it requires more extensive operations to be carried out after striking than are specified for smooth, payment will become due when the finish has been achieved as specified Where a special finish is specified and scheduled, payment will become due when the finish has been achieved as specified
	SABS1200AAC	Where a special smooth finish is specified and scheduled such that it requires more extensive operations to be carried out after striking than are specified for smooth, payment will become due when the finish has been achieved as specified Where a special finish is specified and scheduled, payment will become due when the finish has been achieved as specified

Figure 12: Rules of trade, an example

Each sub-section under each trade, such as “Fabric” was listed, together with each system’s applicable items grouped together, always in the same system-order and colour-order, as stated above. Figure 13 gives an example of a sub-section.

FABRIC	BESMM3	Fabric	1	Mesh reference and weight per m2 stated		m2	Bent Strips in one width, width stated	Area measured for fabric excludes laps Voids ≤ 1m2 in area are not deducted	Minimum laps	Fabric reinforcement is deemed to include hooks and tying wire, all cutting and bending and spacers and chairs which are at the discretion of contractor Bent fabric reinforcement is deemed to include that wrapped around steel members
	SMM2	Fabric reinforcement	F17.a, b	Fabric reinforcement	Stating the mesh, the weight per m2 and minimum extent of side and end laps	m2	Bends, tying wire and distance blocks shall be given in description	Measured to area covered but no allowance made for laps and no deduction shall be made for voids not exceeding 1m2	Self-centering fabric reinforcement shall be so described Temporary strutting shall be given in description when over 3.5m high, stating height in further stages of 1.5m	
			F17.c	Strips required to be in one width	Stating width, the mesh, the weight per 1m2 and minimum extent of end laps	m	In foundations under walls, tension strips to floors and roofs			
	MMBZ	Fabric reinforcement	F17.a, b	Fabric reinforcement	Stating the mesh, the weight per m2 and minimum extent of side and end laps	m2	Bends, tying wire and distance blocks shall be given in description	Measured to area covered but no allowance made for laps and no deduction shall be made for voids not exceeding 1m2	Self-centering fabric reinforcement shall be so described Temporary strutting shall be given in description and where over 3.5m high shall be so described stating height in further stages of 1.5m	
			F17.c	Strips required to be in one width	Stating width, the mesh, the weight per 1m2 and minimum extent of end laps	m	In foundations under walls, tension strips to floors and roofs	Self-centering fabric reinforcement shall be so described		
	SABS1200	Mesh	8.3.2	High-tensile welded mesh	Type reference will be stated	m2				
	SABS1200AAC	Mesh	8.3.2	High-tensile welded mesh	Type reference will be stated	m2				

Figure 13: Grouped items: an example

All the different rules included in each item in each system were also included in the spreadsheet – under the relevant item. In this way, decisions on which rules are important for inclusion in the proposed CESMMSA for each item, were less complicated.

3.5.2 Data-collection procedures for the online survey

The data were collected from a pdf format questionnaire, in which only the fields to be completed by the participants could be accessed.

RICS and the ASAQS acceded to the request to distribute the questionnaire to their African members. It is not clear to how many members it was distributed; as the two institutes did not want to reveal their membership numbers.

As previously mentioned, the e-mail was accompanied by a statement on the focus and aims of the research study, and how the data would be used. Also, confidentiality will be

maintained; and the participants could fill in the questionnaire anonymously, if they chose to do so.

RICS distributed the questionnaire to their members during November 2014; and 54 responses were received. ASAQS distributed the questionnaire to their members in March 2015; and 198 responses were received. Eight responses were not eligible for use in the study; as the participants had left out sections of the questionnaire. A total of 244 responses were used for this research.

3.6 DATA-CAPTURING AND DATA-EDITING

3.6.1 Data-capturing and data-editing for the CESMMSA drafting design

The researcher captured all the data from the existing SMOM systems in a Microsoft Excel, as previously described. Extreme care was taken to make sure that all the data from the different systems was captured fully in the spreadsheets. This was re-checked by the researcher.

3.6.2 Data-capturing and data-editing for the online survey

The researcher captured all the received pdf questionnaires' data in a Microsoft Excel spreadsheet. Extreme care was taken during this process; as finger errors are common in the capturing of data. During this process, double submission by the same participant, was picked up and rectified. Also, 8 responses were incomplete; and they were omitted from the data-analytical process.

From the spreadsheet, graphs in the form of bar charts were generated and incorporated into the study for further analysis.

3.7 DATA ANALYSIS

3.7.1 Data analysis for CESMMSA drafting design

Once all the data from the existing systems had been captured, each item under each trade was analysed by the researcher; and the best possible items including all the relevant information, while keeping the items concise and without any unnecessary information, was chosen to be included in the suggested CESMMSA. Frequently, a combination of more than one system's item was decided upon, or new items were created, and included in the CESMMSA. Decisions were based on the researcher's experience and knowledge of the civil engineering construction industry – as well as on the different projects completed.

After meticulously going through this process for each item, a first draft of the CESMMSA was drawn up. The chosen layout of the first draft was in an easier-to-read tabular format, similar to the new Standard System of Measuring Building Work 2013, Sixth Edition (Second revision) drawn up by the ASAQS. The decision to use this layout was based on the fact that this system was accepted by the AAQS, thus making it acceptable in the whole of Africa. Figure 14 depicts the chosen layout.

	Item or work to be measured	Unit	Measurement rules	Coverage rules	Additional rules
GENERAL					
1	Classification				
			1 Fixed-charge: a charge for work that is executed without reference to time 2 Method-related charge: sum for item inserted by the Contractor to cover item of work relating to his intended method of executing the works 3 Time-related charge: a charge for work the cost of which is varied in proportion to the length of time taken to the execute particular item 4 Value-related charge: a charge directly proportional to the value of the contract		

Figure 14: CESMMSA chosen layout

Following the triangulation mixed-method previously discussed, the researcher analysed the bar chart information applicable to the drafting of the CESMMSA generated from the online survey; and applicable changes were made to the first draft of the system; and a second draft was created.

This second draft was then circulated to the following professionals:

- Five Professional Quantity Surveyors;
- Three Professional Engineers.

The decision to ask the above-mentioned number of professionals was based on using purposive sampling. Purposive sampling means judgmental, selective or subjective sampling: in other words, sampling based on the judgement of the researcher, according to the Laerd Dissertation (2015). Also by using these professionals stakeholder requirements and attention to pricing are taken into consideration.

Comments were received from three quantity surveyors and one engineer, which were accumulated and analyzed to assess which changes needed to be made to the second draft of the suggested system. One of the respondents is also a Contractor and his comments helped to add changes to fulfill the Contractor's needs.

A third and final draft of the suggested CESMMSA was developed and printed and included in this study as Appendix C.

3.7.2 Data analysis for the online survey

As previously stated the data were captured in Microsoft Excel and bar charts were generated from this information to give theoretical meaning to the results, according to Neuman (2014).

3.8 SHORTCOMINGS AND SOURCES OF ERROR

3.8.1 Shortcomings and sources of error for CESMMSA drafting design

As stated before, original item decisions were dependent on the researcher's expert opinion only. Later in the process, three professional quantity surveyors and one engineer gave their professional input, in order to get the best possible items in the CESMMSA. More opinions would have been better, but because this is such a time-consuming process to go through all the trades, only these four respondents were willing to participate.

Also as stated before, not all trades are covered by this study. To complete the CESMMSA, all outstanding trades would have to be surveyed, in order to produce a complete CESMMSA that the profession could firstly test, and then subsequently use.

3.8.2 Shortcomings and sources of error for the online survey

Not all RICS and ASAQS members are professional quantity surveyors; and there is a possibility that some respondents could well be from other professions, or not professionally registered.

Furthermore, the participants might misinterpret the questions; since the survey was in the form of an online survey, and not a one-on-one interview. To minimize any misinterpretation, the questions were simplified as much as possible; and they were verified by two other professional quantity surveyors for comments – prior to the distribution.

3.9 SUMMARY

To give an overview of the total methodology employed, the process flow is illustrated in Figure 15.

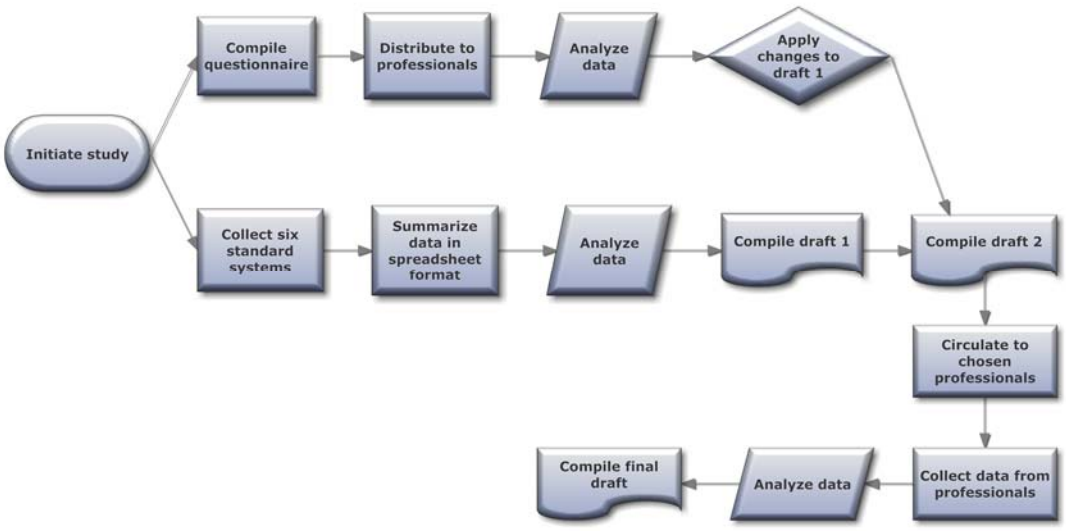


Figure 15: Process flow of research methodology/design

In this chapter, the design, models and methods of the research were discussed and explained. The advantages and the disadvantages of the CESMMSA drafting design and the survey were given. In the next chapter, the results are presented and discussed.

CHAPTER 4

PRESENTATION AND DISCUSSION OF THE RESULTS

4.1 INTRODUCTION

In this chapter, the results of the CESMMSA drafting and the survey will be presented and discussed, with reference to the research questions, the research hypotheses and the literature review.

4.2 CESMMSA DRAFTING RESULTS

4.2.1 The data from six different SMOM systems currently being used in Africa:

As stated before in Chapter 3, the data of all six different SMOMSs were summarised in one Microsoft Excel spreadsheet (Annexure A). This summary of all the items helped with the understanding of what a CESMMS is. All items, including all rules, are listed in a CESMMS; and therefore, the quantity surveyor should clearly see what items need to measured; and what should be included in the rate of each item. This helped in answering the first part of the first research question, namely: “What is a CESMMS?”

The second part of the first research question, namely: “Where do CESMMSs come from?”, was answered in Chapter 2, the Literature Survey.

To fulfill the second purpose of this study, namely: “The study will create a comprehensive, fully integrated CESMMSA” was accomplished by firstly studying six existing CESMMSs with the following results.

Overall, 742 main items, not taking the number of sub-items into consideration, were listed in the summary, as previously explained. In Figure 16, the breakdown of the items, according to CESMMS is depicted.

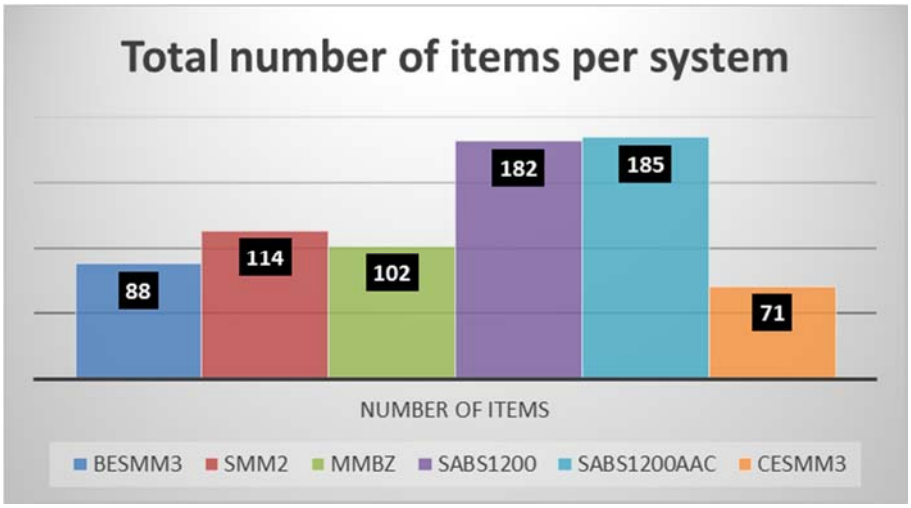


Figure 16: Total number of items per system

SABS1200 and SABS1200AC had the most number of items; whilst CESMM3 had the lowest number. However, it needs to be stated that CESMM3 only has 71 main items; but, the number of sub-items far exceeded all those of the other systems.

Each trade was firstly scrutinised to assess which system did not cover certain important items. To help with this, each trades' items were summarized under the main sections. The results of each trade will be discussed separately.

Preliminaries and General

Under the Preliminaries and General, unnecessary items for party details, document information, site information, works information and public bodies were included in BESMM3, SMM2 and MMBZ. These items should not be in a SMOMS; but they should be covered in the contract document itself. Contractually obligated items, items to be provided by the Contractor for himself and the Employer, items for temporary works, items for prime cost items, provisional items and other items were provided by all the six CESMMSs. These items should be in a CESMMSA.

Figure 17 shows the number of items for a CESMMS per section.

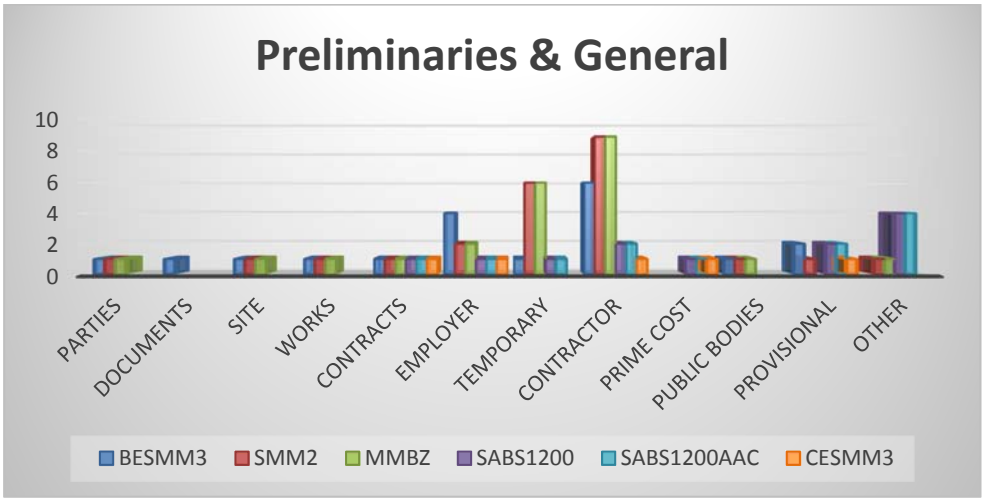


Figure 17: Preliminaries & General

Site Clearance

Only SABS1200 and SABS1200AAC provided items for re-clearing, fences and transport; whilst SABS1200, SABS1200AAC and CESMM3 provided items for clearing of pipelines. All six CESMMSs allowed for items under clearance, trees and building sections. All sections, as shown in Figure 18, are important enough to be included in a CESMMSA.

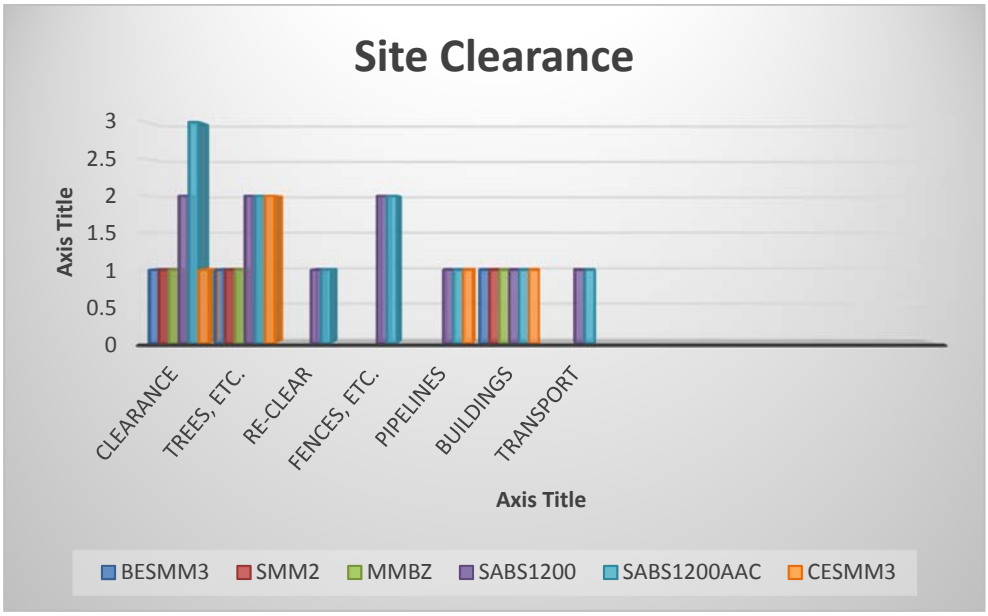


Figure 18: Site clearance

Earthworks

SMM2 and MMBZ provided for items for break-up, surface preparation and water disposal sections; whilst BESMM3 and CESMM3 provided for dredging items. BESMM3 and CESMM3 did not provide items for the preserving and existing services sections. SABS1200 and SABS1200AAC did not provide items for the cutting section. Items for working space were only provided for by SABS1200 and SABS1200AAC; whilst the same two systems and CESMM3 provided for overhaul items. BESMM3 did not provide for items in the section for lateral support. The rest of the sections: excavations, filling and landscaping were provided for by all six CESMMSs.

All sections, as shown in Figure 19, should be covered by a CESMMA.

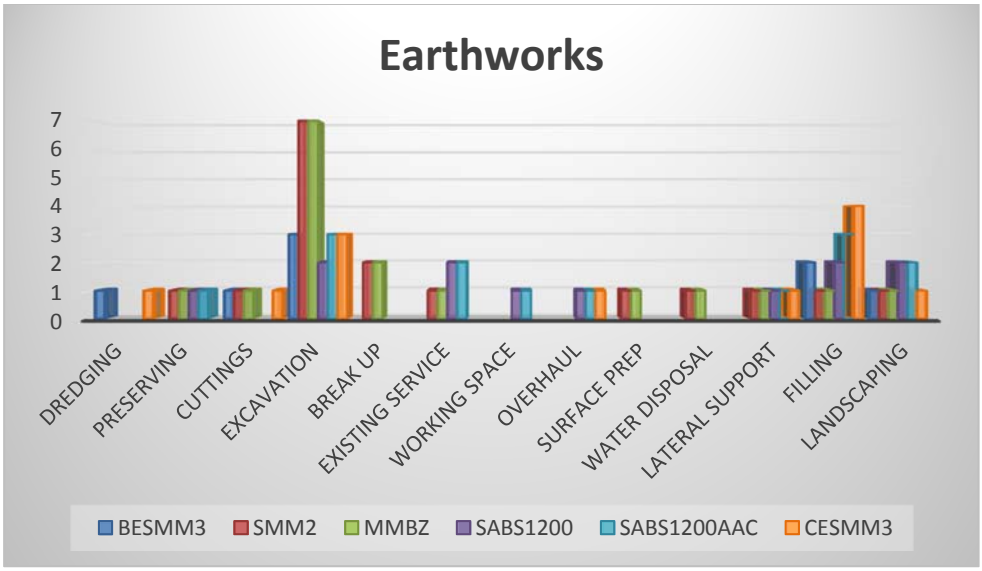


Figure 19: Earthworks

Road Earthworks

SABS1200 and SABS1200AAC provided for items under the preparation section; and only the same two systems plus CESMM3 provided for items under treatment and roads sections. The rest of the CESMMSs did not provide for any road earthworks items. All three sections indicated in Figure 20, should be provided for in a CESMMA.

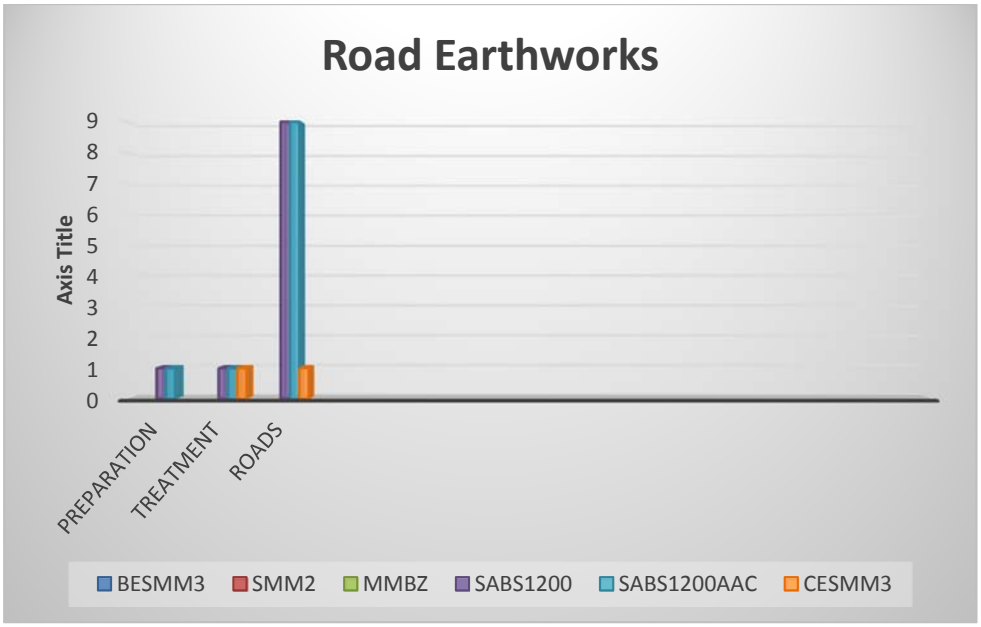


Figure 20: Road earthworks

Pipe Earthworks

BESMM3 did not provide for any sections under this trade. SABS1200 and SABS1200AAC provided for all the sections under this trade; whilst CESMM3 included for trenches, ancillaries, services and beddings sections only. Both SMM2 and MMBZ provided only for items under trenches section. All the sections, as shown in Figure 21, should be included in a CESMMSA.

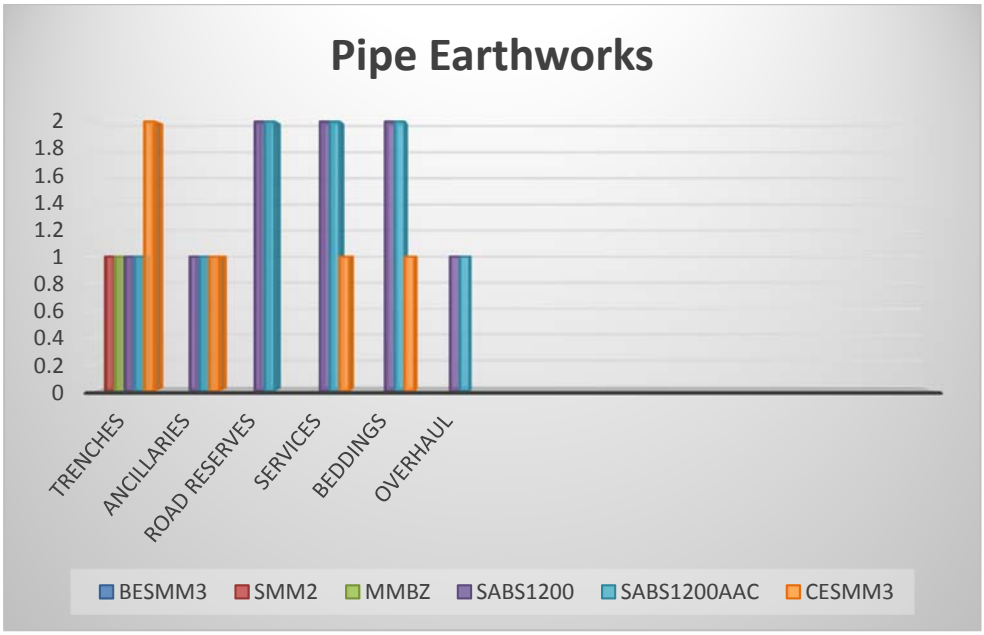


Figure 21: Pipe earthworks

Concrete

All six CESMMSs provided items for the concrete section. SABS1200 and SABS1200AAC included for items in aggregate section; whilst BESMM3 allowed items under extra and sprayed concrete sections. Extra and sprayed concrete sections are for building works; and they should not be included in a CESMMSA. SMM2 and MMBZ allowed for items in casings section, which should be in a CESMMSA; however, they did not allow for the grouting section, which is fundamentally important in a CESMMSA.

All sections, except for extra and sprayed concrete, as shown in Figure 22, should be included in a CESMMSA.

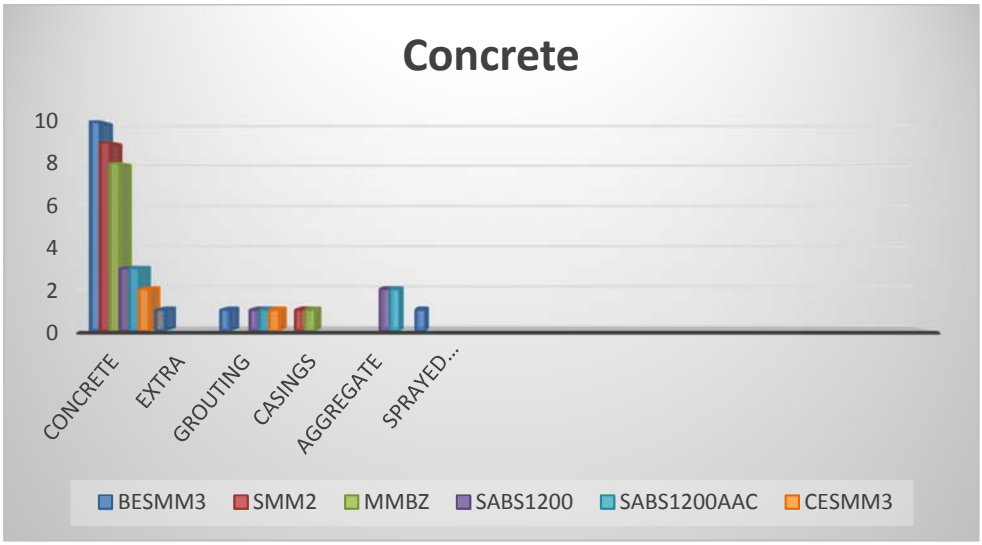


Figure 22: Concrete

Formworks

Only BESMM3 allowed for items for formed finishes, openings and other sections; whilst SMM2 and MMBZ are the only systems allowing for items in the labour section. Some of these sections are necessary in a CESMMSA. All three systems BESMM3, SSM2 and MMBZ allowed for a mortise section; however, this is a building work section and should not form part of a CESMMSA. CESMM3 only allowed items under the formwork section with all the

other five CESMMSs. Narrow widths and holes sections were supplied by all the systems except CESMM3.

All sections shown in Figure 23, except the mortise section, should be covered in a CESMMSA.

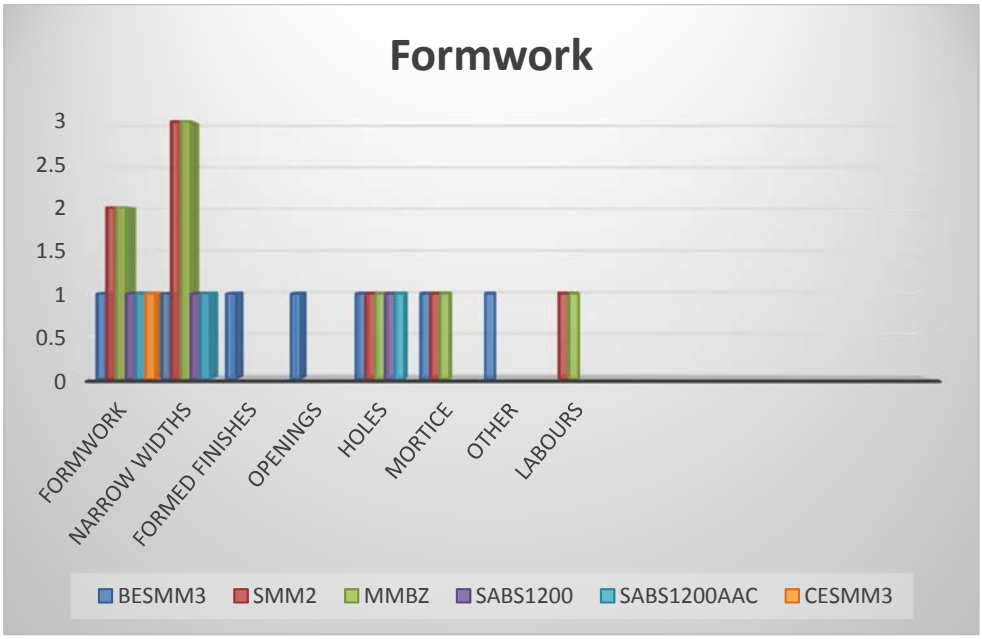


Figure 23: Formwork

Reinforcement and Accessories

All six CESMMSs provided items under the bars section; whilst BESMM3 was the only system to provide items under other and tensioned sections. The fabric section was provided by all systems except CESMM3. Only SMM2 and MMBZ provided for the labour section. Important sections, such as rails, covered by SABS1200 and SABS1200AAC, and bolts, covered by all systems, except MMBZ and CESMM3, need to be in a CESMMSA.

All the sections shown in Figure 24 are important enough to be included in a CESMMSA.

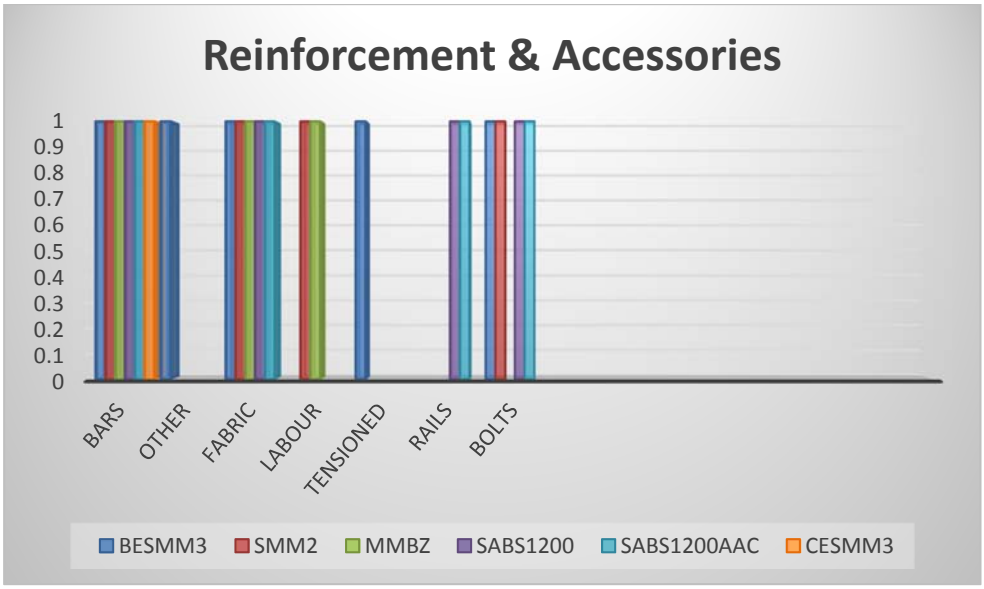


Figure 24: Reinforcement & Accessories

Worked Finishes and Joints

Surfaces and joints sections were covered by all six CESMMSs. SMM2 and MMBZ provided sections for cutting, labour and cast onto sections, of which only the labour section should be included in a CESMMSA. Only sections for surfaces, labour and joints, as shown in Figure 25, should be included in a CESMMSA.

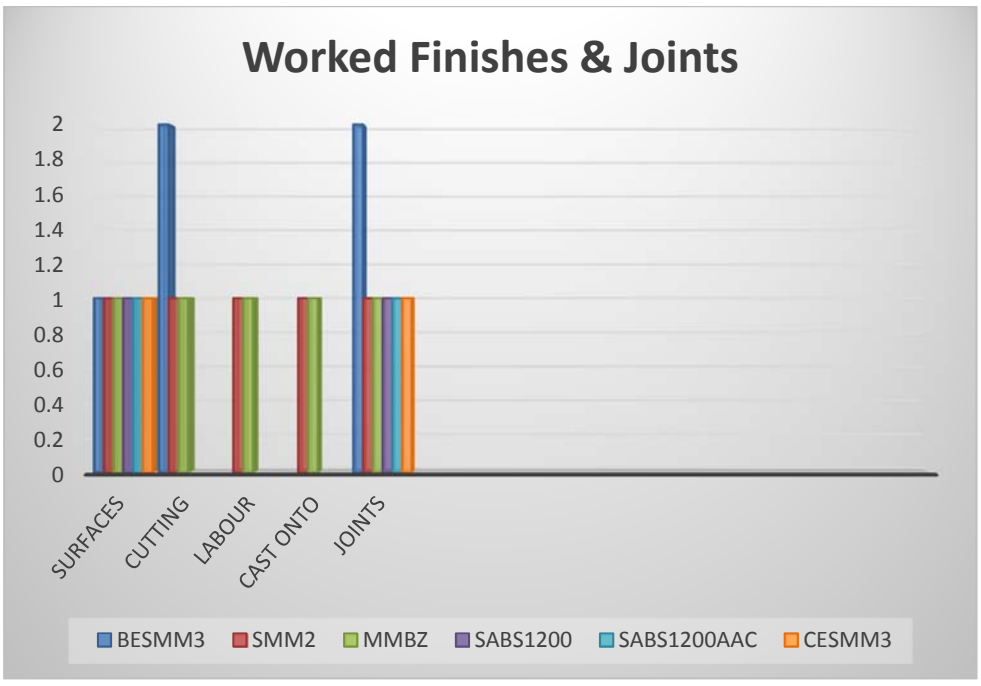


Figure 25: Worked finishes and Joints

Pre-cast and Pre-stressed

SABS1200 and SABS1200AAC provided for all sections under this trade; whilst CESMM3 only provided for the pre-cast and post-tensioned sections. SMM2 and MMBZ allowed for pre-cast testing, pre-stressed members and pre-stressed wire sections only. BESMM3 provided for pre-cast unit sections only. All the sections indicated in Figure 26 should be included in a CESMMSA.

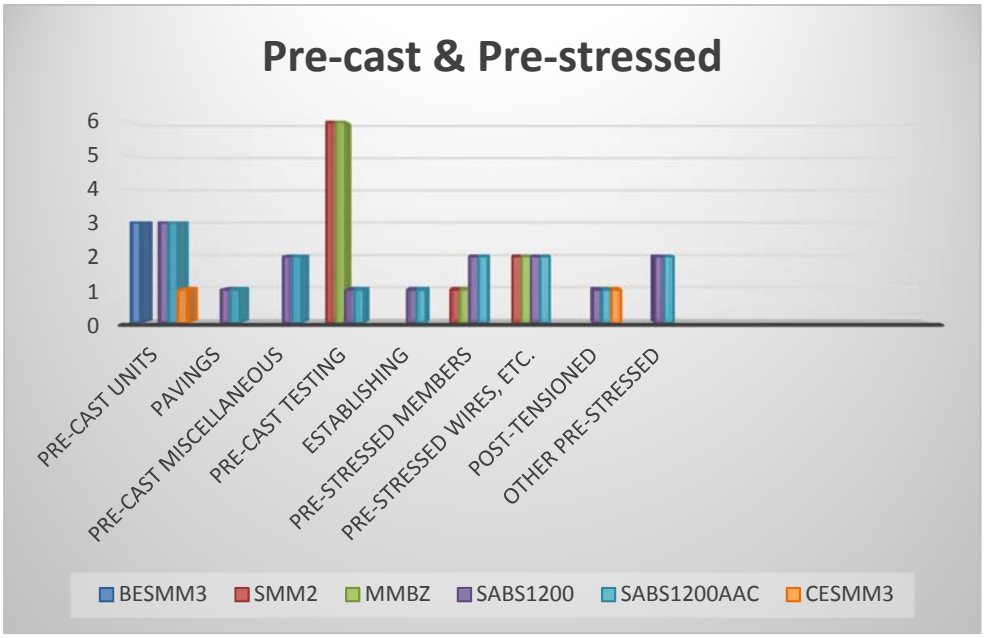


Figure 26: Pre-cast & Pre-stressed

Steelwork

SABS1200 and SABS1200AAC provided for all the sections in this trade, except for miscellaneous, fittings and holes. SMM2 and MMBZ allowed for steelwork, fittings, holes, bolts and corrosion-protection sections only. CESMM3 allowed for steelwork, erection, handrails, ladders, miscellaneous and corrosion-protection sections. BESMM3 allowed for steelwork, erection and corrosion-protection sections only. All sections indicated in Figure 27 should be included in a CESMMSA.

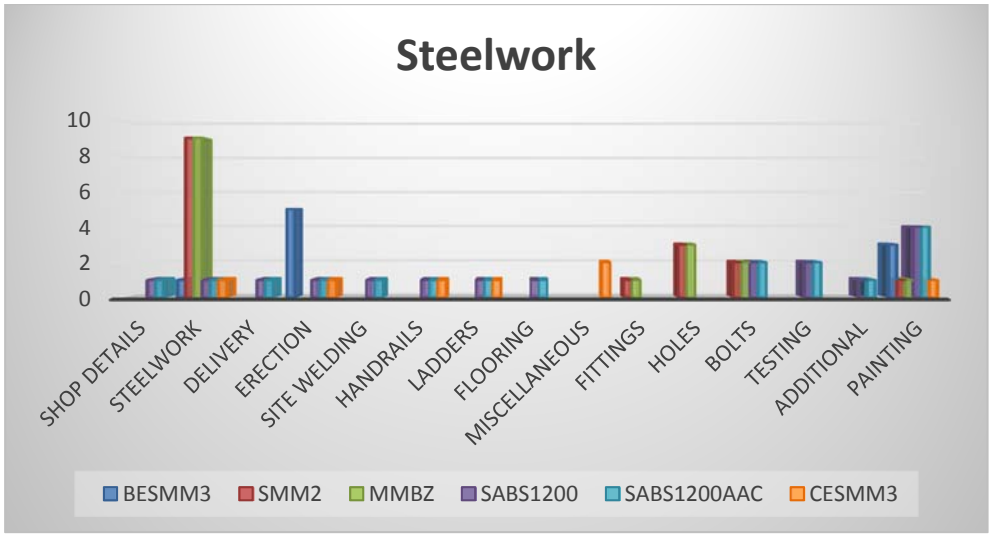


Figure 27: Steelwork

Roads

SABS1200 and SABS1200AAC provided items for all the sections under this trade. SMM2 allowed only for surface treatment, paving and joints, kerbing, gravel and painting sections; whilst CESMM3 allowed for sub-base, base, process material, screening, surface treatment, paving and joints, kerbing, signs and painting sections. All the sections shown in Figure 28 should be included in a CESMMSA.

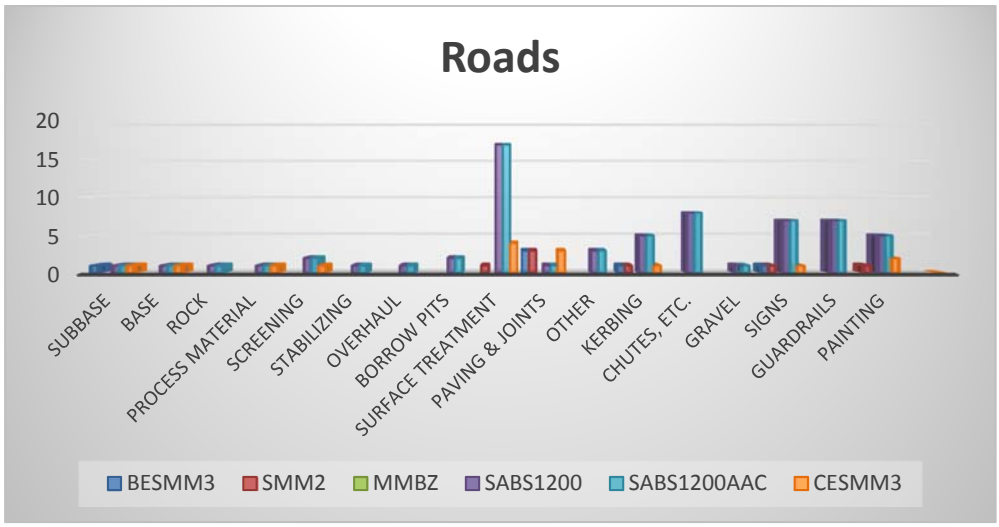


Figure 28: Roads

Pipework

SMM2 and MMBZ provided for items under pipes, fittings, labour, valves, pipe supports and sleeves and plates sections. Only SMM2 allowed for a special pipe section, which should form part of a CESMMSA. SABS1200 and SABS1200AAC allowed for all the sections, except special laying, special pipe, labour, pipe supports, sleeves and plates and testing sections. CESMM3 allowed for all the sections except for short pipes, joints, special pipe, concrete works, cutting, labour, old pipelines, sleeves and plates and testing sections. BESMM3 only allowed for pipes, fittings, cutting, pipe supports, anchors, sleeves and plates and testing sections.

All the sections indicated in Figure 29 should be included in a CESMMSA.

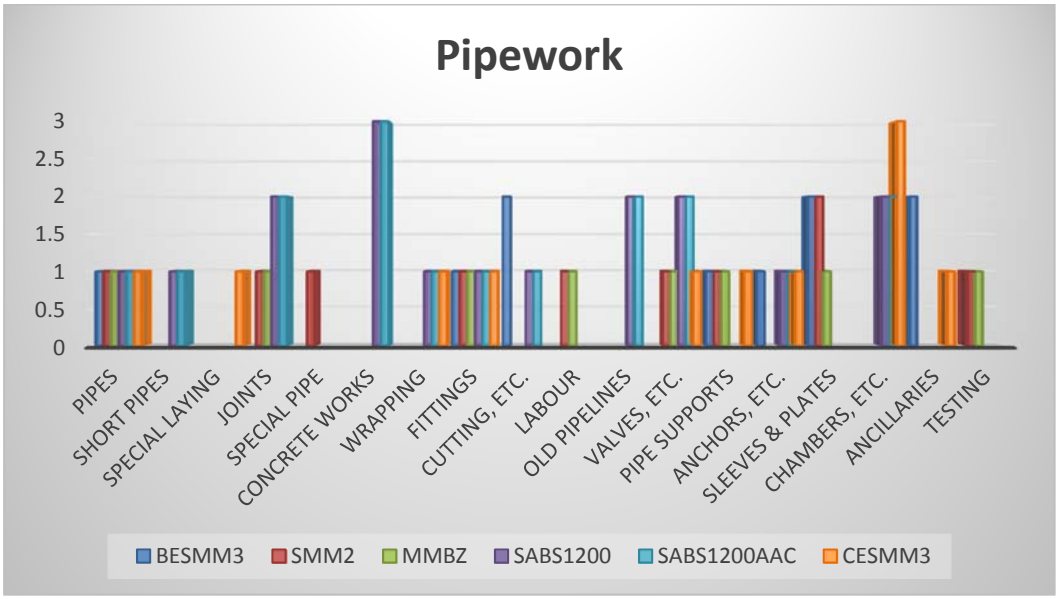


Figure 29: Pipework

General

It is important to note that in some of the SMOMSs certain main sections were covered as a sub-section of another main section. It would then look as if the SMOMS did not provide for the main section, which would be wrong; as the applicable items might be covered as sub-items in another main section.

4.2.2 Creating the 1st draft of the CESMMA

Following the work per section 4.2.1, each item within each section of each trade was scrutinised, analyzed and thoroughly inspected by the researcher, as previously mentioned; and a first draft of the CESMMSA was created. Simultaneously, a questionnaire survey, assessing the opinion of the profession regarding creating a CESMMSA, was sent out to professional quantity surveyors, with the results being depicted in section 4.3.

4.3 QUESTIONNAIRE RESULTS

4.3.1 Section 1: Background Information

The objective for collecting background information of the participants was to determine the geographic location, the gender, the main function and the type of company they were working for.

Question 1: Gender of the participant

The aim of this question was to determine the gender of the participant. Males are historically more involved in civil engineering projects in Africa, due to the nature of the projects; and therefore, they should have more experience in the measuring of civil engineering works. For this study; it is therefore, advantageous if more males answered the questionnaire.

Figure 30 shows that most of the respondents were males.

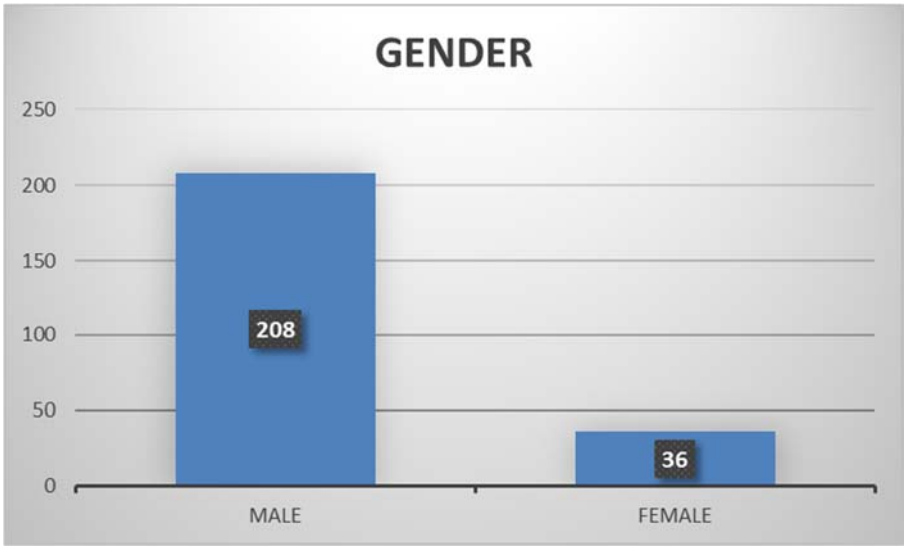


Figure 30: Gender

Question 2: Age group of the participant

The purpose of this question was to ascertain the age group of the participants. This would give an indication of the experience of the participants in measuring and creating bills of quantities.

Figure 31 shows that the largest age group of the participants was between the age of 31 and 40. For this type of study, the participants should have a good understanding of measuring, and how to use a SMOMS; and therefore, it is an advantage that most of the participants were over 31 – with even 41 of the participants over the age of 60.

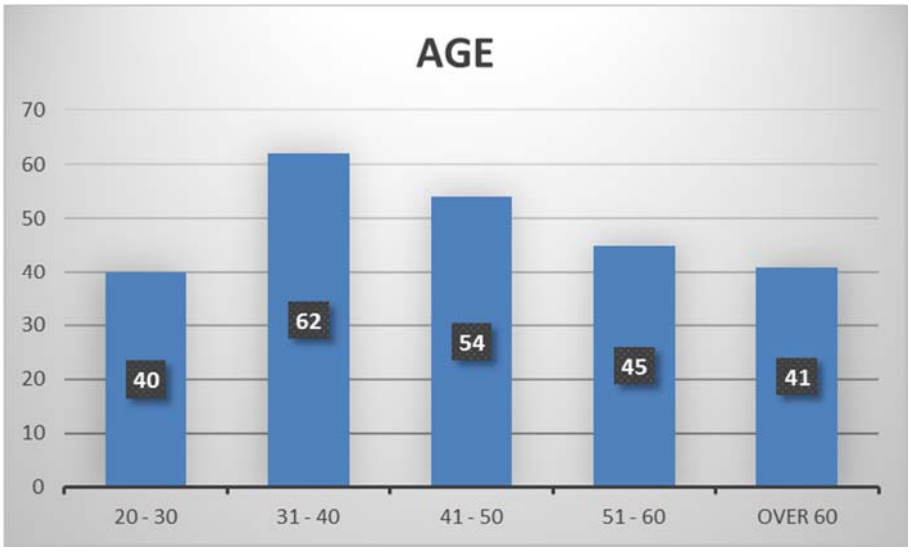


Figure 31: Age

Question 3: Residing country of the participant

The second purpose of the study was to create a CESMMSA; and for this reason, the participants should be ideally from Africa. Figure 32 shows that 96.72% of the participants are from Africa, which is to be expected; because the questionnaire was distributed to members of RICS and ASAQS in Africa.

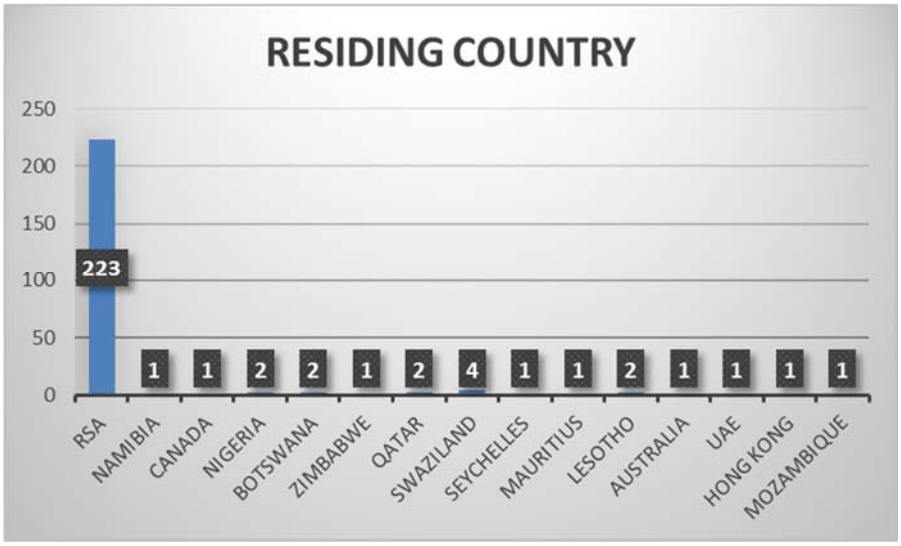


Figure 32: Residing country

Question 4: What is the main function or line of business of the participant?

The question gave only 5 options for the participant from which to choose, namely: Quantity surveyor, architect, engineer, contractor or other. Participants that are in "other" lines of business indicated that they were in financial institutions, tertiary institutions, project management, specialist consultants, etc. The majority of the participants were quantity surveyors; which ties in with all three of the hypotheses involving quantity surveyors.

Figure 33 shows that 223 of the 244 surveys used in this study were completed by quantity surveyors.

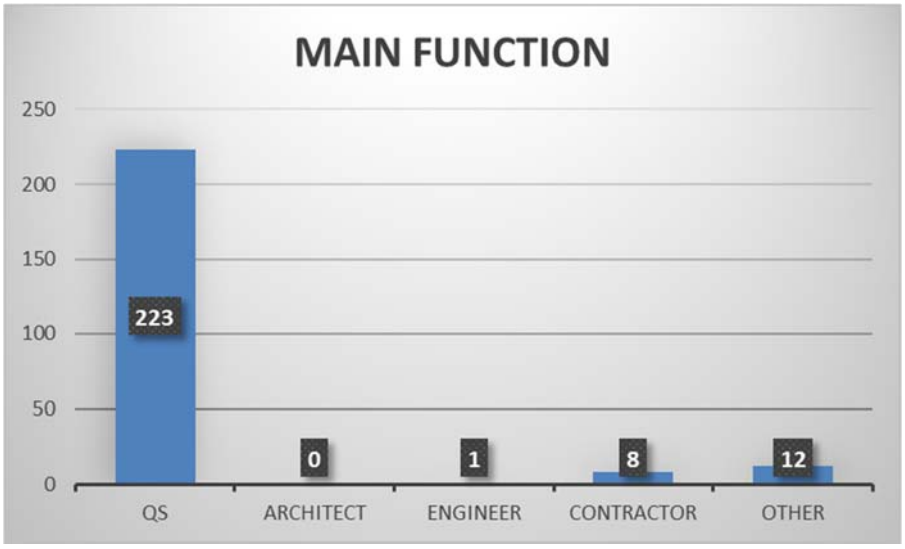


Figure 33: Current main function, or line of business

Question 5: For which type of company are the participants currently working?

Consulting and contracting companies use quantity surveyors to measure for and to produce bills of quantities; therefore these quantity surveyors should know how to use and to evaluate existing SMOMSs. They should also be able to give a good opinion regarding the use of the CESMMSA produced in this study.

Figure 34 shows that 92.21% of the participants are currently working for either a consulting or a contracting company.

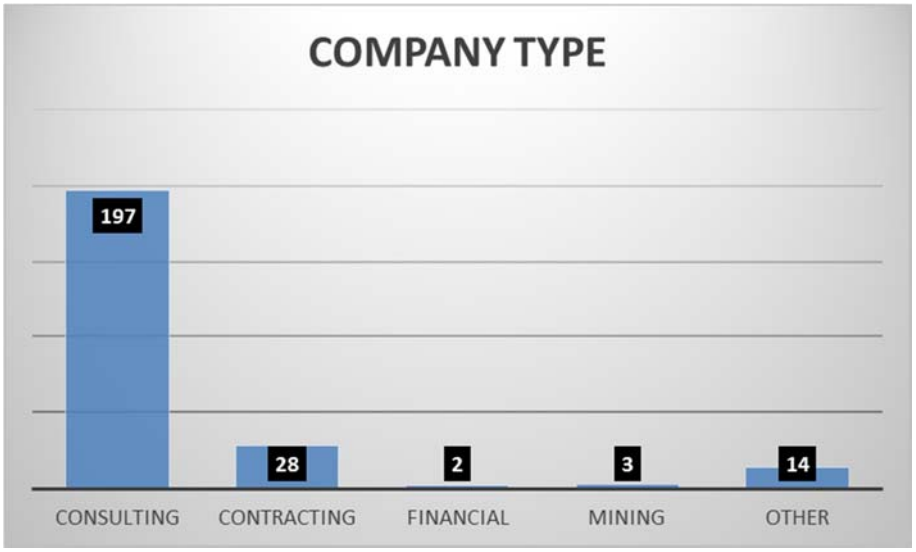


Figure 34: Type of company for which currently working

4.3.2 Section 2: Level of Knowledge of Existing SMOMSs

The objective for collecting the level of knowledge of existing SMOMSs from the participant was to answer the second research question: "Which current CESMMSs used in Africa are known to quantity surveyors?"

Question 1: Which of the listed SMOM systems do the participants know to exist?

The second part of the first purpose of this study is to investigate which systems are known to quantity surveyors. This question looks at which of the existing SMOMSs used in this study are known to the participants. Out of the six listed SMOMSs, 65.1% of the responding members know SABS1200; 42.2% know CESMM3; 28.3% know SABS1200AAC; 6.1% know MMBZ; 5.3% know BESMM3 and 3.3% know SMM2.

Figure 35 shows under each SMOM system the number of participants that know it exists.

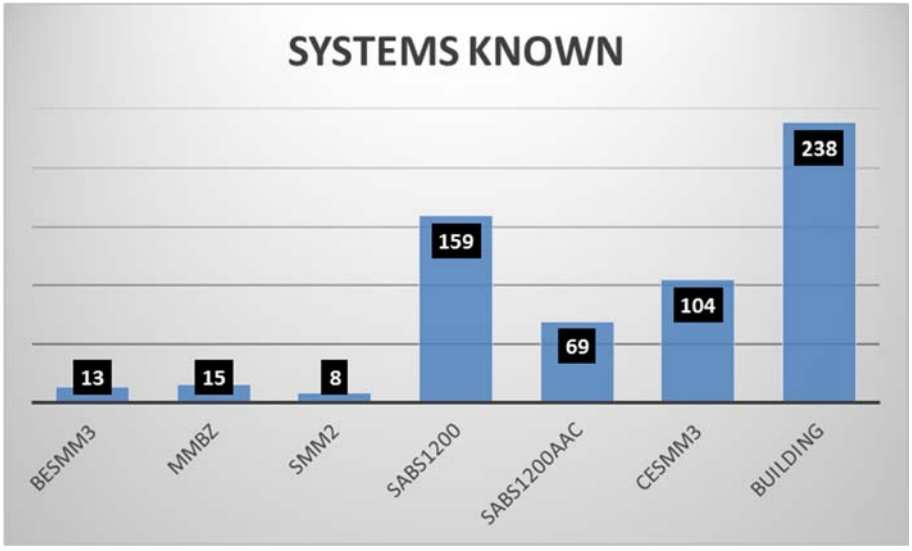


Figure 35: Which of the systems do you know exist?

Question 2: Which of the listed SMOMSs has the participant personally used?

Question 3: How would the participants rate their knowledge of the SMOM systems?

Questions 2 and 3 further investigate the purpose of this study to discover which systems are known to quantity surveyors. To know that a SMOMS exists does not mean that the SMOMS is fully known to the quantity surveyor; and therefore, it does not answer the question fully. When a SMOMS is personally used by the quantity surveyor, he needs to understand the system; and s/he should be able to apply all the rules and regulations. This then gives a good indication of which SMOMSs are known to the quantity surveyors.

Figure 36 shows that out of the six SMOMSs, 48.4% of the responding members have used SABS1200; 18.4% have used SABS1200AAC; 18.0% have used CESMM3; 2.1% have used BESMM3; 0.8% have used SMM2; and 0.4% have used MMBZ.

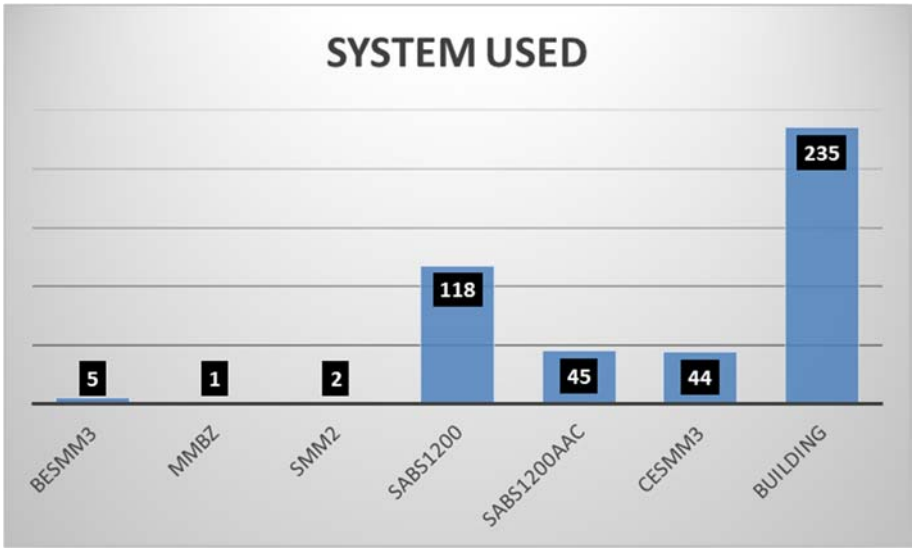


Figure 36: Which of the systems have you personally used?

Figure 37 shows that out of the six SMOMSs responding members know SABS1200 at a medium level; SABS1200AAC and CESMM3 at an average level; and BESMM3, MMBZ and SSM2 at a low level.

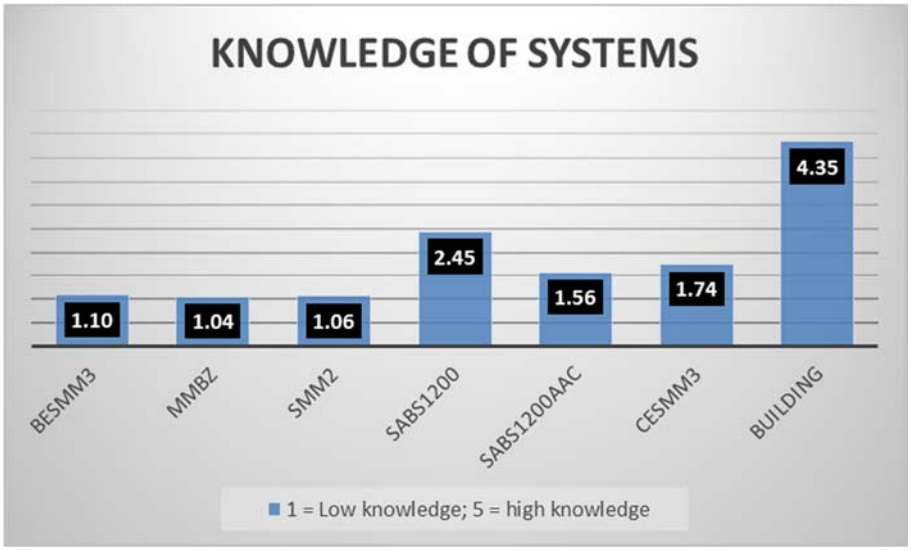


Figure 37: Rating knowledge of systems

From all the results in this section, we can answer the second part of purpose number one of this study, as follows:

Table 2: Rating of systems' results summary

System	% Know system exists	% Used system	Knowledge level of system
SABS1200	65.1	48.4	medium
SABS1200AAC	28.3	18.4	average
CESMM3	42.2	18	average
MMBZ	6.1	0.4	low
BESMM3	5.3	2.1	low
SMM2	3.3	0.8	low

4.3.3 Section 3: Expectation of SMOMSs

The objective for collecting the level of expectation of SMOMS layouts from the participant was to help in creating the format of the CESMMSA created in this study, according to the second purpose of this study.

Question 1: In which format do the participants prefer the SMOMS to be published?

Two options were given to the participants, from which to choose, namely: book format or tabular format. As many as 54.7% of the responding members preferred the system to be published in a book format; and 45.3% preferred it in a tabular format. Traditionally, SMOMSs were in book format; however, all the latest SMOMSs are published in tabular formats, which makes them much easier to read. An example of such a system is the ASAQS' SMOMS for Building Works for Africa, according to the ASAQS (2015). Although the result from the survey shows that participants want the CESMMSA to be published in a book format, the researcher decided after consultation with some senior members of the ASAQS to publish it in a tabular format.

Figure 38 shows the distribution of the respondents

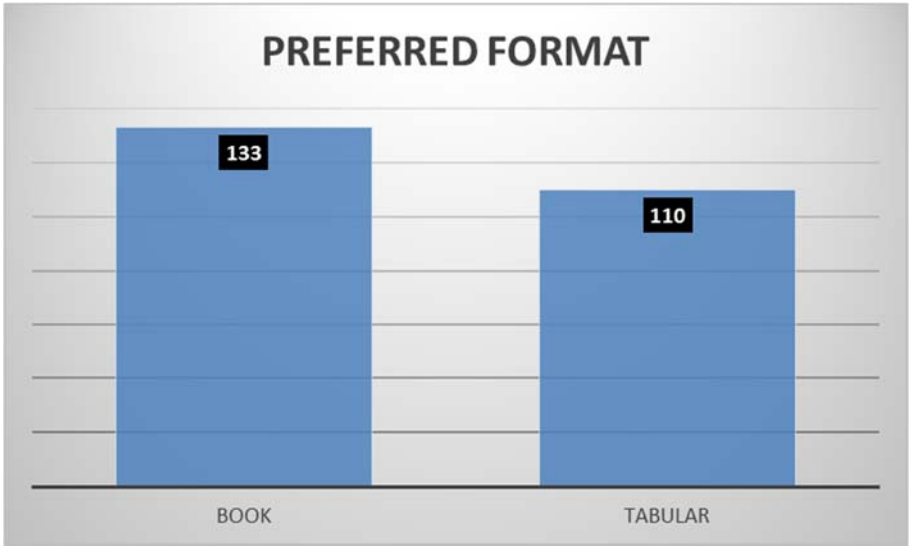


Figure 38: Preferred format

Question 2: Do the participants think that the references to standard specifications should be included in a SMOMS?

The biggest criticism regarding existing SMOMSs used in this study was that it cannot be used throughout the whole continent of Africa; because references are made to local standard specifications. This creates confusion when used outside the country it was created for; as

different specifications apply in different countries. Surprisingly, the results of the survey showed that 74.9% of the responding members think that standard specifications should be included in a system; while 25.1% think that they should not be included. A possible reason could be that most of the participants only work in their country of origin; and they did not think of the cross-border application of the SMOMS. With hind sight, the following question should have been asked to clarify this matter: "Do you work on projects outside your residing country?" The researcher decided not to include any reference to standard specifications in the created CESMMSA; so that the system might be used in the whole of Africa.

Figure 39 shows the results.

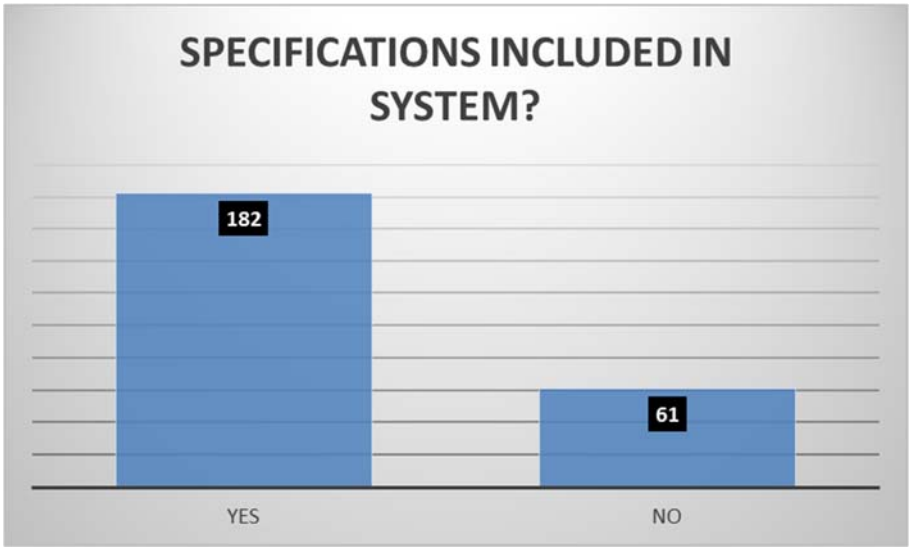


Figure 39: Must references to standard specifications be included in the system?

Question 3: Rate each of the given information that the participant believes should be included in a SMOMS.

The responding members rate that information, such as contents, sections divided by trades, general instructions, general rules, measurement rules, coverage rules and short items are highly important; however, the references to standard specifications are of the lowest (medium) importance to be included. This enforce the researcher's decision, under Question 2 in this section, to exclude any reference to standard specifications.

The created CESMMSA includes the information rated as being of high importance by the participants, as shown in Figure 40.

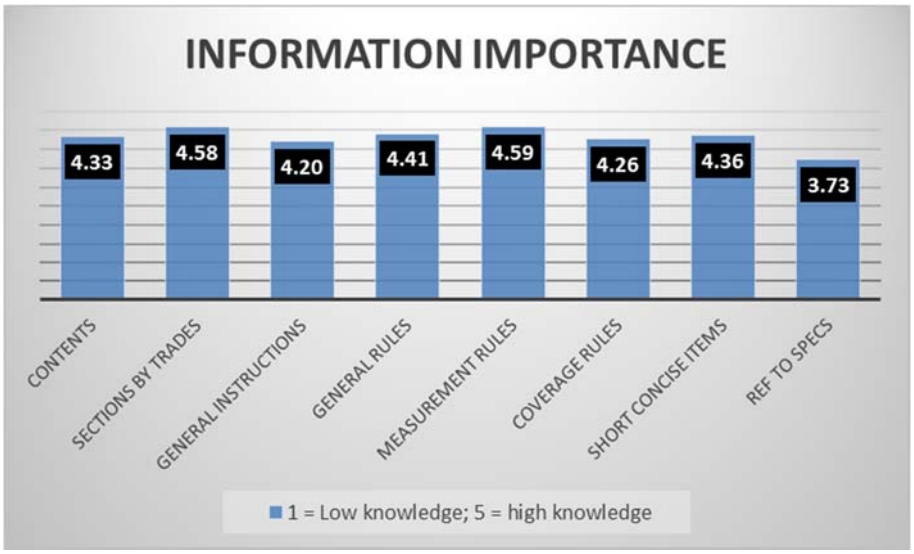


Figure 40: Rate information to be included in system

4.3.4 Section 4: Possible Solution to Improve Current Projects in Africa

The ASAQS recently published a SMOMS for buildings works for Africa according to the ASAQS (2015), accepted by the AAQS. In this section, one of the objectives was to see whether the participants perceived this system as an added value to the profession. The second objective was to test hypotheses 1, 2 and 3, namely: should a CESMMSA be developed; would they use a CESMMSA? and should the CESMMSA be taught in tertiary institutions. This would also meet the third purpose of the study: "Test the opinion of quantity surveyors regarding the use of the created CESMMSA in the future".

Question 1: In the opinion of the participant, to what extent does the ASAQS SMOM building system add value to the profession?

A total of 59.8% of the responding members agreed that the ASAQS recently published SMOMS for building works for Africa; and these add value to their profession; as many as 33.5% agreed somewhat; 4.2% disagreed and 4.2% disagreed somewhat. The majority of the

participants agreed that one system for Africa for building work had already added value to their profession

Figure 41 shows that the published SMOM added value for quantity surveyors.

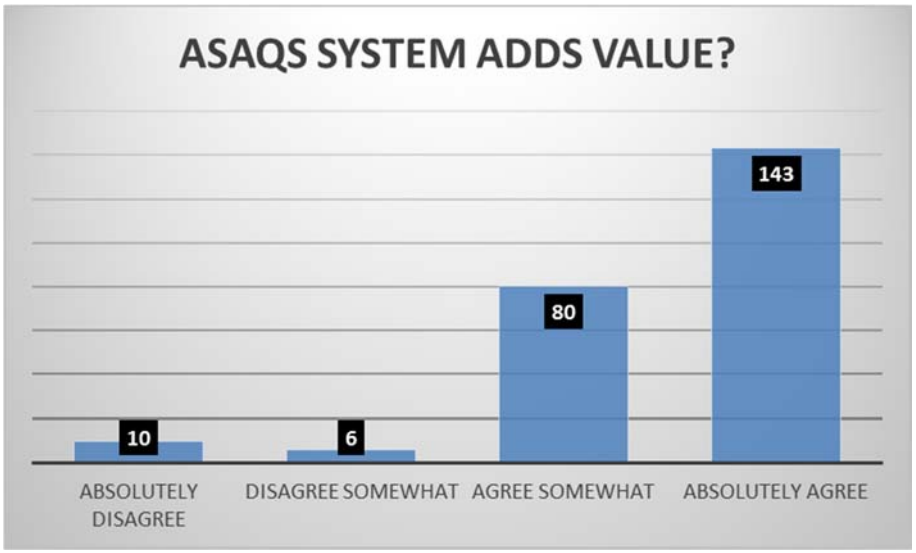


Figure 41: ASAQS system for building works: Does it add value to the profession?

Question 2: To what extent do the participants agree that one concise, easy-to-read, CESMMSA should be developed?

Question 3: If the participants disagree with question 2, what given alternatives would they prefer?

A total of 57.2% of the responding members absolutely agreed that one concise, easy-to-read CESMMSA should be developed for Africa; 31.3% agree somewhat; 8.6% absolutely disagree; 2.5% disagree somewhat; while 2.5% had other suggestions.

Those participants that disagreed and had answered question 3 indicated that they would keep using the existing systems.

It is, therefore, correct to assume that quantity surveyors believe that a CESMMSA should be developed, according to hypothesis one, as indicated in Figure 42.

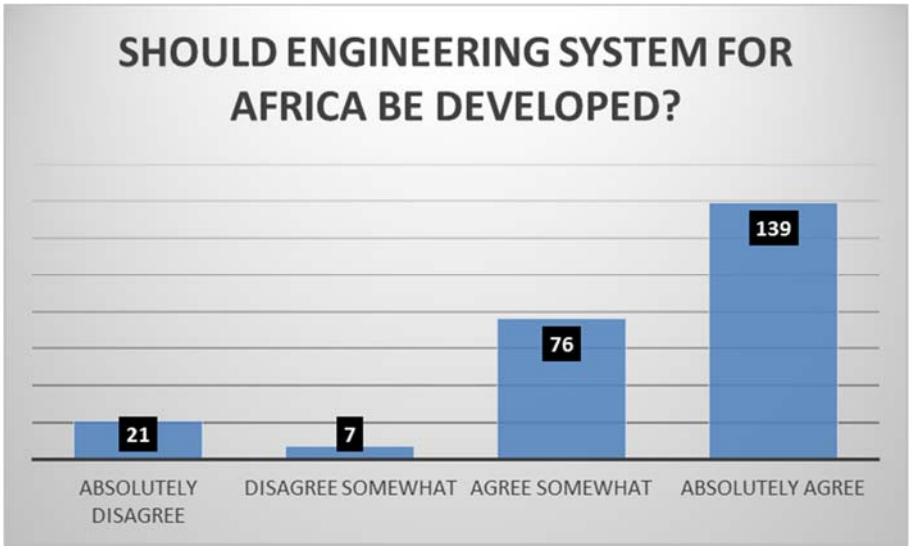


Figure 42: Should an engineering system for Africa be developed?

Question 4: If a CESMMSA is developed, which of the given options regarding use of the system would the participant choose?

The following options were given from which to choose:

- Start using it immediately;
- Study it intensely; and if acceptable start using it;
- Wait and see how the market reacts to it; and then use it;
- Not even look at it;
- Other.

A total of 52.7% of the responding members would study a CESMMSA intensely; and, if acceptable, they would start using it; 37.2% would wait and see how the market reacts to it; and they would then use it; 6.3% would start using it immediately; and 6.1% had other ideas.

The aim of this question was to test hypothesis two, namely: "Quantity surveyors would use developed CESMMSA for work in Africa". All newly developed systems must first be tested by the profession, in order to iron out any possible ambiguities, problems, etc. and to add improvements. Most of the participants would study the system first, before using it; however, it is important to note that they would still look at it, rather than discarding it. This

gives a good indication that quantity surveyors would use the CESMMSA, according to Figure 43.

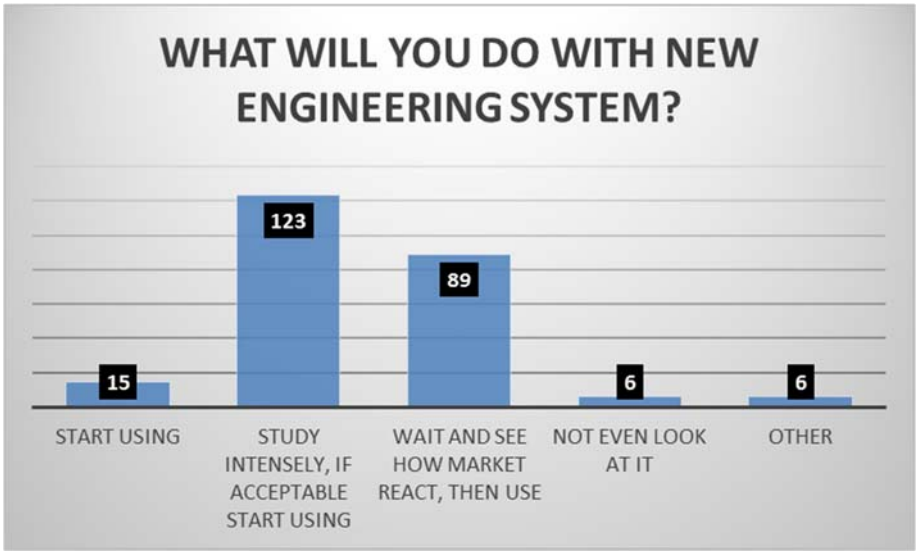


Figure 43: If an engineering system is developed, what would you do with it?

Question 5: If a CESMMSA is developed, which of the given options regarding recommendations to clients would the participant choose?

The following options were given from which to choose:

- Recommend it to your clients;
- Study it intensely, and if acceptable; recommend it to your clients;
- Wait and see how the market reacts to it; and then recommend it to your clients;
- Other options.

A total of 51% of the responding members would study a new CESMMSA intensely; and, if acceptable, they would recommend it to their clients; 35.0% would wait and see how the market reacts to it, and then recommend it to their clients; 10.6% would recommend it to their clients; while 1.7% had other ideas.

The aim of this question was to add to the testing of hypothesis two, namely: "Quantity surveyors would use the developed CESMMSA for work in Africa". On most projects, the client makes the ultimate decision of which SMOMS to use, based on the Quantity Surveyor's recommendation. As previously stated, all newly developed systems must first be tested by

the profession; however, it is positive to see that 10.6% of the participants would recommend using the CESMMSA system to their clients immediately; and 51% would do so, after studying the system for themselves.

Figure 44 shows the results.

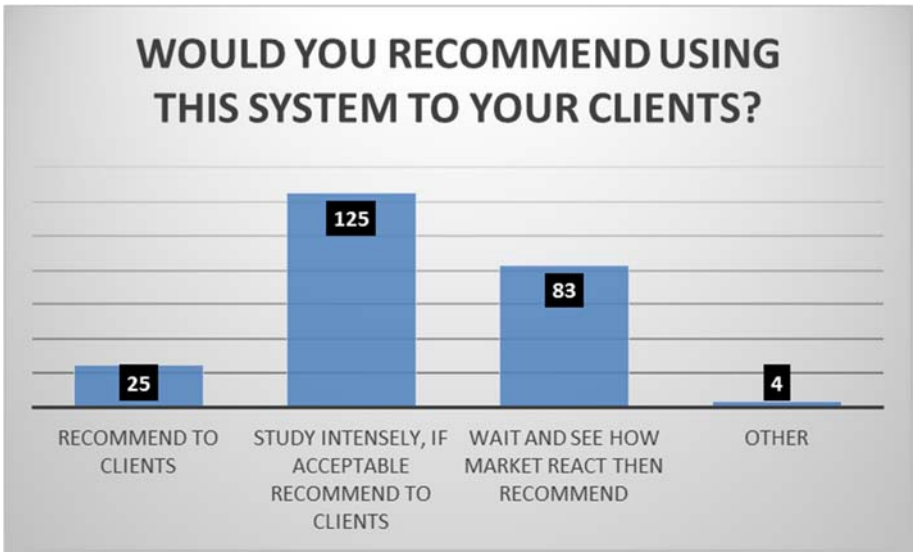


Figure 44: If an engineering system is developed; what would you recommend to your clients?

Question 5: Should the CESMMSA be incorporated into the Tertiary Institution's curricula?

This question was incorporated into the survey to test hypothesis number three, namely: "Quantity surveyors believe that a developed CESMMSA should be taught in Tertiary Institutes". Currently, in South Africa, only the ASAQS' SMOMS for building works are being taught in Tertiary Institutions. The University of Pretoria also covers the basic teachings of the SABS1200 system in their Honours degree. For Quantity Surveyors working in Africa that require knowledge of any other SMOMS used in a certain country, would have to study the system for themselves; and accumulate knowledge, whilst working on the project.

This could lead to initial bills of quantities being drawn up incorrectly for the tender- and contract stage, which would result in a substantial time loss during the construction phase of the project – to re-measure and agree on the final accounts with the applicable contractors with different interpretations of the applicable SMOMS.

From the survey, 97.1% of the responding members think that a new CESMMSA should be incorporated in Tertiary Institutions' curriculum; while 2.9% opposed it. This proves that hypothesis three is indeed correct.

Teaching the developed CESMMSA to students would, furthermore, help the profession by producing Quantity Surveyors who are more prepared to work in the whole of Africa, if the CESMMSA is to be used in all the civil engineering projects, and in the whole of Africa.

Figure 45 shows the results.

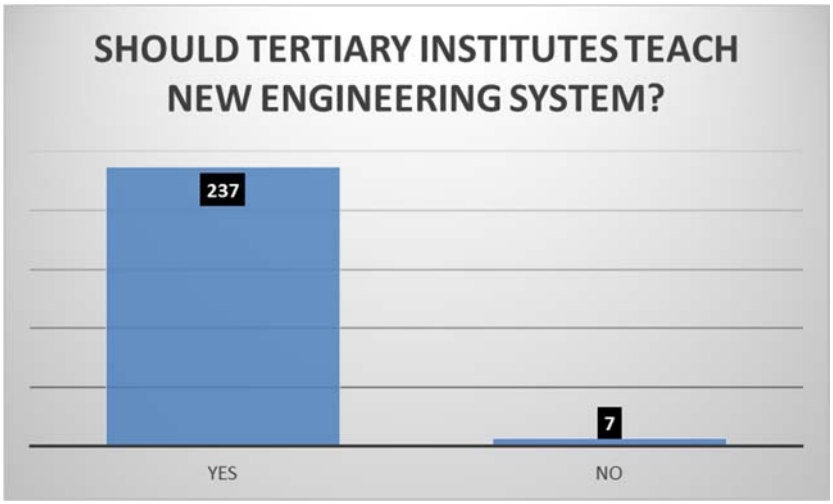


Figure 45: Should tertiary institutes incorporate new engineering system into their curricula?

4.3.5 Summary

It is important to notice that a total of 88.5% of the responding members agreed that one concise CESMMSA should be developed; while 97.1% of the responding members think that such a system should be incorporated in Tertiary Institutions' curriculum, which substantiates the development of such a system in this study. It further indicates that members think such a system would be an improvement on the existing systems.

4.4 CREATING 2ND DRAFT OF CESMMSA

Using the triangulation mixed-method, according to the Laerd Dissertation (2014), as explained in section 3.3, both the data from the existing CESMMSs and the survey could be combined to create a 2nd draft of the CESMMSA.

After analyzing all the data, according to section 4.3, the following changes were made to the first draft of the suggested CESMMSA:

- Although more responding members preferred a book format rather than a tabular format for a standard measuring system, no changes were made to the first draft; as it corresponds with the newly published ASAQS building system that is accepted by the AAQS, which was published in a tabular format.
- A total of 74.9% of the responding members think that standard specifications should be included in a standard measuring system. However, the importance of including a reference under each section for the standard specifications rated the lowest importance of all. Most of the responding members are situated in South Africa; where the same standard specifications are used. Outside South Africa, different standard specifications are used; and therefore, reference to any standard specification in the standard system would not add any further value to the system, or to any project. Therefore, references to standard specifications should rather be included in the project specifications/scope of work/contract data included in each individual project contract document; and no changes were made to the first draft.
- Because the responding members rated it highly that the system should be divided into trades, the system was divided accordingly.
- Responding members think that the contents, and the sections divided by trades, general instructions, general rules, measurement rules, coverage rules and short concise items with enough information should be a high priority in a SMOM; and therefore, it was all included in the second draft.

Following the above, a second draft of the CESMMSA was created.

4.5 TESTING 2ND DRAFT AND CREATING FINAL CESMMSA

Following the creation of a second draft of the suggested CESMMSA, the draft was circulated to five professional quantity surveyors and three professional engineers for testing, of which only three quantity surveyors, and one engineer responded. The decision to send to this number of professional people was covered in section 3.7.1. Comments and suggestions from professionals were accumulated and summarized. This was done to comply with the theory of "method of alternating point of view", accordingto Routio (2007), as explained in section 3.3.

After scrutinising the comments and suggestions, the following changes were included in the third and final draft of the suggested CESMMSA:

- Various grammar and spelling corrections;
- Various item numbering corrections;
- Adding more definitions for clarity;
- Adding coverage rules in Preliminaries section, for better clarification of items;
- Adding measurement rules in Day-works in the Preliminaries section for better clarity;
- Combining Earthworks, Road Earthworks and Pipe Earthworks in one section;
- Removing references to compaction densities in Road Earthworks sub-section;
- Adding general principles in Concrete section, for better clarity;
- Adding additional diameter steel bars under mild steel and high-tensile steel items in Formwork and Reinforcement section;
- Adding additional rules in Formwork and Reinforcement section for better clarification of the items;
- Separating hand- and knee-rails in handrail items and adding corrosion-protection to coverage rules in Steelwork section;
- Adding membrane items in Roadwork section;
- Adding and changing measurement rules and additional rules in Roadwork section;
- Moving roadwork layer works to Earthworks section;

- Expanding General section and expanding ‘Preface’, ‘Definitions’, ‘Coding’ and ‘Bill of Quantities’ sub-divisions;
- Adding fourth level numbering under ‘Coding’ sub-division;
- Removing of duplication of headings in different sections.

The final draft of the suggested CESMMSA is included in this report as Appendix C.

4.6 SUMMARY

In this chapter, the CESMMSA draft design was presented and discussed. The results of the survey were also presented and discussed in relation to the research questions, the purpose of this study, and to test the hypotheses.

In the next chapter, the conclusions, as well as some recommendations are presented.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

5.1 INTRODUCTION

Chapter 1 of the study provided the introduction and background for the study. In Chapter 2, the available literature on SMOMs was reviewed. The design, models and methods of the research were explained in Chapter 3. The findings of the CESMMSA drafting and the survey were provided in Chapter 4.

The main objective of Chapter 5 was to draw conclusions, to make recommendations from the findings of the study, based on the literature review, the research questions and the research hypotheses.

5.2 CONCLUSIONS ON THE RESEARCH QUESTIONS

5.2.1 What is a CESMMS, and where do CESMMSs come from?

According to the definitions, as discussed in Chapter 2 of "standard", "method" and "measurement", a CESMMS means a regular and systematic procedure to determine the system of measuring civil engineering quantities, to remove all uncertainties, and following the best-practice qualities.

As mentioned in Chapter 2, there are currently many CESMMSs being used in the world; however, for the purpose of this study, only the CESMMSs used in Africa were explored. Some of the SMOMs are based on the SMM published by RICS, but with adjustments to suit the local conditions. The origin of the CESMMSs was reviewed in full in Chapter 2:

- BESMM3 drawn up by the Nigerian Institute of Quantity Surveyors;
- MMBZ drawn up by the Surveyor's Institute of Zambia;

- SMM2 drawn up by the Architectural Association of Kenya;
- SABS1200 drawn up by the South African Bureau of Standards;
- SABS1200AAC drawn up by the South African Bureau of Standards and amendments by the Anglo-American Technical Solutions;
- CESMM3 drawn up by a joint division of the Institute of Civil Engineers and the South African Institute of Civil Engineering.

5.2.2 Which current CESMMSs used in Africa are known to Quantity Surveyors?

From the findings of the survey, it was observed that the majority of Quantity Surveyors are familiar with SABS1200, followed by CESMM3 and SABS1200AAC, respectively. Only 6% know MMBZ; 5% know BESMM3; and 3% know SMM2. It was further observed that half of the quantity surveyors surveyed have personally used SABS1200, followed by SABS1200AAC and CESMM3. Only 2% have used BESMM3; and less than 1% have used SMM2 and MMBZ.

If more quantity surveyors outside South Africa had participated in the survey, the above results might have been quite different.

5.2.3 What will Quantity Surveyors do with a newly developed CESMMSA?

From the findings of the survey, it was observed that half of the quantity surveyors would first study the system intensely; and if acceptable, they would recommend it to their clients, and start using it themselves. Only 6% would start using the system immediately; whilst 11% would recommend it immediately to their clients.

5.3 CONCLUSIONS ON THE RESEARCH HYPOTHESES

5.3.1 Hypothesis One

From the findings of the survey in Chapter 4, the hypothesis which states that Quantity Surveyors believe that a CESMMSA should be developed, was supported.

Therefore, creating a CESMMSA in this study was a good decision.

5.3.2 Hypothesis Two

From the findings of the survey in Chapter 4, the hypothesis, which states that Quantity Surveyors would use a developed CESMMSA for work in Africa, was proved to be partly supported. The result shows that quantity surveyors would first study the developed CESMMSA, before using it; or they would wait and see how the market reacted to it, before using it.

5.3.3 Hypothesis Three

From the findings of the survey in Chapter 4, the hypothesis, which states that Quantity Surveyors believe that a newly developed CESMMSA should be taught in Tertiary Institutes, was supported. Almost all the quantity surveyors believe it should be taught in all the Tertiary Institutes.

5.4 RECOMMENDATIONS

Based on the findings of the research project, and the conclusions drawn, the researcher would like to make the following recommendations:

- More interactions between quantity surveyors in Africa should be initiated. The AAQS is trying to enhance this with their general assemblies, etc. However, more and more cross-border projects are occurring in Africa; and the professionals need to move closer together, in order to set the same high standards for all the projects in Africa.
- There are currently shortcomings in the developed CESMMSA; because at present, not all trades are covered; and more comments from professionals are needed to complete the work.
- Once the full CESMMSA is developed; it should be tested in the industry in Africa.

- Other SMMSA should be developed for industries, such as mining, electrical and instrumentation, railways, etc.
- More quantity surveyors need to do research; as it can provide much-needed standards and innovations that would help the profession.

5.5 THE STUDY'S CONTRIBUTION TO THE QUANTITY SURVEYING PROFESSION

The quantity surveying profession has expanded to other sectors, beside the building sector, such as civil engineering, mining, infrastructure, electrical, railways, etc. Currently, there is a lack of SMOMs in most of these sectors. This study has firstly highlighted the importance of developing SMOMSs for Africa. Secondly, it has added value to the civil engineering sector in developing a CESMMSA for all professionals to use on projects in Africa; and hopefully, other sectors will follow suit, by developing SMOMSs for each sector.

5.6 FURTHER RESEARCH

The study was limited to certain chosen trades; and further study needs to be conducted on trades not covered, in order to complete the developed CESMMSA. The complete CESMMSA would then have to be tested in Africa; as this cannot currently be done with the developed CESMMSA in this study, because of its incompleteness.

Other MOMSs, such as systems for Electrical and Instrumentation, Mining Works, Process Piping, etc. need to be developed to cover all the engineering works. Therefore, more research should be promoted among quantity surveyors.

5.7 SUMMARY

This chapter has shown how the research questions and hypotheses were addressed through the literature review, the CESMMSA drafting, and the survey.

Recommendations and suggestions for future studies were also suggested.

REFERENCES

African Association of Quantity Surveyors (AAQS). 2014. Association Information. Available from http://www.aaqs.org/index.php/about (Accessed 22-04-2014)

Anglo American – Mining and Technology. 2014. *Company Information*. Available from https://ww.angloamerican.com/about/whatwedo/technology.aspx (Accessed 29-04-2014).

Anglo American, Anglo Technical Division. 2004. *South African Bureau of Standards Standardized Specification for Civil Engineering Construction with Anglo American, Anglo Technical Division Amendments*.

Architectural Association of Kenya. 2014. *Association information*. Available from http://www.aak.or.ke/index.php/2014-01-14-22-26-13/background (Accessed 22-04-2014)

Architectural Association of Kenya, Quantity Surveyors Chapter. 2008. *Standard Method of Measurement of Building and Associated Civil Works for Eastern Africa*.

Association of South African Quantity Surveyors (ASAQS). 2015. *Standard System of Measuring Building Work for Africa*.

Becker. 2014. *Joint Division of the Institution of Civil Engineers and the SA Institution of Civil Engineering home page*. http://www.ice-sa.org.za (Access 01-09-2015)

BCIS. 2004. *Measurement Based Procurement of Builds: a Survey of Who Measures Buildings. RICS Measurement Conference*. Royal Institution of Chartered Surveyors.

Bureau of Indian Standards. 2003. *IS 1200 Indian Standard Method of Measurement of Building and Civil Engineering Works*.

Business Dictionary. 2015. *Hypothesis definition*. http://www.businessdictionary.com (Access 01-09-2015)

Civil Engineering publication. January 2008. *The adoption of CESMM3 as a standard method of measurement of civil engineering quantities in South Africa*. Volume 20 No 1.

Collins English Dictionary. 2014. Measure definition. Available from: http://www.collinsdictionary.com/dictionary/english/measure (Accessed 29-04-2014)

Council of the Standards Association of Australia (CSAA). 1982. *Australian Standard AS 1181 prepared by Committee CE/14. Measurement of Engineering Works and Associated Building Works*.

Creswell J.W., Plan Clark V.L., Gutmann M.L., Hanson W.E. 2003. *Advanced mixed methods research design Handbook of mixed methods in social and behavioural research*. Thousand Oaks, CA:Sage.

De Beers. 2006. *Fine Residue Deposit Project information*.

De Beers. 2006. *Primary Crusher Project information*.

De Beers. 2002. *Third Thickener Project information.*

Designing Buildings Wiki. 2014. SMM1 information. Available from http://www.designbuildings.co.uk/wiki (Accessed on 08-04-2014)

Early M. and Gould H.F. 2004. *Standard Method of Measurement*. Available from http://www.rics.org

Goh B.H. and Chu Y.L. 2002. *Developing National Standards for the Classification of Construction Information in Singapore*. International Council for Research and Innovation in Building and Construction CIB W78 conference 2002. Aarhus School of Architecture, 12 – 14 June.

Government of the Hong Kong Special Administrative Region. 1992. *Standard Method of Measurement for Civil Engineering Works*.

Institution of Civil Engineers – South Africa. 2014. CESMM3-SA comments. Available from http://www.jointcivils.co.za/cesmm3-sa (Accessed on 14-04-2014)

Jagger D., Ross, A., Love P.E.D. and Smith S. 2001. *Overcoming information opacity in construction: a commentary*. Logistic Information Management, 14, 413-421.

Joint Division of the Institution of Civil Engineers and South African Institution of Civil Engineering. 2011. *Civil Engineering Standard Method of Measurement – Southern African Edition*.

Laerd Dissertation. 2014. *Mixed-methods research design*. Available from http://dissertation.laerd.com/research-strategy-and-research-ethics.php (Accessed on 27-08-2014)

Laerd Dissertation. 2015. Purposive-sampling definition. Available from http://dissertaion.laerd.com (Accessed on 17-09-2015)

Mills A., Lawther P. and Jones D. 2006. *Standard Methods of Measurements – A comparative Study of National and Regional Publications*. Australian Institute of Quantity Surveyors and Royal Institution of Chartered Surveyors.

Nani G., Edwards P.J., Adjei-Kumi T., Badu E., Amoah P., Kumasi K., School of Property, Construction and Project Management, RMIT University, Melbourne, Australia. 2008. *Customisation and desirable characteristics of a standard method of measurement for building works in Ghana*.

Neuman. 2014. *Basics of social research: Qualitative and Quantitative approaches*. Harlow, Essex: Pearson Education Limited.

Nigerian Institute of Quantity Surveyors. 2014. *Institute Information*. Available from http://www.niqs.org.ng/history.aspx (Accessed 22-04-2014).

Nigerian Institute of Quantity Surveyors. 2008. *Building and Engineering Standard Method of Measurement*.

Optimum. 2013. *Water Treatment Project*.

Routio P. 2007. *Models in the research process*. Available from http://www2.uiah.fi/projects/metodi/177.htm (Accessed on 28-08-2014)

Royal Institution of Chartered Surveyors (RICS). 1998. *SMM7 Standard Method of Measurement of Building Works*.

Royal Institution of Chartered Surveyors (RICS). 1998. *The APC Requirements & Competencies, London: Royal Institution of Chartered Surveyors*.

Simushi S. 2010. *Preface in MMBZ*.

Social Research Methods. 2015 Questions definitions. Available from https://www.socialresearchmethods.net/kb/questype.php (Accessed 15-09-2015)

South African Bureau of Standards (SABS1200). 1986. *Standardized Specification for Civil Engineering Construction*.

South African Bureau of Standards. 2014. *Bureau Information*. Available from https://www.sabs.co.za/About-SABS/index.asp (Accessed 29-04-2014).

South African Institution of Civil Engineering (SAICE). 2014. *Mission statement*. Available from https://www.saice.org.za/about/mission-statement (Accessed 29-04-2014)

Standard System Joint Committee, ASAQS. 1991. *First SMOMs in South Africa*.

Surveyor's Institute of Zambia. 2010. *Standard Method of Measurement of Building Works in Zambia*.

Thefreedictionary.com. 2014. *Definitions*. Available from https://www.thefreedictionary.com/p (Accessed 09-02-2014 and 29-05-2014)

University of Jyväskylä, Finland. 2009. *Assessment of Master's Thesis*.

Verster J.J.P. (Basie). 2005. *Managing Cost, Contracts, Communication and Claims: A Quantity Surveying perspective on future opportunities*. University of the Free State, Bloemfontein, South Africa.

Watermeyer R., Lomas M., MacDonald H., Jacquet A., Griffiths A., Baird A. and Cullen M. 2012. *Article on The Changing Landscape for Civil Engineering Contracts: Moving on from SABS 1200*.

Wikipedia, the free encyclopedia. 2014. *Definition of measurement*. Available from https://en/wikipedia.org/wiki/measurement (Accessed on 29-04-2014)

ANNEXURE A: DATA-COLLECTION FROM SIX SYSTEMS USED IN AFRICA

Code	Description	Edition	Institute
BESMM3	Building and Engineering Standard Method of Measurement 3	Third Edition 2008	Nigerian Institute of Quantity Surveyors
MMBZ	Standard Method of Measurement of Building Works in Zambia	April 2010	Surveyor's Institute of Zambia
SMM2	Standard Method Of Measurement of Building and Associated Civil Works for Eastern Africa	Second edition June 2008	Architectural Association of Kenya, Quantity Surveyors Chapter
SABS1200	South African Bureau of Standards Standardized Specification for Civil Engineering Construction	March 1986	South African Bureau of Standards
SABS1200AAC	SABS1200 including Anglo American Amendments	2004	South African Bureau of Standards & Anglo American
CESMM3	Civil Engineering Standard Method of Measurement - Southern African Edition	2011	Joint Division of the Institution of Civil Engineers and South African Institution of Civil Engineering

GENERAL RULES

BESMM3	SMM2	MMBZ	SABS1200 & SABS1200AAC	CESMM3
Rules set out in tables	BOQ shall fully describe and accurately represent the works to be executed Work cannot be measured accurately shall be described as provisional or given in bill of approximate quantities	Bill of Quantities shall fully describe and accurately represent works to be executed	Each section has own rules captured under each section	Definitions: Adjustment item - lump sum addition or deduction made by the tenderer to adjust the total of the priced Bill of Quantities Completion - state of readiness for occupation or use of the whole works although some minor work may be outstanding Daywork - method of valuing work on the basis of time spent by the workmen, the materials used and the equipment employed Method-related charge - the sum for an item inserted in the BOQ by a tenderer according to Contractor's method Permanent works - works other than temporary works to be constructed and completed in accordance with the contract Prime cost item - an amount included in contract for the delivered cost price of goods, services or materials to be supplied under the contract from a specified supplier Provisional sum - an amount included in contract for work that is foreseen but cannot be specified at the time of formation of the contract or a sum included and so designated in the contract as a specific contingency for the execution of the work or the supply of goods materials or services which may be used in whole or in part or not all at the direction and discretion of authorized person Temporary works - temporary works of every kind required on site for the execution and completion of the permanent works and the remedy of any defects Work - includes work to be carried out, goods, materials and services to be supplied, and the liabilities, obligations and risks to be undertaken by the contractor Expressly required - described in the scope of work or instructed in terms of the contract which modify the contents of the scope of work
Classification table: With broken line - alternatives given 1st column: descriptive features 2nd column: sub-group descriptions 3rd column: further division descriptions 4th column: unit 5th column: descriptive features	Measurements: Measured net as fixed in position Each measurement taken to nearest 10mm Rule shall not apply to any dimensions stated in descriptions Minimum deductions of voids dealt with in document they shall refer only to openings or wants which are wholly within boundaries of measured areas Openings or voids/holes at the boundaries of measured areas shall always be subject of deduction irrespective of size	Measurements: Measured net as fixed in position Each measurement taken to the nearest 10mm Rule shall not apply to any dimensions stated in descriptions Minimum deductions of voids dealt with in document they shall refer only to openings or wants which are wholly within boundaries of measured areas Openings or wants that are at the boundaries of measured areas shall always be subject of deduction irrespective of size		
Supplementary rules: Measurement rules: when work shall be measured and method of computing quantities Definition rules: extent and limits of the work Coverage rules: incidental work deemed to be included in item Supplementary info: rules governing information given in addition	Description: Order of stating dimensions in descriptions shall be consistent and generally in length, width and height Where sequence is not appropriate or ambiguity could arise, dimensions shall be specifically identified Unless otherwise stated the following shall be deemed to be included in all items: Labour and all costs in connection therewith Materials, goods and all costs in connection therewith (eg conveyance, delivery, unloading, storing, returning packings, handling, hoisting, lowering) Fitting and fixing materials and goods in position Use of plants and machinery	Descriptions: Order of stating dimensions in descriptions shall be consistent and generally in length, width and height Where sequence is not appropriate or ambiguity could arise, dimensions shall be specifically identified Unless otherwise specifically stated in the bill or herein, the following shall be deemed to be included in all items: Labour and all costs in connection therewith Materials, goods and all costs in connection therewith (eg conveyance, delivery, unloading, storing, returning packings, handling, hoisting, lowering) Fitting and fixing materials and goods in position Use of plant		
Quantities: Measured net, fixed in position except otherwise stated in measurement rule Dimension taken to nearest 10mm (thus >5mm = 10mm; <5mm = 0) Tonnes - to two decimal places; other quantities to nearest whole unit (thus>1 = 1)				Item descriptions: Work classification divides work into 27 main classes

GENERAL RULES

BESMM3	SMM2	MMBZ	SABS1200 & SABS1200AAC	CESMM3
Void deductions - minimum deductions in document only for openings within boundaries of measured areas; openings @ boundaries must always be deducted, irrespective of size Separate items for widths not exceeding as stated limit does not apply where widths are caused by voids	Waste of materials Square cutting Establishment charges, overhead charges and profit All taxes and duties	Waste of materials Square cutting Establishment charges, overhead charges and profit		Each class comprises up to three divisions Each division comprises a list of up to eight descriptive features of work Each item description shall identify the component of work covered with respect to one feature from each division of the relevant class
Descriptions: Sequence length, width, height Precise and unique cross reference to drawings/specifications can be used in description of item Headings read as part of description of items heading applies to Hyphen between two dimensions - mean range of dimensions exceeding 1st dimension but not exceeding 2nd Each section begin with description statin nature and location of work Unless stated, following included with all items: Labour Materials, goods Assembling, fitting and fixing materials and goods in position Plant Waste material Square cutting Establishment, overhead and profit Consumables including jointing material (not gaskets, bolts, nuts and washers) Dimension description - define all dimensions to identify shape and size of item and components	Junctions between straight and curved work shall be included with the work in which they occur Notwithstanding provisions for labours to be given as linear items such labours may be given in the descriptions of any linear items of work in which they occur Notwithstanding provisions for labours to be enumerated, such labour may be given in description of any enumerated item of work on which they occur Labours on existing work shall be so described Sizes of pipes or the like: Where doc requires size of pipes and tubes (measured internally) and bars, cables, conduits, standards and the like (measured externally) to be stated, actual size of pipe, tube, bar shall be stated Quantities: Where unit of billing is metre, kilogram or litre quantities shall be billed to the nearest whole unit Fractions of a unit less than half shall be disregarded, other fractions shall be regarded as whole units BOQ is subject to use of more than two identical units repeated, then the unit of billing shall be to the nearest two decimal places Where application of this clause cause entire item to be eliminated, such item shall be enumerated stating size or weight as appropriate	Junctions between straight and curved work shall in all cases be deemed to be included with the work in which they occur Notwithstanding provisions in this document for labours to be given as linear items such labours may be given in the descriptions of any linear items of work in which they occur Notwithstanding provisions in this document for labours to be enumerated, such labour may be given in description of any enumerated item of work on which they occur Labours on old work shall be so described Grouping sizes: Where doc requires size of pipes and tubes (measured internally) and bars, cables, conduits, standards and the like (measured externally) to be stated they shall be grouped together as follows: Small (not exceeding 55mm diameter) Large (over 55mm but not exceeding 110mm diameter) Extra large (over 110mm diameter) Small quantities, narrow widths, short lengths: All small quantities, narrow widths and short lengths shall be deemed to be included with the work in which they occur Quantities: Where unit of billing shall be in metre and kilogram. Fractions of a nut less than half shall be disregarded and all other fractions shall be regarded as whole units Where application of this clause would cause an entire item to be eliminated, such an item shall be enumerated stating the size or weight as appropriate		Units of measurement: Unit of measurement for each item shall be that stated for the item in the work classification Measurement rules: Set out the conditions under which work shall be measured and the method by which the quantities shall be computed Definition rules: Define the extent and limits of the class of work represented by a word or expression used in the work classification and in the BOQ Coverage rules: Provide that the work stated is deemed to be included in the appropriate items to the extent that such work is included in the contract. A coverage rule does not state all the work covered by an item and does not preclude any of the work stated being covered by a method-related charge Additional description rules: Where additional description is given, a separate item shall be given for each component of work exhibiting a different additional feature Where a descriptive feature in the work classification identifies a range or group of dimensions and an applicable additional description rule requires the particular dimensions
Drawn information:				

GENERAL RULES

BESMM3	SMM2	MMBZ	SABS1200 & SABS1200AAC	CESMM3
Block plan - identify site and locate outline of construction infrastructure Site plan - locate portion of construction infrastructure in relation to set out points Plans, Sections & Elevations: general construction and location of principal elements Component drawing - information for manufacturing and assembling a component Dimensioned diagrams - show space and shape of work covered by an item: may be use i.l.o. Dimension description Schedules seen as drawings	Provisional or prime cost sums: Where provisional or prime cost sums required, choice of term shall be made in conformity with the following definitions unless otherwise provided: "Provisional sum" shall mean sum provided for work or for costs which cannot be entirely foreseen, defined or detailed at the time of documents issued "Prime cost sum" shall mean sum provided for work or services to be executed by nominated sub-contractor, statutory authority or public undertaking for materials or goods to be obtained from a nominated supplier Item shall be exclusive of any profit and any attendance required by the general contractor and provision shall be made for the addition thereof	Provisional or prime cost sums: Where provisional or prime cost sums required, choice of term shall be made in conformity with the following definitions unless otherwise provided in the conditions of contract: "Provisional sum" shall mean sum provided for work or for costs which cannot be entirely foreseen, defined or detailed at the time the tendering documents are issued "Prime cost sum" shall mean sum provided for work or services to be executed by nominated sub-contractor, statutory authority or public undertaking or for materials or goods to be obtained from a nominated supplier Such sum shall be exclusive of any profit required by the general contractor and provision shall be made for the addition thereof		to be stated, the range or group of dimensions shall not also be stated Applicability of rules: Rules printed on a right-hand page above a double line apply to all work in the class. Other rules on a right-hand page apply to particular groups of items as shown by the classification table Use of optional classes: Measurement of works relating to earthworks, trenches and roads can be simplified by eliminating the detailed breakdown of the work and paying for the completed permanent work
Special types of work: Work to be separately identified: On or in existing building Carried out and subsequently removed (not temporary works) Outside curtilage of site In or under water Under compressed air	Work under water: Work executed in or under water shall be so described stating whether canal, river or sea water and (where applicable) the levels of high and low water Work in compressed air: Work in compressed air shall be so described stating the pressure and method of entry and exit Dayworks: "Day works" shall mean work for which the contractor is to be paid on the basis of cost of materials, labour and plant plus an agreed percentage for overheads and profit Works shall be quantified as "dayworks" where the works cant be measured in normal way stipulated in document Such works shall be quantified as provided in P&G: dayworks	Work under water: Work executed in or under water shall be so described stating whether canal or river water and (where applicable) the levels of high and low water Work in compressed air: Work in compressed air shall be so described stating the pressure and method of entry and exit		Coding: For convenience of reference each item in the work classification has been assigned a code number consisting of a letter and not more than three digits Method-related charges: Tenderer may insert in BOQ such items for method-related charges as he may decide to cover items of work relating to his intended method of executing the works, the costs of which are not to be considered as proportional to the quantities of the other items and for which he has not allowed in the rates and prices for the other items Itemization of method-related charges should follow the order of classification and the other requirements set out in class A of the work classification, distinguishing between time-related charges and fixed charges Each item shall be fully described so as to define precisely the extent of the work covered and to identify the resources to be used and the particular items of permanent works or temporary works, if any, to which the item relates Each item shall be fully described so as to define precisely the extent of the work covered and to identify the resources to be used and the particular items of permanent works or temporary works, if any, to which the item relates Insertion of method-related charge by the contractor shall not bind him to adopt the method stated in the item description in executing the works
Fixing, base and background: Fixing through vulnerable materials, such material must be identified as one of the following: Timber Masonry Metal Metal faced materials	Departures from the Standard Method of Measurement: No departure shall be made from this Standard Method except to meet requirements of exceptional circumstances In such case, special methods may be adopted provided principles laid down are observed			

GENERAL RULES

BESMM3	SMM2	MMBZ	SABS1200 & SABS1200AAC	CESMM3
Glass, marble, mosaic, tile and the like Each type of base to be identified separately	Rules of measurement adopted shall be clearly stated in BOQ			Method-related charges are not subject to any adjustment The amount shall be neither increased nor decreased by reason only of any change in method made by the contractor, unless such change has been instructed in terms of the contract
Composite items: Work manufactured off site may be combined into one item, provided items incorporated in composite item off site Shall include breaking down for transport, installation and re-assembly				
Drawn and specification info not available: Estimated quantities can be given as approximate quantity Provisional sum can be provided for work without full descriptions Provisional sum - for work not completely designed, following information to be provided: Nature and construction of work How and where work is fixed to and other work fixed thereto Quantities indicating scope and extent of work Specific limitations Provisional sum - Contractor deemed to make allowance in programming, planning and pricing preliminaries Provisional sum - for undefined work, Contractor deemed to not make allowance in programming, planning and pricing preliminaries				
Symbols and abbreviations - given				
Work to existing buildings: Must be so described: defined as work on, or in, or immediately under existing work Additional P&G items				
General definitions Work described as curved with radii stated details of curved work including concave or convex, if conical or spherical, if to more than one radius and state the radius or radii Radius - measured to the centre line of the material unless otherwise stated				
Free issue materials Give details: Point of delivery or collection and responsibility of handling together with schedule of delivery key issues Material test certificates and identification Methods of protection, storage and associated preparatory work such as degreasing and cleaning Conditions of steel work and pipe work ends				

GENERAL RULES

BESMM3	SMM2	MMBZ	SABS1200 & SABS1200AAC	CESMM3
whilst in the care of the contractor and return of surplus and scraps				
Method-related charges: Apply to measurements under civil and industrial engineering works Method related charges - tenderer decide to cover items or work related to his intended method of executing works, costs are not proportional to quantities of other items and cost not included in other item rates and prices Items for method related charges shall be fully described to identify resources to be used and to which item (permanent works/Temporary works) it relates Adding method related charge item shall not bind the tenderer to adopt the method stated in the item description in executing the works Method related charge item shall not be subject to remeasurement Method-related charges - sum for an item inserted in boq by tenderer for his intended method of executing works Time-related charges - method-related charge work for cost considered proportional to length of time taken to execute Fixed charge - method-related charge not included in time-related charges				

PRELIMINARIES & GENERAL

GENERAL RULES	BESMM3	Fixed charge: work to be considered as independent of duration Time related charge: work to be considered dependent on duration Work of temporary nature: include rates, fees and charges related thereto in sections: Employer's requirements; Site accommodation; General services and facilities & Contractor's temporary works general cost					
	SABS1200	Fixed charge: a charge for work that is executed without reference to time Method-related: sum for item inserted by the Contractor to cover item of work relating to his intended method of executing the works Time-related charge: a charge for work the cost of which is varied in proportion to the length of time taken to execute particular item Value-related charge: a charge directly proportional to the value of the contract Rate cover direct costs plus overheads and include profit, all costs and expenses required for item and all general risks, liabilities and obligations set forth or implied in the documents Fixed-charge & Value-related items: sum tendered for each item will be paid in a single payment after Contractor's obligations in respect of item have been discharged Time-related items: payment in incremental amounts calculated by division of tendered sum by the number of months required to complete site activities					
	SABS1200AAC	Fixed charge: a charge for work that is executed without reference to time Method-related: sum for item inserted by the Contractor to cover item of work relating to his intended method of executing the works Time-related charge: a time-related charge for work, the cost of which, to the Employer, is varied in proportion to the length of time (agreed by the Engineer) taken to execute the particular item scheduled Value-related charge: a charge directly proportional to the value of the contract Rate cover direct costs plus overheads and include profit, all costs and expenses required for item and all general risks, liabilities and obligations set forth or implied in the documents In the absence of a price against an item or in the event of a price marked 'N/A' or íncluded' against any item, no claim in respect of additional costs or charges for provision of any of the duties, services, facilities, or obligations required in respec Fixed-charge: sum tendered for each item will be paid in one single payment in terms of the first progress certificate issued after the Contractor's obligations have, in the opinion of the Engineer, been discharged as far as that item is concerned Value-related items: the sum tendered for each value-related item shall be paid in direct ratio to the value of the measured work in each progress certificate issued after the Contractor's obligations have, in the opinion of the Engineer, been discharged as far as that item is concerned Time-related items: payment in incremental amounts calculated by division of tendered sum by the number of months required to complete site activities					
	CESMM3	Definitions: Fixed charge - method-related charge which is not a time-related charge Method-related charge - the sum for an item inserted in the BOQ by a tenderer according to Contractor's method Time-related charge - a method-related charge for work the cost of which is to be considered as proportional to the length of time taken to execute the wor Measurement rules: Unit of measurement for general item shall be the sum, except where another unit of measurement is used in accordance with rule M2					
PARTIES	BESMM3	Project Particulars	1 2	Name, nature & location Name & addresses		Item	
	SMM2	Name of parties	B1	Names & addresses of employer, Architect, Engineer & Quantity Surveyors stated			
	MMBZ	Name of parties	B1	Names & addresses of employer, Architect, Engineer & Quantity Surveyors stated			
DOCS	BESMM3	Documents	1	List drawings/other documents		Item	
SITE	BESMM3	Site/existing Buildings	1 2 3 4	Site boundaries Existing buildings Existing mains/services Other details		Item	
	SMM2	Description of site	B2.a B2.b B2.c B2.d	Location of site stating mode of access. Limitations of working space and to any adjacent or abutting buildings given Recommendations to visiting site and inspection of any trail holes stating where keys may be obtained & where drawings and other documents may be inspected Any restrictions imposed on use or disposal of any sand or gravel found on site, particulars given Possession of site given in sections , particulars given			

PRELIMINARIES & GENERAL

	MMBZ	Description of site	B2.a	The position of the site shall be described stating the mode of access. Attention shall be drawn to any limitations of working space and to any adjacent or abutting buildings			
			B2.b	Recommendations as to visiting the site and inspection of any trail holes shall be made stating where keys may be obtained (if any required) & where drawings and other documents may be inspected			
			B2.c	Where any restrictions are imposed on use or disposal of any sand or gravel found on site, particulars of the restrictions shall be given			
			B2.d	Where possession of the site will be given in sections , particulars shall be given			
WORKS	BESMM3	Work Description	1	Elements		Item	
			2	Dimension and shape	If not on drawings		
			3	Details of work by others			
	SMM2	Description of the works	B3.a	General description			
			B3.b	Drawings not supplied with Bill, size of building, height above and below ground level and number of storeys given			
			B3.c	Works required to be executed or completed in any specific order or in sections or phases, particulars given			
	MMBZ	Description of the works	B3.a	General description			
			B3.b	Where drawings are not supplied with Bill, particulars of the following shall be given:			
			B3.b.i	Size of building, the height above and below ground level and number of storeys			
			B3.b.ii	Length and height of external elevations, the total length of each different height being given separately			
			B3.c	Where works are required to be executed or completed in any specific order or in sections or phases, particulars shall be given			
CONTRACTS	BESMM3	Form of Contract	1	Schedule of standard conditions		Item	
			2	Special conditions			
			3	Appendix insertions			
			4	Employer's insurance			
			5	Performance guarantee			
	SMM2	Contract particulars	B4.a	Particulars of form and type of contract given			
			B4.b	Conditions of contract standard: particulars of edition to be used given and schedule of the clause headings set out in bill			
			B4.c	Other conditions used: copy of full conditions supplied with bill and schedule of the clause headings set out in bill			
			B4.d	Appendix to conditions of contract where insertions are required, schedule of insertions set out in bill			
	MMBZ	Contract particulars	B4.a	Particulars of form and type of contract shall be given			
			B4.b	Where conditions of contract are standard: particulars of edition to be used shall be given and schedule of the clause headings shall be set out in bill			
			B4.c	Where other conditions are used: a copy of full conditions supplied with bill and schedule of the clause headings shall be set out in bill			
			B4.d	Where there is an appendix to conditions of contract requiring insertions to be made, a schedule of insertions shall be set out in bill			
	SABS1200	Contractual requirements	8.3.1	Contractual requirements	Fixed and Value	Sum	Include providing sureties, insurance of work and plant, third party- and public liability insurance, unemployment insurance and other initial financing obligations

PRELIMINARIES & GENERAL

			8.4.1	Contractual requirements	Time related	Sum	Include providing sureties, insurance of work and plant, third party- and public liability insurance, unemployment insurance and other initial financing obligations
	SABS1200AAC	Contractual requirements	8.3.1	Contractual requirements	Fixed and Value	Sum	Include providing sureties, insurance of work and plant, third party- and public liability insurance, unemployment insurance and other initial financing obligations
			8.4.1	Contractual requirements	Time related	Sum	Include providing sureties, insurance of work and plant, third party- and public liability insurance, unemployment insurance and other initial financing obligations
	CESMM3	Contractual requirements	1	Performance bond Insurance of the works Third party insurance		Sum Sum Sum	Insurance classed as contractual requirements shall to include only provision of insurance in accordance with requirements in contract data
EMPLOYER	SMM2	Employer's liability	B10	Cost on insuring any liability of the employer is required		Prov Sum/ Prime cost	
	MMBZ	Employer's liability	B10	Where cost on insuring any liability of the employer is required to be included in the contract sum		Prov Sum/ Prime cost	
	BESMM3	Employer's Requirements or Limitations Tendering/Sub-letting/Supply	1	Details	Fixed charge Time related charge	Item	
	BESMM3	Employer's Requirements or Limitations Content and use of documents	1 2 3 4 5 6 7	Noise and pollution control Maintain adjoining buildings Maintain public and private roads Maintain live services Security Protection of work in all sections Others	Fixed charge Time related charge	Item	
	BESMM3	Employer's Requirements or Limitations Limitations on method/sequence/timing/use of site	1 2 3 4 5 6 7 8	Design consultants Method and sequence of work Access Use of the site Use or disposal of materials found Start of work Telephone and rental/maintenance Others	Fixed charge Time related charge	Item	
	BESMM3	Employer's Requirements or Limitations Facilities/Temporary works/Services	1 2 3 4 5 6	Offices Sanitary accommodation Temporary fences, hoardings, screens and roofs Name boards Technical and surveying equipment Temperature and humidity	Fixed charge Time related charge	Item	Heating, lighting, cleaning and maintenance included
	SMM2	Obligations imposed by employer	B6	Obligations or restrictions imposed on contractor by employer in respect of any matter not covered by any clause in conditions shall be given as an item stating relevant particulars		Item	
	MMBZ	Obligations imposed by employer	B6	Any obligations or restrictions that may be imposed on the contractor by the employer in respect of any matter not covered by any clause in the conditions of contract shall be given as an item stating relevant particulars		Item	
	SABS1200	Facilities for Engineer	8.3.2.1.a 8.3.2.1.b	Furnished offices Telephone	Fixed and Value Fixed and Value	Sum Sum	

PRELIMINARIES & GENERAL

			8.3.2.1.c	Nameboards	Fixed and Value	Sum	
			8.4.2.1.a	Furnished offices	Time related	Sum	
			8.4.2.1.b	Telephone	Time related	Sum	
			8.4.2.1.c	Nameboards	Time related	Sum	
			8.4.2.1.d	Survey assistants and materials	Time related	Sum	
	SABS1200AAC	Facilities for Engineer	8.3.2.1.a	Furnished offices	Fixed and Value	Sum	
			8.3.2.1.b	Telephone	Fixed and Value	Sum	
			8.3.2.1.c	Nameboards	Fixed and Value	Sum	
			8.4.2.1.a	Furnished offices	Time related	Sum	
			8.4.2.1.b	Telephone	Time related	Sum	
			8.4.2.1.c	Nameboards	Time related	Sum	
			8.4.2.1.d	Survey assistants and materials	Time related	Sum	
	CESMM3	Specified requirements	2.1	Accommodation for the Engineer's staff			Quantity shall be given against all items of which the value is to be ascertained and
			2.1.1	Offices		Sum	determined in accordance with the contract
			2.1.2	Laboratories		Sum	A unit of measurement shall be stated for each such item
			2.1.3	Cabin		Sum	Items shall be given in this class for all testing for which items are not given separately as set out in other classes
			2.2	Services for the Engineer's staff			All work other than permanent works which is expressly stated and of which the
			2.2.1	Transport vehicles		Sum	nature and extent is expressly stated shall be classed as specified requirements
			2.2.2	Telephones		Sum	
			2.3	Equipment for use by the Engineer's staff			Item descriptions for work which is to be carried out after issue of completion
			2.3.1	Office equipment		Sum	certificate shall be so stated
			2.3.2	Laboratory equipment		Sum	Item descriptions shall distinguish between establishment and removal of services
			2.3.3	Surveying equipment		Sum	or facilities and their continuing operation or maintenance
			2.4	Attendance upon the Engineer's staff			
			2.4.1	Drivers		Sum	
			2.4.2	Chainmen		Sum	
			2.4.3	Laboratory assistants		Sum	
			2.5	Testing of materials		Sum	
			2.6	Testing of the works		Sum	Items for testing shall include particulars of samples and of methods of testing
			2.7	Temporary works			
			2.7.1	Traffic diversions		Sum	
			2.7.2	Traffic regulation		Sum	
			2.7.3	Access roads		Sum	
			2.7.4	Bridges		Sum	
			2.7.5	Cofferdams		Sum	
			2.7.6	Pumping		Sum	
			2.7.7	De-watering		Sum	
			2.7.8	Compressed air for tunnelling		Sum	
	BESMM3	Contractor's General Costs		If made available by Employer, details and conditions stated	Fixed charge	Item	
		Temporary Works	1	Temporary roads	Time related charge		
			2	Temporary walkways			
			3	Access scaffolding			
			4	Support scaffolding and propping			
			5	Hoarding, fans, fencing, etc.			
			6	Hardstanding			
			7	Traffic regulations			
			8	Other			
	SMM2	Temporary works generally	B11	Clearing away temporary works and making good after		Item	
	MMBZ	Temporary works generally	B11	Clearing away temporary works and making good after shall be deemed to be included with the items			
	SMM2	Temporary roads	B12	Temporary roads, tracks, hard-standing, crossings and the like		Item	

PRELIMINARIES & GENERAL

TEMPORARY	MMBZ	Temporary roads	B12	Temporary roads, tracks, hard-standing, crossings and the like stating relevant particulars		Item	
	SMM2	Temporary buildings	B13.a B13.b	Temporary sheds, offices, messrooms, sanitary accommodation, other temporary buildings for use of the contractor Lighting, furniture, equipment and attendance included in item Temporary offices for use of the architect, engineers, quantity surveyor, clerk of works and other person acting on behalf of the employer stating floor area required Lighting, furniture, equipment and attendance included in item		Item Item	
	MMBZ	Temporary buildings	B13.a B13.b	Temporary sheds, offices, messrooms, sanitary accommodation, other temporary buildings for use of the contractor Lighting, furniture, equipment and attendance included in item Temporary offices for use of the architect, quantity surveyor, clerk of works and other person acting on behalf of the employer stating floor area required Lighting, furniture, equipment and attendance shall be given in description		Item Item	
	SMM2	Temporary telephones	B14	Temporary telephone facility on site		Item	
	MMBZ	Temporary telephones	B14	Temporary telephone facility on site Cots of all calls and facilities shall be deemed to be included with the item		Item	
	SMM2	Temporary screens	B15	Temporary screens and the like stating area and any requirements regarding construction Doors & windows in screens shall be given in description		Item	
	MMBZ	Temporary screens	B15	Temporary screens and the like stating area and any requirements regarding construction Doors & windows in screens shall be given in description		Item	
	SMM2	Temporary hoardings and gantries	B16.a B16.b	Temporary fencing, hoardings, fans, planked footways, guard-rails, gantries and the like for protecting the public, for the proper execution of the works and for meeting requirements of local or other authority stating conditions imposed by employer regarding construction, access, decoration and advertisement Temporary works specifically required by employer stating relevant particulars		Item Item	
	MMBZ	Temporary hoardings and gantries	B16.a B16.b	Temporary fencing, hoardings, fans, planked footways, guard-rails, gantries and the like as may be necessary for protecting the public, for the proper execution of the works and for meeting requirements of any local or other authority stating conditions imposed by employer regarding construction, access, decoration and advertisement Such temporary works specifically required by employer stating relevant particulars		Item Item	
	SABS1200	Temporary works	8.8.1 8.8.2 8.8.3 8.8.4 8.8.4.a 8.8.4.b 8.8.4.c	Main access road to works (construct and maintain Dealing with traffic (or accommodation of traffic) Protection of …… structure until construction in vicinity is complete Existing Services: Supply or hire of specialist equipment for detection of particular service Use of equipment Excavation by hand in soft material to expose … service		Sum Sum Sum Sum Day/sum m3/day works	Where no items are provided in other sections for detection, exposure, protection and alterations and there is reason to expect presence of services, will be measured here

PRELIMINARIES & GENERAL

			8.8.4.d	Temporary protection, as required in terms of the project specification of …… services		Sum/day works	
			8.8.5	Cost of survey in terms of land survey act			Engineer may schedule item under provisional sums
			8.8.5.a	Trigonometrical survey and plot boundary pegs - locate and record		Stated sum	Payment will be combination of payment by Employer to land surveyor direct and lump sum for all parts of operation excluding, when relevant, the work carried out in a), sum agreed prior to work being carried out and daywork rates
			8.8.5.b	Trigonometrical survey and plot boundary pegs - protect and re-establish		Stated sum	
			8.8.6	Special water control in terms of project specification		Sum	Where abnormal circumstance occurs or may occur at a point or area of the Works, the Engineer may schedule item under Provisional Sums
	SABS1200AAC	Temporary works	8.8.1	Main access road to works (construct and maintain		Sum	
			8.8.2	Dealing with traffic (or accommodation of traffic)		Sum	
			8.8.3	Protection of …… structure until construction in vicinity is complete		Sum	
			8.8.4	Existing Services:			Where no items are provided in other sections for detection, exposure, protection and alterations and there is reason to expect presence of services, will be measured here
			8.8.4.a	Supply or hire of specialist equipment for detection of particular service		Sum	
			8.8.4.b	Use of equipment		Day/sum	
			8.8.4.c	Excavation by hand in soft material to expose … service		m3/day works	
			8.8.4.d	Temporary protection, as required in terms of the project specification of …… services		Sum/day works	
			8.8.5	Cost of survey in terms of land survey act			Engineer may schedule item under provisional sums
			8.8.5.a	Trigonometrical survey and plot boundary pegs - locate and record		Stated sum	Payment will be combination of payment by Employer to land surveyor direct and lump sum for all parts of operation excluding, when relevant, the work carried out in a), sum agreed prior to work being carried out and daywork rates
			8.8.5.b	Trigonometrical survey and plot boundary pegs - protect and re-establish		Stated sum	
			8.8.6	Special water control in terms of project specification		Sum	Where abnormal circumstance occurs or may occur at a point or area of the Works, the Engineer may schedule item under Provisional Sums
	BESMM3	Contractor's General Costs Management and Staff	1 2		Fixed charge Time related charge	Item	Includes management, trades supervision, engineering, programming and production, quantity surveying, support staff, etc.
	BESMM3	Contractor's General Costs Site accommodation	1	If made available by Employer, details and conditions stated	Fixed charge Time related charge	Item	Includes offices, laboratories, cabins, stores, compounds, canteens, sanitary facilities, etc.
	BESMM3	Contractor's General Costs Services and Facilities		If made available by Employer, details and conditions stated	Fixed charge Time related charge	Item	General attendance: includes for use of Contractor's temporary roads, pavings, paths, standing scaffolding, standing power operated hoisting plant, temporary lighting and water supplies, clearing away rubbish, space for sub-contractor's own offices and storage, etc.
			1	Power			
			2	Lighting			
			3	Fuels			
			4	Water			
			5	Telephone and administration			
			6	Safety, health and welfare			
			7	Storage of materials			Where Joint fire code applies: includes hand bells, whistles, klaxons, manually operated sounders, security guards, fire signage, fire doors, fire stopping to lifts-shafts, services ducts and voids, water supplies for fire fighting equipment, fire marshals
			8	Rubbish disposal			
			9	Cleaning			
			10	Drying out			
			11	Protection of work			
			12	Security			
			13	Maintain public and private road			
			14	Small plant and tools			
			15	Others			
			16	General attendance of nominated sub-contractors			
			17	Ditto, in respect of joint fire code requirements			
	SMM2	Water for the works	B7	Water for works & temporary arrangements for storing and distributing Water supplied free of cost, particulars given to the available capacity, source and location of the point of free supply		Item	

PRELIMINARIES & GENERAL

	MMBZ	Water for the works	B7	Water for works & temporary arrangements for storing and distributing Where water will be supplied free of cost to the contractor, particulars shall be given to the available capacity, the source (public main, bore hole) and location of the point of free supply		Item	
	SMM2	Lighting and power for works	B8	Lighting & power and temporary arrangements for distribution and for lighting of hoardings and the like Electric supplied free of cost, particulars given to available capacity for voltage, type of supply and location of point of free supply		Item	
	MMBZ	Lighting and power for works	B8	Lighting & power for the works and temporary arrangements for distribution and for lighting of hoardings and the like Where electric current will be supplied free of cost to the contractor, particulars shall be given to available capacity for voltage, type of supply (alternating, direct) and location of point of free supply		Item	
	SMM2	Contractor's liability	B9.a B9.b B9.c	Contractor's liability for risk of injury to persons & property and of damage to the works unless covered by schedules per B4 Where contractor effect insurance in respect of contractor's liability unless covered by schedules per B4 Employer intends to relieve contractor of liability for risk, relevant particulars given unless covered by schedules per B4		Item	
	MMBZ	Contractor's liability	B9.a B9.b B9.c	Contractor's liability for risk of injury to persons & property and of damage to the works unless covered by schedules per B4 Where the employer requires the contractor to effect insurance in respect of contractor's liability for nay such risk, the relevant particulars shall be given unless covered by schedules per B4 Where the employer intends to relieve contractor of liability for risk, relevant particulars shall be given unless covered by schedules per B4		Item	
	SMM2	Protection of the works	B22	Protection of the works covering all sections of the works		Item	
	MMBZ	Protection of the works	B21	Protection of the works covering all sections		Item	
	SMM2	Removing rubbish & cleaning	B23	Removing rubbish and debris and cleaning the works internally and externally		Item	
	MMBZ	Removing rubbish & cleaning	B22	Removing rubbish and debris and cleaning the works internally and externally		Item	
	BESMM3	Contractor's General Costs Mechanical plant		If made available by Employer, details and conditions stated 1 Cranes 2 Hoists 3 Personnel transport 4 Transport 5 Earth moving plant 6 Concrete plant 7 Piling plant 8 Paving and surfacing plant 9 Other	Time related charge	Item	
	SMM2	Items for convenience in pricing	B5 i ii iii	Items for the following shall be given where applicable unless covered by schedules given in B4: Plant, tools & vehicles Safety, health and welfare of work people Notice and fees to local authorities and public undertakings		Item Item Item	

PRELIMINARIES & GENERAL

CONTRACTOR			iv	Setting out of works		Item	
			v	General foreman		Item	
			vi	National insurances & pensions for work people		Item	
			vii	Holiday for work people		Item	
			viii	Transport for work people		Item	
			ix	Safeguarding of works, materials and plant against damage and theft		Item	
			x	Maintenance of public and private roads		Item	
			xi	Police regulations		Item	
	MMBZ	Items for convenience in pricing	B5	For convenience in pricing, items for the following shall be given where applicable unless covered by schedules given in B4:			
			i	Plant, tools & vehicles		Item	
			ii	Safety, health and welfare of work people		Item	
			iii	Notice and fees to local authorities and public undertakings		Item	
			iv	Setting out of works		Item	
			v	General foreman		Item	
			vi	National insurances & pensions for work people		Item	
			vii	Holiday for work people		Item	
			viii	Transport for work people		Item	
			ix	Safeguarding of works, materials and plant against damage and theft		Item	
			x	Maintenance of public and private roads		Item	
			xi	Police regulations		Item	
	SABS1200	Facilities for contractor	8.3.2.2.a	Offices and storage sheds	Fixed and Value	Sum	
			8.3.2.2.b	Workshops	Fixed and Value	Sum	
			8.3.2.2.c	Laboratories	Fixed and Value	Sum	
			8.3.2.2.d	Living accommodation	Fixed and Value	Sum	
			8.3.2.2.e	Ablution and latrine facilities	Fixed and Value	Sum	
			8.3.2.2.f	Tools and equipment	Fixed and Value	Sum	
			8.3.2.2.g	Water supplies, electric power and communications	Fixed and Value	Sum	
			8.3.2.2.h	Dealing with water	Fixed and Value	Sum	
			8.3.2.2.i	Access	Fixed and Value	Sum	
			8.3.2.2.j	Plant	Fixed and Value	Sum	
			8.4.2.2.a	Offices and storage sheds	Time related	Sum	Cover costs for period stated for site rentals, repairs to and depreciation of buildings, furniture, tools and equipment, storage and distribution of fuels and lubricants, water, electricity, communications, access and sanitation, wages of staff operating and maintaining facilities
			8.4.2.2.b	Workshops	Time related	Sum	
			8.4.2.2.c	Laboratories	Time related	Sum	
			8.4.2.2.d	Living accommodation	Time related	Sum	
			8.4.2.2.e	Ablution and latrine facilities	Time related	Sum	
			8.4.2.2.f	Tools and equipment	Time related	Sum	
			8.4.2.2.g	Water supplies, electric power and communications	Time related	Sum	
			8.4.2.2.h	Dealing with water	Time related	Sum	
			8.4.2.2.i	Access	Time related	Sum	
			8.4.2.2.j	Plant	Time related	Sum	
	SABS1200AAC	Facilities for contractor	8.3.2.2.a	Offices and storage sheds	Fixed and Value	Sum	
			8.3.2.2.b	Workshops	Fixed and Value	Sum	
			8.3.2.2.c	Laboratories	Fixed and Value	Sum	
			8.3.2.2.d	Living accommodation	Fixed and Value	Sum	
			8.3.2.2.e	Ablution and latrine facilities	Fixed and Value	Sum	
			8.3.2.2.f	Tools and equipment	Fixed and Value	Sum	
			8.3.2.2.g	Water supplies, electric power and communications	Fixed and Value	Sum	
			8.3.2.2.h	Dealing with water	Fixed and Value	Sum	
			8.3.2.2.i	Access	Fixed and Value	Sum	
			8.3.2.2.j	Plant	Fixed and Value	Sum	
			8.4.2.2.a	Offices and storage sheds	Time related	Sum	Cover costs for period stated for site rentals, repairs to and depreciation of buildings, furniture, tools and equipment, storage and distribution of fuels and lubricants, water, electricity, communications, access and sanitation, wages of staff operating and maintaining facilities
			8.4.2.2.b	Workshops	Time related	Sum	
			8.4.2.2.c	Laboratories	Time related	Sum	
			8.4.2.2.d	Living accommodation	Time related	Sum	
			8.4.2.2.e	Ablution and latrine facilities	Time related	Sum	
			8.4.2.2.f	Tools and equipment	Time related	Sum	

PRELIMINARIES & GENERAL

			8.4.2.2.g	Water supplies, electric power and communications	Time related	Sum	
			8.4.2.2.h	Dealing with water	Time related	Sum	
			8.4.2.2.i	Access	Time related	Sum	
			8.4.2.2.j	Plant	Time related	Sum	
	CESMM3	Method-related charges	3.1	Accommodation and buildings			
			3.1.1	Office		Sum	Item descriptions shall distinguish between fixed and time-related charges
			3.1.2	Laboratories		Sum	
			3.1.3	Cabins		Sum	
			3.1.4	Stores		Sum	
			3.1.5	Canteens and messrooms		Sum	
			3.2	Services			
			3.2.1	Electricity		Sum	
			3.2.2	Water		Sum	
			3.2.3	Security		Sum	
			3.2.4	Hoardings		Sum	
			3.2.5	Site transport		Sum	
			3.2.6	Personnel transport		Sum	
			3.2.7	Welfare		Sum	
			3.3	Plant			
			3.3.1	Cranes		Sum	
			3.3.2	Transport		Sum	
			3.3.3	Earthmoving		Sum	
			3.3.4	Compaction		Sum	
			3.3.5	Concrete mixing		Sum	
			3.3.6	Concrete transport		Sum	
			3.3.7	Pile driving		Sum	
			3.3.8	Pile boring		Sum	
			3.4	Plant			
			3.4.1	Pipelaying		Sum	
			3.4.2	Paving		Sum	
			3.4.3	Tunnelling		Sum	
			3.4.4	Crushing and screening		Sum	
			3.4.5	Boring and drilling		Sum	
			3.5	Temporary works			
			3.5.1	Traffic diversions		Sum	
			3.5.2	Traffic regulation		Sum	
			3.5.3	Access roads		Sum	
			3.5.4	Bridges		Sum	
			3.5.5	Cofferdams		Sum	
			3.5.6	Pumping		Sum	
			3.5.7	De-watering		Sum	
			3.5.8	Compressed air for tunnelling		Sum	
			3.6	Temporary works			
			3.6.1	Access scaffolding		Sum	
			3.6.2	Support scaffolding and propping		Sum	
			3.6.3	Piling		Sum	
			3.6.4	Formwork		Sum	
			3.6.5	Shafts and pits		Sum	
			3.6.6	Hardstandings		Sum	
			3.7	Supervision and labour			
			3.7.1	Supervision		Sum	
			3.7.2	Administration		Sum	
			3.7.3	Labour teams		Sum	
			3.8	Health and safety			
			3.8.1	General health and safety obligations		Sum	
			3.8.2	Risk assessment		Sum	
			3.8.3	Health and safety plan		Sum	
			3.8.4	Training		Sum	

PRELIMINARIES & GENERAL

		3.8.5 3.8.6	Medical assessment of employees Construction safety officer and other appointments		Sum Sum	
SABS1200	Supervision for duration of construction	8.4.3	Supervision for duration of construction	Time related	Sum	Cover on-site supervision and local administration as necessary including salaries, wages and allowances paid to site agent, general foreman, section foremen, sit surveyors, timekeepers, assistants and other site supervisory staff, and of transport incurred in connection with such staff
SABS1200AAC	Supervision for duration of construction	8.4.3	Supervision for duration of construction	Time related	Sum	Cover on-site supervision and local administration as necessary including salaries, wages and allowances paid to site agent, general foreman, section foremen, sit surveyors, timekeepers, assistants and other site supervisory staff, and of transport incurred in connection with such staff
SMM2	General scaffolding	B17	General scaffolding for the works		Item	
MMBZ	General scaffolding	B17	General scaffolding for the works		Item	
BESMM3	Nominated sub-contractors	1 2 3	Sub contractor's work Main contractor's profit Special attendance: Scaffolding Access roads Hardstanding Positioning Storage Power Temperature Others	Give description Fixed charge Time related charge	PC Sum % Item	General attendance on sub contractor's work measured in section: Contractor's general cost items: Services and facilities Scaffolding: special scaffolding additional to Contractor's standing scaffolding Positioning: includes unloading, distributing, hoisting, placing in position
SMM2	Works by nominated contractors	B20.a B20.b B20.c	Works required by nominated sub-contractor Attendance on nominated sub-contractors deemed to include only allowing use of standing scaffolding, messrooms, sanitary accommodation and welfare facilities, providing space for office accommodation and for storage of plant and materials; providing light and water for the work; clearing away rubbish Special attendance giving particulars (unloading, storing, hoisting, placing in position, providing power, providing special scaffolding) Builder's work in connection with works by nominated sub-contractors shall be given in accordance with appropriate rules, grouped together under heading in each appropriate section of the bill		Prov Sum/ Prime Cost Item Item	
MMBZ	Works by nominated contractors	B20.a B20.b B20.c	Works which are required to be carried out by nominated sub-contractor Attendance on nominated sub-contractors deemed to include only allowing use of standing scaffolding, messrooms, sanitary accommodation and welfare facilities, providing space for office accommodation and for storage of plant and materials; providing light and water for the work; clearing away rubbish Special attendance given particulars (unloading, storing, hoisting, placing in position, providing power, providing special scaffolding) Builder's work in connection with works by nominated sub-contractors shall be given in accordance with appropriate rules. It is desirable for such work to be grouped together under a heading in each appropriate section of the bill		Prov Sum/ Prime Cost Item Item	

PRELIMINARIES & GENERAL

	BESMM3	Nominated Suppliers		1 Suppliers materials 2 Main Contractor's profit	Fixed charge	PC Sum %	Fixing only includes unloading, storing, hoisting, goods and materials, returning packaging, etc.
	SMM2	Goods from nominated suppliers	B20.a B20.b	Goods & materials obtained from nominated supplier Fixing only goods & materials as per rules. Unloading, storing, hoisting goods & materials and returning packing materials to nominated supplier carriage paid and obtaining credits therefore included with the items of fixing only Costs of conveying goods & materials to site, any special packing or the like required to be paid by the contractor, particulars given		Prov Sum/ Prime cost	
	MMBZ	Goods from nominated suppliers	B20.a B20.b	Goods & materials which are required to be obtained from nominated supplier Fixing goods & materials shall be given in accordance with appropriate rules. Unloading, storing, hoisting goods & materials and returning packing materials to nominated supplier carriage paid and obtaining credits thereof shall be deemed to be included with items of fixing Where costs of conveying goods & materials to site, any special packing or the like required to be paid by the contractor, particulars shall be given		Prov Sum/ Prime cost	
PRIME COST	SABS1200	Prime Cost Items	8.6.a 8.6.b 8.6.c	Prime cost of goods or materials to be supplied to the site Overheads, charges and profit on 8.6.a Transport and labour to handle and install 8.6.a		Stated sum % Sum	Engineer to state amount required Cover Contractor's overheads, charges for taking delivery and profit Fixed sum to cover cost of loading, transporting, handling and installing
PRIME COST	SABS1200AAC	Prime Cost Items	8.6.a 8.6.b 8.6.c	Prime cost of goods or materials to be supplied to the site Overheads, charges and profit on 8.6.a Transport and labour to handle and install 8.6.a		Stated sum % Sum	Engineer to state amount required Cover Contractor's overheads, charges for taking delivery and profit Fixed sum to cover cost of loading, transporting, handling and installing
PRIME COST	CESMM3	Prime Cost Items	5.1 5.1.1 5.2 5.2.1 5.3	Selected Subcontractors Overhead charges and profit Nominated Subcontractors Overhead charges and profit Other prime cost items		Sum % Sum % Sum	Item descriptions shall identify the work included
PUBLIC BODIES	BESMM3	Work by statutory authorities		1 Work by local authority 2 Work by statutory undertakers		Prov Sum	Statutory authorities: includes work by public companies responsible for statutory work
PUBLIC BODIES	SMM2	Works by public bodies	B19	Works carried out by local authority or public undertaking (taking up and relaying public roads, forming permanent crossings)		Prov Sum/ Prime Cost	
PUBLIC BODIES	MMBZ	Works by public bodies	B18	Works which may only be carried out by local authority or public undertaking (taking up and relaying public roads and footpaths, forming permanent crossings)	Each separately	Prov Sum/ Prime Cost	
	BESMM3	Provisional Work Provisional Work		1 Defined 2 Undefined		Prov Sum	
	BESMM3	Provisional Work Dayworks		1 Labour 2 Materials 3 Plant		Prov Sum	
	SMM2	Dayworks	B18.a	Cost of labour in dayworks, alternatively a schedule of different categories of labour may be given containing provisional quantity of hours for each category		Sum	

PRELIMINARIES & GENERAL

PROVISIONAL WORK & DAYWORKS				Cost of labour include wages, bonuses and any allowances paid to operatives directly engaged in dayworks (incl operators), where no such agreement exists the actual payment made to work people concerned			
			B18.b	Cost of materials in dayworks, alternatively a schedule containing provisional quantity of different materials		Sum	
			B18.c	Cost of materials included shall be net invoiced price including delivery to site			
			B18.d	Cost of construction plant in dayworks, alternatively a schedule of different categories of plant containing provisional quantity of hours		Sum	
			B18.e	Cost of construction plant include fuel, consumable stores, repairs, maintenance and insurance of plant			
			B18.f	Additional establishment charges, overheads and profit to each of the sums of labour, materials or plant		Item	
			B18.g	Establishment charges, overhead and profit shall include:			
			B18.h	Costs related to employment of labour			
			i	Cost related to the costs of materials including handling and waste in storage			
			ii	Contractors administrative arrangements			
			iii	Construction plant except plant employed exclusively on dayworks			
			iv	Contractors facilities			
			v	Temporary works			
			vi	Sundry items			
			vii				
	SABS1200	Daywork	8.7	Various classes of labour		Rate	Cover travelling, lodging and other emoluments and allowances payable to workmen
				Materials		Rate	
				Plant		Rate	Cover cost of plant operators, consumable stores, fuel and maintenance
				Percentage allowance for addition to the net cost		%	Cover overhead charges and profit, site supervision and site staff, insurances, holidays with pay, use and maintenance of tools and equipment,
	SABS1200AAC	Daywork	8.7	Various classes of labour		Rate	Cover travelling, lodging and other emoluments and allowances payable to workmen
				Materials		Rate	
				Plant		Rate	Cover cost of plant operators, consumable stores, fuel and maintenance
				Percentage allowance for addition to the net cost		%	Cover overhead charges and profit, site supervision and site staff, insurances, holidays with pay, use and maintenance of tools and equipment,
	SABS1200	Sums stated provisionally by Engineer	8.5.a	Work to be executed by the Contractor		Stated sum	Valued in terms of the 'valuation of variations' clause in conditions of contract
			8.5.b	Work to be executed by the Employer or a nominated subcontractor		Stated sum	Engineer to state amount required to complete the activity in the project specification
				Overheads, charges and profit on 8.5.b		%	Cover contractor's overheads, charges and profit on the amounts stated by the Engineer
				Specified activities associated with 8.5.b		Sum/rate/ unit	Cover the cost of such operations associated with the activity, operation or service specified in the project specification
	SABS1200AAC	Sums stated provisionally by Engineer	8.5.a	Work to be executed by the Contractor		Stated sum	Valued in terms of the 'valuation of variations' clause in conditions of contract
			8.5.b	Work to be executed by the Employer or a nominated subcontractor		Stated sum	Engineer to state amount required to complete the activity in the project specification
				Overheads, charges and profit on 8.5.b		%	Cover contractor's overheads, charges and profit on the amounts stated by the Engineer
				Specified activities associated with 8.5.b		Sum/rate/ unit	Cover the cost of such operations associated with the activity, operation or service specified in the project specification
	CESMM3	Provisional Sums	4.1	Dayworks		Sum	
			4.2	Other provisional sums		Sum	

PRELIMINARIES & GENERAL

CONT	SMM2	Contingencies	B24	Contingency provision		Prov Sum	
	MMBZ	Contingencies	B23	Contingency provision		Prov Sum	
OTHER	SABS1200	Other Fixed-charge obligations	8.3.3	Other Fixed-charge obligations	Fixed and Value	Sum	Cover all other obligations that are required for proper execution of the works that are not specifically covered
	SABS1200AAC	Other Fixed-charge obligations	8.3.3	Other Fixed-charge obligations	Fixed and Value	Sum	Cover all other obligations that are required for proper execution of the works that are not specifically covered
	SABS1200	Removal of site establishment	8.3.4	Removal of site establishment	Fixed and Value	Sum	Cover cost of the demolition and removal from site all items established and include for making good and restoring of site
	SABS1200AAC	Removal of site establishment	8.3.4	Removal of site establishment	Fixed and Value	Sum	Cover cost of the demolition and removal from site all items established and include for making good and restoring of site
	SABS1200	Company and head office overhead costs for the duration of the contract	8.4.4	Company and head office overhead costs for the duration of the contract	Time related	Sum	Cover company and head office overhead costs
	SABS1200AAC	Company and head office overhead costs for the duration of the contract	8.4.4	Company and head office overhead costs for the duration of the contract	Time related	Sum	Cover company and head office overhead costs
	SABS1200	Other Time-related obligations	8.4.5	Other Time-related obligations	Time related	Sum	Cover time-related costs of all other obligations that are required and that are not specifically covered
	SABS1200AAC	Other Time-related obligations	8.4.5	Other Time-related obligations	Time related	Sum	Cover time-related costs of all other obligations that are required and that are not specifically covered

SITE CLEARANCE

GENERAL RULES

BESMM3	Information to be supplied in General Conditions or on Drawings: 1. Ground water level and date defined 2. Post contract water level re-established at time of excavation 3. Ground water levels subject to periodic changes due to tidal or similar effects: give mean high and low 4. Details of trail pits or boreholes including location 5. Features retained 6. Liveover or underground services 7. Pile size and layout if applicable
SMM2	Any information available concerning nature of the ground and strata shall be given. Attention shall be drawn to any open trial holes on site Location of demolition shall be given in the description of the item. Shoring and scaffolding incidental to demolitions shall be given in description of iter Materials arising from demolitions shall become the property of the contractor unless otherwise stated. Clearing away such old materials shall be deemed to be included in items. Provision shall be made in bill for credit Materials required to remain the property of the employer shall be so described. Setting aside and storing such old materials on site shall be given in the description of the item Materials permitted to be re-used in work measured as new shall be so described. No adjustment shall be made to the measured quantities of new work in which such old materials are re-used
MMBZ	Any information available concerning nature of the ground and strata shall be given. Particulars of any trial holes or trial bores on site shall be given stating their locatio Location of demolition shall be given in the description of the item. Shoring and scaffolding incidental to demolitions shall be given in description of iter Old materials from demolitions shall become the property of the contractor unless otherwise stated. Clearing away such old materials shall be deemed to be included in items. Provision shall be made in bill for credit Old materials required to remain the property of the employer shall be so described. Setting aside and storing such old materials on site shall be given in the description of the item Old materials permitted to be re-used in work measured as new shall be so described. No adjustment shall be made to the measured quantities of new work in which such old materials are re-used
SABS1200	Definitions: 1. Cleared surface - natural surface of the ground after clearing of surface vegetation has been completed 2. Designated site/area - Site or an area the position in relation to the work to be carried out is shown on drawing or described in project specificatio 3. Finished level - level of the finished earthworks as shown on drawings or stated in the project specificatior 4. Grubbing - operation of digging out the roots of vegetation 5. Original ground level - level of the surface of an area before the commencement of clearing Basic principles: Items scheduled for clearance and demolition will be classified according to the nature of the materials involved and the methods of their disposa Area of surfaced roads, paved areas, railway formation and major structures falling within designated areas will normally be deducted from measurement Where conservation of topsoil without prior clearing is ordered, the removal of topsoil from the specified area will be measured as excavation an no payment will be made for clearing and grubbin Areas will be measured to the nearest 0.1ha or nearest m or km
SABS1200AAC	Definitions: 1. Cleared surface - natural surface of the ground after clearing of surface vegetation has been completed 2. Designated site/area - Site or an area the position in relation to the work to be carried out is shown on drawing or described in project specificatio 3. Finished level - level of the finished earthworks as shown on drawings or stated in the project specificatior 4. Grubbing - operation of digging out the roots of vegetation 5. Original ground level - level of the surface of an area before the commencement of clearing Basic principles: Items scheduled for clearance and demolition will be classified according to the nature of the materials involved and the methods of their disposa Area of surfaced roads, paved areas, railway formation and major structures falling within designated areas will normally be deducted from measurement Where conservation of topsoil without prior clearing is ordered, the removal of topsoil from the specified area will be measured as excavation an no payment will be made for clearing and grubbin Areas will be measured to the nearest 0.1ha or nearest m or km
CESMM3	Includes demolition and removal of natural and artificial articles, objects and obstructions which are above the original surfac Excludes removal of articles, objects, obstructions and materials (other then tree roots) at or below the original surface Items for demolition and site clearance shall be deemed to include disposal of the materials arising Item descriptions for work from which the materials arising remain the property of the Employer shall so state

BESMM3	Site Preparation	1	Site preparation			Vegetation is bushes, scrub, undergrowth, hedges and trees and tree stumps < 600mm girth			
		3	Clearing site vegetation	Sufficient description to identify state	m2				
		4	Lifting turf for preservation	Method of preserving and details stated	m2				
SMM2	Site preparation	D2.a	Anti termite treatment to sub-soil or filling		m2				
		D2.b	Removal of termite nests	Method of destruction shall be stated	Item	Alternatively item given in excavation description			
MMBZ	Site preparation	D2.a	Anti termite treatment to sub-soil or filling		m2				
		D2.b	Removal of termite nests	Method of destruction shall be stated	Item	Alternatively item given in excavation description			

SITE CLEARANCE

SITE CLEARANCE	SABS1200	Clear and grub	8.2.1	Clear and grub		ha/m/km	Removing boulders up to 0.15m3; grubbing trees and tree stumps (except large trees); cutting of trunks and branches exceeding 0.5m in girth in transportable lengths; backfilling of cavities, demolishing structures and disposing of material included	Removal of trees and bushes with roots, other vegetation, rubbish, fences and material interfering with construction included	Disposal of material included	
	SABS1200AAC	Clear and grub	8.2.1	Clear and grub	Freehaul distance of 2km for disposal of cleared and grubbed material shall apply	ha/m/km	Removing boulders up to 0.15m3; grubbing trees and tree stumps (except trees with girt >1m); cutting of trunks and branches exceeding 0.5m in girth in transportable lengths; backfilling of cavities and disposing of material included	Removal of trees and bushes with roots, other vegetation, rubbish, fences and material interfering with construction included	Disposal of material included	
	SABS1200AAC	Clearing of site	8.2.11	Clearing of site	For clearing a-f subclause 5.3	ha/m2/m/km				
	SABS1200AAC	Clearing and stripping	8.2.9	Clearing and stripping of site	For clearing a-f subclause 5.3	ha/m2/m/km				
	SABS1200	Site clearance for pipe trenches	8.3.1a 8.3.1b 8.3.1c	Clear vegetation and trees of girth up to 1m Clear trees of girth over 1m and designated obstacles Remove topsoil (depth stated)	Length measured will be length of pipeline route Area measured from length of pipeline route and the trench width	m/Sum No m2	Cover cost of clearing route of all vegetation, trees and designated obstacles as specified Cover cost of stripping to stated depth, stockpiling and prevention of dust nuisance			
	CESMM3	General clearance	1	General clearance		ha	Demolition and removal of all articles, objects and obstructions expressly required to be cleared included	Removal of hedges shall include removal of hedge stumps of any diameter	Holes left by stump to be backfilled, item description shall state nature of backfilling material	
	BESMM3	Site Preparation	2	Removing trees	Girth 600 - 1500mm Girth 1500 - 3000mm Girth > 3000mm	No	Tree girth measure 1m above ground Stump girth measured at top	Work includes: 1. grubbing up roots 2. disposal of materials 3. filling voids		
	SMM2	Removing trees & hedges	D4.a D4.b D4.c D4.d D4.e	Cutting down trees and grubbing up roots Cutting down hedges & grubbing up roots Clearing site of bushes, scrub, undergrowth and the like & grubbing up roots Grubbing up roots of stumps Grubbing up tree stumps	Girth < 600mmm: small trees Girth > 600mmm in stages of 300mm: give type of tree & appr height State nature, type & height or its location State girth of stump at top State girth of stump at highest point	No No m m2/ha No No	Tree girth measure 1m above ground Alternatively may be item stating approx area Trees have been already cut leaving tree stumps		Trees <600mm within area may be included in description	Trees >600mm must be measured separately
	MMBZ	Removing trees & hedges	D4.a D4.b D4.c	Cutting down trees and grubbing up roots Cutting down hedges & grubbing up roots Clearing site of bushes, scrub, undergrowth and the like & grubbing up roots	Girth < 600mmm: small trees Girth > 600mmm in stages of 300mm State nature, type & height of each hedge or its location	No No m m2/ha	Tree girth measure 1m above ground Alternatively may be item stating approx area		Cutting sown trees <600mm girth within area and grubbing up their roots may be included in description	Trees >600mm must be measured separately

SITE CLEARANCE

TREES, HEDGES & STUMPS	SABS1200	Trees & stumps	8.2.2 a b c	Remove and grub large trees and tree stumps of girth	over 1m and up to and including 2m over 2m and up to and including 3m over 3m, in steps of 1m	No No No	Girth measure at the narrowest point of the tree or stump in first metre of its height above ground level	Clearing and grubbing, cutting branches, backfilling holes and removing, transporting and disposing included		
	SABS1200AAC	Trees & stumps	8.2.2 a b c	Remove and grub large trees and tree stumps of girth	over 1m and up to and including 2m over 2m and up to and including 3m over 3m, in steps of 1m	No No No	Girth measure at the narrowest point of the tree or stump in first metre of its height above ground level	Clearing and grubbing, cutting branches, backfilling holes and removing, transporting and disposing included		
	SABS1200	Trees & stumps	8.2.3	Remove and grub all trees and tree stumps regardless of girth	Where impracticable to measure tree girth eg. Plantations	ha	Exceptional circumstances, give reasons in project specification			
	SABS1200AAC	Trees & stumps	8.2.3	Remove and grub all trees and tree stumps regardless of girth	Where impracticable to measure tree girth eg. Plantations	ha	Exceptional circumstances, give reasons in project specification			
	CESMM3	Trees	2	Trees of girth	500mm - 1m 1-2m 2-3m 3-5m exceeding 5m	No No No No No	Girth shall be measured 1m above ground level	Include removal of stumps where required to be removed	Holes left by stump to be backfilled, item description shall state nature of backfilling material	
	CESMM3	Stumps	3	Stumps of diameter	150-500mm 500mm-1m exceeding 1m	No No No			Holes left by stump to be backfilled, item description shall state nature of backfilling material	
RE-CLEAR	SABS1200	Reclear	8.2.4	Reclear surfaces	Only measured if instructed	ha/m/km	Clearing surface, grubbing, backfilling holes and removing, transporting and disposing of material included			
	SABS1200AAC	Reclear	8.2.4	Reclear surfaces	Only measured if instructed	ha/m/km	Clearing surface, grubbing, backfilling holes and removing, transporting and disposing of material included			
FENCES & HEDGES	SABS1200	Fences	8.2.5	Take down existing fences		km	Taking down fence, coiling wire, sorting and stacking, loading, transporting and offloading included			
	SABS1200AAC	Fences	8.2.5	Take down existing fences		km	Taking down fence, coiling wire, sorting and stacking, loading, transporting and offloading included			
	SABS1200	Hedge or fence	8.2.6	Clear hedge or fence or both where not scheduled separately	Separate items for each type and size of hedge or fence	m	Uprooting, disposing with roots included	Remove fence with wire, posts complete included		

SITE CLEARANCE

	SABS1200AAC	Hedge or fence	8.2.6	Clear hedge or fence or both where not scheduled separately	Separate items for each type and size of hedge or fence	m	Uprooting, disposing with roots included	Remove fence with wire, posts complete included		
PIPELINES	SABS1200	Pipelines & electricity	8.2.7	Dismantle and remove pipelines, electricity transmission lines, cables, etc.	Separate items for each type and diameter	m	Dismantling, lifting and disposing of and additional precautions required during excavation in vicinity included	Excavation and backfilling measured separately		
	SABS1200AAC	Pipelines & electricity	8.2.7	Dismantle and remove pipelines, electricity transmission lines, cables, etc.	Separate items for each type and diameter	m	Dismantling, lifting and disposing of and additional precautions required during excavation in vicinity included	Excavation and backfilling measured separately		
	CESMM3	Pipelines	6	Pipelines of nominal bore	100-300mm 300-500mm exceeding 500mm	m m m	Pipelines within buildings and other structures measured only where nominal bore >300mm	Include demolition and removal of supports		
BUILDING & OTHER STRUCTURES	BESMM3	Demolishing all structures Demolishing individual structures Demolishing parts of structures	C20	Materials remaining the property of the Employer Materials for re-use Make good structures Leaving parts of existing walls temporarily in position to act as buttresses Temporarily diverting, maintaining or sealing off existing services Toxic/hazardous material, type stated	Only temporarily diverting, maintaining or sealing off existing services is measure under this item	Item	Materials arising from demolition are the property of contractor unless otherwise stated Demolishing parts of structures excludes items covered by alterations	Includes disposal of materials other than those remaining the property of the Employer or those re-use Includes temporary support	Method of demolition by specific means supplied Setting aside and storing materials remaining property of Employer or for re-use Employer's restrictions on methods of disposal of materials	
	SMM2	Demolitions	C2.a	Demolishing individual structures (or part thereof)	State lowest level of demolition	Item	Leaving parts of old walls temporarily in position to act as buttresses shall be given in description			
	MMBZ	Demolitions	C2.a	Demolishing individual structures (or part thereof)	State lowest level of demolition	Item	Leaving parts of old walls temporarily in position to act as buttresses shall be given in description			
	SABS1200	Structures/buildings & steelwork	8.2.8	Demolish and remove structures/buildings and dismantle steelwork, etc.	Separate items for steelwork and each structure too large to be included in clearing	Sum				
	SABS1200AAC	Structures/buildings & steelwork	8.2.8	Demolish and remove structures/buildings and dismantle steelwork, etc.	Separate items for steelwork and each structure	Sum				
	CESMM3	Buildings Other structures	4 5	Demolish and remove buildings with volume Demolish and remove other structures with volume Brickwork Concrete Masonry Metal Timber	Not exceeding 50m3 50-100m3 100-250m3 250-500m3 500-1000m3 1000-2500m3 2500-5000m3	Sum Sum Sum Sum Sum Sum Sum	Volume used shall be their approximate volume occupied, excluding any volume below original surface	Type of building and other structure identified in item		

SITE CLEARANCE

				No predominant material	stated exceeding 5000m3	Sum				
TRANSPORT	SABS1200	Transport	8.2.9	Transport materials and debris to unspecified sites and dump (Provisional)	Location of disposal or dumping sites not at the discretion of the Contractor or not specified	t.km/m3.km	Distance is shortest route in one direction measured to nearest 0.1km	Loading, transporting, dumping and charges at dump site included		
	SABS1200AAC	Transport	8.2.9	Extra over disposal of cleared and grubbed material for carting only additional 1km	For all items which include disposal of cleared and grubbed materials	m3.km/m.km/ No.km	Distance is shortest practicable route in one direction measured to nearest 0.1km, less 2km freehaul			

EARTHWORKS

BESMM3	Includes: Excavation, dredging, filling, compaction, disposal and landscaping Excludes: Ground investigation, diaphragm walls and ground anchorages, piles, tunnel shafts Measure net: no allowance for bulking, shrinkage or waste
SMM2	Any information available concerning nature of the ground and strata shall be given. Attention shall be drawn to any open trial holes on sit Work in existing buildings shall be so described. Handling materials and getting them in or out of such buildings shall be deemed to be included in item Quantities given shall be deemed to be the bulk before excavating and no allowance shall be made for any subsequent variations in bull No allowance shall be made for any extra space required to accommodate planking & strutting Depths of excavation are required to be stated, they shall be grouped and given in successive stages of 1.5m (rule D5.f) All excavations shall be measured net and no allowance shall be made for working space, unless otherwise statec The quantity of excavation shall be given by the horizontal area of the bottom of the relevant structure multiplied by the average depth from
MMBZ	Any information available concerning nature of the ground and strata shall be given. Particulars of any trial holes or trial bores on site shall be given stating their locatio Water level in the ground and the date when it was measured shall be stated but, where this information is not available, it shall be ascertained before pumping operations are started on sit Water level so established (by either method) shall be deemed to be the normal water-level in the ground throughout the course of the works notwithstanding any subsequent change Work in existing buildings shall be so described. Handling materials and getting them in or out of such buildings shall be deemed to be included in item Quantities given for excavating and subsequent disposal shall be deemed to be the bulk before excavating and no allowance shall be made for any subsequent variations in bull No allowance shall be made for any extra space required to accommodate planking and strutting Getting out excavated material by any means necessary shall be deemed to be included with the items of excavation Where depth of excavations are required to be stated they shall be grouped and given in successive stages of 1.50m Allowances for working space (which shall not be subject to adjustment if more or less space is actually required) shall be made in measurements of excavations as follows 1. 0.60m from the face of any work exceeding 1m deep below the starting level of excavation and which required formwork, or from the external face of any work which will be covered externally with a dampproof covering occurring at any depth below th starting level of excavation, or from the external face of any work which requires workmen to operate from the outside at any depth below the starting level of excavatio 2. 0.25m from the face of any work not exceeding 1m deep below the starting level of excavation and which requires formwor 3. 1.50m extra length at each end of trenches, which are to receive, post-tensioned concrete ground beams
SABS1200	Definitions: 1. Average haul - average distance that material is transported via the designated or shortest practicable route 2. Backfill - approved material placed in an excavation after specified operations have been performec 3. Borrow - material obtained from various sources such as borrow pits and approved or ordered widening of excavation 4. Borrow pit - an excavation made for the procurement of materia 5. Catchwater drain - open drain or mound intended to intercept water and to lead it to suitable discharge point 6. Freehaul - haul of which the cost is included in the scheduled rate for the material hauled and that is not measured separatel 7. Overbreak - excavation carried out in excess of the theoretical or directed profile 8. Overhaul - haul in excess of freehaul and measured separately 9. Pass - in regard to compacting, a movement of an approved compacting machine from one end of the layer being compacted to the other en 10. Restricted excavation - an excavation so restricted in area or width as to preclude removal of material by a bulldoze 11. Specified density - the ratio of filed density to laboratory-determined modified AASHTO maximum densit 12. Spoil - unsuitable or excess material removed or intended to be removed to waste 13. Stockpile - a pile of material that has been selected, loaded, transported and unloaded in a heap outside the confines of a borrow pit or of an excavation that forms part of the work Classes of excavation: a. Soft excavation - other than in restricted excavation shall be excavation in material that can be efficiently removed or loaded, without prior ripping, by a - bulldozer of mass appr 22t and flywheel power appr 145kW or a tractor-scraper unit of total mass appr 28t and flywheel power appr 245kW pushed by a bulldozer or a track type front-end loader of mass appr 22t and flywheel power appr 145k In restricted excavation, excavation in material that can be efficiently removed by back-acting excavator of flywheel power appr 0.10kW per millimetre of tined-bucket width, without use of pneumatic tools such as paving breaker b. Intermediate excavation - other than in restricted excavation shall be excavation in material that can be efficiently ripped by a bulldozer of mass appr 35t fitted with single-time ripper suitable for heavy ripper of flywheel power appr 220k In restricted excavation, excavation in material requiring back-acting excavator of flywheel power exceeding 0.10kW per millimetre of tined-bucket width or the use of pneumatic tools before removal by equipmer c. Hard rock excavation - other than in restricted excavation shall be excavation in material that cannot, before removal, be efficiently ripped by a bulldozer equivalent to specified under intermediate excavatio In restricted excavation, excavation in material that cannot be efficiently removed without blasting or without wedging and splitting d. Boulder excavation Class A - excavation in material containing more than 40% by volume of boulders of size in the range 0.03 - 20m3, in a matrix of soft material or smaller boulder Excavations in dolomite formations other than solid dolomites will be classes as boulder excavation Class A if formation contains more than 40% by volume of lumps of hard dolomite of size in range 0.03 - 20m3, in a matrix of soft material or smaller lumps hard dolomite Excavation of solid boulders or lumps of size exceeding 20m3 will be classed as hard rock excavatior Excavation of fissured or fractured rock will not be classed as boulder excavation but as hard rock or intermediate excavation, according to nature of materia e. Boulder excavation Class B - excavation of boulders only which are in material containing 40% or less by volume of boulders of size in the range of 0.03 - 20m3 in a matrix of soft material or smaller boulders and which require individual drilling and blasting in ord to be loaded by a track type front-end loader or back-acting excavato Basic principles: Rates tendered shall cover the cost of excavating and re-use of the excavated material in backfilling, forming embankments, terraces, etc., and the cost of disposal of any surplus and unsuitable material within the freehat Separate additional payment will be made for filling excess excavation, forming banks or terraces, disposing of surplus material, or any other contingent work, only where specifically prescribed and schedule Where overhaul is payable, the additional distance will be measured by the shortest practicable route, in one direction only, to the nearest 0.1km and volumes will be computed as specifie Excavations which are required to be backfilled will be measured as if taken out with vertical sides regardless of whether they have been taken out with sloping sides. They will be measured from the net plan of finished concrete footing, foundation, building, et except that in the case of conical bottomed tanks and other such structures, the volume will be measured from the finished outline of the concret Where extra excavation for outside formwork or working space or for any other purpose is specified or ordered or authorized prior to the start of the excavation for a structure, such excavation will be measured as part of the bulk or restricted excavatio as applicable, except where the working space is scheduled as an area Earthworks will be measured by volume once only either in compacted embankment where importation or borrow is designated or ordered and in quantities not exceeding those so ordered or the earthworks consist of a cut to fill operation and are required f the building of a structure of designated strength such as a dam, road or rail embankment or otherwise in excavatior Measurements will be to finished shapes, sections and profiles as shown on drawings and no excavation and no embankment formed outside specified lines and levels will be included unless extra work has been done on written instructior Except where earthworks are carried out to simple geometric shapes the volumes will be computed from cross-sections at suitable intervals by the method of average end area

EARTHWORKS

GENERAL RULES

Where above method is impracticable the volume will be computed from the predetermined capacity of the hauling vehicles, each vehicle shall be loaded to at least predetermined capacit
Volume of hauling vehicles will be taken as 70% of said capacity in the case of soil and gravel and 50% in case of rock and boulder materia
Volumes of material removed during site clearing operations will be disregarded in both excavation and embankment quantitie
Pipe trenches:
Rates cover cost of excavation and the re-use of excavated material for backfilling and disposal of any surplus material along the route of the pipeline within freehaul distance of the sourc
Trench excavations for long pipelines, drains, cables, etc. will be measured by length and those for short runs of pipes, etc. will normally be measured volumetrically but may be measured by lengt
Separate items will be scheduled for lengths of trench of depth not exceeding 1m, for lengths of trench of depth exceeding 1m but not 2m, and so o
Depth will be measured from the surface of the ground along the centre-line of the trench to the bottom of the specified bedding laye
Ground surface will be that existing after any bulk earthworks have been carried out
Separate additional payment will be made for filling excess excavations, disposing of surplus material, or any other contingent work, where work is specifically prescribe
Excavations will be measured as if taken out with vertical sides, regardless of whether they have been taken out with sloping side
Length will be total through-length of the pipeline, duct, etc. from end to end or from face of structure to face of structure and no deduction will be made for valves, manholes, catchpits, valve boxes and the lik
Where shoring is specified length of shoring measured for payment will be the length of the centre-line of the trenc
Pipe bedding:
Operation of bedding will not be measured separately but the provision alongside the trench of bedding materials will be measured separatel
Rate for laying a pipeline shall cover the cost of handling, placing and compacting the bedding materials up to the underside of the main fill, in addition to any other cost associated with laying the pipelin
Volume of bedding materials will be computed from
a) the dimensions of pipe and the side allowance determined as per standard allowance drawing
b) the depth of each bedding section shown on drawings, as applicable
No allowance will be made for bulking of materia
Separate items are scheduled for material for bedding cradle and for selected fill blanket to provide for probability that the excavated material from the trench is more likely to comply with the requirements for the latter than the form
Material displace by the pipeline and by importation of material from sources other than trench excavation shall be disposed of along the pipeline servitude within a distance of 0.5km from source unless otherwise required in terms of project specificatic
Freehaul of 0.5km shall be applicable to selected granular material and to selected fill materia

SABS1200AAC Definitions:

1. Average haul - average distance that material is transported via the designated or shortest practicable route
2. Backfill - approved material placed in an excavation after specified operations have been performe
3. Borrow - material obtained from various sources such as borrow pits and approved or ordered widening of excavation
4. Borrow pit - an excavation made for the procurement of materia
5. Catchwater drain - open drain or mound intended to intercept water and to lead it to suitable discharge point
6. Freehaul - haul of which the cost is included in the scheduled rate for the material hauled and that is not measured separatel
7. Overbreak - excavation carried out in excess of the theoretical or directed profile
8. Overhaul - haul in excess of freehaul and measured separately
9. Pass - in regard to compacting, a movement of an approved compacting machine from one end of the layer being compacted to the other en
10. Restricted excavation - an excavation so restricted in area or width as to preclude removal of material by a bulldozer. Restricted excavation is also to include for hand excavatio
11. Specified density - the ratio of filed density to laboratory-determined modified AASHTO maximum densit
12. Spoil - unsuitable or excess material removed or intended to be removed to waste
13. Stockpile - a pile of material that has been selected, loaded, transported and unloaded in a heap outside the confines of a borrow pit or of an excavation that forms part of the work

Classes of excavation:
a. Soft excavation - other than in restricted excavation shall be excavation in material that can be efficiently removed or loaded, without prior ripping, by a
- bulldozer of mass appr 22t and flywheel power appr 145kW or a tractor-scraper unit of total mass appr 28t and flywheel power appr 245kW pushed by a bulldozer or a track type front-end loader of mass appr 22t and flywheel power appr 145k
In restricted excavation, excavation in material that can be efficiently removed by back-acting excavator of flywheel power appr 0.10kW per millimetre of tined-bucket width, without use of pneumatic tools such as paving breaker
b. Intermediate excavation - other than in restricted excavation shall be excavation in material that can be efficiently ripped by a bulldozer of mass appr 35t fitted with single-time ripper suitable for heavy ripper of flywheel power appr 220k
In restricted excavation, excavation in material requiring back-acting excavator of flywheel power exceeding 0.10kW per millimetre of tined-bucket width or the use of pneumatic tools before removal by equipmer
c. Hard rock excavation - other than in restricted excavation shall be excavation in material that cannot, before removal, be efficiently ripped by a bulldozer equivalent to specified under intermediate excavatio
In restricted excavation, excavation in material that cannot be efficiently removed without blasting or without wedging and splitting
d. Boulder excavation Class A - excavation in material containing more than 40% by volume of boulders of size in the range 0.03 - 20m3, in a matrix of soft material or smaller boulder
Excavations in dolomite formations other than solid dolomites will be classes as boulder excavation Class A if formation contains more than 40% by volume of lumps of hard dolomite of size in range 0.03 - 20m3, in a matrix of soft material or smaller lumps
hard dolomite
Excavation of solid boulders or lumps of size exceeding 20m3 will be classed as hard rock excavatior
Excavation of fissured or fractured rock will not be classed as boulder excavation but as hard rock or intermediate excavation, according to nature of materia
e. Boulder excavation Class B - excavation of boulders only which are in material containing 40% or less by volume of boulders of size in the range of 0.03 - 20m3 in a matrix of soft material or smaller boulders and which require individual drilling and blasti
in order to be loaded by a track type front-end loader or back-acting excavato

Basic principles:
Rates tendered shall cover the cost of excavating and re-use of the excavated material in backfilling, forming embankments, terraces, etc., and the cost of disposal of any surplus and unsuitable material within the freeha
Separate additional payment will be made for filling excess excavation, forming banks or terraces, disposing of surplus material, or any other contingent work, only where specifically prescribed and schedule
Where overhaul is payable, the additional distance will be measured by haul route as approved by the Engineer in one direction only, to the nearest 0.1km and volumes will be computed as specifie
Excavations which are required to be backfilled will be measured as if taken out with vertical sides regardless of whether they have been taken out with sloping sides. They will be measured from the net plan of finished concrete footing, foundation, building, et
except that in the case of conical bottomed tanks and other such structures, the volume will be measured from the finished outline of the concret
Where extra excavation for outside formwork or working space or for any other purpose is specified or ordered or authorized prior to the start of the excavation for a structure, such excavation will be measured as part of the bulk or restricted excavatio
as applicable, except where the working space is scheduled as an area
Except where earthworks are carried out to simple geometric shapes, the volume shall be computed from cross-sectional areas at suitable intervals approved by the Enginee
Measurements will be to finished shapes, sections and profiles as shown on drawings and no excavation and no embankment formed outside specified lines and levels will be included unless extra work has been done on written instructior
Except where earthworks are carried out to simple geometric shapes the volumes will be computed from cross-sections at suitable intervals by the method of average end area
Where above method is impracticable the volume will be computed from the predetermined capacity of the hauling vehicles, each vehicle shall be loaded to at least predetermined capacit
Volume for hauling vehicles will be taken as 70% of said capacity in the case of soil and gravel and 50% in case of rock and boulder materia
Volumes of material removed during site clearing operations will be disregarded in both excavation and embankment quantitie

EARTHWORKS

				Pipe trenches: Rates cover cost of excavation and the re-use of excavated material for backfilling and disposal of any surplus material along the route of the pipeline within freehaul distance of 2km of the sourc Trench excavations for long pipelines, drains, cables, etc. will be measured by length and those for short runs of pipes, etc. will normally be measured volumetrically but may be measured by lengt Separate items will be scheduled for lengths of trench of depth not exceeding 1m, for lengths of trench of depth exceeding 1m but not 2m, and so or Depth will be measured from the surface of the ground along the centre-line of the trench to the bottom of the specified bedding laye Ground surface will be that existing after any bulk earthworks have been carried out Separate additional payment will be made for filling excess excavations, disposing of surplus material, or any other contingent work, where work is specifically prescribe Excavations will be measured as if taken out with vertical sides, regardless of whether they have been taken out with sloping sides Length will be total through-length of the pipeline, duct, etc. from end to end or from face of structure to face of structure and no deduction will be made for valves, manholes, catchpits, valve boxes and the lik Where shoring is specified length of shoring measured for payment will be the length of the centre-line of the trench Pipe bedding: Operation of bedding will not be measured separately but the provision alongside the trench of bedding materials will be measured separatel Rate for laying a pipeline shall cover the cost of handling, placing and compacting the bedding materials up to the underside of the main fill, in addition to any other cost associated with laying the pipelin Volume of bedding materials will be computed from a) the dimensions of pipe and the side allowance determined as per standard allowance drawings b) the depth of each bedding section shown on drawings, as applicable No allowance will be made for bulking of materia Separate items are scheduled for material for bedding cradle and for selected fill blanket to provide for probability that the excavated material from the trench is more likely to comply with the requirements for the latter than the forme Material displace by the pipeline and by importation of material from sources other than trench excavation shall be disposed of along the pipeline servitude within a distance of 2km from source unless otherwise required in terms of project specificatic Freehaul of 2km shall be applicable to selected granular material and to selected fill materia						
	CESMM3			Definitions: Commencing Surface - in relation to an item in the BOQ, the surface of the ground before any work covered by the item has been carried out; and in relation to a group of items in the BOQ for work in different materials in an excavation or a bored, drilled drive hole, the surface of the ground before nay work covered by any item in the group has been carried ou Excavated Surface - in relation to an item in the BOQ, the surface to which excavation included in the word covered by the item has been carried out; and in relation to a group of items in the BOQ for excavation in different materials, the surface to which excavatic included in the work covered by any item in the group has been carried ou Final surface - surface indicated on the Drawings to which excavation is to be carried ou Original surface - surface of the ground before any work has been carried ou Excavation other than hand excavation: Soft - for cuttings soft is material that can be efficiently removed or loaded without prior ripping by any of the following plant: bulldozer of mass appr 22t and flywheel power appr 145kW or tractor-scraper unit of total mass appr 28t and flywheel power ap 245kW pushed by a bulldozer or track-type front-end loader of mass appr 22t and flywheel power appr 145kW Soft - for foundations, soft is material that can be efficiently removed by a back-acting excavator of flywheel power appr 0.1kW per millimetre of tine-bucket width, without the use of pneumatic tools such as paving breaker Rock - Intermediate - for cuttings, material that can be efficiently ripped by a bulldozer of mass appr 35t, fitted with a single-tine ripper suitable for heavy ripping and flywheel power appr 229kW Rock - intermediate - for foundations, material that requires ac back-acting excavator of flywheel power exceeding 0.1kW per tined-bucket width or the use of pneumatic tools before removal by the equipment equivalent to that specified for so Rock - hard rock - for cuttings, material that cannot, before removal, be efficiently ripped by a bulldozer equivalent to that specified for intermediat Rock - hard rock - for foundations, material (excluding boulder material) that cannot be efficiently removed without blasting or without wedging and splittin Rock - Boulder class A - material containing more than 40% by volume of boulders of size in the range 0.03 - 20m3, in a matrix of soft material or smaller boulders. Dolomite formations other than solid dolomite if the formation contains more than 40% by volun of lumps of hard dolomite of size in the range 0.03 - 20m3, in matrix of soft material or smaller lumps of hard dolomite. Solid boulders or lumps of size exceeding 20m3 is hard rock materi Fissured or fractured rock is not classed as boulder material but as hard rock or intermediate according to the nature of the materia Rock - Boulder class B - material containing 40% or less by volume of boulders of size in the range 0.03 - 20m3, in a matrix of soft material or smaller boulders and which require individual drilling and blasting in order to be loaded by a track type font-end load or back-acting excavator, as specified in soft for cuttings or soft for foundations Measurement rules: Quantities shall be computed net using dimensions from drawings with no allowance for bulking, shrinkage or waste Where boundaries between different materials are not shown on the drawings, measurement shall be made on the site Definition rules: Excavation other than topsoil or artificial hard material is classified as soft and rock (intermediate, hard rock, boulder class A and boulder class E Pipework and ancillaries: Except that material is not classified as boulders (class A or B) material in trench excavation by mechanical means is classified as defined in 1.(Material in trenches excavated by hand shall be deemed to be soft class 1 material unless otherwise stated in description Items shall include excavation, preparation of surfaces, disposal of excavated material, upholding sides of excavation, backfilling and removal of dead services, except to the extent that such work is included in class EA and I, J and K or in items for extras to excavatio and backfilling in this class Items shall include concrete, reinforcement, formwork, joints and finishes						
GING	BESMM3	Excavation by dredging	1	Topsoil	Maximum depth: < 0.25m	m3	Commencing surface adopted in BOQ shall be adopted for measurement of completed work	Excavation within borrow pits include removal and replacement of overburden and unsuitable material	Excavation include upholding sides of excavation, additional excavation to provide working space and removal of dead services	Location and limits of excavation by dredging shall be stated

EARTHWORKS

DRED	CESMM3	Excavation by dredging	1.1	Topsoil	Maximum depth: not exceeding 0.25m	m3	Excavation classed as by dredging shall be measured as by dredging irrespective of the method of excavation adopted by the contractor	Excavated material shall be deemed to be material other than topsoil, rock or artificial hard material unless otherwise stated in item description	Items for excavation shall include upholding sides of excavation, additional excavation to provide working space and removal of dead services	Location and limits of excavation by dredging shall be stated in item descriptions where its extent would otherwise be uncertain
PRESERVING SOIL	SMM2	Preserving vegetable soil	D3	Excavating vegetable soil to be preserved	State average depth	m2	Soil deposited on site in permanent spoil heaps or spread on site so described stating location of deposits or average distance from excavation in m or km			
	MMBZ	Preserving vegetable soil	D3	Excavating vegetable soil to be preserved	State average depth	m2	Soil deposited on site in permanent spoil heaps or spread on site so described stating location of deposits or average distance from excavation in m or km			
	SABS1200	Remove topsoil	8.3.1.2	Remove topsoil to nominal depth 150mm, stockpile and maintain		m2	Cover cost of removing, stockpiling and preventing dust nuisance			
	SABS1200AAC	Remove topsoil	8.3.1.2	Remove topsoil to nominal depth 150mm, stockpile and maintain		m3	Cover cost of removing, stockpiling and preventing dust nuisance			
PREPARATION FOR ROADWORKS	SABS1200	Preparation of site for roadworks	8.3.2a 8.3.2b	Preparation and stripping of site/removal of topsoil to stated depth, stockpiling and maintaining Preparation and stripping of site/removal, haulage and spreading of topsoil		m3 m3	Cover cost of preparing site and of stripping to stated depth, stockpiling, and preventing dust nuisance Cover cost of preparing site and of stripping to stated depth and immediately hauling and spreading to stated depth on another part of the site within freehaul distance	Where stripping to greater depths is ordered, the area measured for payment will be increased pro rata to the average increase in depth determined from levels taken before and after additional stripping is carried out		
	SABS1200AAC	Preparation of site for roadworks	8.3.2a 8.3.2b	Preparation and stripping of site/removal of topsoil to stated depth, stockpiling and maintaining Preparation and stripping of site/removal, haulage and spreading of topsoil		m3 m3	Cover cost of preparing site and of stripping to stated depth, stockpiling, and preventing dust nuisance Cover cost of preparing site and of stripping to stated depth and immediately hauling and spreading to stated depth on another part of the site within freehaul distance	Where stripping to greater depths is ordered, the area measured for payment will be increased pro rata to the average increase in depth determined from levels taken before and after additional stripping is carried out		
	SABS1200	Treatment of road-bed	8.3.3a	Road-bed preparation and compaction of material to: minimum of 90% of modified AASHTO maximum density minimum of 93% of modified AASHTO maximum density minimum of 100% of modified AASHTO maximum density		m3 m3 m3	Cover cost of scarifying, watering, shaping and compacting including mixing of in-place and imported material if required			

EARTHWORKS

TREATMENT OF ROAD-BED			8.3.3b	In-place treatment of road-bed in intermediate at hard rock material by: Ripping Blasting		m3 m3	Cover ripping or blasting as the case may be, shaping, scarifying, sizing, knapping, rolling, mixing of in-place and imported material, if required and preparation and compaction of the material as specified			
	SABS1200AAC	Treatment of road-bed	8.3.3a	Road-bed preparation and compaction of material to: minimum of 90% of modified AASHTO maximum density minimum of 93% of modified AASHTO maximum density minimum of 100% of modified AASHTO maximum density		m3 m3 m3	Cover cost of scarifying, watering, shaping and compacting including mixing of in-place and imported material if required			
			8.3.3b	In-place treatment of road-bed in intermediate at hard rock material by: Ripping Blasting		m3 m3	Cover ripping or blasting as the case may be, shaping, scarifying, sizing, knapping, rolling, mixing of in-place and imported material, if required and preparation and			
	CESMM3	Road bed treatment	2.1 2.2 2.3	Scarify and compact Ripping Blasting	Mod AASHTO maximum dry density 90% 93% 100%	m3 m3 m3				
CUTTINGS	BESMM3	Excavation for cuttings	2	Material other than topsoil, rock or artificial hard material	0.25 - 0.50m		Dredging excavation measured as by dredging irrespective of method Contractor adopted	Excavation from within borrow pits classed as general excavation		Excavation below body of open water shall identify body of water
	SMM2	Cuttings	D7	Excavating cuttings		m3				
	MMBZ	Cutting	D7	Excavating cuttings		m3				
	CESMM3	Excavation for cuttings	1.2 1.3	Material other than topsoil, rock or artificial hard material Rock type: intermediate	0.25 - 0.5m 0.5 - 1m	m3	Measurement of excavation by dredging shall be made from soundings unless otherwise stated An item shall be given for each separate stage of excavation where separate stages are expressly required	Excavation in or under an embankment, executed prior to placing of fill, shall be classed as excavation for cuttings Excavation from within borrow pits shall be classed as general excavation	Except if overburden is expressly included, items for excavation within borrow pits shall be deemed to include removal and replacement of overburden and unsuitable material	Item descriptions for excavation below body of open water shall identify the body of water
	SABS1200	Cut to fill, borrow to fill for roads	8.3.4 8.3.4a 8.3.4b	Cut to fill, borrow to fill: Compact to 90% of modified AASHTO maximum density Rockfill, process and compact	Cut to fill and borrow to fill will be scheduled separately	m3 m3	Cover cost of excavating in the road prism and if in soft material, transporting, preparing, processing, shaping (including forming side channels and benching, if applicable), watering, mixing, compacting and finishing the slopes of cuts and fills			
	SABS1200AAC	Cut to fill, borrow to fill for roads	8.3.4 8.3.4a 8.3.4b	Cut to fill, borrow to fill: Compact to 90% of modified AASHTO maximum density Rockfill, process and compact	Cut to fill and borrow to fill will be scheduled separately	m3 m3	Cover cost of excavating in the road prism and if in soft material, transporting, preparing, processing, shaping (including forming side channels and benching, if applicable), watering, mixing, compacting			

EARTHWORKS

ROAD ITEMS	SABS1200	Selected layer for roads	8.3.5	Selected layer compacted to 93% of modified AASHTO maximum density		m3	Cover cost of procuring, furnishing, transporting and placing selected layer material including excavating in the road prism as if in soft excavation and trimming			
	SABS1200AAC	Selected layer for roads	8.3.5	Selected layer compacted to 93% of modified AASHTO maximum density		m3	Cover cost of procuring, furnishing, transporting and placing selected layer material including excavating in the road prism as if in soft excavation and trimming			
	SABS1200	Intermediate and hard material for roads	8.3.6 8.3.6a 8.3.6b 8.3.6c 8.3.6d	Extra-over cut to fill, borrow to fill and selected layer for excavating and breaking down material to: Intermediate excavation Hard excavation Boulder excavation Class A Boulder excavation Class B		 m3 m3 m3 m3	Cover additional cost of excavation in various materials including breaking down of the material			
	SABS1200AAC	Intermediate and hard material for roads	8.3.6 8.3.6b	Extra-over cut to fill, borrow to fill and selected layer for excavating and breaking down material to: Hard excavation		 m3	Cover additional cost of excavation in various materials including breaking down of the material			
	SABS1200	Cut to spoil or stockpile for roads	8.3.7 8.3.7a 8.3.7b 8.3.7c 8.3.7d 8.3.7e	Cut to spoil or stockpile from Soft excavation Intermediate excavation Hard excavation Boulder excavation Class A Boulder excavation Class B		 m3 m3 m3 m3 m3	Cover cost of excavating from road prism (including forming side channels and benching, if applicable) in various classes of excavation, loading, transporting, offloading and disposing of material to a site as directed, and shaping and grading smoothly any piles of spoil material so they are free draining			
	SABS1200AAC	Cut to spoil or stockpile for roads	8.3.7 8.3.7a 8.3.7b 8.3.7c 8.3.7d 8.3.7e	Cut to spoil or stockpile from Soft excavation Intermediate excavation Hard excavation Boulder excavation Class A Boulder excavation Class B		 m3 m3 m3 m3 m3	Cover cost of excavating from road prism (including forming side channels and benching, if applicable) in various classes of excavation, loading, transporting, offloading and disposing of material to a site as directed, and shaping and grading smoothly any piles of spoil material so			
	SABS1200	Removal of oversize material for roads	8.3.8	Removal of oversize material	Only material in excess of 5% of the loose volume of the layer on the road will be measured when removed on instruction of the Engineer. Cost of removing first 5% shall be covered by the rates for constructing fill layers. No material with a maximum dimension of 600mm or more will be measured	m3	Cover cost of excavating material in all classes of excavation, loading and transporting to the road, placing and any breakdown treatment given or attempted, blading off the road, stockpiling alongside the road, loading and transporting and offloading and spreading all positions indicated by the Engineer			
	SABS1200AAC	Removal of oversize material for roads	8.3.8	Removal of oversize material	Only material in excess of 5% of the loose volume of the layer on the road will be measured when removed on instruction of the Engineer. Cost of removing first 5% shall be covered by the rates for constructing fill layers. No material with a maximum dimension of 600mm or more will be measured	m3	Cover cost of excavating material in all classes of excavation, loading and transporting to the road, placing and any breakdown treatment given or attempted, blading off the road, stockpiling alongside the road, loading and transporting and offloading and spreading all positions indicated by the Engineer			
	SABS1200	Overbreak of excavation for roads	8.3.9 8.3.9a 8.3.9b	Overbreak of excavation in: Intermediate excavation Hard excavation	Item shall not apply when in-place treatment of road bed in intermediate or hard rock material is carried out over the same area	 m2 m2	Cover cost of unavoidable overbreak and cost of draining and backfilling with suitable rock material and compacting it to the lines and levels specified for			

EARTHWORKS

		8.3.9c 8.3.9d	Boulder excavation Class A Boulder excavation Class B		m2 m2	to the lines and levels specified for excavation			
SABS1200AAC	Overbreak of excavation for roads	8.3.9 8.3.9a 8.3.9b 8.3.9c 8.3.9d	Overbreak of excavation in: Intermediate excavation Hard excavation Boulder excavation Class A Boulder excavation Class B	Item shall not apply when in-place treatment of road bed in intermediate or hard rock material is carried out over the same area	m2 m2 m2 m2	Cover cost of unavoidable overbreak and cost of draining and backfilling with suitable rock material and compacting it to the lines and levels specified for excavation			
SABS1200	Materials bladed to windrow for roads	8.3.10	Materials bladed to windrow	Materials temporarily bladed to windrow, on instruction from Engineer, will be measured in its original position before blading off, by the method of average end areas	m3	Cover cost of temporarily removing such material and subsequently replacing the material as well as all tidying up that may be required after completion of replacement			
SABS1200AAC	Materials bladed to windrow for roads	8.3.10	Materials bladed to windrow	Materials temporarily bladed to windrow, on instruction from Engineer, will be measured in its original position before blading off, by the method of average end areas	m3	Cover cost of temporarily removing such material and subsequently replacing the material as well as all tidying up that may be required after completion of replacement			
SABS1200	Temporarily stockpiling material for roads	8.3.11	Extra-over preparation of site/cut to fill or borrow to fill/selected layer for temporary stockpiling of material	Material stockpiled on the written instruction of the Engineer will be measured in its final position in the works after placing and compaction	m3	Cover extra cost, except overhaul, of clearing, light grading, temporary stockpiling, stabilizing or maintaining stockpile, removing stockpile and final shaping and tidying up of the stockpile site after removal			
SABS1200AAC	Temporarily stockpiling material for roads	8.3.11	Extra-over preparation of site/cut to fill or borrow to fill/selected layer for temporary stockpiling of material	Material stockpiled on the written instruction of the Engineer will be measured in its final position in the works after placing and compaction	m3	Cover extra cost, except overhaul, of clearing, light grading, temporary stockpiling, stabilizing or maintaining stockpile, removing stockpile and final shaping and tidying up of the stockpile site after removal			
SABS1200	Catchwater rounds and channels for roads	8.3.15	Catchwater rounds and channels and mitre banks and channels		m3	Cover cost of forming catchwater rounds and channels and mitre banks and channels as specified			
SABS1200AAC	Catchwater rounds and channels for roads	8.3.15	Catchwater rounds and channels and mitre banks and channels		m3	Cover cost of forming catchwater rounds and channels and mitre banks and channels as specified			
CESMM3	Reinstatement	7.1 7.2 7.3 7.4 7.5	Breaking up and temporary reinstatement of roads Breaking up and temporary reinstatement of footpaths Breaking up, temporary and permanent reinstatement of roads Breaking up, temporary and permanent reinstatement of footpaths Reinstatement of land	Pipe bore: not exceeding 300mm 300 - 900mm 900 - 1800mm stated exceeding 1800mm	m	Reinstatement shall be measured for pipes, ducts and metal culverts Lengths shall be measured along centre lines and shall include lengths occupied by manholes and other chambers	Dimension used for classification of bore shall be the maximum nominal distance between the inside faces of the outer walls of the pipe, duct or culvert to be installed Crossings of roads and paths shall be classed as breaking up and reinstatement of roads and paths	Additional reinstatement shall be deemed to be included in the items for manholes and other chambers Removal and reinstatement of kerb and channels shall be deemed to be included in the items for breaking up and reinstatement of roads and footpaths	Types and depths of surfacing, including base and sub-base courses shall be stated in item Item descriptions for reinstatement of land and for strip topsoil from easement and reinstate shall distinguish between grassland, gardens, sports fields and cultivated land

EARTHWORKS

			7.6	Strip topsoil from easement and reinstate			Strip topsoil from easement and reinstate shall be measured only where it is expressly required that a width of ground greater than the nominal trench width defined is stripped of topsoil before trench excavation and subsequently reinstated		Items for strip topsoil from easement and reinstate shall be deemed to include storing and protecting topsoil and reinstatement of land	Item descriptions for strip topsoil from easement and reinstate shall state any limitations on the width to be stripped and reinstated
	SMM2	Excavation generally	D5.c D5.d	Extra over all kinds of excavations for excavating in materials ... Extra over all kinds of excavation irrespective of depth for excavating in silt/sand ...	Materials defined such as consolidated murram or gravel, decomposed or stratified rock, stone and boulders < 0.5m3, harder than normal or soft material Running silt or running sand	m3 m3	Can be excavated by ripping or which is in confined spaces and requires excavation by hand using compressor tools			
	MMBZ	Surface excavation	D6	Excavating surfaces over 300mm deep to reduce levels Excavating surfaces not exceeding 300mm deep to reduce levels	State average depth	m3 m				
	BESMM3	Excavation for foundations	3	Rock	0.50 - 1.0m		Measurement of dredging excavation shall be from soundings unless otherwise stated			Location and limits of excavation shall be stated.
	SMM2	Excavation generally	D5.e	Extra over all kinds of excavation irrespective of depth for excavating in rock	Rock is defined as material of such size or position that it can only be removed by means of wedges, compressed air plant, other special plant, or explosives	m3				
	MMBZ	Rock	D5.d	Extra over all kinds of excavation irrespective of depth for excavating in rock	Rock: any material met with in excavation which is of such size or position that it can only be removed by means of wedges, compressed air or other special plant or explosives	m3				
	BESMM3	General excavation	4 5	Stated artificial hard material exposed at the commencing surface Stated artificial hard material not exposed at the commencing surface	1.0 - 2.0m 2.0 - 5.0m 5.0 - 10.0m 10.0 - 15.0m Stated exceeding 15m		Where expressly required separate items for each separate excavation stages Volume measured for structure or foundation excavation is volume occupied by or vertically above any part of the structure or foundation Volume measured for excavation below body of open water is volume when water surface is at level given as reference Isolated volume of artificial hard material or rock within other materials shall not be measured separately unless volume exceeds 1m3 or where minimum volume is 0.25m3 where net width of excavation is less than 2m Volume measured for excavation within borrow pits shall be net volume measured for filling			Excavation around pile shafts and underpinning shall be so described and classed as excavation for foundations Commencing Surface shall be identified in description for excavation for which Commencing Surface is not the Original Surface. Excavated Surface shall be identified in description for work involving excavation where Excavated Surface is not the Final Surface Excavation expressly required to be executed by hand shall be so described

EARTHWORKS

	BESMM3	Excavation ancillaries	1	Trimming of excavated surfaces		m2	Trimming of excavated surfaces shall be measured to surfaces which receive no Permanent Works whether trimming is expressly required or not	Disposal of excavated material shall be off site unless otherwise stated		Descriptions for trimming and preparation of excavated surfaces shall identify surfaces which are:
			2	Preparation of excavated surfaces			Preparation of excavation shall be measure to surfaces which are to receive Permanent Works whether preparation is expressly required or not except surfaces to receive filling or landscaping and surfaces for which formwork is measured	Trimming, preparation, disposal and double handling shall be deemed to be carried out upon material other than topsoil, rock or artificial hard material unless otherwise stated		1. inclined at an angle of 10 - 45 to the horizontal; 2. inclined at an angle of 45 - 90 to the horizontal; 3. vertical degree
			3	Disposal of excavated material		m3				
			4	Double handling of excavated material			Double handling measured only when expressly required. Volume of void formed in temporary stockpile from which material is removed			Disposal of material on the Site: location shall be stated in description for disposal of excavated material
			5	Dredging to remove silt			Dredging to remove silt measured only if expressly required			
			6	Excavation of material below the Final Surface and replacement with stated material						
			7	Timber supports left in		m2	Area measured for timber or metal supports left in shall be area of supported surfaces expressly required to be left in			
			8	Metal supports left in						
	SMM2	Surface excavation	D6	Excavating surfaces over 300mm deep to reduce levels		m3				
				Excavating surfaces not exceeding 300mm deep to reduce levels	State depth	m2				
	SMM2	Basements	D8	Excavating basements and the like	State starting level and depth in 1.5m stages	m3	Existing voids shall be deducted			
	MMBZ	Basements	D8	Excavating basements and the like	State starting level and the depth in 1.5m stages	m3	Existing voids shall be deducted			
	SMM2	Foundation trenches	D9	Excavating trenches to receive foundations	State starting level and depth in 1.5m stages	m3	Preliminary trenches for basement retaining walls which are constructed before basements shall be so described	No distinctions between surface trenches and basement trenches		
	MMBZ	Foundation trenches	D9	Excavating trenches to receive foundations	State starting level and depth in 1.5m stages	m3	Preliminary trenches for basement retaining walls which are constructed before basements are excavated, shall be so described	No distinctions between surface trenches and basement trenches	In case trenches over 1m deep minimum width measured shall be 0.75m for the depth of the trench down to the top of the concrete foundations, thereafter the width measured shall be the net width of the concrete foundations therein	
	SMM2	Pits	D10	Excavating pits to receive bases of stanchions, isolated piers and the like	State starting level and depth in 1.5m stages	m3	Group together	No distinctions between surface pits and basement pits		

EARTHWORKS

EXCAVATION	MMBZ	Pits	D10	Excavating pits to receive bases of stanchions, isolated piers and the like Excavating pits not exceeding 1m3	State starting level and depth in 1.5m stages Describe fully	m3 No	Group together	No distinctions between surface pits and basement pits	Pits over 1.5m deep the minimum size measured on plan shall be 1.25m in each direction measured down to the top of the concrete base. Thereafter the net size of the concrete base shall be measured	
	MMBZ	Below normal water level	D5.c	Extra over all kinds of excavation irrespective of depth for excavating below normal water level Extra over for excavating in running silt or running sand (grouped together)	Below normal water level shall be so described	m3 m3				
	SMM2	Disposal of excavated materials	D15.c D15.d D15.f	Earth backfilling Earth filling over 300mm thick Earth filling not exceeding 300mm thick Surplus spoil	Except as otherwise provided in D11 - pipe trenches State average thickness State location of deposits or average distance from excavation in m or km	m3 m3 m2 m3	Earth filling required to be deposited and compacted in layers shall be so described stating maximum thickness of layers and compaction standard required Soil deposited on site in permanent spoil heaps or spread on site shall be so described	Earth filling shall be measured as equal to the void to be filled. Any thickness stated shall be deemed to be measured after compacting Soil removed from site shall be described and provision of chute, dump or tip shall be deemed to be included unless otherwise stated	Multiple-handling of excavated materials and transporting about the site as necessary shall be deemed to be included with the items of final disposal. Multiple-handling which is specifically required shall be given in the description of disposal items	
	MMBZ	Disposal of excavated materials	D15.c D15.d D15.f	Earth backfilling Earth filling in making up levels over 300mm thick Earth filling not exceeding 300mm thick Surplus spoil	Except as otherwise provided in D11 - pipe trenches State average thickness State location of deposits or average distance from excavation in m or km	m3 m3 m2 m3	Earth filling required to be deposited and compacted in layers shall be so described stating maximum thickness of layers Soil deposited on site in permanent spoil heaps or spread on site shall be so described	Earth filling shall be measured as equal to the void to be filled. Any thickness stated shall be deemed to be measured after compacting Soil removed from site shall be described and provision of shoot, dump or tip shall be deemed to be included unless otherwise stated	Multiple-handling of excavated materials and transporting about the site as necessary shall be deemed to be included with the items of final disposal. Multiple-handling which is specifically required shall be given in the description of disposal items	
	SABS1200	Bulk excavation	8.3.2a 8.3.2b	Excavate in all materials and use for embankment or backfill or dispose as ordered Extra over for: Intermediate excavation	Separate items for each type of excavation or each structure and for each class or manner of disposal of excavated material	m3 m3	Cover cost of complying with all precautions required including excavation, basic selection, loading, transportation within freehaul distance, offloading, spreading or backfilling, watering, compacting, final grading, complying with the requirements for tolerances, providing testing and disposal of spoil Cover additional cost			

EARTHWORKS

			Hard rock excavation Boulder excavation, Class A Boulder excavation, Class B						
SABS1200AAC	Bulk excavation	8.3.2a 8.3.2b	Excavate in all materials and use for embankment or backfill or dispose as ordered Extra over for: Class "B" excavation	Separate items for each type of excavation or each structure and for each class or manner of disposal of excavated material	m3 m3	Cover cost of complying with all precautions required including excavation, basic selection, loading, transportation within freehaul distance, offloading, spreading or backfilling, watering, compacting, final grading, complying with the requirements for tolerances, providing testing and disposal of spoil Cover additional cost			
SABS1200	Restricted excavation	8.3.3a 8.3.3b	Excavate for restricted foundations, footings and pipe trenches in all materials and use for backfill or embankment or dispose Extra over for: Intermediate excavation Hard rock excavation Boulder excavation, Class A Boulder excavation, Class B	Separate items for separate structures and in case of pipe trenches to different depths in 1m increments	m3 m3	Cover cost of complying will all precautions required including excavation, selecting and keeping selected material separate, temporary stockpiling, loading, transportation within freehaul distance, offloading, backfilling, watering, compacting, testing and disposal of spoil Cover additional cost			
SABS1200AAC	Restricted excavation	8.3.3a 8.3.3b	Excavate for restricted foundations, footings and pipe trenches in all materials and use for backfill or embankment or dispose Extra over for: Class "B" excavation	Separate items for separate structures and in case of pipe trenches to different depths in 2m increments	m3 m3	Cover cost of complying will all precautions required under precautions in addition to the cost of excavating, selecting and keeping selected material separate, loading, transportation within freehaul distance, offloading, backfilling, watering, compacting, testing and disposal of spoil Cover additional cost			
SABS1200AAC	Excavation to stockpile	8.3.14	Bulk or restricted excavations and stockpiling		m3	Cover cost of complying with requirements of project specification, excluding requirements for backfilling, watering and compacting, final grading, complying with the requirements for tolerances and providing for testing			
CESMM3	Excavation for foundations	1.4	Rock type: hard rock	1 - 2m	m3	Volume measured shall be volume which is to be either occupied by or vertically above any part of the structure or foundation			Excavation around pile shafts and for underpinning shall each be so described and classed as excavation for foundations

EARTHWORKS

			1.5	Rock type: boulder class A	2 - 5m		Volume measured for excavation below a body of open water shall be the volume below water when the water surface is at the level (or the higher level of fluctuation if applicable) shown on drawings			Commencing surface shall be identified in description of each item for work involving excavation for which the commencing surface is not the original surface
	CESMM3	General excavation	1.6 1.7 1.8	Rock type: boulder class B Stated artificial hard material exposed at the commencing surface Stated artificial hard material not exposed at the commencing surface	5 - 10m 10 - 15m stated exceeding 15m	m3	Isolated volume of artificial hard material or hard rock occurring within other material to be excavated shall not be measured separately unless its volume exceedings 1m3 except that the minimum volume shall be 0.25m3 where the net width of excavation is less than 2m Volume measured within borrow pits shall be the net volume measured for filling			Excavated surface shall be identified in the description of each item for work involving excavation for which the excavated surface is not the final surface Item descriptions for excavation within borrow pits shall so state Item descriptions shall identify separately excavation which is expressly required to be carried out by hand
	CESMM3	Excavation ancillaries	5.1 5.2 5.3 5.4 5.5 5.6 5.7 5.8	Trimming of excavated surfaces Preparation of excavated surfaces Disposal of excavated material Double handling of excavated material Dredging to remove silt Excavation of material below the final surface and replacement with stated material Timber supports left in Metal supports left in	Topsoil Material other than topsoil, rock or artificial hard material Rock type: intermediate Rock type: hard rock Rock type: boulder class A Rock type: boulder class B Stated artificial hard material	m2 m2 m3 m3 m3 m3 m2 m2	Trimming of excavated surfaces shall be measured to surfaces which are to receive no permanent works whether trimming is expressly required or not Preparation of excavated surfaces shall be measured to surfaces which are to receive permanent works except surfaces which are to receive filling or landscaping and surfaces for which formwork is measured Volume of disposal of excavated material shall be the difference between the total net volume of excavation and the net volume of excavated material used for filling Double handling shall be measured only to the extent that it is expressly required. Volume shall be that of the void formed in the temporary stockpile from which the material is removed Dredging to remove silt shall be measured only to the extent that it is expressly required that silt which accumulates after the final surface has been reached shall be removed Area measured for timber or metal supports shall be the area of supported	Trimming, preparation, disposal and double handling shall be deemed to be carried out upon material other than topsoil, rock or artificial hard material unless otherwise stated in item description Disposal of excavated material shall be deemed to be disposal off the site unless otherwise stated in item description	Item descriptions for excavation ancillaries in connection with excavation by dredging shall be so described Item descriptions for trimming of excavated surfaces and preparation of excavated surfaces shall identify surfaces which are: a) inclined at an angle of 10° - 45° to the horizontal b) inclined at an angle of 45° - 90° to the horizontal c) vertical Where material is for disposal on the site the location of disposal areas shall be stated in item description	

EARTHWORKS

SMM2	Pipe trenches and the like	D11	Excavating trenches to receive service pipes, cables, kerbs and the like	State diameter and starting level and average depth to nearest 250mm	m	Filling in, compacting, grading bottoms & disposing of surplus spoil shall be given in description			
MMBZ	Pipe trenches and the like	D11	Excavating trenches to receive service pipes, cables, kerbs and the like	State starting level and average depth to nearest 150mm	m	Filling in, compacting, grading bottoms & disposing of surplus spoil shall be given in description			
SABS1200	Pipe trenches	8.3.2a 8.3.2b 8.3.2c	Excavate in all materials for trenches, backfill, compact and dispose of surplus material Extra-over for: Intermediate excavation Hard rock excavation Excavate and dispose of unsuitable material from trench bottom (provisional)	Items provided for various pipe diameters in steps not greater than specified in 5.2 and various depths in increments of 1m measured to bottom of the bedding layer Separate items for depth increments Volume computed from trench width and additional depth ordered	m/m3 m3 m3 m3	Cover cost of complying with requirements, excavation, backfilling, compacting and disposing of surplus material within freehaul distance Cover additional cost of excavation and handling of the more difficult material and the disposal within freehaul distance and replacement of unsuitable material Cover cost of excavation of additional depth in any material, the disposal of unsuitable material within freehaul distance and the backfilling of additional depth with suitable material from side of the trench	Volume computed from trench width and the depth from the top of the intermediate or hard rock excavation to the bottom of the same material or the bottom of the trench, whichever is the lesser		
SABS1200AAC	Pipe trenches	8.3.2a 8.3.2b 8.3.2c	Excavate in all materials for trenches, backfill, compact and dispose of surplus material Extra-over for: Class "B" excavation Excavate and dispose of unsuitable material from trench bottom (provisional)	Items provided for various pipe diameters in steps not greater than specified in 5.2 and various depths in increments of 1m measured to bottom of the bedding layer Separate items for depth increments Volume computed from trench width and additional depth ordered	m/m3 m3 m3	Cover cost of complying with requirements, excavation, backfilling, compacting, routine testing, provision of test results and disposing of surplus material within freehaul distance Cover additional cost of excavation and handling of the more difficult material and the disposal within freehaul distance and replacement of unsuitable material Cover cost of excavation of additional depth in any material, the disposal of unsuitable material within freehaul distance and the backfilling of additional depth with suitable material as specified on drawings	Volume computed from trench width and the depth from the top of the Class "B" excavation to the bottom of the same material or the bottom of the trench, whichever is the lesser		
CESMM3	Trenches for pipes, ducts and metal culverts	5.1	Nominal bore: not exceeding 200mm	Depth: not exceeding 1.5m	m3	Volume of material other than topsoil, rock or artificial hard material only if excavated by mechanical means and of soft class 1 material only if excavated by hand	Nominal trench width shall be as defined in class L	Trenches shall be carried out in material other than topsoil, rock or artificially hard material if by mechanical means and in soft class 1 if by hand	Item description for trenches shall identify separately trenches in road crossings

EARTHWORKS

			5.2	200 - 300mm	1.5 - 2m	m3	Volume for trenches calculated by multiplying together the average depth measured to the underside of the pipe or culvert bedding and length of the material removed or backfilled and the nominal trench width	Depths used for classification of trench shall be measured from the commencing surface to the inverts of the pipes	Items for trenches shall be deemed to include excavation, preparation of surfaces, disposal of excavated material, upholding sides of excavation, backfilling and removal of dear services except to the extent that such work is included in classes J, K and L and items shoring of trenches opposite structures and services and protect services	Item description for trenches shall identify separately trenches which are expressly required to be carried out by hand Commencing surface shall be identified in the description of each item for work involving excavation for which the commencing surface is not also the original surface Where more than one pipe, duct or metal culvert is expressly required to be laid in one trench the item description for each pipe, duct or metal culvert shall so state and also identify the pipe, duct or metal culvert run Trench depths exceeding 4m shall be stated in item descriptions to the next higher multiple of 0.5m
			5.3	300 - 600mm	2 - 2.5m	m3	Commencing surface adopted for preparation of BOQ shall be adopted for measurement of completed work Backfilling of trenches shall not be measured except as set out in filling of french and rubble drains and in class I for backfilling with material other than excavated from the trenches	Material classifications for hand excavation of trenches shall be as specified		
			5.4	600 - 900mm	2.5 - 3m	m3				
			5.5	900 - 1200mm	3 - 3.5m	m3				
			5.6	1200 - 1500mm	3.5 - 4m	m3				
			5.7	1500 - 1800mm	exceeding 4m	m3				
			5.8	exceeding 1800mm						
	CESMM3	French drains, rubble drains, ditches and trenches	4.1	Filling french and rubble drains with graded material		m3	Excavation and pipe laying for piped french and rubble drains are measured in class EA if expressly required, or I as applicable Cross-sectional areas of lined ditches shall be measured to the excavated surface			Nature of filling material shall be stated for filling french and rubble drains Materials and dimensions of linings to ditches shall be stated in item
			4.2	Filling french and rubble drains with rubble		m3				
			4.3	Trenches for unpiped rubble drains	Cross-sectional area: not exceeding 0.25m2	m				
			4.4	Rectangular section ditches: unlined	0.25 - 0.5m2	m				
			4.5	Rectangular section ditches: lined	0.5 - 0.75m2	m				
			4.6	Vee section ditches: unlined	0.75 - 1m2	m				
			4.7	Vee section ditches: lined	1 - 1.5m2	m				
			4.8	Trenches for pipes or cables not to be laid by the contractor	1.5 - 2m2 2 - 3m2 stated exceeding 3m2	m				
	SABS1200	Excavation ancillaries for pipe trenches	8.3.3.1	Make up deficiency in backfill material (provisional):	Volume computed from trench width and depth from top of backfill to top of bedding as shown on drawing		Cover cost of selection of suitable material, moving of material to points alongside trench spaced to suit Contractor and disposal of material that is replaced all within freehaul distance			
			8.3.3.1a	from other necessary excavations on site		m3				

EARTHWORKS

			8.3.3.1b	by importation from designated borrow pits		m3	Cover cost of royalties, if applicable excavation and selection of suitable material, moving of material to points alongside trench spaced to suit Contractor and disposal of material that becomes surplus as a result of importation, all within freehaul distance Cover cost of acquisition of material (including royalties, if applicable), moving of material to points alongside trench spaced to suit Contractor and disposal of material that becomes surplus as a result of importation, all within freehaul distance			
			8.3.3.1c	by importation from commercial or off-site sources selected by the Contractor		m3				
	SABS1200AAC	Excavation ancillaries for pipe trenches	8.3.3.1	Make up deficiency in backfill material (provisional):	Volume computed from trench width and depth from top of backfill to top of bedding as shown on drawing					
			8.3.3.1a	from other necessary excavations on site		m3	Cover cost of selection of suitable material, moving of material to points alongside trench spaced to suit Contractor and disposal of material that is replaced all within freehaul distance Cover cost of royalties, if applicable excavation and selection of suitable material, moving of material to points alongside trench spaced to suit Contractor and disposal of material that becomes surplus as a result of importation, dealing with overburden, all within freehaul distance			
			8.3.3.1b	by importation from designated borrow pits		m3				
			8.3.3.1c	by importation from commercial or off-site sources selected by the Contractor		m3	Cover cost of acquisition of material (including royalties, if applicable), moving of material to points alongside trench spaced to suit Contractor and disposal of material that becomes surplus as a result of importation, all within freehaul distance			
	CESMM3	Extras to excavation and backfilling for pipework		Mechanical excavation:	Excavation of rock	m3	Volume of extras shall be calculated by multiplying together the average depth and length of the material removed or backfilled and the nominal trench width	Nominal trench width if not stated in the contract shall be taken as 500mm greater than the maximum nominal distance between the inside faces of the outer pipe walls where this distance does not exceed 1m and as 750mm greater that this distance where it exceeds 1m		Item descriptions shall identify separately excavation which is expressly required to be carried out by hand Items for excavation of rock shall identify separately excavation in material classified as intermediate and hard rock
			1.1	In pipe trenches	Excavation of mass concrete		No volume of extras to excavation and backfilling in manholes and other chambers shall be measured outside the maximum plan are of the manhole or other chamber			

EARTHWORKS

PIPE TRENCHES			1.2 1.3 1.4 1.5 1.6 1.7	In manholes and other chambers In headings In thrust boring In pipe jacking Hand excavation: In pipe trenches In manholes and other chambers	Excavation of reinforced concrete Excavation of other artificial hard material Backfilling above the final surface with concrete Backfilling above the final surface with stated material other than concrete Excavation of natural material below the final surface and backfilling with concrete Excavation of natural material below the final surface and backfilling with stated material other than concrete Soft class 2 Soft class 3 Intermediate Rock		Volume of extras to excavation and backfilling for pipe laying in headings, in thrust boring and in pipe jacking shall be measured by multiplying together the internal cross-sectional area of pipe and the length of the material excavated or backfilled Packing in headings shall not be measured Backfilling above final surface shall be measured only where expressly required that material excavated shall not be used for backfilling Excavation below the final surface and backfilling shall be measured only where it is expressly required An isolated volume of hard rock, concrete or other artificial hard material occurring within other material to be excavated shall not be measured separately unless its volume exceeds 0.25m3	Material classifications for hand excavation of trenches shall be as SANS...		
	SABS1200	Compaction in road reserves for pipe trenches	8.3.3.3	Compaction in road reserves		m3	Cover cost of additional compactive effort required and of additional selection of material			
	SABS1200AAC	Compaction in road reserves for pipe trenches	8.3.3.3	Extra over for compaction in road reserves		m3	Cover cost of additional compactive effort required and of additional selection of material			
	SABS1200	Particular items for pipe trenches	8.3.4a 8.3.4b 	Shore trench opposite structure or service Temporary works: control water inflow from .... to .... Provided equipment Operate and maintain Remove equipment	Length measured will be centre-line of trench regardless of whether supports are place on one or on both sides of trench	m Sum Days Sum	Cover cost for both sides of trench if necessary, of supply, placing, maintenance and removal of timbering and other support measures together with any cost that results from inconvenience of working in the supported trench and the cost of any risks inherent in the operation Cover cost of providing necessary plant or materials or both, fully erected and operative on the site Cover cost for operation and maintenance of pumps, well points, sheeting, close timbering and other equipment Cover removing goods and restoring site to its original condition			

EARTHWORKS

	SABS1200AAC	Particular items for pipe trenches	8.3.4a	Shore trench opposite structure or service	Length measured will be centre-line of trench regardless of whether supports are place on one or on both sides of trench	m	Cover cost for both sides of trench if necessary, of supply, placing, maintenance and removal of timbering and other support measures together with any cost that results from inconvenience of working in the supported trench and the cost of any risks inherent in the operation			
			8.3.4b	Temporary works: control water inflow from .... to						
				Provided equipment		Sum	Cover cost of providing necessary plant or materials or both, fully erected and operative on the site			
				Operate and maintain		Days	Cover cost for operation and maintenance of pumps, well points, sheeting, close timbering and other equipment			
				Remove equipment		Sum	Cover removing goods and restoring site to its original condition			
	SABS1200	Existing services for pipe trenches	8.3.5	Existing services that intersect or adjoin a pipe trench						
			8.3.5a	Services that intersect a trench (angles between centre-lines in plan of 45 - 90°)	Except where water pipes are to be recovered, existing water pipes, sewers, stormwater pipes, concrete-lined channels and drains, box culverts, electric cables, ducts, kerbs, channels, erf connections and various sizes of pipes and services that intersect a trench of specified width and require various degrees of care, whether or not their presence is known before they are uncovered, will be measured separately	No		Unit refers to one service, but services that are so grouped that they can be contained within a horizontal dimension of 200mm measured at right angles to the axis of the services will be measured as one unit		
			8.3.5b	Services that adjoin a trench (parallel to or at an angel between centre-lines in plan of less than 45°)	Trench of specified width runs parallel to or at an angle in plan of less than 45° to an existing service and is such that the nearer side of the bottom of the trench lies at least partly between a vertical plane and a plane that lies at an angel of 45° below the horizontal, both planes passing through the axis of the service, the length of service within the minimum base width of the trench, will be measured for payment under this item	m	Cover additional cost of care in excavation necessitated by the presence of such service, protecting and maintaining such service in operation of means of temporary supports or shoring, delays and disruption of the progress of work and repairs necessitated by damage caused by Contractor	The side of the trench which is rendered liable to collapse because of existence of services will be measured for shoring		
	SABS1200AAC	Existing services for pipe trenches	8.3.5	Existing services that intersect or adjoin a pipe trench						
			8.3.5a	Services that intersect a trench (angles between centre-lines in plan of 45 - 90°)	Except where water pipes are to be recovered, existing water pipes, sewers, stormwater pipes, concrete-lined channels and drains, box culverts, electric cables, ducts, kerbs, channels, erf connections and various sizes of pipes and services that intersect a trench of specified width and require various degrees of care, whether or not their presence is known before they are uncovered, will be measured separately	No		Unit refers to one service, but services that are so grouped that they can be contained within a horizontal dimension of 200mm measured at right angles to the axis of the services will be measured as one unit		

EARTHWORKS

		8.3.5b	Services that adjoin a trench (parallel to or at an angel between centre-lines in plan of less than 45°)	Trench of specified width runs parallel to or at an angle in plan of less than 45° to an existing service and is such that the nearer side of the bottom of the trench lies at least partly between a vertical plane and a plane that lies at an angel of 45° below the horizontal, both planes passing through the axis of the service, the length of service within the minimum base width of the trench, will be measured for payment under this item	m	Cover additional cost of care in excavation necessitated by the presence of such service, protecting and maintaining such service in operation of means of temporary supports or shoring, delays and disruption of the progress of work and repairs necessitated by damage caused by Contractor	The side of the trench which is rendered liable to collapse because of existence of services will be measured for shoring		
CESMM3	Protect services	7.1 7.2	Intersecting services Adjacent services		Nr m	Length measured shall be the length of service for which the nearer side of the bottom of the trench lies at least partly between a vertical plane and a plane that lies at an angle of 45° below the horizontal, both planes passing through the axis of the service Protection is not measured under this item if shoring opposite services is measured	Shall mean services intersecting the trench centreline at an angle in plan of 45 - 90° Mean services that are parallel to or at an angle between the centrelines in plan of less than 45°		
SABS1200	Finishing for pipe trenches	8.3.6.1 8.3.6.1a 8.3.6.1b 8.3.6.1c 8.3.6.1d	Reinstate road surfaces complete with all courses: Gravel on shoulders Asphalt of thickness ….mm in parking area Asphalt of thickness ….mm in roadway Etceteras	Area from length of finished road and the trench width	 m2 m2 m2 m2	Cover cost of temporary accommodation of traffic (including signs and bypasses), excavation (including equipment required to break up, remove and stockpile original surface material) and subsequently of reinstatement as specified, including cost of delays and cost of any risk of having to repair damage			
SABS1200AAC	Finishing for pipe trenches	8.3.6.1 8.3.6.1a 8.3.6.1b 8.3.6.1c 8.3.6.1d	Reinstate road surfaces complete with all courses: Gravel on shoulders Asphalt of thickness ….mm in parking area Asphalt of thickness ….mm in roadway Etceteras	Area from length of finished road and the trench width	 m2 m2 m2 m2	Cover cost of temporary accommodation of traffic (including signs and bypasses), excavation (including equipment required to break up, remove and stockpile original surface material) and subsequently of reinstatement as specified, including cost of delays and cost of any risk of having to repair damage			
SABS1200	Pipe bedding	8.2.1 8.2.1a 8.2.1b	Provision of bedding from trench excavation: selected granular material Selected fill material		m3 m3	Rate cover cost of acquiring, from within 0.5km, bedding that complies with the relevant requirements of the specification, of delivering it to points alongside the trench spaced to suit the contractor's methods of working, and disposing of displaced material within a freehaul distance of 0.5km	The rate for supply and laying of pipelines covers the cost of handling bedding material from alongside the trench and placing it under and around the pipeline		
SABS1200AAC	Pipe bedding	8.2.1 8.2.1a	Provision of bedding from trench excavation: selected granular material		m3	Rate cover cost of acquiring, from within 2km, bedding that complies with the	The rate for supply and laying of pipelines covers the cost of		

EARTHWORKS

		8.2.1b	Selected fill material		m3	relevant requirements of the specification, of delivering it to points alongside the trench spaced to suit the contractor's methods of working, and disposing of displaced material within a freehaul distance of 0.5km	of pipelines covers the cost of handling bedding material from alongside the trench and placing it under and around the pipeline		
SABS1200	Supply only of bedding by importation	8.2.2	Supply only of bedding by importation:						
		8.2.2.1	From other necessary excavations (provisional):			Rate cover the operations specified in 8.2.1			
		8.2.2.1a	Selected granular material		m3				
		8.2.2.1b	Selected fill material		m3				
		8.2.2.2	From borrow pits (provisional):						
		8.2.2.2a	Selected granular material		m3	Rate cover cost of acquiring (including opening up and subsequently spreading surplus material, overburden and topsoil) in the manner specified, regardless of distance, the required bedding from borrow pits, delivering it to points alongside the trench spaced to suit Contractor's methods of working and of disposing of material displaced by such importation, within freehaul distance of 0.5km			
		8.2.2.2b	Selected fill material		m3				
		8.2.2.3	From commercial sources (provisional):			Rate cover cost of acquiring, regardless of distance, the required bedding from commercial sources, of delivering it to points alongside the trench spaced to suit the Contractor's methods of working and of disposing the material displaced by such importation, within a freehaul distance of 0.5km			
		8.2.2.3a	Selected granular material		m3				
		8.2.2.3b	Selected fill material		m3				
SABS1200AAC	Supply only of bedding by importation	8.2.2	Supply only of bedding by importation:						
		8.2.2.1	From other necessary excavations (provisional):			Rate cover the operations specified in 8.2.1			
		8.2.2.1a	Selected granular material		m3				
		8.2.2.1b	Selected fill material		m3				
		8.2.2.2	From borrow pits (provisional):						
		8.2.2.2a	Selected granular material		m3	Rate cover cost of acquiring (including opening up and subsequently spreading surplus material, overburden and topsoil) in the manner specified, regardless of distance, the required bedding from borrow pits, delivering it to points alongside the trench spaced to suit Contractor's methods of working and of disposing of material displaced by such importation, within freehaul distance of 2km			
		8.2.2.2b	Selected fill material		m3				
		8.2.2.3	From commercial sources (provisional):			Rate cover cost of acquiring, regardless of distance, the required bedding from commercial sources, of delivering it to points alongside the trench spaced to suit the Contractor's methods of working and of disposing the material displaced by such importation, within a freehaul			
		8.2.2.3a	Selected granular material		m3				

EARTHWORKS

			8.2.2.3b	Selected fill material		m3	distance of 2km			
	CESMM3	Beds	3.1	Sand	Nominal bore: not exceeding 200mm	m	Length of beds, haunches and surrounds shall be measured along pipe centre line including lengths occupied by fittings and valves but not including lengths occupied by manholes and other chambers through which they are not continued	Items shall include beds of the same material Items for multiple pipes shall be classified according to nominal distance between the inside faces of the outer pipe walls		Materials used and the depths of beds shall be stated in description Multiple pipes shall be so described stating the number of pipes and the maximum nominal distance between the inside faces of the outer pipe walls
		Haunches	3.2	Selected excavated granular material	200 - 300mm	m				
		Surrounds	3.3	Imported granular material	300 - 600mm	m				
			3.4	Mass concrete	600 - 900mm					
			3.5	Reinforced concrete	900 - 1200mm					
					1200 - 1500mm					
					1500 - 1800mm					
					stated exceeding 1800mm					
	SABS1200	Overhaul of bedding and fill material	8.2.5	Overhaul of material for bedding cradle and selected fill blanket	Applicable to bedding from trench and other necessary excavation as is hauled for distances in excess of 0.5km with the written approval of the Engineer	m3.km	Rate cover cost of transporting and off-loading the bedding material and of loading and disposing of material displaced by such bedding within a freehaul distance of 0.5km	Volume will be computed and the distance will be the distance (in excess of 0.5km) by the shortest practicable route in one direction measured to the nearest 0.1km		
	SABS1200AAC	Overhaul of bedding and fill material	8.2.5	Overhaul of material for bedding cradle and selected fill blanket	Applicable to bedding from trench and other necessary excavation as is hauled for distances in excess of 2km with the written approval of the Engineer	m3.km	Rate cover cost of transporting and off-loading the bedding material and of loading and disposing of material displaced by such bedding within a freehaul distance of 2km	Volume will be computed and the distance will be the distance (in excess of 2km) by the shortest practicable route in one direction measured to the nearest 0.1km		
BREAKING UP	SMM2	Breaking up concrete and brickwork	D12	Extra over all kinds of excavation for breaking up concrete, reinforced concrete work and the like within excavation		m3				
	MMBZ	Breaking up concrete and brickwork	D12	Extra over all kinds of excavation irrespective of depth for breaking up concrete, reinforced concrete work and the like within excavation		m3				
	SMM2	Breaking up paving and the like	D13	Breaking up surface concrete, reinforced surface concrete, paving, tarmacadam and the like	State thickness and method of disposal	m2	Alternatively, breaking up such hard material may each be given in m2 as extra over excavation			
	MMBZ	Breaking up paving and the like	D13	Breaking up surface concrete, reinforced surface concrete, paving, tarmacadam and the like on the surface of the ground	State method of disposal	m2	Alternatively, breaking up such hard material on the surface may each be given in m2 as extra over excavation			
	SMM2	Existing conservancy tanks, septic tanks and the like	D14	Clearing out and removing contents of conservancy tanks, septic tanks and the like	State volume and method of disposal	No				
	MMBZ	Existing cesspits	D14	Cleaning out and removing contents of cesspits	State method of disposal	No				
	SABS1200	Existing services - location	8.3.8.1a	Supply (unless hired under item b below) of specialist equipment for detection		Sum				

EARTHWORKS

EXISTING SERVICES			8.3.8.1b 8.3.8.1c	The use or hire of specialist equipment for detection Excavate by hand in soft material to expose ..... Service		Hour/ Sum m3/ daywork	Cover cost of delays and disruption of progress of work caused by search for particular service, in addition to cost of searching for it			
	SABS1200AAC	Existing services - location	8.3.8.1a 8.3.8.1b 8.3.8.1c	Supply (unless hired under item b below) of specialist equipment for detection The use or hire of specialist equipment for detection Excavate by hand in soft material to expose ..... Service		Sum Hour/ Sum m3/ Sum	Cover cost of delays and disruption of progress of work caused by search for particular service, in addition to cost of searching for it			
	SABS1200	Existing services - dealing with services that are at risk because of the construction of earthworks	8.3.8.2a 8.3.8.2b 8.3.8.2c	Cables Permanent protection of ..... Services Temporary protection of ..... Services	Unit means one cable or if more than one any number of cables so grouped that the cross-section containing them has a horizontal dimension not exceeding 200mm Unit sum will be used only where work to be done is specified and defined completely in tender document	No Sum/ daywork Sum/ daywork	Cover cost of location, etc., as specified, delays and disruption of the progress of the work due to the existence of service and, in addition, the cost of dealing with the service as per project specification			
	SABS1200AAC	Existing services - dealing with services that are at risk because of the construction of earthworks	8.3.8.2a 8.3.8.2b 8.3.8.2c	Cables Permanent protection of ..... Services Temporary protection of ..... Services	Unit means one cable or if more than one any number of cables so grouped that the cross-section containing them has a horizontal dimension not exceeding 200mm Unit sum will be used only where work to be done is specified and defined completely in tender document	No Sum Sum	Cover cost of location, etc., as specified, delays and disruption of the progress of the work due to the existence of service and, in addition, the cost of dealing with the service as per project specification			
WORKING SPACE	SABS1200	Working space	8.3.5	Extra excavation in all materials to provide working space around structure	Area computed from perimeter of the structure and the average depth of excavation on the perimeter of the structure	m2	Cover cost of operations			
	SABS1200AAC	Working space	8.3.5 8.3.5.1	Extra excavation in all materials to provide working space around structure Extra-over for backfilling to working space with imported approved material	Area computed from perimeter of the structure and in depth stages of 2m of excavation on the perimeter of the structure Area computed from perimeter of the structure and the depth of excavation specified in depth stages of 2m	m2 m2	Cover cost of operations Cover cost of operations	When specified or ordered that the material from the excavation is unsuitable for backfilling		
OVERHAUL	SABS1200	Overhaul	8.3.6a 8.3.6b	Limited overhaul (provisional) Long overhaul (provisional)	Volumes will be computed for designated dimensions, no allowance for bulking	m3 m3.km	Distances will be measured to the nearest 0.1km from the end of the limited overhaul range in one direction only, by the shortest practicable route			
	SABS1200AAC	Overhaul	8.3.6a	Overhaul	Volumes will be computed from the distance of the haul route as specified in one direction measured to the nearest 0.1km, less freehaul, multiplied by volume of material being moved. No allowance for bulking	m3.km				

EARTHWORKS

	CESMM3	Overhaul	1.1 1.2	Limited overhaul Unlimited overhaul		m3 m3.km	Overhaul is measured where expressly required Where unlimited overhaul is measured, limited overhaul must also be measured Volume measured shall be the net volume measured for filling or the difference between the net volume of excavation and the net volume of filling in the case of disposal	Freehaul is defined as haulage within the first 0.5km Limited overhaul is haulage of material over any distance within the range over 0.5 up to 1km Unlimited overhaul is haulage of material for a distance greater than 1km		
SURFACE TREATMENT	SMM2	Surface treatment	D16.a D16.d D16.e	Treating surface of ground or surface of filling or bottom of excavation Trimming sides of cutting Trimming sides of embankments to slope Trimming sides of excavations in rock to produce fair faces	Compacting required to be carried out by specific means shall be appropriately described State angle of slope State angle of slope	m2 m2 m2 m2	Alternatively such treatment may be given in description of any superficial item of excavation, earth filling, hardcore filling, concrete or paving	Levelling and normal compacting are deemed included	Special treatment to bottoms of excavation in rock shall be described	
	MMBZ	Surface treatment	D16.a D16.d D16.e	Treating surface of ground or surface of filling or bottom of excavation Trimming sides of cutting Trimming sides of embankments to slope Trimming sides of excavations in rock to produce fair faces	Compacting required to be carried out by specific means shall be appropriately described	m2 m2 m2 m2	Alternatively such treatment may be given in description of any superficial item of excavation, earth filling, hardcore filling, concrete or paving	Levelling and normal compacting are deemed included	Special treatment to bottoms of excavation in rock shall be described	
DISPOSAL OF WATER	SMM2	Disposal of water	D18.a D18.b	Keeping excavations free from water Keeping excavations free from spring or running water	All water except spring or running water	Item Prov Sum/ Prime cost	Alternatively item may be given in description of excavation Alternatively item may be given as a provisional number of actual pumping hours for different classes of pumps likely to be required	Providing pumps and other equipment, power and attendance for pumping and standing time shall be deemed to be included		
	MMBZ	Disposal of water	D18.a D18.b D18.c	Keeping excavations free from water Keeping excavations free from water below the water level Keeping excavations free from water below the water level Keeping excavations free from spring or running water	All water except spring or running water and water below water level in the round	Item Item Prov Sum/ Prime cost Prov Sum/ Prime cost	Alternatively item may be given in description of excavation Water level has been stated as per clause D1.a Water level remains to be ascertained as per clause D1.a Alternatively item may be given as a provisional number of actual pumping hours for different classes of pumps likely to be required	Providing pumps and other equipment, power and attendance for pumping and standing time shall be deemed to be included Alternatively item may be given as a provisional number of actual pumping hours for different classes of pumps likely to be required		

EARTHWORKS

LATERAL SUPPORT	SMM2	Planking and strutting generally	D19	Planking and strutting	Providing everything requisite to uphold sides of excavation by whatever means (other than special shoring or steel sheet piling)	Item	Alternatively item may be included in description of excavation			
	MMBZ	Planking and strutting generally	D19	Planking and strutting	Providing everything requisite to uphold sides of excavation by whatever means (other than special shoring or steel sheet piling)	Item	Alternatively item may be included in description of excavation			
	SABS1200	Additional lateral support	8.3.7	Additional lateral support between ..... and ....., if ordered (provisional)	Area computed by multiplying vertical depth by length of the face or faces ordered to be supported	Sum	Cover cost of designing, providing, installing, maintaining and removing lateral support	Cover work ensuring stability, ordered by the Engineer		
	SABS1200AAC	Additional lateral support	8.3.7	Lateral support Timber Steelwork	 As alternative As alternative	Sum m3 t	Cover cost of designing, providing, installing, maintaining and removing lateral support Cover cost of design, installation including bolts, wedges, welding, etc. maintaining	Cover work ensuring stability, ordered by the Engineer		
	CESMM3	Shore trenches opposite structures or services	6			m	Measured along the centreline of the trench regardless of whether supports are placed on one or on both sides of the trench		Shall be deemed to include any inconvenience of working in the supported trench	
	BESMM3	Filling	1 2 3 4	To structures Embankments General To stated depth or thickness	Excavated top soil Imported top soil Non-selected excavated material other than topsoil or rock Selected excavated material other than top soil or rock Imported natural material other then top soil or rock Excavated rock Imported rock Imported artificial material	m2	Filling to form temporary roads for incorporation into permanent filling - volume places shall not be deducted from measured filling Additional filling for settlement of or penetration into underlying material shall only be measured if its depth exceeds 75mm Volume of imported filling shall be the difference between net volume of filling and net volume of excavated material derived from work in other sections Filling deposited below water and quantities cannot be measured satisfactorily by any means, volume shall be measured in transport vehicles at the place of deposit	Filling material are non-selected excavated material other than topsoil or rock, unless otherwise stated Excavated rock classed filling only where use of rock as filling at stated locations is expressly required Class filling to stated depth or thickness where material is provided of uniform total compacted depth or thickness such as drainage blankets, topsoil, pitching and beaching Bulk filling shall not be classed as to stated depth or thickness notwithstanding that it may be compacted in separate layers of material of stated thickness	Items for filling shall include compaction	Material shall be identified in item descriptions with imported filling State different compaction requirements for same filling Limit of rate of depositing filling shall be stated Descriptions for filling shall identify surfaces which are: 1. inclined at an angle of 10 - 45 to the horizontal; 2. inclined at an angle of 45 - 90 to the horizontal; 3. vertical degree
	SMM2	Hardcore filling	D20.b	Hardcore filling making up levels over 300mm thick Hardcore filling not exceeding 300mm thick	 State average thickness	m3 m2	Hardcore filling required to be deposited and compacted in layers shall be so described stating maximum thickness of layers and compaction standard required	Hardcore filling shall be measured as equal to the void to be filled. Any thickness stated shall be deemed to be measured after compacting	Treating surface of hardcore shall be accordance with D16.a & b	

EARTHWORKS

			D20.e	Hand-packing hardcore to form vertical or battering face over 300mm wide		m2				
			D20.f	Hand-packing hardcore to form vertical or battering face not exceeding 300mm wide Forming sinkings in hardcore	State width State size	m m				
	MMBZ	Hardcore filling	D20.b	Hardcore filling making up levels over 300mm thick		m3	Hardcore filling required to be deposited and compacted in layers shall be so described stating maximum thickness of layers	Hardcore filling shall be measured as equal to the void to be filled. Any thickness stated shall be deemed to be measured after compacting	Treating surface of hardcore shall be accordance with D16.a & b	
				Hardcore filling not exceeding 300mm thick	State average thickness	m2				
			D20.e	Handpicking hardcore to form vertical or battering face over 300mm wide		m2				
			D20.f	Handpicking hardcore to form vertical or battering face not exceeding 300mm wide Forming sinkings in hardcore	State width State size	m m	No deduction of hardcore shall be made			
	SABS1200	Importing of material	8.3.4a	Extra-over for importation of materials from commercial sources or from borrow pits	Importation from different sources scheduled separately for each designated source of supply and for each different area of use	m3	Cover cost of royalties, acquiring suitable material, forming access, removal of overburden, loading, transportation, offloading at point of placing, removal of access and replacing of overburden	Rate for importing from designated borrow pit cover cost, royalties, excavation, selection of suitable material, loading, transportation and offloading at point of placing		
			8.3.4b	Opening up and closing down of designated borrow pit	Only when a new borrow pit has to be established or access to existing borrow pit has to be established	Sum	Cover cot of opening up and of restoring site			
			8.3.4c	Dealing with overburden	Volume calculated by method of average end areas	m3	Cover cost of digging trial holes, removing overburden to stockpile and spreading overburden evenly over floor and sides of borrow pit when borrowing is complete			
	SABS1200AAC	Importing of material	8.3.4a	Importation of materials from commercial sources, from borrow pits, waste rock dumps or stockpile	Importation from different sources scheduled separately for each designated source of supply and for each different area of use	m3	Cover cost of complying with requirements of project specification where applicable, excavating, selecting and keeping suitable material separate (where relevant) loading, transporting, offloading, placing, watering, compaction, testing and including, in the case of borrow pits selected by the Contractor, removal of overburden and, if applicable, royalties			
			8.3.4b	Opening up and closing down of designated borrow pit	Only when a new borrow pit has to be established or access to existing borrow pit has to be established	Sum	Cover cot of opening up and of restoring site			
			8.3.4c	Dealing with overburden (designated borrow pits only)	Volume shall be computed from cross-sectional areas and depths at suitable intervals approved by Engineer	m3	Cover cost of digging trial holes, removing overburden to stockpile and spreading overburden evenly over floor and sides of borrow pit when borrowing is complete			
ING	CESMM3	Opening and closing of borrow pits	3	Opening and closing of borrow pits		Nr	Shall be measured only when a new borrow pit has to be established or when access to an existing borrow pit has to be established		Shall be deemed to include the access to the borrow pit and the restoration of the borrow area and access	

EARTHWORKS

FILL	CESMM3	Overburden	4	Overburden		m3			Overburden shall be deemed to include trial holes, removal, stockpiling and spreading back the overburden	
	SABS1200	Backfilling	8.3.9	Extra-over for backfill or for fill material against structures	Item will be scheduled only when a particular material has been specified in specification or shown on the drawings to be placed within a defined zone against a structure	m3	Cover cost of supplying, placing and compacting specified material and the disposal of replaced material, if applicable	Volume measured will be volume of material complying with the specified requirements and placed within the defined zone		
	SABS1200AAC	Backfilling	8.3.9	Extra-over for backfill or for fill material from excavations against structures	Item will be scheduled only when a particular material has been specified in specification or shown on the drawings to be placed within a defined zone against a structure	m3	Cover cost of supplying, placing and compacting specified material and the disposal of replaced material, if applicable	Volume measured will be volume of material complying with the specified requirements and placed within the defined zone		
	CESMM3	Filling	6.1	To structures	Excavated topsoil	m3	Filling of excavations around completed structures shall be measured only to the extent that the volume filled is also measured as excavation	Filling material shall be non-selected excavated material other than topsoil or hard rock, unless otherwise stated in item	Items for filling shall be deemed to include compaction	Materials shall be identified in item descriptions for filling with imported material
			6.2	Embankments	Imported topsoil	m3	Filling to form temporary roads is subsequently permitted in terms of the contract for incorporation into permanent filling the volume places shall be deducted from the measurement of filling	Filling material shall be classed as excavated hard rock only where the use of hard rock as filling at stated locations is expressly required		Where different compaction requirements are specified for same filling material they shall be stated in item for filling
			6.3	General	Non-selected excavated material other than topsoil or hard rock	m3	Additional filling necessitated by settlement of or penetration into underlying material shall be measured only to the extent that its depth exceeds 75mm	Filling shall be classed as to stated depth or thickness where material is provided of uniform total compacted depth or thickness such as in selected subgrade layer, drainage blankets, topsoilling, pitching and beaching		Where rate of deposition of filling material is limited the limitation shall be stated in item descriptions for filling
			6.4	To stated depth or thickness	Selected excavated material other than topsoil or hard rock	m2	Volume of imported filling measured shall be the difference between the net volume of filling and the net volume of excavated material derived from work used for filling	Bulk filling shall no be classes as to stated depth or thickness notwithstanding that it may be compacted in separate layers of material of stated thickness		Materials shall be identified in item descriptions for filling to stated depth or thickness
					Imported natural material other than topsoil or hard rock		Where hard rock filling is deposited into soft areas the volume shall be measured in the transport vehicles at the place of deposition			Item descriptions for filling to stated depth or thickness shall identify work upon surfaces which are:
					Excavated hard rock Imported hard rock Imported artificial material		Where filling is to be deposited below water, the quantity cannot be measured satisfactorily by any other means, its volume shall be measured in transport vehicles at the place of deposition			a) inclined at an angle of 10 - 45° to the horizontal; b) inclined at an angle of 45 - 90° to the horizontal; c) vertical degree

EARTHWORKS

	BESMM3	Filling ancillaries	1	Trimming of filled surfaces	Topsoil	m2	Trimming of filled surfaces shall be measured to surfaces which receive no Permanent Works whether trimming is expressly required or not	Trimming and preparation shall be carried out upon material other than topsoil, rock or artificial hard material unless otherwise stated		Descriptions for filling shall identify surfaces which are: 1. inclined at an angle of 10 - 45 to the horizontal; 2. inclined at an angle of 45 - 90 to the horizontal; 3. vertical degree Type and grade of material shall be stated in description for geotextiles
			2	Preparation of filled surfaces	Material other than topsoil, rock or artificial hard material	m2	Preparation of filled surfaces shall be measure to surfaces which are to receive Permanent Works whether preparation is expressly required or not except surfaces to receive filling or landscaping and surfaces for which formwork is measured			
			3	Geotextiles	Rock Stated artificial hard material	m2	Area of additional geotextile in laps shall not be measured			
	CESMM3	Filling ancillaries	7.1	Trimming of filled surfaces	Topsoil	m2	Trimming of filled surfaces shall be measured to surfaces which receive no Permanent Works whether trimming is expressly required or not	Trimming and preparation shall be carried out upon material other than topsoil, rock or artificial hard material unless otherwise stated		Descriptions shall identify work upon surfaces which are: a) inclined at an angle of 10 - 45° to the horizontal; b) inclined at an angle of 45 - 90° to the horizontal; c) vertical degree Type and grade of material shall be stated in description for geotextiles
			7.2	Preparation of filled surfaces	Material other than topsoil, rock or artificial hard material	m2	Preparation of filled surfaces shall be measure to surfaces which are to receive Permanent Works whether preparation is expressly required or not except surfaces to receive filling or landscaping and surfaces for which formwork is measured			
			7.3	Geotextiles	Rock type: intermediate Hard rock Boulder class A Boulder class B Stated artificial hard material	m2	Area of additional geotextile in laps shall not be measured			
	SABS1200AAC	Testing of dump rock	8.3.15	Testing of dump rock		m2	Cover cost of complying with requirements in project specification			
	BESMM3	Landscaping	1	Turfing		m2	Lengths of hedges measured shall be their developed lengths along the centre lines		Items for landscaping shall be deemed to include fertilizing, trimming and preparation of surfaces	Where turfing is pegged or wired state in description Turfing and grass seeding shall identify work upon surfaces which are inclined at an angle exceeding 10degrees to horizontal
			2	Hydraulic mulch grass seeding						
			3	Other grass seeding						
			4	Plants, stated species and size		Nr				
			5	Shrubs, stated species and size						
			6	Trees, stated species and size						
			7	Hedges, stated species, size and spacing	Single row Double row	m				
	SMM2	Soiling, seeding, planting	D17	Soiling, seeding, planting and fertilizing to surfaces	State thickness of soil and quantity per m2 of seed, plants or fertilizer	m2	Give separately			
	MMBZ	Soiling, seeding, planting	D17	Soiling, seeding, planting and fertilizing to surfaces	State thickness of soil and quantity per m2 of seed, plants or fertilizer	m2	Give separately			

EARTHWORKS

LANDSCAPING	SABS1200	Topsoiling	8.3.10	Topsoiling		m2	Cover cost of excavating from stockpiles, hauling and spreading			
	SABS1200AAC	Topsoiling	8.3.10	Topsoiling		m2	Cover cost of excavating from stockpiles, hauling and spreading			
	SABS1200	Grassing or other vegetation cover	8.3.11	Grassing or other vegetation cover	Separate items for different types of cover	m2	Cover cost of grassing or other cover as specified			
	SABS1200AAC	Grassing or other vegetation cover	8.3.11	Grassing or other vegetation cover	Separate items for different types of cover	m2	Cover cost of grassing or other cover as specified			
	CESMM3	Landscaping	8.1	Turfing		m2	Lengths of hedges measured shall be their developed lengths along the centre lines		Items for landscaping shall be deemed to include fertilizing, trimming and preparation of surfaces	Where turfing is pegged or wired state in description Turfing and grass seeding shall identify work upon surfaces which are inclined at an angle exceeding 10° to horizontal
			8.2	Hydraulic mulch grass seeding		m2				
			8.3	Other grass seeding		m2				
			8.4	Plants, stated species and size		Nr				
			8.5	Shrubs, stated species and size		Nr				
			8.6	Trees, stated species and size		Nr				
			8.7	Hedges, stated species, size and spacing	Single row Double row	m				

CONCRETE

GENERAL RULES	BESMM3	Information to be supplied in General Conditions or on Drawings: 1. Relative positions of concrete members 2. Size of members 3. Thickness of slabs 4. Permissible loads in relation to casting items Concrete volume measured net, no deductions for reinforcement; steel sections of area≤ 0.5m; cast in accessories; voids ≤ 0.05m in volume (except voids in troughed and coffered slabs Concrete include finishing as struck from basic finish formwork or with a non-mechanical tamped finis Give kind and quality of materials and mix details; tests of materials and finished work; measures to achieve watertightness; limitations on method, sequence, speed or size of pouring; methods of compaction and curin
	SMM2	Particulars of the following shall be given: 1. Kind and quality of materials for concrete 2. Any tests of materials 3. Any tests of the finished work 4. Composition and mix (or strength requirements) of the concrete 5. Any additives: accelerators, retarders, air-entraining agents, waterproofing agents and the like Concrete required to be placed by particular method (eg poured at a stated speed) shall be so describec Concrete required to be consolidated by a particular method (eg mechanically tamped, vibrated) shall be so describec Concrete required to be cured by a particular method shall be so describec Curved labours on concrete shall be described irrespective of radius Labour on existing concrete shall be so described Concrete shall be measured as executed but no deduction shall be made for the following 1. Volume of any steel embedded in the concrete 2. Voids not exceeding 0.1m2 in work given in square metres 3. Voids not exceeding 0.05m3 in work given in cubic metres Plain in-situ concrete shall be given under an appropriate heading Reinforced in-situ concrete shall be given under an appropriate heading
	MMBZ	Particulars of the following shall be given: 1. Kind and quality of materials for concrete 2. Any tests of materials 3. Any tests of the finished work 4. Composition and mix (or strength requirements) of the concrete Concrete required to be placed by particular method (eg poured at a stated speed) shall be so describec Concrete required to be consolidated by a particular method (eg mechanically tamped, vibrated) shall be so describec Concrete required to be cured by a particular method shall be so describec Curved labours on concrete shall be described irrespective of radius Labour on old concrete shall be so described Concrete shall be measured as executed but no deduction shall be made for the following 1. Volume of any steel embedded in the concrete 2. Voids not exceeding 0.1m2 in work given in square metres 3. Voids not exceeding 0.05m3 in work given in cubic metres Plain in-situ concrete and associated formwork shall be given under an appropriate heading Reinforced in-situ concrete and its reinforcement and associated frame work shall be given under an appropriate heading
	SABS1200	Definitions: 1. Fixture: an item such as a bolt, anchorage, bearing or the like that is cast or grouted into concrete 2. Formwork: Temporary works required to support and shape the concrete for a structure 3. Grade of concrete: an identifying number for the concrete, the number being numerically equal to the specified strength at 28 days expressed in megapascal 4. Prescribed mix concrete: concrete for which the Engineer has prescribed the mix proportion 5. Ready-mix concrete: concrete complying with the relevant requirements of the specification and delivered on the Site in a plastic state 6. Strength concrete: concrete designed primarily for strength Concrete: Concrete will be measured net to the dimensions shown on the drawings or to the dimensions cast, whichever are the smalle Structural elements that are undersized will be measured for payment only if they are accepted by the Enginee No allowance will be made for concrete required to make up overbreak in soft excavation, but payment will be made for additional concrete or formwork, ordered in writing by the Engineer to replace unsuitable material or overbreak in hard rock or in intermedia excavation Subfoundation carpets and blinding layers will be measured to the plan size of the concrete structure resting on the carpet, or the plan size of the excavation where additional excavation is provided to facilitate erection of form Where the concrete is scheduled by volume it will be measured on the mean thickness as cast, provided that the Engineer is satisfied that the excavation has not at any point been taken deeper or wider than necessar Where concrete is placed directly against the sides or bottom of excavations in hard rock or in intermediate excavation, an item may be included in the schedule of quantities for any additional concrete placed in overbrea Such additional concrete will be measured on the basis of the superficial area of the sides or bottom, or both, as applicable, of the theoretical net excavation in rock that is overbroken and in contact with the contra

CONCRETE

	Separate items will be scheduled, as applicable, for each type and each grade of concrete, for each type of cement and each type of aggregate, and for each unit of the works or each element of a structure, where these could materially influence the pricir of the work and where the cost of expositing concrete is affected by it position in the works or by the conditions of placing, such as a) slabs that are sloping, conical, or horizontal and those of different thicknesse b) concrete deposited under water or between tides, the levels of demarcation being stated c) small quantities each less than 0.5m3 of formed concrete and d) different surface finishes (other than striking-off and levelling) such as wood-floated or steel-floated finishes and granolithic or mortar screed The unit rate shall cover the cost of the design of the mix in the case of strength concrete, the provision of concrete (made with ordinary portland cement unless otherwise scheduled), mixing, testing, placing, compacting, the forming of stop-ends and unforesee construction joints, striking-off or levelling as applicable, and curing and repairing where necessary Floor slabs, where placed on subfoundation carpets or directly on the prepared ground surface, will be measured to the net thickness dimensioned on the drawing Concrete in a column supporting a reinforced concrete beam or slab structure will be measured between the top surface of the foundation, beam, or slab on which the foot of the column is standing and the underside of the beam or slab supported by the colun No deduction or addition will be made for nosings, bolt holes, chamfers or splays of size up to 50mm x 50mm, grooves or chases not exceeding 0.015m3 each in volume, or holding-down bolts, rails, steel sections and reinforcement cast in the concre
SABS1200AAC	Definitions: 1. Fixture: an item such as a bolt, anchorage, bearing or the like that is cast or grouted into concrete 2. Formwork: Temporary works required to support and shape the concrete for a structure 3. Grade of concrete: an identifying number for the concrete, the number being numerically equal to the specified strength at 28 days expressed in megapascal 4. Prescribed mix concrete: concrete for which the Engineer has prescribed the mix proportion 5. Ready-mix concrete: concrete complying with the relevant requirements of the specification and delivered on the Site in a plastic state 6. Strength concrete: concrete designed primarily for strength Concrete: Concrete will be measured net to the dimensions shown on the drawings or to the dimensions cast, whichever are the smalle Structural elements that are undersized will be measured for payment only if they are accepted by the Enginee No allowance will be made for concrete required to make up overbreak in soft excavation, but payment will be made for additional concrete or formwork, ordered in writing by the Engineer to replace unsuitable material or overbreak in hard rock or in intermedia excavation Subfoundation carpets and blinding layers will be measured to the plan size of the concrete structure resting on the carpet, or the plan size of the excavation where additional excavation is provided to facilitate erection of form Where the concrete is scheduled by volume it will be measured on the mean thickness as cast, provided that the Engineer is satisfied that the excavation has not at any point been taken deeper or wider than necessar Where concrete is placed directly against the sides or bottom of excavations in hard rock or in intermediate excavation, an item may be included in the schedule of quantities for any additional concrete placed in overbrea Such additional concrete will be measured on the basis of the superficial area of the sides or bottom, or both, as applicable, of the theoretical net excavation in rock that is overbroken and in contact with the contra Separate items will be scheduled, as applicable, for each type and each grade of concrete, for each type of cement and each type of aggregate, and for each unit of the works or each element of a structure, where these could materially influence the pricir of the work and where the cost of expositing concrete is affected by it position in the works or by the conditions of placing, such as a) slabs that are sloping, conical, or horizontal and those of different thicknesse b) concrete deposited under water or between tides, the levels of demarcation being stated c) small quantities each less than 0.5m3 of formed concrete and d) different surface finishes (other than striking-off and levelling) such as wood-floated or steel-floated finishes and granolithic or mortar screed The unit rate shall cover the cost of the design of the mix in the case of strength concrete, the provision of concrete (made with ordinary portland cement unless otherwise scheduled), mixing, testing, placing, compacting, the forming of stop-ends and unforesee construction joints, striking-off or levelling as applicable, and curing and repairing where necessary Floor slabs, where placed on subfoundation carpets or directly on the prepared ground surface, will be measured to the net thickness dimensioned on the drawing Concrete in a column supporting a reinforced concrete beam or slab structure will be measured between the top surface of the foundation, beam, or slab on which the foot of the column is standing and the underside of the beam or slab supported by the colun No deduction or addition will be made for nosings, bolt holes, chamfers or splays of size up to 50mm x 50mm, grooves or chases not exceeding 0.015m3 each in volume, or holding-down bolts, rails, steel sections and reinforcement cast in the concre
CESMM3	Volume of concrete measured shall include that occupied by a) reinforcement and other metal sections b) prestressing components c) cast-in components each not exceeding 0.1m3 in volume d) rebates, grooves, throats, fillets, chamfers or internal splays each not exceeding 0.1m2 in cross-sectional area e) pockets and holes which are defined as large or small voids in accordance with rule D3 of class C f) joints or joint components between adjacent volumes of in situ concrete Volume of concrete measured shall exclude that of nibs or external splays each not exceeding 0.01m2 in cross-sectional area

BESMM3	Foundations				m3	Reinforced	Thickness range stated in descriptions excludes projections and recesses	Foundations include attached column bases and pile caps	Requirements for beds to be laid in bays
SMM2	Foundation and bases	F3.a	Foundations in trenches		m3	Irrespective of thickness	Foundations to stanchions, columns and piers, which are combined, with foundations in trenches shall be classified as foundations in trenches		
		F3.c	Foundations to stanchions, columns and piers, which are isolated	Grouped together	m3				
		F3.e	Casing to steel grillages		m3				
		F3.f	Grouting under steel stanchion-bases	State mix of grout and number of bases or grillages	m2				
		F3.g	Grouting under steel grillages		m2				

CONCRETE

MMBZ	Foundation and bases	F3.a F3.c F3.e F3.f F3.g	Foundations in trenches Foundations to stanchions, columns and piers, which are isolated Casing to steel grillages Grouting under steel stanchion-bases Grouting under steel grillages Building in and grouting anchor bolts and the like	Grouped together State mix of grout and number of bases or grillages State length of bolt and mix of grout	m3 m3 m3 m2 m2 No	Irrespective of thickness	Foundations to stanchions, columns and piers, which are combined, with foundations in trenches shall be classified as foundations in trenches		
SMM2	Machine bases	F4	Machine bases		m3				
MMBZ	Machine bases	F4.a F4.b	Large machine bases Small machine bases	Over 0.15m3 Not exceeding 0.15m3, state size	m3 No				
BESMM3	Ground beams Isolated foundations					Reinforced > 5% Sloping ≤ 15^{o}	Thickness range stated of coffered and troughed slabs is measured overall	Isolated foundations include isolated column bases, isolated pile caps and machine bases Beds include blinding beds; plinths and thickening of beds	
SMM2	Isolated foundations	F2.c	Isolated foundations to stanchions, columns and piers	Group together	m3				
BESMM3	Beds					Sloping ≥ 15^{o}		Slabs include attached beams and beam casings whose depth is ≤3 times their width (depth measured below the slab) and column drop heads	
SMM2	Beds	F5.a	Beds over 300mm thick Beds not exceeding 300mm thick	State thickness	m3 m2	Beds laid to slopes not exceeding 15 degrees from horizontal shall be so described Beds laid to slopes exceeding 15 degrees from horizontal shall be so described	Beds laid in bays shall be so described stating size of bays Formwork between bays shall be given in description		
MMBZ	Beds	F5.a	Beds over 300mm thick Beds not exceeding 300mm thick	State thickness	m3 m2	Beds laid to slopes exceeding 15 degrees from horizontal and those laid to slopes over 15 degrees from horizontal shall be so described	Beds laid in bays shall be so described stating size of bays Formwork between bays shall be given in description		
BESMM3	Slabs					Poured on or against earth or unblinded hardcore		Coffered and troughed slabs include margins with width ≤ 500mm; wider margins included in ordinary slabs	
SMM2	Floors, roofs and the like	F7.a	Suspended floors, roofs and the like Classified: Horizontal Sloping not exceeding 15^{o} from horizontal	State thickness	m2	Those laid around or between steel filler joists (measured over fillers) shall be so described Curved roofs, conical roofs, spherical roofs and elliptical roofs shall each be so described irrespective of radius	Measured over all bearings and grouped together		

CONCRETE

			Sloping over 15° from horizontal Vertical						
		F7.b	Haunchings		m3				
		F7.c	Tops and cheeks of dormers	State thickness	m2	Group together			
MMBZ	Floors, roofs and the like	F7.a	Suspended floors, roofs and the like	State thickness	m2	Those laid around or between steel filler joists (measured over fillers) shall be so described Curved roofs, conical roofs, spherical roofs and elliptical roofs shall each be so described irrespective of radius	Measured over all bearings and grouped together		
			Classified: Horizontal Sloping not exceeding 15° from horizontal Sloping over 15° from horizontal Vertical						
		F7.b	Haunchings		m3				
		F7.c	Tops and cheeks of dormers	State thickness	m2	Group together			
BESMM3	Coffered and troughed slabs Walls and the likes Filling hollow walls							Walls include attached columns and piers	
SMM2	Walls	F8.b	Walls over 300mm thick		m3	Retaining walls shall be so described	Measurements of walls shall be taken between attached piers or pilasters Thickness of attached piers or pilasters shall be taken as the combined thickness of the wall and the pier/pilaster	Attached or isolated piers, pilasters and the like (except where caused by openings) having a length on plan not exceeding 4 times the thickness and those caused by openings in walls shall be classified as walls	
			Walls not exceeding 300mm thick	State thickness	m2				
		F8.c	Projections on walls to form cornices, bands and the like		m3	Grouped together	Measured beyond the face of the wall		
		F8.d	Concrete fillings to cavities of hollow walls	State thickness	m2	Splaying the top edge shall be deemed to be included in the item			
MMBZ	Walls	F8.b	Walls over 300mm thick		m3	Retaining walls shall be so described	Measurements of walls shall be taken between attached piers or pilasters Thickness of attached piers or pilasters shall be taken as the combined thickness of the wall and the pier or pilaster	Attached or isolated piers, pilasters and the like (except where caused by openings) having a length on plan not exceeding 4 times the thickness and those caused by openings in walls shall be classified as columns Those having length over 4 times the thickness and those caused by openings in walls shall be classified as walls	
			Walls not exceeding 300mm thick	State thickness	m2				
		F8.c	Projections on walls to form cornices, bands and the like	State size	m3	Grouped together	Measured beyond the face of the wall		
		F8.d	Concrete fillings to hollow walls	State thickness	m2	Splaying the top edge shall be deemed to be included in the item			
BESMM3	Beams, lintels Beam casings	1 2	Isolated Isolated deep			Reinforced Reinforced > 5%		Deep beams and beam casings are those whose depth (measured below the slab where attached) is > 3 times their width	

CONCRETE

CONCRETE		Columns Column casings	3	Attached deep		m3		Columns are only measured when isolated and when their length on plan is ≤ 4 times their thickness		
	SMM2	Beams and columns	F10	Beams, lintels, columns and the like	Each given separately	m3	Horizontal members & sloping members not exceeding 15° from horizontal shall be so described Sloping members over 15° from horizontal shall be so described	Floor & roof beams shall be measured below slab	Projections shall be added to appropriate item	
	MMBZ	Beams and columns	F10	Beams, lintels, columns and the like	Each given separately	m3	Horizontal members & sloping members not exceeding 15° from horizontal (grouped together) shall be so described Vertical members and sloping members over 15° from horizontal (grouped together) shall be so described	Floor & roof beams shall be measured below slab	Projections shall be added to appropriate item	
	BESMM3	Staircases							Staircases include landings and strings	
	SMM2	Steps	F11.a F11.b	Steps, staircases and strings Solid balustrades and landings	Separately stating thickness	m3 m2				
	MMBZ	Steps	F11.a F11.b	Steps, staircases and strings Solid balustrades and landings	Grouped together Separately stating thickness	m3 m2				
	BESMM3	Upstands							Upstands exclude kickers	
	SMM2	Kerbs	F12	Kerbs	State size	m3/m				
	MMBZ	Kerbs	F12	Kerbs	State size	m3/m				
	BESMM3	Filling	1 2 3 4	Mortices Holes (nr) Chases > 0.01m2 Chases < 0.01m2		nr m3 m3 m				
	BESMM3	Others	1	Details stated		m3				
	SABS1200	Prescribed mix concrete	8.4.1	Prescribed mix concrete in....	Proportions and positions or elements in the works will be stated	m3				
	SABS1200AAC	Prescribed mix concrete	8.4.1	Prescribed mix concrete in....	Proportions and positions or elements in the works will be stated	m3				
	SABS1200	Blinding	8.4.2	Blinding layer in ..... Concrete .... either of the following will be stated: Minimum thickness and proportions or grade Proportions or grade		 m2 m3				
	SABS1200AAC	Blinding	8.4.2	Blinding layer in ..... Concrete .... either of the following will be stated: Minimum thickness and proportions or grade Proportions or grade		 m2 m3				

CONCRETE

	SABS1200	Strength concrete	8.4.3	Strength concrete, grade….	Grade and positions or elements in the Works will be stated. Except where ordinary portland cement is required, the type of cement will be stated	m3				
	SABS1200AAC	Strength concrete	8.4.3	Strength concrete, grade….	Grade and positions or elements in the Works will be stated. Except where ordinary portland cement is required, the type of cement will be stated	m3				
	CESMM3	Provision of concrete:								
		Design mix	1.1	Grade: 7.5MPa	Cement to SANS……..	m3		Items shall be classified in accordance with SANS…		Specification of the concrete mix in accordance with SANS 2001 shall be stated in item descriptions for provision of concrete unless a mix reference is stated for which the specification is given elsewhere in the contract
			1.2	10MPa	9.5mm aggregate			Mix shall be classed as a prescribed mix or special mix where the mix is specified in SANS……		
			1.3	15MPa	13.2mm aggregate					
			1.4	20MPa	19mm aggregate					
			1.5	25MPa	37.5mm aggregate					
					Other stated cement or blend of cement					
			1.6	30MPa	and extender:			Concrete mix shall be classed as a designed mix where the performance is stated in the contract and the mix proportions are to be selected by the contractor		
			1.7	35MPa	9.5mm aggregate					
			1.8	40MPa	13.2mm aggregate					
					19mm aggregate					
					37.5mm aggregate					
		Prescribed mix	2.1	Grade 10 to SANS…	42.5N or R cement with 19mm aggregate	m3				
			2.2	Grade 15 to SANS…	32.5N or R cement with 19mm aggregate					
			2.3	Grade 20 to SANS…	42.5N or R cement with 13mm aggregate					
			2.4	Grade 25 o SANS…	32.5N or R cement with 13mm aggregate					
			2.5	Grade 30 to SANS…						
		Special mix	3.1	No fines concrete: 38mm aggregate to SANS…						
			3.2	No fines concrete: 19mm aggregate to SANS…						
			3.3	No fines concrete: 13mm aggregate to SANS…						
			3.4	No fines concrete: clinker aggregate to SANS…						
			3.5	Breeze concrete to SANS…						
		Prescribed mix	4			m3				
	CESMM3	Placing of concrete					Columns and piers integral with a wall shall be measured as part of the wall, except where expressly required to be cast separately	Prestressed concrete which is also reinforced shall be classed as prestressed concrete		Item description for placing of concrete which is expressly required to be placed against an excavated surface (other than blinding) shall so state
							Beams integral with a slab shall be measured as part of the slab, except where expressly required to be cast separately			Cross-sectional dimensions of special beam sections shall be stated in item descriptions, except where a beam type or mark number is stated for which dimensions are given on drawings
		Mass	1	Blinding	Thickness: not exceeding 150mm	m3		Thickness used for classification of blinding hall be the minimum thickness		

CONCRETE

		Reinforced	2	Bases, footings, pile caps and ground slabs	150 - 300mm	m3		Thickness used for classification of ground slabs, suspended slabs and walls shall exclude the additional thickness of integral beams, columns, piers and other projections Concrete in suspended slabs and walls less than 1m wide or long shall be classed as concrete in beams and columns respectively Beams shall be classed as special beam sections where their cross-section profiles are rectangular or approximately rectangular over less than 4/5 of their length or where they are of box or other composite section		Item descriptions for components classed as other concrete forms shall identify the component and include on of the following: a) the principal dimensions of the concrete component b)a type or mark number of a concrete component for which principal dimensions are given on drawings c) a statement locating a concrete component for which principal dimensions are given on drawings
		Prestressed	3	Suspended slabs	300 - 500mm	m3				
			4	Walls	exceeding 500mm					
			5	Columns and piers	Cross-sectional area:					
			6	Beams	not exceeding 0.03m2					
			7	Casing to metal sections	0.03 - 0.1m2					
					0.1 - 0.25m2					
					0.25 - 1m2					
					exceeding 1m					
					Special beam sections					
			8	Other concrete forms						
EXTRA	BESMM3	Items extra over in situ concrete in which they occur	1	Working around heating panels and the likes		m2		Area measured is the system area		
			2	Monolithic finishes, thickness stated			Top sloping ≤ 15° Top sloping > 15°		Monolithic finishes include those which are cast onto concrete by lining formwork	
	BESMM3	Grouting	1	Stanchion base		nr				
			2	Grillages						
	SABS1200	Grouting	8.7a	Grouting under bases (or beds)	Grouting under structural steel column bases or members or under pumps, meters or other machinery will be measured by the volume of grout (before the edges are trimmed at 45° from the bottom edges of bedplates) necessary to fill the voids and pockets between the underside of the metalwork and the top of the concrete	m3	Rate shall cover the cost of scabbling, cleaning and preparing the concrete surfaces, providing an approved grout, placing and ramming it solidly into all voids and pockets and mitring the outside edges to a true wood-floated finish. Formwork, if any, will be measured separately	No deduction will be made for bolts, packers and baseplate shear keys protruding into the grout space		
			8.7b	Grouting for holding down bolts	Separate items will be scheduled for HD bolts or pockets, as applicable, of different diameters, lengths and types and for bearings and miscellaneous metal work of different types	t/No	Rate shall cover the cost of scabbling, cleaning and preparing the concrete surfaces, providing an approved grout, placing and ramming it solidly into all voids and pockets and mitring the outside edges to a true wood-floated finish. Formwork, if any, will be measured separately	Quantity will be measured by the volume of grout necessary to fill the voids in the concrete	No deductions will be made for bolts and packers protruding into the grout space	

CONCRETE

GROUTING	SABS1200AAC	Grouting	8.7a	Grouting under bases (or beds)	Grouting under structural steel column bases or members or under pumps, meters or other machinery will be measured by the volume of grout (before the edges are trimmed at 45° from the bottom edges of bedplates) necessary to fill the voids and pockets between the underside of the metalwork and the top of the concrete	m3	Rate shall cover the cost of scabbling, cleaning and preparing the concrete surfaces, providing an approved grout, placing and ramming it solidly into all voids and pockets and mitring the outside edges to a true wood-floated finish. Formwork, if any, will be measured separately	No deduction will be made for bolts, packers and baseplate shear keys protruding into the grout space		
			8.7b	Grouting for holding down bolts	Separate items will be scheduled for HD bolts or pockets, as applicable, of different diameters, lengths and types and for bearings and miscellaneous metal work of different types	t/No	Rate shall cover the cost of scabbling, cleaning and preparing the concrete surfaces, providing an approved grout, placing and ramming it solidly into all voids and pockets and mitring the outside edges to a true wood-floated finish. Formwork, if any, will be measured separately	Quantity will be measured by the volume of grout necessary to fill the voids in the concrete	No deductions will be made for bolts and packers protruding into the grout space	
	CESMM3	Concrete accessories	8.4	Grouting under plates	Area: not exceeding 0.1m2 0.1 - 0.5m2 0.5 - 1m2 stated exceeding 1m2	Nr			Materials shall be stated in item descriptions for grouting under plates	
ROADS, ETC	SMM2	Roads, footpaths & pavings	F6	Roads, footpaths and pavings	As per F5, each described	m3/m2				
	MMBZ	Roads, footpaths & pavings	F6	Roads, footpaths and pavings	As per F5, each described	m3/m2				
CASINGS	SMM2	Casings to steelwork	F9	Casings to steel beams, lintels, stanchions and the like	Each given separately	m3	Horizontal members & sloping members not exceeding 15° from horizontal shall be so described Sloping members over 15° from horizontal shall be so described	Floor & roof beams shall be measured below the slab	Projections shall be added to appropriate item	
	MMBZ	Casings to steelwork	F9	Casings to steel beams, lintels, stanchions and the like	Each given separately	m3	Horizontal members & sloping members not exceeding 15° from horizontal (grouped together) shall be so described Vertical members and sloping members over 15° from horizontal (grouped together) shall be so described	Floor & roof beams shall be measured below the slab	Projections shall be added to appropriate item	
AGGREGATE & CEMENT	SABS1200	Aggregate	8.4.5	Aggregate (where measured separately)		m3	Rate shall cover the cost of supplying and using the aggregate in the manner specified			
	SABS1200AAC	Aggregate	8.4.5	Aggregate (where measured separately)		m3	Rate shall cover the cost of supplying and using the aggregate in the manner specified			
	SABS1200	Cement	8.4.6	Cement (where measured separately)		t	Rate shall cover the cost of supplying and using the cement in the manner specified			
	SABS1200AAC	Cement	8.4.6	Cement (where measured separately)		t	Rate shall cover the cost of supplying and using the cement in the manner specified			

CONCRETE

SPRAYED CONCRETE	BESMM3	Sprayed in situ concrete: Slabs Walls Beams Columns	1	Thickness stated	Tops Soffits	m2	Curved	Reinforcement measured separate		Kind and quality of materials Preparatory work Method of application and finish

FORMWORK

GENERAL RULES

BESMM3	Information to be supplied in General Conditions or on Drawings: 1. Relative positions of concrete members 2. Size of members 3. Thickness of slabs 4. Permissible loads in relation to casting items Formwork is measured to concrete surfaces of the finished structure which require temporary support during casting Curved work is so described with the radii stated Plain formwork surfaces are those which contain no steps, rebates, pockets or other discontinuities Formwork left in is that which is not designed to remain in position but is nonetheless impossible to remove Permanent formwork is that which is designed to remain in position Formwork is deemed to include adaptation to accommodate projecting pipes, reinforcing bars and the like Formwork is deemed to include all cutting, splayed edges and the like Kind and quality of materials and propping requirements for permanent formwork to be provided Basic finish where not at the discretion of the Contractor to be provided
SMM2	Formwork shall be measured as the actual surfaces of the finished structure which require to be supported during the deposition of concrete, including the upper surfaces of the work sloping more than 1º from horizontal Where face of concrete is troughed or similarly shaped, the method of measuring the formwork shall be stated No allowance shall be made for overlaps and passings at angles and no deduction shall be made for the following 1. Voids not exceeding 1m2 2. Intersections of main beams with walls or columns 3. Intersections of secondary beams with main beams Battens, struts, reversed cut strings, bolting, wedging, easing, striking and removing shall be deemed to be included Formwork to curved surfaces, conical surfaces and spherical surfaces shall each be so described stating the radius Formwork to eliptical surfaces and other surfaces curved to more than one radius shall be so described stating the radi Curved linear items of formwork shall be so described irrespective of the radi Formwork left in shall be so described Formwork required to be lined with particular material (e.g. wall board; handboard; plywood, paper) shall be so described Making good exposed faces of concrete after removal of sawn formwork (e.g. cutting off projecting fins, filling in small voids) shall be given in the description of the formwor
MMBZ	Formwork shall be measured as the actual surfaces of the finished structure which require to be supported during the deposition of concrete, including the upper surfaces of the work sloping more than 1º from horizontal Where face of concrete is troughed or similarly shaped, the method of measuring the formwork shall be stated No allowance shall be made for overlaps and passings at angles and no deduction shall be made for the following 1. Voids not exceeding 1m2 2. Intersections of main beams with walls or columns 3. Intersections of secondary beams with main beams Battens, struts, reversed cut strings, bolting, wedging, easing, striking and removing shall be deemed to be included Formwork to curved surfaces, conical surfaces and spherical surfaces shall each be so described stating the radius Formwork to eliptical surfaces and other surfaces curved to more than one radius shall be so described stating the radi Curved linear items of formwork shall be so described irrespective of the radius Formwork coated with a retarding agent shall be so described Formwork left in shall be so described Wrot formwork shall be so described Formwork required to be lined with particular material (e.g. wall board; handboard; plywood, paper) shall be so described Making good exposed faces of concrete after removal of sawn formwork (e.g. cutting off projecting fins, filling in small voids) shall be given in the description of the formwor
SABS1200	Definitions: 2. Formwork: Temporary works required to support and shape the concrete for a structure Formwork: Formwork, other than continuous lengths of narrow widths (below), will be measured as the net area of the face of the concrete to be supported during the deposition of concret No deductions will be made for fillets and splays of size up to 50mm x 50mm or for openings of diameter up to 0.7m or of area up to 0.5m Formwork in continuous lengths of narrow widths and of fillets or splays over 20mm x 20mm will be measured by length, the width or range of widths being stated in the schedul Boxing-out, the forming of holes, and other such operations will be measured by number, basic dimensions, perimeters, or drawing references, as stated in the schedul Separate items will be scheduled for: a) each class of finish required on the formed concrete, b) the different angles of inclination of formwork given below horizontal - exceeding 85° and not exceeding 95° sloping - exceeding 10° and not exceeding 85° battered - not exceeding 10° vertical - 0° c) for each inclination of each type of structural element, such as walls and beams, and for different prop heights for beams and slabs, and for formwork to curved (single and double), curved in plan only, arched, domical, specially moulded and other types wo d) for depths of openings required in the formed concrete as follows not exceeding 0.5m exceeding 0.5m but not exceeding 1.0m

FORMWORK

exceeding 1.0m but not exceeding 1.5m
exceeding 1.5m but not exceeding 2.0m
exceeding 2.0m
measured perpendicular to the surface
e) for large and small voids classified as follows:
large - exceeding 0.35 and not exceeding 0.7m diameter for circular voids and exceeding 0.1 and not exceeding 0.5m2 in area for other void
small - not exceeding 0.35m diameter for circular voids and not exceeding 0.1m2 in area for other void
The unit rate shall cover the cost of all parts of formwork in contact with the concrete (including forming fillets or splays up toe 20mm x 20mm) and the necessary bearers, struts and other supports plus the labour an plant necessary to erect and strike such formwo

SABS1200AAC Definitions:
2. Formwork: Temporary works required to support and shape the concrete for a structure
Formwork:
Formwork, other than continuous lengths of narrow widths (below), will be measured as the net area of the face of the concrete to be supported during the deposition of concret
No deductions will be made for fillets and splays of size up to 50mm x 50mm or for openings of diameter up to 0.7m or of area up to 0.5m
Formwork in continuous lengths of narrow widths and of fillets or splays over 20mm x 20mm will be measured by length, the width or range of widths being stated in the schedul
Boxing-out, the forming of holes, and other such operations will be measured by number, basic dimensions, perimeters, or drawing references, as stated in the schedul
Separate items will be scheduled for:
a) each class of finish required on the formed concrete;
b) the different angles of inclination of formwork given below
horizontal - exceeding 85° and not exceeding 95°
sloping - exceeding 10° and not exceeding 85°
battered - not exceeding 10°
vertical - 0°
c) for each inclination of each type of structural element, such as walls and beams, and for different prop heights for beams and slabs, and for formwork to curved (single and double), curved in plan only, arched, domical, specially moulded and other types wo
d) for depths of openings required in the formed concrete as follows
not exceeding 0.5m
exceeding 0.5m but not exceeding 1.0m
exceeding 1.0m but not exceeding 1.5m
exceeding 1.5m but not exceeding 2.0m
exceeding 2.0m
measured perpendicular to the surface
e) for large and small voids classified as follows:
large - exceeding 0.35 and not exceeding 0.7m diameter for circular voids and exceeding 0.1 and not exceeding 0.5m2 in area for other void
small - not exceeding 0.35m diameter for circular voids and not exceeding 0.1m2 in area for other void
The unit rate shall cover the cost of all parts of formwork in contact with the concrete (including forming fillets or splays up toe 20mm x 20mm) and the necessary bearers, struts and other supports plus the labour an plant necessary to erect and strike such formwo

BESMM3	Sides of foundations	1	Plain vertical	Height > 1.0m	m2	Left in	Passings of ground beams are not deducted from area of formwork	Foundations include bases and pile caps Edges of suspended slabs exclude those associated with attached beams at slab perimeters	
	Sides of ground beams Edges of suspended slabs Sides of upstands Steps in top surfaces Step in soffits Machine bases and plinths	2	Dimensioned description	Height ≤ 0.25m Height 250 - 500mm Height 500 - 1000mm	m	Permanent			
	Soffits of slabs Soffits of landings	1 2	Slabs thickness 200mm and thereafter in 100mm stages	Horizontal Sloping ≤ 15° Sloping > 15°	m2	Height to soffit ≤ 1.50m and thereafter in 1.50m stages Left in Permanent	Voids ≤ 5m2 irrespective of location are not deducted from area measured	Formwork to soffits of slabs includes formwork to landings occurring at floor levels	
	Soffits of coffered or troughed slabs						Soffits of coffered or troughed slabs are measured as if to a plain surface Thickness stated of coffered or troughed slabs is measured overall	Soffits of coffered or troughed slabs include margins which are ≤ 500mm wide	

FORMWORK

		Top formwork					Left in Permanent	Top formwork is measured for surfaces sloping > 15° or where otherwise specifically required	
		Walls			Vertical	m2	Height 3m above floor level	Voids 5m irrespective of location are not deducted from the area measured	Walls include isolated columns and column casings whose length on plan is > four times their thickness
					Battered		Interrupted To one side only, wall thickness and background to other side stated Left in Permanent to both sides Permanent to one side only, wall thickness and background to other side stated	Area measured for walls whose height is 3m includes the area below 3m high Area of wall kickers is not deducted	
		Beams (nr)	1	Attached to slabs	Regular shaped, shape and size stated	m2		Passings of subsidiary beams or other projections are not deducted from areas of formwork but the slab is supported by permanent formwork the downstand beam is regarded an isolated beam Regular shaped includes rectangular, circular, hexagonal or other definable regular shape	Formwork to beams columns and casings is deemed to include ends
		Beam casings (nr)	2 3	Attached to walls Isolated	Irregular shaped, dimensioned diagram	m			
		Columns (nr)	1	Attached to walls	Regular shaped, shape and size stated	m2			
		Column casings (nr)	2	Isolated	Irregular shaped, dimensioned diagram	m			
	SMM2	Formwork generally	F19.d	Coating formwork with retarding agent		m2	Any further treatment after removal of formwork to produce required finish (rubbing down with carborundum) shall be included with item and fully described		
			F19.f	Extra over formwork for wrought face	Can be described in item	m2			
			F19.g	Lining material left in position	State method of securing	m2			
	MMBZ	Formwork generally	F19.g	Lining material left in position	State method of securing	m2			
	SMM2	Formwork to surfaces	F20.a	Formwork to surfaces classified:		m2			
			F20.a.i	Horizontal soffits of floors, roofs, landings and the like	Group together				
			F20.a.ii	Sloping soffits of floors, roofs, staircases and the like	Group together				
			F20.a.iii	Sloping upper surfaces of floors, roofs, staircases and the like	Group together				
			F20.a.iv	Vertical or battering sides of foundations, ground beams, machine bases and the like	Group together				
			F20.a.v	Vertical or bettering sides of walls, solid balustrades and the like	Group together				
			F20.a.vi	Vertical or battering sides of stanchion-casings, columns, piers, pilasters and the like	Group together				

FORMWORK

FORMWORK			F20.a.viii	Sides and soffits of openings in walls, recesses in walls, projecting panels on walls and the like	Group together				
			F20.a.viii	Sides and soffits of dormers, gablets and the like	Group together				
			F20.a.ix	Sides and soffits of horizontal beam-casings, beams, lintels and the like	Group together				
			F20.a.x	Sides and soffits of sloping beam-casings, staircase-strings and the like	Group together				
			F20.a.xi	Sloping upper surfaces of beam-casings, beams, stair case-strings and the like more than 15 º from horizontal	Group together				
			F20.b	Soffits requiring strutting over 3.5m high	State height in further stages of 1.5m	m2	Formwork to sides and soffits of beams occurring below slabs where strutting is measured shall be given separately stating same strutting height as slab soffit			
			F20.c	Soffits of solid concrete floors or roofs over 250mm thick		m2				
			F20.d	Isolated beam-casings and isolated beams		m2	Soffits require strutting over 2.5m high formwork shall be so described including formwork to sides, stating the height in further stages of 1.5m			
	MMBZ	Formwork to surfaces	F20.a	Formwork to surfaces classified:		m2				
			F20.a.i	Horizontal soffits of floors, roofs, landings and the like	Group together					
			F20.a.ii	Sloping soffits of floors, roofs, staircases and the like	Group together					
			F20.a.iii	Sloping upper surfaces of floors, roofs and the like where more than 15 degrees from horizontal	Group together					
			F20.a.iv	Vertical or battering sides of foundations, ground beams, large machine bases and the like	Group together					
			F20.a.v	Vertical or bettering sides of walls, solid balustrades and the like	Group together					
			F20.a.vi	Vertical or battering sides of stanchion-casings, columns, piers, pilasters and the like	Group together					
			F20.a.viii	Sides and soffits of openings in walls, recesses in walls, projecting panels on walls and the like	Group together					
			F20.a.viii	Sides and soffits of dormers, gablets and the like	Group together					
			F20.a.ix	Sides and soffits of horizontal beam-casings, beams, lintels and the like	Group together					
			F20.a.x	Sides and soffits of sloping beam-casings, staircase-strings and the like	Group together					
			F20.a.xi	Sloping upper surfaces of beam-casings, beams, stair case-strings and the like more than 15 º from horizontal	Group together					
			F20.b	Soffits requiring strutting over 3.5m high	State height in further stages of 1.5m	m2				
			F20.c	Soffits of solid concrete floors or roofs over 225mm thick		m2				
			F20.d	Isolated beam-casings and isolated beams		m2	Detached from concrete floors or roofs			
	SABS1200	Formwork	8.2.1	Rough formwork to.....	Surface to be formed will be identified in the schedule	m2				
			8.2.2	Smooth formwork to....	Surface to be formed will be identified in the schedule	m2				
			8.2.3	Special smooth, repaired and rubbed formwork to....	Surface to be formed will be identified in the schedule	m2				
			8.2.4	Special off-form to....	Surface to be formed will be identified in the schedule	m2				

FORMWORK

	SABS1200AAC	Formwork	8.2.1	Rough formwork to.....	Surface to be formed will be identified in the schedule	m2				
			8.2.2	Smooth formwork to....	Surface to be formed will be identified in the schedule	m2				
			8.2.3	Special smooth, repaired and rubbed formwork to....	Surface to be formed will be identified in the schedule	m2				
			8.2.4	Special off-form to....	Surface to be formed will be identified in the schedule	m2				
	CESMM3	Formwork: rough	1	Plane horizontal	Width: not exceeding 0.1m	m	Measured for surfaces of in situ concrete which require temporary support during casting except where otherwise stated	Plane formwork shall be classified according to its angle of inclination as follows:		Formwork left in shall be so described in item descriptions for formwork
		smooth	2	Plane sloping	0.1 - 0.2m	m	Shall not be measured for the following:	Horizontal: 85 - 90°		Item descriptions which is to upper surfaces shall so state, except where the surfaces are inclined at an angle not exceeding 10° to the vertical
		special off-form	3	Plane battered	0.2 - 0.4m	m2	a) edges of blinding concrete not exceeding 0.2m wide	Sloping: 10 - 85°		Item descriptions shall state where the formwork is to blinding concrete
		other stated finish or surface features	4	Plane vertical	0.4 - 1.22m	m2	b) joints and associated rebates and grooves	Battered: 0 - 10°		Radii of curved formwork shall be stated in item descriptions as follows:
			5	Curved to one radius in one plane	exceeding 1.22m	m2	c) temporary surfaces formed at the discretion of the contractor	Formwork shall be deemed to be for plane areas and to exceed 1.22mm wide unless otherwise stated		a) to one radius in one plane (cylindrical), radius stated
			6	Other curved		m2	d) surfaces of concrete which are expressly required to be cast against an excavated surface			b) to one radius in two planes (spherical), radius stated
			7	For voids	Small void depth: not exceeding 0.5m	Nr	e) surfaces of concrete which are cast against excavated surfaces inclined at an angle less than 45° to the horizontal	Classification of large and small voids shall be as follows:		c) varying radius (conical), maximum and minimum radii stated
					0.5 - 1m		Formwork to upper surfaces of concrete shall be measured to surfaces inclined at an angle exceeding 15° to the horizontal and to other upper surfaces for which formwork is expressly required	Large: circular voids 0.35 - .7m diameter; other voids 0.1 - 0.5m2		Formwork for concrete components of constant cross-section, other than projections and intrusions, shall state the principal cross-sectional dimensions of the component and its mark number, location or other unique identifying feature
					1 - 2m		Formwork for surfaces of voids larger than those classed as large voids in accordance with rule D3 shall be measured as set out in this class for formwork generally	Small: circular voids not exceeding 0.35m diameter; other voids not exceeding 0.1m2		Formwork for curved concrete components of constant cross-section shall be so described stating the radii
					stated exceeding 2m		Formwork for surfaces of projections and intrusions exceeding 0.01m2 in cross-sectional area shall be measured as set out in this class for formwork generally	Depth of voids shall be measured perpendicularly to the adjacent surface of concrete		If smooth formwork is special smooth formwork the item shall state so
					Large void depth: not exceeding 0.5m		Area of formwork measured shall include the area of formwork obscured by:			Item description for special off-form formwork shall state whether it is board-marked or special pattern
					0.5 - 1m		a) forms for large and small voids			
					1 - 2m		b) forms for projections and intrusions			
					stated exceeding 2m		c) inserts			

FORMWORK

			8	For concrete components of constant cross section	Beams Columns Walls Other members Projections Intrusions			Nibs and external splays not exceeding 0.01m2 in cross-sectional area shall be classed as projections Rebate, grooves, internal splays, throats, fillets and chamfers not exceeding 0.01m2 in cross-sectional area shall be classed as intrusions		
NARROW WIDTHS, ETC.	BESMM3	Recesses (nr) Nibs (nr) Rebates and their likes (nr)	1	Dimensioned description			Extra over the formwork in which they occur Left in Permanent	Recesses, nibs and rebates are only measured as extra over on superficial items of formwork		Formwork to recesses is deemed to include ends
	SMM2	Formwork to edges and risers	F21.a F21.a.i F21.a.ii F21.a.iii F21.a.iv F21.b	Edges classified: Edges of beds, roads, footpaths, pavings and the like Edges of suspended floors, landings and roofs Sides of kerbs and upstands Risers of steps and staircase Soffits of projecting eaves and hoods not exceeding 300mm wide Ditto exceeding 300mm wide	State width in stages of 75mm Grouped together Grouped together Grouped together Grouped together In stages of 75mm	m m m2				
	MMBZ	Formwork to edges and risers	F21.a F21.a.i F21.a.ii F21.a.iii F21.a.iv F21.b	Edges classified: Edges of beds, roads, footpaths, pavings and the like Edges of suspended floors, landings and roofs Sides of kerbs and upstands Risers of steps and staircase Edges and soffits of projecting eaves and hoods not exceeding 300mm wide Ditto exceeding 300mm wide	State width in stages of 100mm Grouped together Grouped together Grouped together Grouped together In stages of 100mm	m m m2				
	SABS1200	Narrow widths	8.2.5	Narrow widths up to .....mm wide	Constant width (if in excess of 300mm) or the range of widths if up to 300mm or width and depth in the case of grooves or chases will be stated	m				
	SABS1200AAC	Narrow widths	8.2.5	Narrow widths up to .....mm wide	Constant width (if in excess of 300mm) or the range of widths if up to 300mm or width and depth in the case of grooves or chases will be stated	m				
	SMM2	Formwork to bands and cornices	F22	Extra over for projecting or sunk bands, cornices and the like	Give size	m				
	MMBZ	Formwork to bands and cornices	F22	Extra over for projecting or sunk bands, cornices and the like	Give size	m				

FORMWORK

	SMM2	Formwork to grooves, chases, chamfers and mouldings	F23.a	Throats, grooves, chases, rebates, chamfers over 50mm wide, splayed internal angles over 25mm wide, mouldings and the like Splayed or moulded stops	State size	m No	Plain stops shall be deemed to be included with the formwork	Stops shall be deemed to be included with formwork	Forming chamfers not exceeding 50mm wide & forming splayed internal angles not exceeding 25mm wide shall be given in the description of formwork	
	MMBZ	Formwork to grooves, chases, chamfers and mouldings	F23.a	Throats, grooves, chases, rebates, chamfers over 50mm wide, splayed internal angles over 50mm wide, mouldings and the like Splayed or moulded stops	State size	m No	Plain stops shall be deemed to be included with the formwork	Stops shall be deemed to be included with formwork	Forming chamfers not exceeding 50mm wide & forming splayed internal angles not exceeding 50mm wide shall be given in the description of formwork	
FORMED FINISHES	BESMM3	Extra over basic finish for formed finishes	1 Slabs 2 Walls 3 Beams 4 Columns 5 Others, stated			m2			Formed finishes are those where a finish other than a basic finish is required	Details of formed finishes
OPENINGS, ETC.	BESMM3	Wall kickers Suspended wall kickers Wall ends, soffits and steps in walls Openings in walls Stairflights (nr)	 1 Plain 2 Dimensioned description Width of stairflight stated, waist and risers 1 described 2 Dimensioned diagram	 Width > 1m Width 250mm Width 250 - 500mm Width 500 - 1000mm String width stated String dimensioned diagram	 m m2 m	Left in Permanent Left in Permanent Junction with wall	Formwork to wall kickers is measured along the center line of the wall and is deemed to include both sides Lengths of stairflights are measured between top and bottom nosings		Height where specifically required
	BESMM3	Holes	2 Girth 500 - 1000mm 3 and thereafter in 1m stages 4 Chases > 0.01m2 5 Chases < 0.01m2	Depth 250 - 500mm Depth 500 - 1000mm Depth > 1m depth stated		Circular Irregular shape, dimensioned description Left in Permanent		Holes are those ≥ 5m2	
	SMM2	Holes	F48.a Holes for pipes, tubes, bars, cables, conduits and the like F48.b Small holes for ducting, trunking, etc.	State size of member and thickness of concrete State size of member and thickness of concrete	No No	Grouped together Grouped together	Fixing pipe sleeves shall be given in the description		
	MMBZ	Holes	F51.a Holes for pipes, tubes, bars, cables, conduits and the like F51.b Small holes for ducting, trunking, etc.	State size of member and thickness of concrete State sectional area in stages of 0.025m2 and the thickness	No No	Grouped together Grouped together	Fixing pipe sleeves shall be given in the description		
	SABS1200	Holes/Voids	8.2.6 Box out holes/form voids: 8.2.6.a Small, circular, of diameter up to and including 0.35m: Up to and including 0.5m deep Over 0.5 and up to and including 1.0m deep Over 1.0 and up to and including 1.5m deep		 No No No				

FORMWORK

HO				Over 1.5 and up to and including 2.0m deep		No				
				Over 2.0m deep		No				
				Small, other than circular, of area up to and						
			8.2.6b	including 0.1m2	Depths as in a. above	No				
				Large, circular, of diameter over 0.35m up to and						
			8.2.6c	including 0.7m	Depths as in a. above	No				
				Large, other than circular, of area over 0.1m2 and						
			8.2.6d	up and including to 0.5m2	Depths as in a. above	No				
	SABS1200AAC	Holes/Voids	8.2.6	Box out holes/form voids:						
				Small, circular, of diameter up to and including						
			8.2.6.a	0.35m:						
				Up to and including 0.5m deep		No				
				Over 0.5 and up to and including 1.0m deep		No				
				Over 1.0 and up to and including 1.5m deep		No				
				Over 1.5 and up to and including 2.0m deep		No				
				Over 2.0m deep		No				
				Small, other than circular, of area up to and						
			8.2.6b	including 0.1m2	Depths as in a. above	No				
				Large, circular, of diameter over 0.35m up to and						
			8.2.6c	including 0.7m	Depths as in a. above	No				
				Large, other than circular, of area over 0.1m2 and						
			8.2.6d	up and including to 0.5m2	Depths as in a. above	No				
MORTICE	BESMM3	Mortices	1	Girth ≤ 500mm	Depth ≤ 250mm	nr	Rectangular		Mortices include pockets	
	SMM2	Mortices	F49	Mortices, sinkings and the like	State purpose	No	Running mortices with lead or mortar shall be given in description	Making good concrete in connection with holes and mortices shall be given in description of such labours		
	MMBZ	Mortices	F52	Mortices, sinkings and the like	State purpose	No	Running mortices with lead or mortar shall be given in description	Making good concrete in connection with holes and mortices shall be given in description of such labours		
COMPLE	BESMM3	Complex shapes			Dimensioned description Dimensioned diagram	nr	Left in Permanent			
LABOURS	SMM2	Labours on formwork	F24.a	Raking cutting		m	Splayed edges and notches shall be deemed to be included with the formwork item			
				Curved cutting		m				
			F24.c	Cutting and fitting formwork around projecting members	Single or in groups	No	E.g. around pipes, continuity bars			
	MMBZ	Labours on formwork	F24.a	Raking cutting		m	Splayed edges and notches shall be deemed to be included with the formwork item			
				Curved cutting		m				
			F24.c	Cutting and fitting formwork around projecting members	Single or in groups	No	E.g. around pipes, continuity bars			

REINFORCEMENT

GENERAL RULES

BESMM3	Information to be supplied in General Conditions or on Drawings: 1. Relative positions of concrete members 2. Size of members 3. Thickness of slabs 4. Permissible loads in relation to casting items Kind and quality of materials Details of tests Bending restrictions
SMM2	Particulars of following shall be given: 1. Kind and quality of steel 2. Any tests of bars 3. Any restrictions as to hot or cold bending
MMBZ	Particulars of following shall be given: 1. Kind and quality of steel 2. Any tests of bars 3. Any restrictions as to hot or cold bending
SABS1200	Reinforcement: Steel for normal reinforced concrete will be measured net by mass of all bars, including supporting steel detailed on the reinforcing schedule Mass will be computed from the nominal bar size and the nominal mass per unit length No allowance will be made for cutting, waste, spacer devices (materials other than steel bars) or binding wire Separate item will be scheduled for: a) each steel section where rails and other steel sections are used and b) steel to be fixed in different parts of the work where this could materially influence the pricing o the worl Steel reinforcement for precast concrete units will not be measured unless so scheduled Welded mesh will be measured by area as shown on the drawings, no allowance being made for cutting, waste, laps or deductions for end cover. Areas measured will be those of the concrete floor or slab reinforced by means of mes In the case of continuous units partly reinforced by mesh, the area will be computed from the outside dimensions of the area covered by mesh regardless of whether additional reinforcing steel is present in the same are Steel offcuts resulting from the cutting and bending of reinforcement in accordance with the bending schedule shall be deemed to be the property of the Contracto The total mass of all round and square steel bars will be scheduled as bars of nominal size 25mm (diameter or side, as relevant) for the purpose of obtaining a basic contract price, and the bars of all sizes actually used will be subject to the terms of the conditions contract covering valuation of variations The quantities (or percentages) of all other sizes of steel bars that may be required will be scheduled as provisional quantities that are subject to a stated clause in the special conditions of contract, and the contract prices for these will be fixed regardless of th magnitude of variations (if any) of quantities Welded mesh will be scheduled separately for each type and mass per square metre of mesh The unit rates for steel bars of nominal size 25mm shall cover the cost of supply, cutting, bending, placing in position and fixing of the reinforcing and supporting steel scheduled and the provision of all spacer devices and binding wire, as well as the cost of tes The extra-over rates for bars of all nominal sizes other than 25mm shall cover any differences in cost arising from any or all of the operations set out above in respect of bars of such other size The unit rate for welded mesh shall cover the supply, cutting and placing of mesh and the cost of all waste due to laps
SABS1200AAC	Reinforcement: Steel for normal reinforced concrete will be measured net by mass of all bars, including supporting steel detailed on the reinforcing schedule Mass will be computed from the nominal bar size and the nominal mass per unit length No allowance will be made for cutting, waste, spacer devices (materials other than steel bars) or binding wire Separate item will be scheduled for: a) each steel section where rails and other steel sections are used and b) steel to be fixed in different parts of the work where this could materially influence the pricing o the worl Steel reinforcement for precast concrete units will not be measured unless so scheduled Welded mesh will be measured by area as shown on the drawings, no allowance being made for cutting, waste, laps or deductions for end cover. Areas measured will be those of the concrete floor or slab reinforced by means of mes In the case of continuous units partly reinforced by mesh, the area will be computed from the outside dimensions of the area covered by mesh regardless of whether additional reinforcing steel is present in the same are Steel offcuts resulting from the cutting and bending of reinforcement in accordance with the bending schedule shall be deemed to be the property of the Contracto The total mass of all round and square steel bars will be scheduled as bars of nominal size 25mm (diameter or side, as relevant) for the purpose of obtaining a basic contract price, and the bars of all sizes actually used will be subject to the terms of the conditio of contract covering valuation of variations The quantities (or percentages) of all other sizes of steel bars that may be required will be scheduled as provisional quantities that are subject to a stated clause in the special conditions of contract, and the contract prices for these will be fixed regardless of th magnitude of variations (if any) of quantities Welded mesh will be scheduled separately for each type and mass per square metre of mesh The unit rates for steel bars of nominal size 25mm shall cover the cost of supply, cutting, bending, placing in position and fixing of the reinforcing and supporting steel scheduled and the provision of all spacer devices and binding wire, as well as the cost of tes The extra-over rates for bars of all nominal sizes other than 25mm shall cover any differences in cost arising from any or all of the operations set out above in respect of bars of such other size The unit rate for welded mesh shall cover the supply, cutting and placing of mesh and the cost of all waste due to laps

BESMM3	Bar		1	Nominal size stated	Straight	t	Horizontal, length 12 - 15m	The weight of bar reinforcement excludes surface treatments and rolling margin	Horizontal bars include bars sloping ≤ 30° from horizontal	Bar reinforcement is deemed to include hooks and tying wire and spacers and chairs which are at the discretion of the contractor

REINFORCEMENT

BARS					Bent Curved Links		and thereafter in 3m stages Vertical length 6 - 9m	Stage lengths in the fourth column are the lengths before bending	Vertical bars include bars sloping > 30º from the horizontal	
	SMM2	Bar reinforcement	F16	Bar reinforcement including links, stirrups, binders, special spacers and the like	State size	kg	Bends, hooks, tying wire, distance blocks and ordinary spacers shall be given in description Bars over 12m long shall be so described stating length in further 2m stages Bars specially bent to curve shall be so described irrespective or radius Twisted bars or bars of special section shall be so described High-tensile steel bars shall be so described	No allowance in calculating weight shall be made for tying wire, ordinary spacers or rolling margin	Reinforcement shall not be classified as to location in structure	
	MMBZ	Bar reinforcement	F16	Bar reinforcement including links, stirrups, binders, special spacers and the like	State size, each size separately	kg/t	Bends, hooks, tying wire, distance blocks and ordinary spacers shall be given in description Bars over 10m long shall be so described stating length in further 1.5m stages Bars specially bent to curve shall be so described irrespective or radius Twisted bars or bars of special section shall be so described High-tensile steel bars shall be so described	No allowance in calculating weight shall be made for tying wire, ordinary spacers or rolling margin	Reinforcement shall not be classified as to location in structure	
	SABS1200	Bars	8.3.1	Steel bars	Type of steel (mild, high-tensile, or other) will be stated	t				
	SABS1200AAC	Bars	8.3.1	Steel bars	Type of steel (mild, high-tensile, or other) will be stated	t				
	CESMM3	Reinforcement	5.1	Plain round steel bars to SANS…	Nominal size: 6mm	t	Mass of steel reinforcement shall betaken as 0.785kg/m per 100mm2 of cross-section (7.85 t/m3)	Nominal size stated in item shall be the cross-sectional size defined in SANS… Welded, swaged or screwed sleeve joints in reinforcing bars shall be classed as special joints	Items for reinforcement shall be deemed to include supporting reinforcement other than steel supports to top reinforcement	Descriptions for bar reinforcement shall state the lengths of bars to the next higher multiple of 3m where they exceed 12m before bending
			5.2	Deformed high yield steel bars to SANS…	8mm	t	Mass of other reinforcing materials shall be taken as stated in the contract			Special joint descriptions shall state the type of joint and type and size of reinforcing bar
			5.3	Stainless steel bars of stated quality	10mm	t	Mass of reinforcement measured shall include the mass of steel supports to top reinforcement			Steel fabric descriptions shall state the fabric reference in accordance with SANS… or the wire and mesh arrangement per SANS… Fabric of other stated material descriptions shall state the sizes and nominal mass per square metre
			5.4	Reinforcing bars of other stated material	12mm 16mm 20mm 25mm 32mm or greater	t	Area of additional fabric in laps shall not be measured			
			5.5	Special joints		Nr				

REINFORCEMENT

			5.6 5.7	Steel fabrics to SANS... Fabric of other stated material	Nominal mass: not exceeding 2kg/m2 2 -3kg/m2 3 - 4kg/m2 4 - 5kg/m2 5 - 6kg/m2 6 - 7kg/m2 7 - 8kg/m2 stated exceeding 8kg/m2	m2 m2				
OTHER	BESMM3	Spacers and chairs Special joint	1 2	Dimensioned description Nominal size and type stated		t nr		Spacers, chairs and special joints are measured only when they are not at the discretion of Contractor		
FABRIC	BESMM3	Fabric	1	Mesh reference and weight per m2 stated		m2	Bent Strips in one width, width stated	Area measured for fabric excludes laps Voids ≤ 1m2 in area are not deducted	Minimum laps	Fabric reinforcement is deemed to include hooks and tying wire, all cutting and bending and spacers and chairs which are at the discretion of contractor Bent fabric reinforcement is deemed to include that wrapped around steel members
	SMM2	Fabric reinforcement	F17.a,b F17.c	Fabric reinforcement Strips required to be in one width	Stating the mesh, the weight per m2 and minimum extent of side and end laps Stating width, the mesh, the weight per 1m2 and minimum extent of end laps	m2 m	Bends, tying wire and distance blocks shall be given in description In foundations under walls, tension strips to floors and roofs	Measured to area covered but no allowance made for laps and no deduction shall be made for voids not exceeding 1m2	Self-centering fabric reinforcement shall be so described Temporary strutting shall be given in description when over 3.5m high, stating height in further stages of 1.5m	
	MMBZ	Fabric reinforcement	F17.a,b F17.c	Fabric reinforcement Strips required to be in one width	Stating the mesh, the weight per m2 and minimum extent of side and end laps Stating width, the mesh, the weight per 1m2 and minimum extent of end laps	m2 m	Bends, tying wire and distance blocks shall be given in description In foundations under walls, tension strips to floors and roofs	Measured to area covered but no allowance made for laps and no deduction shall be made for voids not exceeding 1m2 Self-centering fabric reinforcement shall be so described	Self-centering fabric reinforcement shall be so described Temporary strutting shall be given in description and where over 3.5m high shall be so described stating height in further stages of 1.5m	
	SABS1200	Mesh	8.3.2	High-tensile welded mesh	Type reference will be stated	m2				
	SABS1200AAC	Mesh	8.3.2	High-tensile welded mesh	Type reference will be stated	m2				
LABOUR	SMM2	Labours on fabric reinforcement	F18	Raking cutting and curved cutting on fabric reinforcement	Give separately stating the mesh and the weight of fabric	m	Notching fabric reinforcement around obstructions shall be deemed to be included			
	MMBZ	Labours on fabric reinforcement	F18	Raking cutting and curved cutting on fabric reinforcement	Give separately stating the mesh and the weight of fabric	m	Notching fabric reinforcement around obstructions shall be deemed to be included			

REINFORCEMENT

TENSIONED	BESMM3	Members tensioned (nr)		1	Dimensioned description		nr	Composite construction	Post tensioning is measured by the number of tendons in identical members		Number, length, material and size of wires and tendons Ducts, vents and grouting Anchorages and end treatment Stressing sequence, transfer stress, initial stress Limitation on propping
RAILS	SABS1200	Rails or other sections	8.3.3		Rails or other steel sections used as reinforcement		t				
	SABS1200AAC	Rails or other sections	8.3.3		Rails or other steel sections used as reinforcement		t				

JOINTS

GENERAL RULES	BESMM3	Information shown either on location drawings under Preliminaries/General conditions Construction joints located at the discretion of the Contractor are not measured Kind and quality of materials								
JOINTS	BESMM3	Plain Formed Cut Sealants		1 Width or depth 150mm 2 and thereafter in 150mm stages	Dimensioned description	m	Curved	Widths or depth of joints is measured overall	Plain joints are those which do not require formwork Formed joints are deemed to include formwork	Details of fillers, waterstops, dowels, backing, strips and reinforcement crossing joints Method of application Preparation of contact surfaces, cleaners, primers and sealers
	SMM2	Expansion joints in concrete	F15	Expansion joints over 300mm wide Expansion joints not exceeding 300mm wide	 State width	m2 m	 Formwork shall be given in description			
	MMBZ	Expansion joints in concrete	F15	Expansion joints over 300mm wide Expansion joints not exceeding 300mm wide	 State size	m2 m	 Formwork shall be given in description			
	SABS1200	Joints	8.5	Joints	Separate items will be scheduled for contraction and expansion joints of different types and sizes and involving different types, sizes and qualities of water bars, soft board, sealers, etc.	m	Rate shall cover cost of all materials and labour for the construction of each joint as specified or shown on the drawings, including the cost of formwork, testing and making good			
	SABS1200AAC	Joints	8.5	Joints	Separate items will be scheduled for contraction and expansion joints of different types and sizes and involving different types, sizes and qualities of water bars, soft board, sealers, etc.	m	Rate shall cover cost of all materials and labour for the construction of each joint as specified or shown on the drawings, including the cost of formwork, testing and making good			
	CESMM3	Joints	6.1 6.2 6.3 6.4 6.5 6.6 6.7	Open surface plain Open surface with filler Formed surface plain Formed surface with filler Plastics or rubber waterstops Metal waterstops Sealed rebates or grooves	Average width: not exceeding 0.5m 0.5 -1m stated exceeding 1m Average width: not exceeding 150mm 150 - 200mm 200 - 300mm stated exceeding 300mm	m2 m2 m2 m2 m m m	Joints shall be measured only where they are at locations where joints are expressly required Widths of joints shall be measured between the outer surfaces of concrete with no deduction or addition for widths or depths occupied by rebates, grooves, fillets or waterstops The lengths of waterstops shall be measured along their centre line	Joints for which temporary support of the whole surface are of concrete is required during casting shall be classed as formed surface joints Other joints shall be classed as open surface joints	Items for open surface and formed surface joints shall be deemed to include intermediate surface treatment where expressly required Items for joints shall be deemed to include formwork Items for waterstops shall be deemed to include cutting and joining of waterstops and provision of special fittings at angles and junctions	Dimensions and nature of components shall be stated in item descriptions

JOINTS

			6.8	Dowels	Plan or greased Sleeved or capped	Nr				
ANGELS, ETC.	BESMM3	Angels in water stops Intersections in water stops				nr	Angels and intersections are measured only where they are welded or purpose made			

WORKED FINISHES

GENERAL RULES	BESMM3	Information shown either on location drawings under Preliminaries/General conditions Curved work is so described								
	MMBZ	Hacking faces of concrete to provide key shall be deemed to be included with the items of finishings. Hacking by special mechanical means shall be so describe								
	SABS1200	Where a special smooth finish is specified and scheduled such that it requires more extensive operations to be carried out after striking than are specified for smooth, payment will become due when the finish has been achieved as specifie Where a special finish is specified and scheduled, payment will become due when the finish has been achieved as specifie								
	SABS1200AAC	Where a special smooth finish is specified and scheduled such that it requires more extensive operations to be carried out after striking than are specified for smooth, payment will become due when the finish has been achieved as specifie Where a special finish is specified and scheduled, payment will become due when the finish has been achieved as specifie								
SURFACE FINISHES	BESMM3	Tamping by mechanical means Power floating Trowelling Hacking Grinding Sandblasting Finishing achieved by other means				m2	Sloping Falls Crossfalls Soffits			Description of finish required and method of achieving where not at the discretion of the Contractor
	SMM2	Grinding and sand-blasting	F46	Grinding, sand-blasting, bush hammering, brushing to expose aggregate and the like treatment to the face of concrete	Work to soffits shall be so described	m2				
	MMBZ	Grinding and sand-blasting	F49	Grinding, sand-blasting, bush hammering, brushing to expose aggregate and the like treatment to the face of concrete	Work to soffits shall be so described	m2				
	SABS1200	Unformed surface finishes	8.4.4 8.4.4a 8.4.4b 8.4.4c 8.4.4d	Unformed surface finishes: Wood-floated finish Steel-floated finish Power-floated finish Other special finish	Where better than rough finishes are required, items will be scheduled for each class or type of finish	m2				
	SABS1200AAC	Unformed surface finishes	8.4.4 8.4.4a 8.4.4b 8.4.4c 8.4.4d	Unformed surface finishes: Wood-floated finish Steel-floated finish Power-floated finish Other special finish	Where better than rough finishes are required, items will be scheduled for each class or type of finish	m2				
	CESMM3	Concrete accessories	8.1	Finishing of top surfaces	Wood float Steel trowel Other stated surface treatment Granolithic finish Other stated applied finish	m2	Surface treatments shall not be measured to surfaces formed at the contractor's discretion Areas of tops of walls and other surfaces which are not given separate finishing treatment shall not be measured as finishing of top surfaces No deduction from the areas measured for holes and openings in the finished surfaces each not exceeding 0.5m2		Items for granolithic and other stated applied finish shall be deemed to included materials, surface treatment, joints and formwork	Material, thicknesses and surface treatments of granolithic and other stated applied finish shall be stated in description
			8.2	Finishing of formed surfaces	Aggregate exposure using retarder	m2				

WORKED FINISHES

			8.3	Inserts	Bush hammering Other stated surface treatment carried out after striking formwork Smooth-special Linear inserts Other inserts		Where inserts are expressly required to be grouted into preformed openings the formwork shall be measured	Components cast or grouted into in situ concrete except reinforcement, prestressing and jointing materials shall be classed as inserts	Items for inserts shall deemed to include their supply unless otherwise stated	Descriptions shall identify the components to be cast or grouted in and state their principal dimensions Item descriptions shall identify: a) those which project from one surface of the concrete b) those which project from two surfaces of the concrete c) those which are totally within the concrete volume Where expressly required to be grouted into preformed openings in concrete item descriptions shall so state Materials for grouting and sizes of opening shall be stated
CUTTING	BESMM3	Cutting chases Cutting rebates	1 2 3 4	Depth ≤ 50mm Depth 50 - 100mm Depth 100 - 150mm Depth > 150mm, depth stated		m	Specific width stated Making good In reinforced concrete	Width is required to be stated only where there is a specific width requirement		
	BESMM3	Cutting mortices Cutting holes	1 2 3 4	Depth ≤ 100mm Depth 100 - 200mm Depth 200 - 300mm Depth > 300mm, depth stated		nr	Specific cross sectional size stated Making good In reinforced concrete	Cross sectional size is required to be stated only where there is a specific cross sectional size requirement		
	SMM2	Cutting grooves chases, chamfers and the like	F47	Cutting grooves, chases, rebates, chamfers and the like	State size	m	If produced by formwork, F23			
	MMBZ	Cutting grooves chases, chamfers and the like	F50	Cutting grooves, chases, rebates, chamfers and the like	State size	m	If produced by formwork, F23			
OUR	SMM2	Labours on concrete	F14.a F14.b	Treating surface of unset concrete over 300mm thick Forming channels and chases in surface of unset concrete	 Stating shape, width and depth	m2 m	Treatments to surface not exceeding 300mm thick shall be given in description Channels to falls shall be so described		Grading to cross-falls, to falls, to cambers, to slopes, tamping, trowelling Channels & chases requiring additional concrete shall be so described stating size of additional concrete	 Formwork shall be given in description & ends angles, intersections and out lets shall be given in description

WORKED FINISHES

LAB	MMBZ	Labours on concrete	F14.a	Treating surface of unset concrete over 300mm thick		m2	Treatments to surface not exceeding 300mm thick shall be given in description		Grading to cross-falls, to falls, to cambers, to slopes, tamping, trowelling	
			F14.b	Forming channels and chases in surface of unset concrete	Stating shape, width and depth	m	Channels to falls shall be so described		Channels & chases requiring additional concrete shall be so described stating size of additional concrete	Formwork shall be given in description & ends angles, intersections and out lets shall be deemed to be included
CAST ONTO	SMM2	Finishes on to concrete	F13	Extra over for finishes cast onto concrete	Describe material and thickness of finish	m2	Measured on exposed face		Material: granolithic, cast stone, terrazo, mosaic	
	MMBZ	Finishes cast on to concrete	F13	Extra over concrete for finishes cast onto concrete	Describe material and thickness of finish	m2	Measured on exposed face		Material: granolithic, cast stone, terrazo, mosaic	

ACCESSORIES

GENERAL RULES	BESMM3	Information to be supplied in General Conditions or on Drawings: 1. Relative positions of concrete members 2. Size of members 3. Thickness of slabs 4. Permissible loads in relation to casting items								
	SABS1200	Definitions: 1. Fixture: an item such as a bolt, anchorage, bearing or the like that is cast or grouted into concrete								
	SABS1200AAC	Definitions: 1. Fixture: an item such as a bolt, anchorage, bearing or the like that is cast or grouted into concrete								
BOLTS, ETC.	BESMM3	Type or name stated			Dimensioned description	m2	Spacing dimensions stated	Cast-in accessories are normally measured by number. Linear or area measured may be used provided that any appropriate spacing dimensions are given in descriptions	Cast-in accessories include anchor bolts, anchor boxes, anchor fixing bolts, etc., dowels, column guards and isolated glass lenses. Cast-in accessories exclude reinforcement, tying wire, distance blocks, spacers, chairs, structural steelwork, hollow blocks, filler blocks, permanent formwork, joints and all components around which concrete is cast, but which are not fixed by the Contractor	Kind and quality of materials and sizes or manufacture's reference
	SMM2	Anchor bolts	F2.g	Building in and grouting anchor bolts and the like	State length of bolt in stages of 150mm and the mix of grout	No				
	SABS1200	Bolts and miscellaneous metal work	8.8	HD Bolts and miscellaneous metal work	Separate items will be scheduled for different diameters, lengths and types and for bearings and miscellaneous metal work of different types	t	Rate shall cover the cost of supplying and delivering or taking delivery (as applicable), fixing or casting into concrete and all cleaning, preparation and finishing	Whether to be supplied by the contractor or by others will be stated		
	SABS1200AAC	Bolts and miscellaneous metal work	8.8	HD Bolts and miscellaneous metal work	Separate items will be scheduled for different diameters, lengths and types and for bearings and miscellaneous metal work of different types	t	Rate shall cover the cost of supplying and delivering or taking delivery (as applicable), fixing or casting into concrete and all cleaning, preparation and finishing	Whether to be supplied by the contractor or by others will be stated		

PRE-CAST

GENERAL RULES

BESMM3	Information to be supplied in General Conditions or on Drawings: 1. Details or precast concrete members showing stressing arrangements 2. Full details of anchorages, ducts, sheeting and vents 3. Relative positions of concrete members 4. Size of members 5. Thickness of slabs 6. Permissible loads
SMM2	Precast units shall be given under appropriate heading Particulars of the following shall be given: 1. Kind, quality and size of reinforcement 2. Shape of cross-section of unit 3. Nature and extend of surface finish 4. Composition and mix of jointing and bedding materials 5. Method of fixing Formwork or moulds for precast units shall be deemed to be included with the items
MMBZ	Precast units shall be given under appropriate heading Particulars of the following shall be given: 1. Kind, quality and size of reinforcement 2. Shape of cross-section of unit 3. Nature and extend of surface finish 4. Composition and mix of jointing and bedding materials 5. Method of fixing Formwork or moulds for precast units shall be deemed to be included with the items
SABS1200	Where units are measured by volume, reinforcement and fixtures will be scheduled and no deduction will be made for small openings and hole Generally, reinforcement and fixtures will not be measured separately where units are measured by number or where the measurement of a unit is by area or by length (of a uniform section Where other items are schedules separately, they will be measured and paid for as describec
SABS1200AAC	Where units are measured by volume, reinforcement and fixtures will be scheduled and no deduction will be made for small openings and hole Generally, reinforcement and fixtures will not be measured separately where units are measured by number or where the measurement of a unit is by area or by length (of a uniform section Where other items are schedules separately, they will be measured and paid for as describec

BESMM3	Type or name stated	1	Dimensioned description		nr	Reinforcement, details stated	Precast units are normally measured by number. Linear measurement may be used where the length of units is at the discretion of the Contractor, where the individual units are of an identical standard length or where otherwise identical units vary in their length. In these cases, number of units is stated Where floor units are the same length they may be measured in square meters and grouped together stating length Where units are measured linear, angles, fair ends, stoolings and the like are enumerated as extra over the units	Precast units are deemed to include moulds, reinforcement, bedding, fixings, temporary supports, cast-in accessories and pretensioning	Kind and quality of materials and mix details
		2	Dimensioned description (nr)		m	Cast-in accessories, detail stated			Tests of materials and finished work Methods of compaction and curing
		3	Dimensioned description	Floor units, lengths stated	m2				Bedding and fixing Surface finishes Kind and quality of pretensioning materials spacing and stresses
BESMM3	Items extra over the units on which they occur	1	Angels		nr				

PRE-CAST

UNITS	BESMM3	Joints	2 3 4 1	Fair ends Stoolings Others, details stated Dimensioned profile description	Sizes of filling and sealants stated	m		Enumerated joints may be given in the description of precast items in which they occur		Kind and quality of materials
	SMM2	Structural Units	2 F26 F24.d	Dimensioned description Structural units (eg. Stanchions, beams, purlins, trusses) Precast units over 2m long	State size	nr No No				
	MMBZ	Structural Units	F26 F25.d	Structural units (eg. Stanchions, beams, purlins, trusses) Precast units over 2m long	State size	No No				
	SABS1200	Precast units	8.2.1	Provide structural precast units	Dimensions of individual units and whether reinforcement is included or measured separately will be stated	No	Rate covers cost of labour, equipment, moulds, material including facings, reinforcement, fixtures (except where reinforcement and fixtures are measured separately), mixing, placing, compacting and floating-off of concrete and the cost of temporary stacking, curing and delivering the units to and stacking on the site	Separate items will be scheduled for different qualities of concrete, different types and sizes of units and small units of volume of formed concrete not exceeding 0.5m3		
	SABS1200AAC	Precast units	8.2.1	Provide structural precast units	Dimensions of individual units and whether reinforcement is included or measured separately will be stated	No	Rate covers cost of labour, equipment, moulds, material including facings, reinforcement, fixtures (except where reinforcement and fixtures are measured separately), mixing, placing, compacting and floating-off of concrete and the cost of temporary stacking, curing and delivering the units to and stacking on the site	Separate items will be scheduled for different qualities of concrete, different types and sizes of units and small units of volume of formed concrete not exceeding 0.5m3		
	SABS1200	Precast units	8.2.2	Erection of structural precast units	Details of jointing, where applicable, will be stated and separate items will be scheduled for different positions of units for erection purposes		Rate covers cost of removal of the units from temporary stacking, of all materials, plant and labour required for building units in or fixing them into position including cost of provision of hard standings, lifting gear, temporary scaffolding and supports necessary to keep units stable until the permanent support system is able to stabilize the units			
	SABS1200AAC	Precast units	8.2.2	Erection of structural precast units	Details of jointing, where applicable, will be stated and separate items will be scheduled for different positions of units for erection purposes		Rate covers cost of removal of the units from temporary stacking, of all materials, plant and labour required for building units in or fixing them into position including cost of provision of hard standings, lifting gear, temporary scaffolding and supports necessary to keep units stable until the permanent support system is able to stabilize the units			

PRE-CAST

	CESMM3	Beams	1	Length: not exceeding 5m	Mass: not exceeding 250kg	Nr		Mass used shall be the mass of each unit Concrete components which are cast other than in their final position shall generally be classed as precast concrete units	Precast concrete shall be deemed to include reinforcement, formwork, joints and finishes	Position of the works and specification of the concrete to be used in each type of precast unit shall be stated in item descriptions
		Prestressed pre-tensioned beams	2	5 - 7m	250 - 500kg	Nr				Mark or type number of each precast concrete unit shall be stated
		Prestressed post-tensioned beams	3	7 - 10m	500kg - 1t	Nr		Where site precasting units is adopted for reasons other than to obtain multiple use of formwork and the nature of the work is characteristic of in situ concrete, but involves the movement of the cast units into their final positions, the units shall be classed as in situ concrete and items given in class A for the temporary works associated with the movement of the units		Units with different dimensions hall be given different mark or type number Particulars of tendons and prestressing shall be stated in item descriptions for prestressed pre-tensioned units
		Columns	4	10 - 15m	1 - 2t	Nr				Cross-section type and principal dimensions shall be stated in item descriptions for beams, columns ,segmental units, units for subways, culverts, ducts, copings, sills and weir blocks Average thickness shall be stated in item descriptions for slabs
			5	15 - 20m	2 - 5t	Nr				
			6	20 - 30m	5 - 10t	Nr				Mass per metre shall be stated in items descriptions for units for subways, culverts, ducts, copings, sills and weir blocks
			7	exceeding 30m	10 - 20t stated exceeding 20t	Nr				
		Slabs	5.1	Area: not exceeding 1m2		Nr				
			5.2	1 - 4m2						
			5.3	4 - 15m2						
			5.4	15 - 50m2						
			5.5	exceeding 50m2						
		Segmental units				Nr				
		Units for subways, culverts and ducts				m				
		Copings, sills and weir blocks	8.1	Cross-sectional area: not exceeding 0.1m2		m				
			8.2	0.1 - 0.5m2						
			8.3	0.5 - 1m2						
			8.4	exceeding 1m2						

PRE-CAST

STEPS, ETC.	SMM2	Steps and staircases	F27	Steps, landings, solid balustrade panels and the like	State extreme size	No	Members of irregular shape shall be so described	Nosings, rebates, fair ends, returned ends, shaped ends, wall-holds and the like shall be given in the description		
	MMBZ	Steps and staircases	F27	Steps, winders, landings, solid balustrade panels and the like	State extreme size	No	Members of irregular shape shall be so described	Nosings, rebates, fair ends, returned ends, shaped ends, wall-holds and the like shall be given in the description		
KERB, ETC.	SMM2	Kerbs and edgings	F28	Kerbs, edging and the like Fair ends, rounded ends, angles, intersections and the like specially cast	State size	m No	Curved members shall be so described stating mean radius			
	MMBZ	Kerbs and edgings	F28	Kerbs, edging and the like Fair ends, rounded ends, angles, intersections and the like specially cast	State size	m No	Curved members shall be so described stating mean radius			
SHELVES, ETC.	SMM2	Shelves seats, duct covers, sills lintels and copings	F29	Shelves, divisions, seats, duct covers, sills, lintels, copings and the like Notches, rounded corners, fair ends, stooled ends, returned ends, angles and the like Irregular shape	State size State extreme size	m No No	Curved members shall be so described stating mean radius			
	MMBZ	Shelves seats, duct covers, sills, lintels and copings	F29	Shelves, divisions, seats, duct covers, sills, lintels, copings and the like Notches, rounded corners, fair ends, stooled ends, returned ends, angles and the like Irregular shape	State size State extreme size	m No No	Curved members shall be so described stating mean radius			
TEMPLATES	SMM2	Templates	F30	Templates (padstones), bases to posts and the like	State size	No				
	MMBZ	Templates	F30	Templates (or padstones), bases to posts and the like	State size	No				
PIER-CAPS, ETC.	SMM2	Pier-caps and chimney-caps	F31	Pier-caps, chimney-caps and the like	State size and shape where other than rectangular	No	Openings in chimney-caps shall be given in description			
	MMBZ	Pier-caps and chimney-caps	F31	Pier-caps, chimney-caps and the like	State size and shape where other than rectangular	No	Openings in chimney-caps shall be given in description			
QUOINS, ETC.	SABS1200	Quoins, etc	8.2.3	Quoins, etc. (wedge or angle blocks)	Overall size will be stated	No	Rate cover cost of manufacture, delivery and erection			
	SABS1200AAC	Quoins, etc	8.2.3	Quoins, etc. (wedge or angle blocks)	Overall size will be stated	No	Rate cover cost of manufacture, delivery and erection			
PAVINGS	SABS1200	Paving slabs	8.2.4	Concrete paving slabs	Size and thickness of slab will be stated and area of joints will be included in the are measured	m2	Rate cover cost of manufacturing, delivering, laying and jointing of paving slabs, including provision and trimming of suitable sand bedding			
	SABS1200AAC	Paving slabs	8.2.4	Concrete paving slabs	Size and thickness of slab will be stated and area of joints will be included in the are measured	m2	Rate cover cost of manufacturing, delivering, laying and jointing of paving slabs, including provision and trimming of suitable sand bedding			

PRE-CAST

MISCELLANEOUS METALWORK	SABS1200	Miscellaneous built-in metalwork	8.2.5	Miscellaneous built-in metalwork	Separate items scheduled for miscellaneous built-in metalwork of different masses and sizes	kg/t	Rate cover anchorages and miscellaneous built-in metalwork shall cover the cost of supplying and delivering (or taking delivery, as applicable) fixing into position and building into the concrete			
	SABS1200AAC	Miscellaneous built-in metalwork	8.2.5	Miscellaneous built-in metalwork	Separate items scheduled for miscellaneous built-in metalwork of different masses and sizes	kg/t	Rate cover anchorages and miscellaneous built-in metalwork shall cover the cost of supplying and delivering (or taking delivery, as applicable) fixing into position and building into the concrete			
BEARINGS, ETC.	SABS1200	Bearings, etc.	8.2.6	Bearings, finger and fin joints, etc., to details given on drawing ….	Separate items will be scheduled for different types of bearings, etc. and for each constituent item or unit where applicable	kg/t/No	Rate cover cost of supplying and constructing or building in each bearing, joint, etc. as applicable			
	SABS1200AAC	Bearings, etc.	8.2.6	Bearings, finger and fin joints, etc., to details given on drawing ….	Separate items will be scheduled for different types of bearings, etc. and for each constituent item or unit where applicable	kg/t/No	Rate cover cost of supplying and constructing or building in each bearing, joint, etc. as applicable			
LOAD TESTING	SABS1200	Load testing	8.2.7	Load testing of units:						
			8.2.7a	Non-destructive tests	Separate items for different shapes or sizes or types of units	No/Sum	Rate cover cost of all equipment, measuring devices and labour required for carrying out the test given			
			8.2.7b	Destructive tests		Sum	Rate cover cost of all equipment, materials and labour required for performing test specified in project specification and for replacing the unit destroyed during the test			
			8.2.7c	Special tests (provisional)		Day labour/ Sum	Rate cover cost of operations agreed between Contractor and Engineer before testing unit			
	SABS1200AAC	Load testing	8.2.7	Load testing of units:						
			8.2.7a	Non-destructive tests	Separate items for different shapes or sizes or types of units	No/Sum	Rate cover cost of all equipment, measuring devices and labour required for carrying out the test given			
			8.2.7b	Destructive tests		Sum	Rate cover cost of all equipment, materials and labour required for performing test specified in project specification and for replacing the unit destroyed during the test			
			8.2.7c	Special tests (provisional)		Day labour/ Sum	Rate cover cost of operations agreed between Contractor and Engineer before testing unit			

PRE-STRESSED

GENERAL RULES	SMM2	Prestressed concrete work (work where reinforcement is tensioned before or as the load is applied) and its reinforcement and associated formwork shall be given under appropriate heading General description of the prestressed work and of the system and method of tensioning shall be given Where special and complicated construction is involved drawing shall be providec Particulars of the following shall be given: 1. Steel wires and any prepatory treatment 2. Type of jack to be used for tensioning 3. Types of cones, wedges, anchor-plates, spacers, distance-pieces and the like 4. Amount of tension to be applied to wires 5. Number and diameter of wires to be simultaneously tensioned 6. Whether wires to be pre-tensioned or post-tensioned or tensioned as the load is applied and whether from one or both end 7. Maturity of concrete before pre-tensioning is released or post-tensioning is appliec 8. Tests to be applied 9. Cutting off, sealing and treating the ends of wires and cables									
	MMBZ	Prestressed concrete work (work where reinforcement is tensioned before or as the load is applied) and its reinforcement and associated formwork shall be given under appropriate headin General description of the prestressed work and of the system and method of tensioning shall be given Where special and complicated construction is involved drawing shall be providec Particulars of the following shall be given: 1. Steel wires and any prepatory treatment 2. Type of jack to be used for tensioning 3. Types of cones, wedges, anchor-plates, spacers, distance-pieces and the like 4. Amount of tension to be applied to wires 5. Number and diameter of wires to be simultaneously tensioned 6. Whether wires to be pre-tensioned or post-tensioned or tensioned as the load is applied and whether from one or both end 7. Maturity of concrete before pre-tensioning is released or post-tensioning is appliec 8. Tests to be applied 9. Cutting off, sealing and treating the ends of wires and cables									
	SABS1200	Where prestressing is sufficiently detailed on the drawing or in schedule, measurement will generally be by mass Where different systems compete with one another at tender stage, measurement may be made in terms of units that are the product of force and length or in terms of force units per 8.2.7.1 and 8.2.7..								
	SABS1200AAC	Where prestressing is sufficiently detailed on the drawing or in schedule, measurement will generally be by mass Where different systems compete with one another at tender stage, measurement may be made in terms of units that are the product of force and length or in terms of force units per 8.2.7.1 and 8.2.7..								
ESTABLISHING	SABS1200	Establishing	8.2.1	Extablishing on site, maintenance and dismantling of tensioning beds and equipment	Will be scheduled only where required to establish facilities on site as part of temporary works for tensioning in-situ concrete	Sum	Cover cost of setting up, operating, maintaining and on completion dismantling the beds and equipment			
	SABS1200AAC	Establishing	8.2.1	Extablishing on site, maintenance and dismantling of tensioning beds and equipment	Will be scheduled only where required to establish facilities on site as part of temporary works for tensioning in-situ concrete	Sum	Cover cost of setting up, operating, maintaining and on completion dismantling the beds and equipment			
ERS	SMM2	Structural in-situ members	F38.a F38.b F38.c	Structural in-situ members Members cast in section Construction joints between sections	As per F10: beams and columns State number and average length of sections	 No	Beams, columns, etc. Not in one continuous operation			
	MMBZ	Structural in-situ members	F40.a F40.b F40.c	Structural in-situ members Members cast in section Construction joints between sections	As per F10: beams and columns State number and average length of sections	 No	Beams, columns, etc. Not in one continuous operation			
	SABS1200	Manufacture	8.2.2	Manufacture of precast prestressed units	State dimensions or drawing number	No/m	Cover cost of royalties, of all material including concrete and reinforcing and prestressing steel, formwork and moulds and labour and quipment required for mixing, placing, compacting, floating off, stressing, temporary stacking and curing	Separate items for different qualities of concrete and different types of sizes of units (small units volume not exceeding 0.5m3 of concrete will be grouped)		

PRE-STRESSED

IN-SITU MEMBE	SABS1200AAC	Manufacture	8.2.2	Manufacture of precast prestressed units	State dimensions or drawing number	No/m	Cover cost of royalties, of all material including concrete and reinforcing and prestressing steel, formwork and moulds and labour and quipment required for mixing, placing, compacting, floating off, stressing, temporary stacking and curing	Separate items for different qualities of concrete and different types of sizes of units (small units volume not exceeding 0.5m3 of concrete will be grouped)		
	SAS1200	Erection and building-in	8.2.4	Erection and building-in of units	Mass of each unit and details of connections must be stated	No	Cover cost of removal temporary stacking, erection (including hoisting, scaffolding and temporary supports), building-in or fixing into position and construction of all structural connections	Separate items for different sizes and different positions of units		
	SAS1200AAC	Erection and building-in	8.2.4	Erection and building-in of units	Mass of each unit and details of connections must be stated	No	Cover cost of removal temporary stacking, erection (including hoisting, scaffolding and temporary supports), building-in or fixing into position and construction of all structural connections	Separate items for different sizes and different positions of units		
CONES, ETC.	SMM2	Cones, ducts and recesses	F39.a F39.a.i F39.a.ii F39.a.iii F39.b F39.d F39.e	Forming and grouting or sealing the ducts or grooves, giving following particulars: Sleeves or sheathing Temporary supports required in the formation of the ducts Composition of the grout Ducts or grooves over 6m long Forming and grouting air-holes or sides of ducts Fillings in jacking or anchoring recesses	State number and size State length in further stages of 3m State finish to exposed surface of filling	m m No No	Curved sleeves and curved sheathing shall each be so described irrespective of radius			
	MMBZ	Cones, ducts and recesses	F41.a F41.a.i F41.a.ii F41.a.iii F41.b F41.d F41.e	Forming and grouting or sealing the ducts or grooves, giving following particulars: Sleeves or sheathing Temporary supports required in the formation of the ducts Composition of the grout Ducts or grooves over 6m long Forming and grouting air-holes or sides of ducts Fillings in jacking or anchoring recesses	State number and size State length in further stages of 3m State finish to exposed surface of filling	m m No No	Curved sleeves and curved sheathing shall each be so described irrespective of radius			
	SABS1200	Sheathing and tendons	8.2.3.2	Supply and install sheathing and tendons (characteristic strength stated)	Separate items for tendons of different materials, scross-sections, types of construction	t	Cover supplying sheathing complete with threaded inlets and with vents, of fixing complete sheathing to formwork of supplying and making up tendons (including spacers and waste) and threading the tendons through the sheaths	Mass of tendons measured will include the mass of any loop or fan		
	SABS1200AAC	Sheathing and tendons	8.2.3.2	Supply and install sheathing and tendons (characteristic strength stated)	Separate items for tendons of different materials, scross-sections, types of construction	t	Cover supplying sheathing complete with threaded inlets and with vents, of fixing complete sheathing to formwork of supplying and making up tendons (including spacers and waste) and threading the tendons through the sheaths	Mass of tendons measured will include the mass of any loop or fan		

PRE-STRESSED

WIRES & CABLES	SMM2	Wires and cables	F40.a	Supplying steel wires or cables	State ultimate strength and size of the wire or cable	kg	Measured between anchorages	Each size given separately	No allowance for extra lengths, in anchorages or elsewhere	
	MMBZ	Wires and cables	F42.a	Supplying steel wires or cables	State ultimate strength and size of the wire or cable	kg/t	Measured between anchorages	Each size given separately	No allowance for extra lengths, in anchorages or elsewhere	
			F42.b	Fixing each length or wire or cable	State length, number of strands in each cable, type of central core and type of sheathing	No	Degreasing, straightening, cutting to lengths and assembling wires and cables deemed to be included with items			
			F42.c	Cones, wedges, anchor plates, spacers, distance pieces and the like	Each separately	No				
			F42.d	Tensioning each length of wire or cable	State sequence	No	Cutting of ends of wires and cables shall be deemed to be included with items			
	SABS1200	Anchorages and couplers	8.2.3.3	Supply and install anchorages and couplers to suit tendons			Cover cost of supplying, fabricating, storing, handling, protecting, forming a recess for anchorage and for coupler, installing and fixing complete anchorage assembly (including coupler) to formwork, together with cost of reinforcement design for whole anchorage zone and cost of helical reinforcement supplied as part of anchorage assembly	Rate exclude cost of length of tendon forming the loop or fan		
			8.2.3.3 a	Anchorage at jacking end		No				
			8.2.3.3 b	Anchorage at dead end		No				
			8.2.3.3 c	Coupler at jacking end		No				
			8.2.3.3 d	Coupler at dead end		No				
	SABS1200	Anchorages and couplers	8.2.3.3	Supply and install anchorages and couplers to suit tendons			Cover cost of supplying, fabricating, storing, handling, protecting, forming a recess for anchorage and for coupler, installing and fixing complete anchorage assembly (including coupler) to formwork, together with cost of reinforcement design for whole anchorage zone and cost of helical reinforcement supplied as part of anchorage assembly	Rate exclude cost of length of tendon forming the loop or fan		
			8.2.3.3 a	Anchorage at jacking end		No				
			8.2.3.3 b	Anchorage at dead end		No				
			8.2.3.3 c	Coupler at jacking end		No				
			8.2.3.3 d	Coupler at dead end		No				
REINFORCING	SMM2	Reinforcement	F41	Reinforcement as per F16 - 18						
	MMBZ	Reinforcement	F43	Reinforcement as per F16 - 18						
	SABS1200	Reinforcement	8.2.3.1	Measured as per SABS 1200G						
	SABS1200AAC	Reinforcement	8.2.3.1	Measured as per SABS 1200G						
FORMWORK	SMM2	Formwork	F42.a	Formwork as per F19-24, subject to:						
			F42.a.1	Special requirements as to strutting and supports shall be stated						
			F42.a.2	Formwork to pre-tensioned and post-tensioned work shall each be so described						
			F42.a.3	Temporary restraints for tensioning and the like shall be given in description of formwork						
			F42.b	Formwork to recesses for anchorages	State size and shape	No				
			F42.c	Formwork to temporary construction joints	State sections of the abutting units	No				
	MMBZ	Formwork	F44.a	Formwork as per F19-24, subject to:						
			F44.a.i	Special requirements as to strutting and supports shall be stated						

PRE-STRESSED

			F44.a.ii	Formwork to pre-tensioned and post-tensioned work shall each be so described						
			F44.a.iii	Temporary restraints for tensioning and the like shall be given in description of formwork						
			F44.b	Formwork to recesses for anchorages	State size and shape	No				
			F44.c	Formwork to temporary construction joints	State sections of the abutting units	No				
	SABS1200	Formwork	8.2.3.1	Measured as per SABS 1200G						
	SABS1200AAC	Formwork	8.2.3.1	Measured as per SABS 1200G						
POST-TENSIONED	SABS1200	Post-tensioned	8.2.3.4	Post-tensioning and grouting of items supplied under 8.2.3.2 and 8.2.3.3	Separate items scheduled for longitudinal, transverse and vertical tensioning	No	Cover cost of royalties, site supervision and labour, plant and materials, prestressing of unit by tensioning all or a few tendons at a time, anchoring off or coupling, or both, trimming of tendon ends and flushing out, grouting and making good anchorage recesses			
	SABS1200AAC	Post-tensioned	8.2.3.4	Post-tensioning and grouting of items supplied under 8.2.3.2 and 8.2.3.3	Separate items scheduled for longitudinal, transverse and vertical tensioning	No	Cover cost of royalties, site supervision and labour, plant and materials, prestressing of unit by tensioning all or a few tendons at a time, anchoring off or coupling, or both, trimming of tendon ends and flushing out, grouting and making good anchorage recesses			
	CESMM3	Post-tensioned prestressing	7.1	Horizontal internal tendons in insitu concrete	Length: not exceeding 5m	Nr	Prestressing shall be measured by number of tendons where tendons are used and by the number of external jacking operations where stress is induced by jacking only	Profiled tendons in horizontal components shall be classed as horizontal tendons Lengths of tendons used for classification shall be their developed lengths between the outer faces of anchorages	Items for prestressing shall be deemed to include ducts, grouting and other components and tasks ancillary to prestressing	Item description shall identify the concrete component to be stressed and state the composition of the tendon and particulars of the anchorage
			7.2	Inclined or vertical internal tendons in in situ concrete	5 - 7m	Nr				
			7.3	Horizontal internal tendons in precast concrete	7 - 10m	Nr				
			7.4	Inclined or vertical internal tendons in precast concrete	10 - 15m	Nr				
			7.5	External jacking operations	15 - 20m 20 - 25m 25 - 30m stated exceeding 30m	Nr				
	SABS1200	Steelwork	8.2.5	Miscellaneous built-in steelwork	Separate items for different masses an sizes of miscellaneous built-in steelwork	kg/t	Cover cost of supplying and delivering (or taking delivery) fixing into position and building into concrete the various items of steelwork			
	SABS1200AAC	Steelwork	8.2.5	Miscellaneous built-in steelwork	Separate items for different masses an sizes of miscellaneous built-in steelwork	kg/t	Cover cost of supplying and delivering (or taking delivery) fixing into position and building into concrete the various items of steelwork			
	SABS1200	Tests	8.2.6	Special tests		Sum	Cover complying with requirements for tests stated			

PRE-STRESSED

OTHER	SABS1200AAC	Tests	8.2.6	Special tests		Sum	Cover complying with requirements for tests stated			
	SABS1200	Alternative items: Sheating and tendons	8.2.7.1	Supply and install sheathing and tendons	Unit, meganewton metre, will be calculated as the product of characteristic strength in megapascals of prestessing steel, the cross-sectional are of the tendon in m2 and length of tendon in m between faces of the anchorages	MN.m	Cover cost of supplying sheathing complete with threaded inlets and with vents, fixing complete sheathing to formwork, supplying and making up tendons (including cost of spacers and waste) and threading tendons through the sheaths	In case of fan and loop anchorages the legnth of tendon will include the length of tendon forming the loop or fan	Separate items for tendons of different materials, cross-sections, characteristic stengths, types of construction, etc.	
	SABS1200AAC	Sheating and tendons	8.2.7.1	Supply and install sheathing and tendons	Unit, meganewton metre, will be calculated as the product of characteristic strength in megapascals of prestessing steel, the cross-sectional area of the tendon in m2 and length of tendon in m between faces of the anchorages	MN.m	Cover cost of supplying sheathing complete with threaded inlets and with vents, fixing complete sheathing to formwork, supplying and making up tendons (including cost of spacers and waste) and threading tendons through the sheaths	In case of fan and loop anchorages the legnth of tendon will include the length of tendon forming the loop or fan	Separate items for tendons of different materials, cross-sections, characteristic stengths, types of construction, etc.	
	SABS1200	Anchorages and couplers	8.2.7.2 8.2.7.2 a 8.2.7.2 b 8.2.7.2 c 8.2.7.2 d	Supply and install anchorages and couplers to suit tendons Anchorage at jacking end Anchorage at dead end Coupler at jacking end Coupler at dead end	Unit, meganewton metre, will be calculated as the product of characteristic strength in megapascals of prestessing steel, the cross-sectional area of the effectively anchored or coupled tendon in m2	MN MN MN MN	Cover cost of fabricating, supplying, storing, handling, protecting, forming a recess for anchorage and for coupler, installing and fixing complete anchorage assembly (including coupler) to formwork, with cost of reinforcement design for the whole anchorage zone and the cosdt of helical reinforcement supplied as part of the acnhorage assembly	Rate for loop or fan anchorages shall exclude the cost of the length of tendon forming the loop or fan		
	SABS1200AAC	Anchorages and couplers	8.2.7.2 8.2.7.2 a 8.2.7.2 b 8.2.7.2 c 8.2.7.2 d	Supply and install anchorages and couplers to suit tendons Anchorage at jacking end Anchorage at dead end Coupler at jacking end Coupler at dead end	Unit, meganewton metre, will be calculated as the product of characteristic strength in megapascals of prestessing steel, the cross-sectional area of the effectively anchored or coupled tendon in m2	MN MN MN MN	Cover cost of fabricating, supplying, storing, handling, protecting, forming a recess for anchorage and for coupler, installing and fixing complete anchorage assembly (including coupler) to formwork, with cost of reinforcement design for the whole anchorage zone and the cosdt of helical reinforcement supplied as part of the acnhorage assembly	Rate for loop or fan anchorages shall exclude the cost of the length of tendon forming the loop or fan		

STEELWORK

GENERAL RULES

BESMM3	Information to be supplied in General Conditions or on Drawings: 1. Position of the work in relation to other parts of the work and of the proposed building 2. Types and sizes of structural members and their positions in relation to each other 3. Details of connections or of the reactions, moments and axial loads at connection point Types and grades of materials Details of welding tests and X-rays Details of performance tests
SMM2	Steelwork shall be grouped as follows and each group with its associated labours shall be given un appropriate heading 1. Unframed steelwork (mainly or completely unframed) 2. Framed steelwork (in structures mainly or completely framed) Particulars of the following shall be given: 1. Kind and quality of steel 2. Tests of materials, workmanship and finished structure Framed steelwork: particulars given of the method of fabrication and type of site connections (riveted, bolted, turned-bolted, welded Framing plans and all available detail drawings of framed steelwork shall be provided with bill, but where not practicable the work shall be described in detail stating are on plan, number of storeys and overall height of each bloc Work in position involving extra handling or fixing between existing work shall be so described stating the location Steelwork shall be measured as executed but no deduction shall be made for splay cuts, notches, holes and slots and no allowances shall be made for rolling margin or weight of weld-meta Plates of irregular shape shall be measured net All cuttings, welds, notchings and the like labours shall be deemed to be included with item Weight given for compound or composite members (compound girders, roof trusses) shall be aggregated weight of the component parts together with the weight of the bolts and rivet-head
g	Steel sections are required to be classified in accordance with this clause should be grouped and described as follows 1. Angels and tees 2. Joists and channels 3. Broad-flange joists and universal joists 4. Castellated joists
h	Weight-groups of steel sections are required to be stated in accordance with this clause, weights per m shall be grouped and described as follows 1. Not exceeding 5kg 2. Over 5kg but not exceeding 10kg 3. Over 10kg but not exceeding 20kg 4. Over 20kg but not exceeding 50kg 5. Over 50kg but not exceeding 100kg 6. Over 100kg but not exceeding 150kg 7. Over 150kg Steel sections (except those forming par of compound or composite members) in length not exceeding 1.5m shall be so describe Curved steel sections (except those forming part of compound or composite members) shall be so described stating length, radius or radii of the curve and whether curved in width or the dept Curved compound or composite members shall be so described stating the radius or radii and whether curved in the width or the dept Cranked members shall be so described stating the number of cranks
MMBZ	Steelwork shall be grouped as follows and each group with its associated labours shall be given un appropriate heading 1. Unframed steelwork (mainly or completely unframed) 2. Framed steelwork (in structures mainly or completely framed) Particulars of the following shall be given: 1. Kind and quality of steel 2. Tests of materials, workmanship and finished structure Framed steelwork: particulars given of the method of fabrication and type of site connections (riveted, bolted, turned-bolted, welded Framing plans and all available detail drawings of framed steelwork shall be provided with bill, but where not practicable the work shall be described in detail stating are on plan, number of storeys and overall height of each bloc Work in position involving extra handling or fixing between existing work shall be so described stating the location Steelwork shall be measured as executed but no deduction shall be made for splay cuts, notches, holes and slots and no allowances shall be made for rolling margin or weight of weld-meta Plates of irregular shape shall be measured net All cuttings, welds, notchings and the like labours shall be deemed to be included with item Weight given for compound or composite members (compound girders, roof trusses) shall be aggregated weight of the component parts together with the weight of the bolts and rivet-head
g	Steel sections are required to be classified in accordance with this clause should be grouped and described as follows 1. Angels and tees (grouped together) 2. Joists and channels (grouped together) 3. Broad-flange joists and universal joists (grouped together) 4. Castellated joists
h	Weight-groups of steel sections are required to be stated in accordance with this clause, weights per m shall be grouped and described as follows 1. Not exceeding 10kg 2. Over 10kg but not exceeding 20kg 3. Over 20kg but not exceeding 45kg 4. Over 45kg but not exceeding 90kg 5. Over 90kg but not exceeding 135kg 6. Over 135kg but not exceeding 270kg 7. Over 270kg Steel sections (except those forming par of compound or composite members) in length not exceeding 1.5m shall be so describe

STEELWORK

				Curved steel sections (except those forming part of compound or composite members) shall be so described stating length, radius or radii of the curve and whether curved in width or the dept Curved compound or composite members shall be so described stating the radius or radii and whether curved in the width or the dept Cranked members shall be so described stating the number of cranks					
	SABS1200			Work involving steel members and platework will be measured by mass of steel Sundry items will be measured by number, mass or area, depending on the nature of the item Where there is considerable repetition of articles of the same description and mass (e.g. ladders, foundation bolts, frames, loose cleats, etc.) that are measured by mass, the number of such articles and the mass or length, as applicable, of each will be stated i the schedule Mass of steelwork will be calculated on the basis of the nominal mass per unit length as stated in the SA Institute of Steel Construction steel tables or, where not so stated, the mass will be calculated from a steel density of 7.85kg/m Mass fittings such as cleats, gussets, battens and stiffeners will be added to the mass of the members Tolerances for rolling margins and other permissible deviations will be neglectec No deductions will be made for holes for fasteners or for milling or planning and no additions will be made for rolling margin, waste, weld metal or shop fastener Unless otherwise stated gussets will be measured on the basis of the minimum enclosing rectangle Each large, shaped plate such as a roof, a bottom to a circular tank or a hopper bottom to a bunker or a silo, will be measured on the basis of the net size of the elemen Corrosion protection: 1. Coat: a single layer of a corrosion-protection materia 2. Coating system: the method and degree of surface preparation, the type of coating, the number of coats and their thickness, the method of application of the coats and the requirements of the completed systen Units - corrosion-protection coatings will be measured in the same units as the steelwork that is to be protectec Tonnage - tonnage will be measured as the gross tonnage of unpainted steel (i.e. including portions to be embedded, underside of baseplates, etc., but not crane rails Cladding and sheeting: Shall be measured as the total area covered by the cladding and sheeting, no deduction being made for openings left or cut for protrusions such as pipes, ducts, etc. or for areas covered by overlaps, ridging, parts of flashings, ventilators and the lik Deductions will be made for doors, windows and other openings of similar dimension Flashings, ridging, facilities for dealing with rainwater, and other items of various shaped sections will each be described, measured separately (by length or number) and paid for as extra-over item					
	SABS1200AAC			Work involving steel members and platework will be measured by mass of steel Sundry items will be measured by number, mass or area, depending on the nature of the item Where there is considerable repetition of articles of the same description and mass (e.g. ladders, foundation bolts, frames, loose cleats, etc.) that are measured by mass, the number of such articles and the mass or length, as applicable, of each will be stated i the schedule Mass of steelwork will be calculated on the basis of the nominal mass per unit length as stated in the SA Institute of Steel Construction steel tables or, where not so stated, the mass will be calculated from a steel density of 7.85kg/m Mass fittings such as cleats, gussets, battens and stiffeners will be added to the mass of the members Tolerances for rolling margins and other permissible deviations will be neglectec No deductions will be made for holes for fasteners or for milling or planning and no additions will be made for rolling margin, waste, weld metal or shop fastener Unless otherwise stated gussets will be measured on the basis of the minimum enclosing rectangle Each large, shaped plate such as a roof, a bottom to a circular tank or a hopper bottom to a bunker or a silo, will be measured on the basis of the net size of the elemen Corrosion protection: 1. Coat: a single layer of a corrosion-protection materia 2. Coating system: the method and degree of surface preparation, the type of coating, the number of coats and their thickness, the method of application of the coats and the requirements of the completed systen Units - corrosion-protection coatings will be measured in the same units as the steelwork that is to be protectec Tonnage - tonnage will be measured as the gross tonnage of unpainted steel (i.e. including portions to be embedded, underside of baseplates, etc., but not crane rails Cladding and sheeting: Shall be measured as the total area covered by the cladding and sheeting, no deduction being made for openings left or cut for protrusions such as pipes, ducts, etc. or for areas covered by overlaps, ridging, parts of flashings, ventilators and the lik Deductions will be made for doors, windows and other openings of similar dimension Flashings, ridging, facilities for dealing with rainwater, and other items of various shaped sections will each be described, measured separately (by length or number) and paid for as extra-over item					
	CESMM3			Painting carried out on site shall be classes as painting class V Masses calculated for miscellaneous metalwork assemblies shall include the mass of all metal components and attached piece No deduction from the masses or areas measured for miscellaneous metalwork shall be made for openings and holes each not exceeding 0.5m2 in are Items for miscellaneous metalwork shall deemed to include fixing to other work, supplying of fixing components and drilling or cutting of other wor Item descriptions shall state specification and thicknesses of metalwork, surface treatments and principal dimensions of miscellaneous metalwork assemblie					
SHOP DETAILS	SABS1200	Shop detail drawings	8.3.1.1	Preparation of shop detail drawings	Payment under this item will only be made where such drawings are required in terms of the specifications	t/Sum	Rate cover cost of preparation and submission to Engineer of acceptable shop detail drawings and supporting calculations			
	SABS1200AAC	Shop detail drawings	8.3.1.1	Preparation of shop detail drawings	Payment under this item will only be made where such drawings are required in terms of the specifications	t/Sum	Rate cover cost of preparation and submission to Engineer of acceptable shop detail drawings and supporting calculations			
	BESMM3	Framing fabrication	1	Columns	Weigh ≤ 40kg/m	t	Castellated	The mass of framing includes all components except fittings	Fabrication includes all operations up to and including delivery to site	Items for fabrication measured by weight are deemed to include shop and site black bolts, nuts and washers for structural framing to structural connections

STEELWORK

			2	Beams	Weight 40 - 100kg/m		Tapered	Fittings are all grouped irrespective of the member to which they attached Mass of framing is measured from their overall lengths with no deductions for splay cuts or mitred ends or for the mass of metal removed from notches and holes each > 0.1m2 in area measured on plane No allowance is made for the mass of weld fillets, black bolts, nuts, washers, rivets and protective coatings Mass of steel is taken for measurement as 785 kg/m2; mass of other metals is stated	Purlins and cladding rails are measured by weight when hot rolled Wire, cables, rods and bars include sag rods, ties and the like Special bots and fasteners are those other than black bolts and holding down bolts or assemblies	
			3	Bracings	Weight > 100kg/m		Curved			
			4	Purlins and cladding rails			Cambered			
			5	Grillages			Hollow, shape stated			
			6	Overhead crane rails	Details of fixing clips and resilient pads stated					
			7	Trestles, towers and built up columns	Details of construction stated					
			8	Trusses and built up girders						
			9	Wires, cables, rods and bars						
			10	Fittings						
			11	Holding down bolts or assemblies	Details stated	nr				
			12	Special bolts and fasteners						
SMM2	Grillages	N2.a		Grillages		kg	Plain grillages (consisting of joists or channels) shall be so described and components classified per g & h	Compound grillages shall be so described and components classified per N4.c		
MMBZ	Grillages	Q2.a		Grillages		kg/t	Plain grillages (consisting of joists or channels) shall be so described and components classified per g & h	Compound grillages shall be so described and components classified per Q4.c		
SMM2	Girders	N3.a		Girders		kg	Plain girders (consisting of joists or channels) shall be so described and components classified per g & h Classified as plain plate (one web-plate with angle-flanges); compound plate (one web plate with angle flanges and one or more flange-plates); box plate (two web-plates with angle flanges and two or more flange plates) Those fitted to girder shall be so described	Compound girders shall be so described and classified as compound single (consisting of one joist or channel with one or more flange-plates) or compound multiple (two more joists or channels)	Runway rails for travelling cranes on girders shall be given in description of girder to which they attached stating shape of cross-section and method of fixing	Weight of runway rails together with weight of associated fastenings shall be aggregated with weight of girder
		N3.d		Plate girders	State composition and depth (except shown on drawings)	kg				
		N3.e		Shelf-angles and stiffener-angles on girders	State weight-group of angles per h	kg				
		N3.f		Latticed girders	State length and composition and depth (except shown on drawings)	kg				

STEELWORK

STEELWORK	MMBZ	Girders	Q3.a	Girders		kg/t	Plain girders (consisting of joists or channels) shall be so described and components classified per g & h	Compound girders shall be so described and classified as:	Runway rails for travelling cranes on girders shall be given in description of girder to which they attached stating shape of cross-section and method of fixing	
							Classified as plain plate (one web-plate with angle-flanges); compound plate (one web plate with angle flanges and one or more flange-plates); box plate (two web-plates with angle flanges and two or more flange plates)	Compound single (consisting of one joist or channel with one or more flange-plates) or compound multiple (two more joists or channels)	Weight of runway rails together with the weight of the associated fastenings shall be aggregated with the weight of the girder	
			Q3.d	Plate girders	State composition and depth (except shown on drawings)	kg/t		Those fitted to girder shall be so described		
			Q3.e	Shelf-angles and stiffener-angles on girders	State weight-group of angles per h	kg/t	Grouped together			
			Q3.f	Latticed girders	State length and composition and depth (except shown on drawings)	kg				
	SMM2	Stanchions	N4.a	Stanchions		kg	Plain stanchions (consisting of joists or channels) shall be so described and components classified per g & h	Compound stanchions shall be so described and classified as compound single (consisting of one joist or channel with one or more flange-plates) or compound multiple (two more joists or channels)		
			N4.d	Latticed stanchions and battened stanchions	State number of stanchions and the composition	kg				
			N4.e	Bloom base to stanchions	State number of bases, method of attachment and extent of machining required	kg				
	MMBZ	Stanchions	Q4.a	Stanchions		kg/t	Plain stanchions (consisting of joists or channels) shall be so described and components classified per g & h	Compound stanchions shall be so described and classified as compound single (consisting of one joist or channel with one or more flange-plates) or compound multiple (two more joists or channels)		
			Q4.d	Latticed stanchions and battened stanchions	State number of stanchions and the composition	kg/t				
			Q4.e	Bloom base to stanchions	State number of bases, method of attachment and extent of machining required	kg/t				
	SMM2	Solid or tubular columns	N5.a	Solid steel columns	State diameter and number of columns	kg				
			N5.b	Tubular steel columns	State thickness of metal, outside diameter and number of columns	m				
	MMBZ	Solid or tubular columns	Q5.a	Solid steel columns	State diameter and number of columns	kg/t				
			Q5.b	Tubular steel columns	State thickness of metal, outside diameter and number of columns	m				
	SMM2	Portal frames	N6	Portal frames	State composition and span	kg				
	MMBZ	Portal frames	Q6	Portal frames	State composition and span	kg/t				
	SMM2	Roof trusses	N7.a	Roof-trusses	State span in stages of 3m, the rise and composition	kg	Gable-trusses, hip-trusses, half-trusses and valley-trusses shall each be so described			

STEELWORK

MMBZ	Roof trusses	Q7.a	Roof-trusses	State span in stages of 3m and composition	kg/t	Gable-trusses, hip-trusses, half-trusses and valley-trusses shall each be so described			
SMM2	Gables, hips and valleys	N8	Gable-members, hip-members, valley-members and the like		kg	Classified per g and h			
MMBZ	Gables, hips and valleys	Q8	Gable-members, hip-members, valley-members and the like	Grouped together	kg/t	Classified per g and h			
SMM2	Purlins rails	N9.a	Purlins and rails	State weight if in m	kg/m	Plain purlins and plain rails shall be so described classified per g and h	Compound purlins, compound rails, battened purlins and battened rails shall be so described		
MMBZ	Purlins and rails	Q9.a	Purlins and rails	State weight if in m	kg/t/m	Plain purlins and plain rails (grouped together) shall be so described classified per g and h	Compound purlins, compound rails, battened purlins and battened rails shall be so described		
SMM2	Braces and struts	N10	Braces, struts and the like	Grouped together	kg	Classified per g and h			
MMBZ	Braces and struts	Q10	Braces, struts and the like	Grouped together	kg/t	Classified per g and h			
SABS1200	Supply and fabrication of steelwork	8.3.1.2	Supply and fabrication of steelwork	Separate items will be scheduled for each type of member and each structural position	t	Rate cover cost of supply, trial assembly (if required) and fabrication of the steelwork complete with all necessary cleats, brackets, gussets, shop fasteners, packs, baseplates and the like, and loading ready for despatch to site	Members will be subdivided to distinguish between different methods of jointing, e.g. welding and bolting	Type of fasteners will stated where necessary	
SABS1200AAC	Supply and fabrication of steelwork	8.3.1.2	Supply and fabrication of steelwork	Separate items will be scheduled for each type of member and each structural position	t	Rate cover cost of supply, trial assembly (if required) and fabrication of the steelwork complete with all necessary cleats, brackets, gussets, shop fasteners, packs, baseplates and the like, and loading ready for despatch to site	Members will be subdivided to distinguish between different methods of jointing, e.g. welding and bolting	Type of fasteners will stated where necessary	
CESMM3	Fabrication of main members for bridges	1.1 1.2 1.3	Rolled sections Plates or flats Built-up box or hollow sections	Straight on plan Curved on plan Straight on plan and cambered Curved on plan and cambered	t	Mass of members, other than plates or flats, shall be calculated from the overall lengths of the members with no deductions for splay-cut or mitred ends Mass of members shall be that of plates, rolled sections, shear connectors, stiffeners, cleats, packs, splice plates and other fittings No allowance shall be made in measurements for rolling margin and other permissible deviations Mass of weld fillets, bolts, nuts, washers, rivets and protective coatings shall not be measured No deductions shall be made for mass of metal removed to form notches and holes each not exceeding 0.1m2 in are measured in plane		Deem to include delivery of fabricated metalwork to site	Materials and grades of materials used shall be stated Descriptions shall identify tapered or castellated members Descriptions other than for portal frames shall identify cranked members Details of members comprising boom and infill construction shall be stated in item description for trestles, towers and built-up columns and trusses and built-up girders Descriptions for anchorages and holding down bolt assemblies shall state particulars of the type of anchorage or assembly

STEELWORK

		Fabrication of subsidiary members for bridges	2.1	Deck panels			Mass of steel shall be taken as 785kg/m2 per 100mm thickness (7.85t/m3)			Items shall be supported by separate bills of quantities listing each individual component of the composite item in this class
			2.2	Bracings			Masses of other metals shall be taken as stated in scope of work or pricing assumptions or supplier's catalogue			Supporting BOQ shall be in the form on one of the example BOQ in steel construction institute
			2.3	External diaphragms			Anchorages and holding down bolt assemblies shall be measured by the number of complete assemblies			
		Fabrication of members for frames	1	Columns	Straight on plan	t				
			2	Beams	Curved on plan	t				
		Fabrication of other members	3	Portal frames	Straight on plan and cambered	t				
			4	Trestles, towers and built-up columns	Curved on plan and cambered	t				
			5	Trusses and built-up girders		t				
			6	Bracings, purlins & cladding rails		t				
			7	Grillages		t				
			8	Anchorages and holding down bolt assemblies		Nr				
DELIVERY	SABS1200	Delivery to site	8.3.2.1	Normal delivery	Transportation (delivery) of steelwork to site will be scheduled separately Separate items will be scheduled for members that are abnormal in shape, size or mass as warrant special arrangements for their transportation in terms of road traffic ordinance	t	Rates cover cost of transportation from the shop to the site of the works, including handling on and off railway trucks, if required as part of the transit operation, and the cost of any demurrage incurred in connection with the movement of the steelwork			
			8.3.2.2	Extra over for abnormal loads		t				
	SABS1200AAC	Delivery to site	8.3.2.1	Normal delivery	Transportation (delivery) of steelwork to site will be scheduled separately Separate items will be scheduled for members that are abnormal in shape, size or mass as warrant special arrangements for their transportation in terms of road traffic ordinance	t	Rates cover cost of transportation from the shop to the site of the works, including handling on and off railway trucks, if required as part of the transit operation, and the cost of any demurrage incurred in connection with the movement of the steelwork			
			8.3.2.2	Extra over for abnormal loads		t				
	BESMM3	Framing erection	1	Trial erection		t			Erection includes all operations subsequent to fabrication	
			2	Permanent erection on site						
	BESMM3	Permanent formwork	1	Type and method of fixing stated		m2	Curved		Permanent formwork is that which is structurally integral with the framing	
	BESMM3	Cold rolled purlins and cladding rails	1	Type and method of fixing stated		m	Castellated Tapered Curved Cambered Hollow, shape stated			
	BESMM3	Isolated structural member	1	Plain member, use stated	Weight ≤ 40 kg/m			Mass of built up members is calculated as defined from steelwork	Isolated structural member is a member not part of a framing	Isolated structural members are deemed to include fabrication and erection

STEELWORK

ERECTION	BESMM3	Filling hollow sections	2 3 1 2	Built-up member use and details of construction stated Fittings Water Concrete	Weight 40 - 100kg/m Weight > 100kg/m Details stated	Item		Fixing bolts are measured in accordance with carpentry	Use as defined under 1st item above Fixing bolts are bolts fixing an isolated structural member to another element	
	SABS1200	Erection on site	8.3.3	Erection on site	Separate items will be scheduled for expansion bolts and other anchorages for handrailing and the like	t/No	Rate cover cost of offloading steelwork from vehicles on site, stacking in a designated area, moving from such area, assembly, erection, aligning, provision of erection equipment, temporary supports and safety measures			
	SABS1200AAC	Erection on site	8.3.3	Erection on site	Separate items will be scheduled for expansion bolts and other anchorages for handrailing and the like	t/No	Rate cover cost of offloading steelwork from vehicles on site, stacking in a designated area, moving from such area, assembly, erection, aligning, provision of erection equipment, temporary supports and safety measures			
	CESMM3	Erection of members for bridges Erection of members for frames Erection of other members	1 2 3 4 5 6 7	Trial erection Permanent erection Site bolts: black Site bolts: HSFG general grade Site bolts: HSFG higher grade Site bolts: HSFG load indicating or load limit types, general grade Site bolts: HSFG load indicating or load limit types, higher grade	Diameter: not exceeding 16mm 16 - 20mm 20 - 24mm 24 - 30mm 30 - 36mm 36 - 42mm stated exceeding 42mm	t t Nr Nr Nr Nr Nr			Deemed to include work carried out after delivery of fabricated metalwork to site Items for site bolts shall be deemed to include supply and delivery to site	Descriptions shall separately identify and locate separate bridges and structural frames and where appropriate parts of bridges or frames Where fixing clips and resilient pads are used to secure overhead crane rails, item descriptions shall so state
SITE WELDING	SABS1200	Site welding	8.3.5	Site welding	Separate items will be scheduled describing the extent, nature and position of site welding	m	Rate cover cost of access, including scaffolding, preparation of weld areas, welding, including supply of consumables and equipment, and the cleaning up of the weld, including grinding, if necessary, and removal of weld spatter			
	SABS1200AAC	Site welding	8.3.5	Site welding	Separate items will be scheduled describing the extent, nature and position of site welding	m	Rate cover cost of access, including scaffolding, preparation of weld areas, welding, including supply of consumables and equipment, and the cleaning up of the weld, including grinding, if necessary, and removal of weld spatter			

STEELWORK

HANDRAILING	SABS1200	Handrailing	8.3.7 8.3.7a 8.3.7b 8.3.7c HD bolts, nuts and washers for each stanchion	Handrails: Handrail assembly complete (drawing number stated) Handrail assembly complete (details given): Horizontal Sloping (measured on slope) Shaped ends Handrail (type stated): Rails only Stanchions only Bends, end closures and accessories		Sum m m No n No No Sets	Rate cover cost of supplying all materials and fixing bolts, assembling and grouting in Rate cover cost of supplying rails, stanchions (with base) complete with nuts and washers as necessary and assembling and installing the rails and stanchions complete with grouting in			
	SABS1200AAC	Handrailing	8.3.7 8.3.7a 8.3.7b 8.3.7c HD bolts, nuts and washers for each stanchion	Handrails: Handrail assembly complete (drawing number stated) Handrail assembly complete (details given): Horizontal Sloping (measured on slope) Shaped ends Handrail (type stated): Rails only Stanchions only Bends, end closures and accessories		Sum m m No m No No Sets	Rate cover cost of supplying all materials and fixing bolts, assembling and grouting in Rate cover cost of supplying rails, stanchions (with base) complete with nuts and washers as necessary and assembling and installing the rails and stanchions complete with grouting in			
	CESMM3	Miscellaneous metalwork	1.4	Handrails		m	Lengths of handrails and bridge parapets shall be measured along their top members			
LADDERS	SABS1200	Ladders	8.3.8	Ladders, complete and installed (drawing number or type and length stated)		No/t	Rate cover cost of supplying all materials for each ladder, including lugs or other means of fixing to walls, floors, etc. as shown on drawing and fabricating, installing and grouting in			
	SABS1200AAC	Ladders	8.3.8	Ladders, complete and installed (drawing number or type and length stated)		No/t	Rate cover cost of supplying all materials for each ladder, including lugs or other means of fixing to walls, floors, etc. as shown on drawing and fabricating, installing and grouting in			
	CESMM3	Miscellaneous metalwork	1.3	Ladders		m	Lengths of ladders shall be measured along the lengths of stringers			Where ladders include safety loops, rest platforms or returned stringers, item descriptions shall so state
NG, ETC.	SABS1200	Flooring	8.3.9 8.3.9a 8.3.9b	Flooring, complete and installed with frames (drawing number stated) Open grid floors Floorplate floors		Sum/m2/No m2/Sum m2/t	Rate cover cost of supplying flooring complete with frames as shown on drawings and cost of all fixings, installing, fixing (including welding, where applicable) and grouting in			
	SABS1200AAC	Flooring	8.3.9 8.3.9a 8.3.9b	Flooring, complete and installed with frames (drawing number stated) Open grid floors Floorplate floors		Sum/m2/No m2/Sum m2/t	Rate cover cost of supplying flooring complete with frames as shown on drawings and cost of all fixings, installing, fixing (including welding, where applicable) and grouting in			

STEELWORK

FLOORI	CESMM3	Miscellaneous metalwork	1.1	Stairways and landings		t				
			1.2	Walkways and platforms		t				
			1.5	Bridge parapets		m				
			1.6	Miscellaneous framing	Angle section Channel section I section Tubular section	m	Lengths of miscellaneous framing shall be measured along the external perimeter of framing			
			1.7	Plate flooring		m2			Items for plate and open grid flooring shall be deemed to include supporting metalwork unless otherwise stated	
			1.8	Open grid flooring		m2				
MISCELLANEOUS	CESMM3	Miscellaneous metalwork	2.1	Cladding		m2				
			2.2	Welded mesh panelling		m2				
			2.3	Duct covers		m2				
			2.4	Tie rods		Nr				
			2.5	Walings		m				
			2.6	Bridge bearings	Roller Slide Rocker Cylindrical Spherical Plain rubber Laminated rubber Rubber pot	Nr				
			2.7	Uncovered tanks	Volume: not exceeding 1m3	Nr				
			2.8	Covered tanks	1 - 3m3 3 - 10m3 10 - 30m3 30 - 100m3 100 - 300m3 300 - 1000m3 stated exceeding 1000m3	Nr				
	SABS1200	Cladding and sheeting	8.2.2	Supply and install cladding and sheeting	Area measured will be that of exposed surface of the finished building Separate items scheduled for side cladding and roof sheeting, subdivided for eachtype of sheeting and finish, each profile and straight and curved sheets	m2	Cover cost of supplying, delivering, storing on site, handling, maoving, installing and fixing sheeting (finished or prepainted) complete with all necessary fasteners, and cutting, notching and waste including scaffolding, temporary supports, hoisting facilities and safet precautions			
			8.2.3	Supply and install ancillaries	Ancillaries such as flashings, ridging, ventilation openings, rainwater goods, cranked or bullnosed sheets and similar lengths of constant profile to be measure in length	m or No	Cover cost of supplying, delivering, storing on site, handling, moving, installing and fixing relevant ancillary item complete and waste, all scaffolding, temporary supports, hoisting facilities and safety precautions			

STEELWORK

CLADDING AND SHEETING					Ancillaries such as separate ventilators, stop-ends, shoes and the like to be measured in number, but where description gives total number of each unit required or the number per metre, this may be included in description of item measured by length Separate items for each type, finish, shape and, when relevant, profile of ancillary item				
			8.2.4	Painting	Not applicable to pre-painted material Separate items for painting applied to cladding and sheeting, applied to ancillaries measured by length, for significantly different heights above ground and for significantly different locations	m2/m/Sum	Cover cost of supplying all painting materials and their applciation in manner specified, inclduing scaffolding and safety precautions required			
			8.2.5	Testing, where ordered	Separate items for each test ordered	Sum	Cover cost of provision of all necessary facilities for setting up each test, carrying it out, repeating the test (if applicable), reporting results and replacing and making good as necessary			
	SABS1200AAC	Cladding and sheeting	8.2.2	Supply and install cladding and sheeting	Area measured will be that of exposed surface of the finished building Separate items scheduled for side cladding and roof sheeting, subdivided for eachtype of sheeting and finish, each profile and straight and curved sheets	m2	Cover cost of supplying, delivering, storing on site, handling, maoving, installing and fixing sheeting (finished or prepainted) complete with all necessary fasteners, and cutting, notching and waste including scaffolding, temporary supports, hoisting facilities and safet precautions			
			8.2.3	Supply and install ancillaries	Ancillaries such as flashings, ridging, ventilation openings, rainwater goods, cranked or bullnosed sheets and similar lengths of constant profile to be measure in length Ancillaries such as separate ventilators, stop-ends, shoes and the like to be measured in number, but where description gives total number of each unit required or the number per metre, this may be included in description of item measured by length Separate items for each type, finish, shape and, when relevant, profile of ancillary item	m or No	Cover cost of supplying, delivering, storing on site, handling, moving, installing and fixing relevant ancillary item complete and waste, all scaffolding, temporary supports, hoisting facilities and safety precautions			

STEELWORK

			8.2.4	Painting	Not applicable to pre-painted material Separate items for painting applied to cladding and sheeting, applied to ancillaries measured by length, for significantly different heights above ground and for significantly different locations	m2/m/Sum	Cover cost of supplying all painting materials and their applciation in manner specified, incldluing scaffolding and safety precautions required			
			8.2.5	Testing, where ordered	Separate items for each test ordered	Sum	Cover cost of provision of all necessary facilities for setting up each test, carrying it out, repeating the test (if applicable), reporting results and replacing and making good as necessary			
FITTINGS	SMM2	Fittings	N11.a	Fittings to unframed steelwork (caps, bases, splice-plates, cleats, brackets, stiffeners, distance pieces, separators)	Each separately stating size and method of fixing	No	Notchings, bolts, rivets and welds shall be given in description of fitting	Fittings to framed steelwork deemed to be included with items and weight of fitting together with weight of associated bolts and rivet heads shall be aggregated with weight of member to which they are attached	Driving rivets on site shall be deemed to be included with items and weight of heads shall be aggregated with weight of work in which they occur	
	MMBZ	Fittings	Q11.a	Fittings to unframed steelwork (caps, bases, splice-plates, cleats, brackets, stiffeners, distance pieces, separators)	Each separately stating size and method of fixing	No	Notchings, bolts, rivets and welds shall be given in description of fitting	Fittings to framed steelwork deemed to be included with items and weight of fitting together with weight of associated bolts and rivet heads shall be aggregated with weight of member to which they are attached	Driving rivets on site shall be deemed to be included with items and weight of heads shall be aggregated with weight of work in which they occur	
HOLES, RIVETS, ETC.	SMM2	Holes	N12	Holes, countersunk holes and tapped holes required for other trades	Separately stating size of hole and thickness of metal	No	Those required to be made on site shall be so described	All other holes shall be deemed to be included with items of both unframed and framed steelwork		
	MMBZ	Holes	Q12	Holes, countersunk holes and tapped holes required for other trades	Separately stating size of hole and thickness of metal	No	Those required to be made on site shall be so described	All other holes shall be deemed to be included with items of both unframed and framed steelwork		
	SMM2	Site rivets	N13.b	Countersinking rivet heads on site		No				
	MMBZ	Site rivets	Q13.b	Countersinking rivet heads on site		No				
	SMM2	Wedging bases and grillages	N14	Wedging under stanchion-bases and under steel grillages	Separately irrespective of number of wedges	No				
	MMBZ	Wedging bases and grillages	Q14	Wedging under stanchion-bases and under steel grillages	Separately irrespective of number of wedges	No				
	SMM2	Turned bolts	N15	Turned bolts	Stating diameter and length	No	Nuts and washers shall be given in description			
	MMBZ	Turned bolts	Q15	Turned bolts	Stating diameter and length	No	Nuts and washers shall be given in description			

STEELWORK

BOLTS	SMM2	Anchor bolts	N16	Anchor bolts	State diameter	kg	Nuts and washers shall be given in description			
	MMBZ	Anchor bolts	Q16	Anchor bolts	State diameter	kg	Nuts and washers shall be given in description			
	SABS1200	Erection bolts	8.3.4	Erection bolts	Separate items will be scheduled for each grade and type of bolt	t/No	Rate cover cost of supplying, delivery and storage on site of bolts, washers and nuts			
	SABS1200AAC	Erection bolts	8.3.4	Erection bolts	Separate items will be scheduled for each grade and type of bolt	t/No	Rate cover cost of supplying, delivery and storage on site of bolts, washers and nuts			
	SABS1200	Holding down bolts	8.3.6	Holding-down bolts	Separate items will be scheduled for each diameter, size and shape of bolt	t/No	Rate cover cost of supplying and delivering HD bolts complete with washers and nuts, and all treading, shaping, anchor plates and frames, as shown on drawings, and stacking them on site ready for installation by others, as directed			
	SABS1200AAC	Holding down bolts	8.3.6	Holding-down bolts	Separate items will be scheduled for each diameter, size and shape of bolt	t/No	Rate cover cost of supplying and delivering HD bolts complete with washers and nuts, and all treading, shaping, anchor plates and frames, as shown on drawings, and stacking them on site ready for installation by others, as directed			
GUTTERS	SMM2	Gutters	N17.a N17.b	Gutters in conjunction with structural steelwork Extra over for gutter fittings (bends, junctions, angles, stopped ends, outlets)	If m state shape of cross section, thickness of metal and method of jointing and securing State separately	kg/m No				
	MMBZ	Gutters	Q17.a Q17.b	Gutters in conjunction with structural steelwork Extra over for gutter fittings (bends, junctions, angles, stopped ends, outlets)	If m state shape of cross section, thickness of metal and method of jointing and securing State separately	kg/t/m No				
TESTING	SABS1200	Testing	8.3.10	Non-destructive testing		h/No	Rate cover cost of carrying out test that is specially required and of supplying the necessary test certificates to the Engineer			
	SABS1200AAC	Testing	8.3.10	Non-destructive testing		h/No	Rate cover cost of carrying out test that is specially required and of supplying the necessary test certificates to the Engineer			
COMMISSIONING	SABS1200	Commissioning	8.3.11	Commissioning (turn key projects)		Sum	Rate cover cost of all materials and operations specified			
	SABS1200AAC	Commissioning	8.3.11	Commissioning (turn key projects)		Sum	Rate cover cost of all materials and operations specified			
	SABS1200	Additional items	8.3.12	Additional items: Daywork rates Trial assembly Destructive tests Machining Dismantling Re-erection Tying-in to existing building	Paid on direct cost basis under daywork or on a pre-agreed basis of a sum for provision of equipment, etc.					

STEELWORK

ADDITIONAL				Coding of welders Independent testing Radiographic or ultrasonic testing						
	SABS1200AAC	Additional items	8.3.12	Additional items: Daywork rates Trial assembly Destructive tests Machining Dismantling Re-erection Tying-in to existing building Coding of welders Independent testing Radiographic or ultrasonic testing	Paid on direct cost basis under daywork or on a pre-agreed basis of a sum for provision of equipment, etc.					
	BESMM3	Surface preparation	1 2 3 4 5	Blast cleaning Picking Wire brushing Flame cleaning Others, details stated		m2				Type of preparation, details of application and timing
	BESMM3	Surface treatment	1 2 3 4	Galvanising Sprayed metal coating Protective painting Others, details stated		m2				
	SMM2	Painting	N18	Painting by steel fabricator or erector	Stating preparation of surface, number of coats to be applied and whether executed at steelworks or at site before erection of after erection	m2	Parts treated shall be briefly described			
	MMBZ	Painting	Q18	Painting by steel fabricator or erector	Stating preparation of surface, number of coats to be applied and whether executed at steelworks or at site before erection of after erection	kg/t	Parts treated shall be briefly described	Weight of steel to be treated		
	SABS1200	Surface dressing and repairs	8.2.1	Surface dressing and repairs at place of fabrication	Measured as mass of steelwork as scheduled	t	Rate cover cost of removing slag and weld spatter, grinding welds to a smooth profile, chamfering or radiusing sharp edges, deburring, repairing laminations, inspections, testing and testing documentation, if applicable			
	SABS1200AAC	Surface dressing and repairs	8.2.1	Surface dressing and repairs at place of fabrication	Measured as mass of steelwork as scheduled	t	Rate cover cost of removing slag and weld spatter, grinding welds to a smooth profile, chamfering or radiusing sharp edges, deburring, repairing laminations, inspections, testing and testing documentation, if applicable			
	SABS1200	Transporting	8.2.2	Transport	Transport to and from coating site will be measured in terms of the mass of steelwork as scheduled	t	Rate cover cost of transporting the steelwork to and from the coating site inclusive of dunnage			
	SABS1200AAC	Transporting	8.2.2	Transport	Transport to and from coating site will be measured in terms of the mass of steelwork as scheduled	t	Rate cover cost of transporting the steelwork to and from the coating site inclusive of dunnage			

STEELWORK

CORROSION PROTECTION	SABS1200	Surface preparation and coating application	8.2.3 8.2.3a 8.2.3b	Surface preparation and coating application: In the shop On site	Measured by gross length of stated section, gross area or gross mass of steelwork as scheduled, including the length, area of mass of the portion of the steelwork not coated, such as a portion that is to be embedded and the underside of baseplates	m/m2/t m/m2/t	Rate covers cost of surface preparation as specified, the supply and application of the coatings, the repair of damaged areas, inspection, testing and testing documentation	If applicable unit rate shall include the cost of cleaning down of the surfaces and the repairing of shop coats		
	SABS1200AAC	Surface preparation and coating application	8.2.3 8.2.3a 8.2.3b	Surface preparation and coating application: In the shop On site	Measured by gross length of stated section, gross area or gross mass of steelwork as scheduled, including the length, area of mass of the portion of the steelwork not coated, such as a portion that is to be embedded and the underside of baseplates	m/m2/t m/m2/t	Rate covers cost of surface preparation as specified, the supply and application of the coatings, the repair of damaged areas, inspection, testing and testing documentation	If applicable unit rate shall include the cost of cleaning down of the surfaces and the repairing of shop coats		
	CESMM3	Off site surface treatment	8.1 8.2 8.3 8.4 8.5 8.6 8.7	Blast cleaning Pickling Flame cleaning Wire brushing Metal spraying Galvanising Painting		m2	Surface treatment carried out on site shall be classes as painting			Materials and number of applications shall be stated in item description for metal spraying, galvanizing and painting
	SABS1200	Site establishment	8.2.4	Establishment on site for corrosion protection	Measurement and payment will only be made for this item when it is specified that the application of corrosion protection be carried out on site and when such an item has been scheduled	Sum	Race covers cost of carrying out these operations, the cost of which does not vary with the amount of corrosion protection applied, the establishment on site and the subsequent removal of all special plant and equipment used for the application of corrosion-protection coatings	Work will be paid as a lump sum of which 75% will become payable when all equipment is on site and the first item has been protected against corrosion, and the remaining 25% will become payable after corrosion protection has been completed and the equipment has been removed from site	Where no item has been scheduled, the costs will be held to have been covered by the tendered rates given for the items requiring corrosion protection	
	SABS1200AAC	Site establishment	8.2.4	Establishment on site for corrosion protection	Measurement and payment will only be made for this item when it is specified that the application of corrosion protection be carried out on site and when such an item has been scheduled	Sum	Race covers cost of carrying out these operations, the cost of which does not vary with the amount of corrosion protection applied, the establishment on site and the subsequent removal of all special plant and equipment used for the application of corrosion-protection coatings	Work will be paid as a lump sum of which 75% will become payable when all equipment is on site and the first item has been protected against corrosion, and the remaining 25% will become payable after corrosion protection has been completed and the equipment has been removed from site	Where no item has been scheduled, the costs will be held to have been covered by the tendered rates given for the items requiring corrosion protection	

STEELWORK

	BESMM3	Localised protective coating	1	Type stated		m2	Grooves, throats, flutes and rebase are only measured separately on superficial items of masonry and attached piers			

PIPES

GENERAL RULES

BESMM3	Information to be supplied in General Conditions or on Drawings: 1. Scope and location of the work, including extent of work in motor, machinery or plant room Work in plant rooms is identified separately Finishes and surface treatments exclude insulation and decorative finishes which are measure under thermal insulation and painting Providing everything necessary for jointing is deemed to be included Patterns, moulds, templates and the like are deemed to be included Specified codes of practice and regulations Kind and quality of materials Gauge, thickness or substance of materials Tests with which materials must comply Finishes or surface treatments applied on site Finishes or surface treatments applied off site stating whether applied before or after fabrication or assembly
SMM2	Work shall be grouped as follows: 1. Rainwater installation 2. Cold and hot water installation 3. Fire fighting installation 4. Foul drainage above ground 5. Sanitary installation Particulars of following shall be given: 1. Any regulations, rules, byelaws and the like which the installation is required to comply 2. Kind of material 3. Quality of material 4. Gauge, thickness or substance of material 5. Any tests with which materials, plant and equipment are required to comply Assembling and jointing together the component parts of composite units and providing any necessary mating flanges and jointing materials shall be deemed to be included with items concerned Work required to be primed or painted before delivery to the site shall be so described Work required to be galvanised, chromium-plated, stove-enamelled, porcelain-enamelled, anodized or otherwise specially finished shall be appropriately described stating whether treated before or after manufacture or assemb Method of fixing and provision of nails, bolts, nuts, holes, screws, plugs, shot-fired pins and the like shall be given in description of wor Nature of background to which work is fixed shall be given in the description of the work. Backgrounds shall be grouped as follows 1. Building board (include hardboard, asbestos-cement sheet, plasterboard, fibre board, and similar materials which do not grip a wood screw 2. Timber (include softwood, hardwood, block board, plywood and similar material which will grip a wood screw 3. Metal faced or composition faced timber (include faced block board, faced ply-wood and similar materials which grip a wood screw when a lead hole and a shank clearance hole have been drilled 4. Brickwork, concrete or stonework (include reinforced concrete, blockwork and similar materials) irrespective of any plaster, glazed tiles, composition or other finish (exclude glass) to surfac 5. Plain metal (include metal which requires drilling) 6. Glass (include any material resembling glass) Temporary work shall be so described. Removing temporary work and making good after, shall be deemed to included with item Adequate drawings and specifications of installations shall be provided with the bil
MMBZ	Work shall be grouped as follows: 1. Rainwater installation 2. Sanitary installation 3. Cold and hot water installation 4. Heating installation stating the type 5. Ventilating and air conditioning installation stating the type 6. Fire fighting installation 7. Hydraulic installation 8. Compressed air installation 9. Gas installation stating the type Particulars of following shall be given: 1. Any regulations, rules, byelaws and the like which the installation is required to comply 2. Kind of material 3. Quality of material 4. Gauge, thickness or substance of material 5. Any tests with which materials, plant and equipment are required to comply Assembling and jointing together the component parts of composite units and providing any necessary mating flanges and jointing materials shall be deemed to be included with items concerned Where composite units are supplied by the employer, particulars of the assembly work involved shall be given Patterns, moulds, templates and the like shall be deemed to be included with the items Work required to be primed or painted before delivery to the site shall be so described Work required to be galvanised, chromium-plated, stove-enamelled, porcelain-enamelled, anodized or otherwise specially finished shall be appropriately described stating whether treated before or after manufacture or assemb Method of fixing and provision of nails, bolts, nuts, holes, screws, plugs, shot-fired pins and the like shall be given in description of wor Nature of background to which work is fixed shall be given in the description of the work. Backgrounds shall be grouped as follows 1. Building board (include hardboard, asbestos-cement sheet, plasterboard, fibre board, and similar materials which do not grip a wood screw 2. Timber (include softwood, hardwood, block board, plywood and similar material which will grip a wood screw 3. Metal faced or composition faced timber (include faced block board, faced ply-wood and similar materials which grip a wood screw when a lead hole and a shank clearance hole have been drilled 4. Brickwork, concrete or stonework (include reinforced concrete, blockwork and similar materials) irrespective of any plaster, glazed tiles, composition or other finish (exclude glass) to surfac

PIPES

	5. Plain metal (include metal which requires drilling 6. Glass (include any material resembling glass) Heating, ventilating and air conditioning work within boiler houses and plant rooms and such work external to buildings shall be so described in each cas Temporary work shall be so described. Removing temporary work and making good after, shall be deemed to included with iten Adequate drawings and specifications of installations shall be provided with the bil Purpose made pipes and purpose made pipe fittings shall each be so described. Purpose made curved pipes shall be so described stating the mean radiu Wrapped, coated or lined pipe work shall be so described stating the type of treatmen Pipework required to be temporarily fixed in position, dismantled for chromium plating and subsequently refixed shall be so describe									
SABS1200	Definitions: 1. Fitting: a special or valve or any process of jointing (except welding) straight pipes to one another and to specials and valve 2. Special: any pipe other than a straight pipe. Under this definition are included all sizes of specials such as bends, tees, crosses, angle branches, reducers and adapter 3. Straight pipe: a straight pipe of uniform bore and of standard or non-standard length Excavation and backfilling of trenches and laying of medium-pressure pipelines, will be measured separately under SABS1200DE									
SABS1200AAC	Definitions: 1. Fitting: a special or valve or any process of jointing (except welding) straight pipes to one another and to specials and valve 2. Special: any pipe other than a straight pipe. Under this definition are included all sizes of specials such as bends, tees, crosses, angle branches, reducers and adapter 3. Straight pipe: a straight pipe of uniform bore and of standard or non-standard length Excavation and backfilling of trenches and laying of medium-pressure pipelines, will be measured separately under SABS1200DE									
CESMM3	Items for fittings and valves shall be deemed to include supply of materials by contractor, unless otherwise stated Items for fittings and valves shall be deemed to include excavation, preparation of surfaces, disposal of excavated material, upholding sides of excavation, backfilling and removal of dead services except to the extent that such work is included in classes EA, I, K and Centre line for multiple pipes, ducts or culverts shall be the line equidistant between the inside faces of the outer pipe wall Items for work in manholes and pipework ancillaries shall include excavation, preparation of surfaces, disposal of excavated material, upholding sides of excavation backfilling and removal of dead services, except to the extend that such work is included i classes EA if expressly required and I, J and L Items for work in manholes and pipework ancillaries shall be deemed to include concrete, reinforcement, formwork, joints and finishe									
BESMM3	Pipes	1 2 3 4 5	Straight Curved, radii stated Flexible Extendable Flow and return header pipes	Type, nominal size, method of jointing, type, spacing and method of fixing supports stated Type, length and nominal size of main pipe, number, type, length and diameter of each branch pipe, method of construction and method of jointing ends, type, number and method of fixing support stated	m nr	Background stated In ducts In trenches In chases In floor screeds In in-situ concrete	Pipes are measured over all fittings and branches Flexible and extendable pipes are measured fully extended		Pipes are deemed to include joints in their running lengths Pipes are deemed to include joints necessary solely for erection purposes
SMM2	Pipes	Q7	Pipes	State type and nominal size, method of jointing	m	Classification according to purpose for which pipes are installed (over-flow, waste, soil, etc.) Measured over all pipe fittings, short running lengths and branches	Flexible pipe and extensible pipes (measured as fully extended) shall each be so described	Pipes laid or fixed in ducts, trenches and chases and pipes embedded in floor screed shall be so described	No distinction shall be made between pipes fixed vertically, horizontally or to falls Pipe supports (clips, saddles, pipe hooks, holder bats) shall be given in description of pipes
MMBZ	Pipes	S8	Pipes	State type and nominal size, method of jointing	m	Classification according to purpose for which pipes are installed (over-flow, waste, soil, etc.) Measured over all pipe fittings, short running lengths and branches	Flexible pipe and extensible pipes (measured as fully extended) shall each be so described	Pipes laid or fixed in ducts, trenches and chases and pipes embedded in floor screed shall be so described	Pipe supports (clips, saddles, pipe hooks, holder bats) shall be given in description of pipes

PIPES

PIPES	SABS1200	Pipes	8.2.1	Supply, lay and bed pipes complete with couplings	Separate items will be scheduled for each diameter and each type and class of pipe laid	m	Rate cover cost of provision of the pipes complete with couplings and the cost of handling, inspecting, transporting, bedding, laying, jointing, cutting, testing and when relevant disinfecting of the pipes and the joints	Pipelines will be measured by length over all lengths as laid and not deduction will be made for specials and valves		
	SABS1200AAC	Pipes	8.2.1	Supply, lay and bed pipes complete with couplings	Separate items will be scheduled for each diameter and each type and class of pipe laid	m	Rate cover cost of provision of the pipes complete with couplings and the cost of handling, inspecting, transporting, bedding, laying, jointing, cutting, testing and when relevant disinfecting of the pipes and the joints	Pipelines will be measured by length over all lengths as laid and not deduction will be made for specials and valves		
	CESMM3	Clay pipes	1	Nominal bore: not exceeding 200mm	Not in trenches	m	Commencing surface adopted in preparation of BOQ shall be adopted for measurement of completed work	Pipes not in trenches shall include pipes suspended or supported above the ground or other surface, pipes in headings, tunnels or shafts, pipes installed by thrust boring and pipe jacking and pipes laid within volumes measured separately for excavation	Items for pipes shall be deemed to include supply of all materials unless otherwise stated	Location or type of pipework in each item or group of items shall be stated in descriptions so that pipe runs can be identified by reference to drawings Materials, joint types, nominal bores and lining requirements of pipes shall be stated and reference given to applicable standards and specified qualities
		Concrete pipes	2	200 - 300mm	In trenches, depth: not exceeding 1.5m	m	Backfilling of trenches shall not be measured except for french and rubble drains and for backfilling with material other than excavated from the trenches	Pipes not in trenches shall be classed as such only where pipes are expressly required not to be laid in trenches	Items shall deem to include pipe cutting	
		Iron pipes	3	300 - 600mm	1.5 - 2m	m	Lengths of pipes shall be measured along the centre lines	Depths used for classification of pipes in trenches shall be measured from the commencing surface to the inverts of pipes	If item for trenches for pipes, ducts and metal culverts of class EA is not expressly required, items for pipes in trenches shall be deemed to include excavation, preparation of surfaces, disposal of excavated material, upholding sides of excavation, backfilling and removal of dead services except to the extent that such work is included in classes J, K and L	Item descriptions for pipes not in trenches shall distinguish between the different categories of pipes Commencing surface shall be identified in description of each item of work involving excavation if item for trenches for pipes, ducts and metal culverts of class EA is not expressly required or for each item for pipes in trenches if the item for trenches for pipes, ducts and metal culverts of class EA is expressly required, for which the commencing surface is not also the original surface
		Steel pipes	4	600 - 900mm	2 - 2.5m	m	Lengths of pipes in trenches shall include lengths for fittings and valves and exclude lengths occupied by pipes and fittings comprising backdrops to manholes			

PIPES

		Polyvinyl chloride pipes	5	900 - 1200mm	2.5 - 3m	m	Lengths of pipes not in trenches shall exclude lengths occupied by fittings and valves Additional items shall be given in classes K and L for work in connections with pipes not in trenches other than provision, laying and jointing pipes Lengths of pipes entering manholes and other chambers shall be measured to the inside surfaces of the chambers except that pipes and fittings comprising backdrops to manholes shall be included in items for manholes measured in class K			Where more than one pipe is expressly required to be laid in one trench the item description for each pipe shall so state and also identify the pipe run Where pipes are laid in French or rubble drains item descriptions shall so state Trench depths exceeding 4m shall be stated in item to the next higher multiple of 0.5m Item descriptions shall identify separately excavation which is expressly required to be carried out by hand
		Glass reinforced plastic pipes	6	1200 - 1500mm	3 - 3.5m	m				
		High density polyethylene pipes	7	1500 - 1800mm	3.5 - 4m	m				
		Medium density polyethylene pipes	8	exceeding 1800mm	exceeding 4m	m				
SHORT PIPES	SABS1200	Short pipe runs	8.2.5	Supply and place pipes, valves and specials (short pipe runs)	Short pipe runs that include frequent bends or other specials will be measured in terms of the quantities of scheduled items such as bends, tee, reducers, valves and stated lengths (or stated approximate lengths) of straight pipe	No	Rate cover cost for provision of each pipe, special, and valve and, as applicable, the fixing, anchoring or bedding of them in the manner shown on the drawings or required in terms of the project specification			
	SABS1200AAC	Short pipe runs	8.2.5	Supply and place pipes, valves and specials (short pipe runs)	Short pipe runs that include frequent bends or other specials will be measured in terms of the quantities of scheduled items such as bends, tee, reducers, valves and stated lengths (or stated approximate lengths) of straight pipe	No	Rate cover cost for provision of each pipe, special, and valve and, as applicable, the fixing, anchoring or bedding of them in the manner shown on the drawings or required in terms of the project specification			
SPECIAL PIPE LAYING	CESMM3	Special pipe laying methods	2.1	In headings	Nominal bore: not exceeding 200mm	m	Shall be measured only where they are expressly required Access pits, shafts and jacking blocks, where expressly stated in contract to be executed by contractor and of which the nature and extent are expressly stated in contract, shall be measured as specified requirements in class A		Items shall include crossings, provision and removal of access pits, shafts and jacking blocks unless otherwise stated and other work associated with special pipe laying methods not included in the item for provision, laying and jointing of pipes in class I	Descriptions shall identify the run of pipe or pipes and type of packing
			2.2	Thrust boring	200 - 300mm					
			2.3	Pipe jacking	300 - 600mm					
					600 - 900mm					
					900 - 1200mm					
					1200 - 1500mm					
					1500 - 1800mm					
					stated exceeding 1800mm					

PIPES

JOINTS	SMM2	Pipe joints	Q9				Providing materials, heat, bolts, nuts, washers and everything else necessary for making joints shall be deemed to be included with item	Joints and connectors in running length shall be given in description of the pipe state method of jointing	Cutting and pinning ends of pipe supports; ears cast, soldered or welded on to pipes shall be given in the description of pipes	
			Q9.c	Extra over pipes for ornamental joints		No				
			Q9.d	Extra over for reducing joints		No	Classification either soldered branch joints or welded reducing joints			
			Q9.e	Extra over for branch joints		No	Classification either soldered branch joints or welded branch joints stating type of branch (square, angle, sweep)	Perforating pipe shall be deemed to be included with item		
			Q9.f	Screwed sockets, tappings, bosses and welding-necks welded to pipes or flanges	State size and kind of pipe and method of jointing	No		Perforating pipe shall be deemed to be included with item		
			Q9.g	Special connections and special joints	State size and kind of pipe and method of jointing	No	Classification shall be: Connections between pipes of differing materials connections between pipes and appliances or equipment stating the nature of the appliance or equipment isolated joints which differ from those given in description of pipe (flanged joints having welded joints generally) expansion joints stating the type of joint (bellows, sliding) and amount of expansion to be accommodated			
			Q9.h	Connecting ends of flue pipe to boilers, stone chimneys and the like	State size and kind of pipe and method of jointing and type of packing required	No				
	MMBZ	Pipe joints	S9				Providing materials, heat, bolts, nuts, washers and everything else necessary for making joints shall be deemed to be included with item	Joints in running length shall be given in description of the pipe state method of jointing		
			S9.c	Extra over pipes for ornamental joints		No				
			S9.d	Extra over for reducing joints		No	Classification either soldered branch joints or welded reducing joints			
			S9.e	Extra over for branch joints		No	Classification either soldered branch joints or welded branch joints stating type of branch (square, angle, sweep)			
			S9.f	Screwed sockets, tappings, bosses and welding-necks welded to pipes or flanges	State size and kind of pipe or flange	No				
			S9.g	Special connections and special joints	State size and kind of pipe and method of jointing	No	Classification shall be: Connections between pipes of differing materials Connections between pipes and appliances or equipment stating the nature of the appliance or equipment Isolated joints which differ from those given in description of pipe (flanged joints having welded joints generally) Expansion joints stating the type of joint (bellows, sliding) and amount of expansion to be accommodated			
			S9.h	Connecting ends of flue pipe to boilers, stone chimneys and the like	State size and kind of pipe and method of jointing and type of packing required	No				

PIPES

	SABS1200	Joints with machined collars and special couplings	8.2.6	Extra over pipes/valves/specials for supplying and installing joints with machined collars and special couplings	Details of special couplings required will be given in schedule	No	Rate cover cost of providing pipes with machined collars and slip-on couplings as scheduled, and of installation complete			
	SABS1200AAC	Joints with machined collars and special couplings	8.2.6	Extra over pipes/valves/specials for supplying and installing joints with machined collars and special couplings	Details of special couplings required will be given in schedule	No	Rate cover cost of providing pipes with machined collars and slip-on couplings as scheduled, and of installation complete			
	SABS1200	Encasing joints	8.2.7	Extra over pipes for encasing joints	Where wrapping or protection of joints, etc. is ordered, payment will be made as an extra-over per joint	No	Rate cover cost of material, plant and labour necessary for the completion of the joint			
	SABS1200AAC	Encasing joints	8.2.7	Extra over pipes for encasing joints	Where wrapping or protection of joints, etc. is ordered, payment will be made as an extra-over per joint	No	Rate cover cost of material, plant and labour necessary for the completion of the joint			
SPECIAL PIPES	SMM2	Special pipework	Q8.a Q8.b Q8.c	Curved pipes Wrapped, coated or lined pipework Pipework temporarily fixed in position, dismantled for chromium-plating and subsequently refixed	State mean radius State type of treatment	m m m				
CONCRETE WORKS	SABS1200	Concrete bedding cradle	8.2.3	Concrete bedding cradle		m3	Rate cover cost of providing and placing concrete screed and cradle and when relevant formwork for pipes of all diameters regardless of the method of construction			
	SABS1200AAC	Concrete bedding cradle	8.2.3	Concrete bedding cradle		m3	Rate cover cost of providing and placing concrete screed and cradle and when relevant formwork for pipes of all diameters regardless of the method of construction			
	SABS1200	Concrete casing	8.2.12	Concrete casing	Measured net volume to specified width and depth in excess of the external volume of the pipe (volume of pipe will be deducted)	m3	Rate cover cost of formwork (including stop ends at flexible joints) and concrete			
	SABS1200AAC	Concrete casing	8.2.12	Concrete casing	Measured net volume to specified width and depth in excess of the external volume of the pipe (volume of pipe will be deducted)	m3	Rate cover cost of formwork (including stop ends at flexible joints) and concrete			
	SABS1200	Encasing pipe in concrete	8.2.4	Encasing of pipes in concrete	Separate items scheduled for each size of pipe and for each grade of concrete specified	m3	Cover cost of dealing with any excavation (in all materials including dispose of surplus) that is additional to that measured under item for pipe trench excavation, the cost of encasing pipe in concrete including cost of formwork and cost of formwork to form flexible joints at 4m centres	Volume computed from dimensions of concrete given on drawing		
	SABS1200AAC	Encasing pipe in concrete	8.2.4	Encasing of pipes in concrete	Separate items scheduled for each size of pipe and for each grade of concrete specified	m3	Cover cost of dealing with any excavation (in all materials including dispose of surplus) that is additional to that measured under item for pipe trench excavation, the cost of encasing pipe in concrete including cost of formwork and cost of formwork to form flexible joints at 4m centres	Volume computed from dimensions of concrete given on drawing		

PIPES

WRAPPING, ETC.	SABS1200	Special wrapping	8.2.15	Special wrapping in corrosive soil (diameter and location stated)		m	Rate cover cost of provision and fixing of wrapping and the cost of any delay and inconvenience caused by the requirement to wrap			
	SABS1200AAC	Special wrapping	8.2.15	Special wrapping in corrosive soil (diameter and location stated)		m	Rate cover cost of provision and fixing of wrapping and the cost of any delay and inconvenience caused by the requirement to wrap			
	CESMM3	Wrapping and lagging	6		Nominal bore: not exceeding 200mm 200 - 300mm 300 - 600mm 600 - 900mm 900 - 1200mm 1200 - 1500mm 1500 - 1800mm stated exceeding 1800mm	m	Lengths shall be measured along each pipe centre line including lengths occupied by fittings and valves but not including lengths occupied by manholes and other chambers through which the pipes are not continued		Include wrapping and lagging of fittings, valves and joints	Materials used shall be stated in description
FITTINGS	BESMM3	Items extra over the pipes in which they occur	1 Made bends 2 Special joints and connections 3 Fittings, pipe ≤ 65mm diameter 4 Fittings, pipe > 65mm diameter		Type and method of jointing stated One end Two ends Three ends Others, details stated Type stated	nr	Nominal size stated where different from pipe in which joint occurs With inspector door Method of jointing stated where different from pipe in which fitting occurs	Fittings which are reducing are measured extra over the largest pipe in which they occur	Special joints and connections are joints which differ from those generally occurring in the running length or are connections to pipes of a different profile or material, connections to existing pipes or to equipment, appliances or ends of flue pipes	Cutting and jointing pipes to fittings, loops and compensators is deemed to be included
	SMM2	Pipe fittings	Q11.a Extra over pipes for pipe fittings Q11.b Extra over pipes for pipe closers measured on site and cut to exact length			No No	Separate for bends, springs, swan-necks, offsets, y-junctions, double Y-junctions, shoes, blank flanges, puddle flanges, bushes, reducers, elbows, twin-elbows, tees, crosses, unions	Cutting and fitting pipes to all fittings shall be deemed to be included with items		
	MMBZ	Pipe fittings	S11.a	Extra over pipes for pipe fittings	Mild steel pipes not exceeding 20mm diameter and copper pipes not exceeding 15mm shall be deemed to include all fittings	No	Separate for bends, springs, swan-necks, offsets, y-junctions, double Y-junctions, shoes, blank flanges, puddle flanges, bushes, reducers, elbows, twin-elbows, tees, crosses, unions	Cutting and fitting pipes to all fittings shall be deemed to be included with items	All short lengths shall be deemed to be included with items	
	SABS1200	Specials	8.1.2	Extra over pipes for supplying, laying and bedding of specials complete with couplings		No				

PIPES

	SABS1200AAC	Specials	8.1.2	Extra over pipes for supplying, laying and bedding of specials complete with couplings		No				
	CESMM3	Clay pipe fittings	1	Bends	Nominal bore: not exceeding 200mm	Nr	Pipe fittings comprising backdrops to manholes shall be included in the items for manholes	Pipe fittings on pipes of different nominal bores shall be classified in the third division according to nominal bore of the largest pipe	items for straight specials shall be deemed to include cutting	Materials, joint types, nominal bores and lining requirements of pipe fittings shall be stated in descriptions and reference given to applicable standards and specified qualities
		Concrete pipe fittings	2	Junctions and branches	200 - 300mm	Nr	Straight specials shall be measured only where they are expressly required	A straight special is a length of pipe either cut to length or made to order		Fittings will puddle flanges shall be so described
		Iron or steel pipe fittings	3	Tapers	300 - 600mm	Nr	Straight specials shall not be measured where they are necessitated only by the layout of the work			Item description for pipe fittings to cast iron or spun iron pipework of nominal bore exceeding 300mm and to all steel pipework shall state the principal dimensions of each fitting
		Polyvinyl chloride pipe fittings	4	Double collars	600 - 900mm	Nr	Pipe runs between manholes, chambers and other structures whose lengths are not an exact multiple of a standard pipe length shall be deemed to require straight specials only if they are expressly required as rocker pipes			Vertical bends in pipework of which nominal bore exceeds 300mm shall be so described
		Glass reinforced plastic pipe fittings	5	Adaptors	900 - 1200mm	Nr				Fittings to pipework not in trenches shall be so described
		High density polyethylene pipe fittings	6	Glands	1200 - 1500mm	Nr				Fittings to relined water mains measured in class Y shall be so described
		Medium density polyethylene pipe fittings	7	Bellmouths	1500 - 1800mm	Nr				
			8	Straight specials	exceeding 1800mm					
CUTTING & COUPLING	SABS1200	Cutting and coupling	8.1.4	Extra over pipes for cutting of the pipe and the supplying and fixing of the extra coupling	Separate items for each size of pipe	No	Rate cover cost of cutting of the pipe and of supplying and fitting of the additional coupling and of the delivery of unused off-cuts of pipes to the Engineer's office or store			
	SABS1200AAC	Cutting and coupling	8.1.4	Extra over pipes for cutting of the pipe and the supplying and fixing of the extra coupling	Separate items for each size of pipe	No	Rate cover cost of cutting of the pipe and of supplying and fitting of the additional coupling and of the delivery of unused off-cuts of pipes to the Engineer's office or store			
EXPANSIONS	BESMM3	Expansion loops	1	Type, nominal size, method of jointing, number and method of fixing any supports stated	Limiting dimension and expansion accommodated stated	nr	Background and method of fixing stated In ducts In trenches			
	BESMM3	Expansion compensators			Expansion accommodated stated	nr				
LABOURS	SMM2	Labours on pipes	Q10	Extra over pipe for labours (made bends, made springs, made offsets)		No				
	MMBZ	Labours on pipes	S10	Extra over pipe for labours (made bends, made springs, made offsets)	Pipes not exceeding 20mm diameter shall be deemed to be included in item	No				

PIPES

OLD PIPELINE	SABS1200	Remove old pipeline	8.2.8	Remove old pipeline (depth range stated)	Total length of pipeline ordered to be removed will be measured by length for each stated depth range and no deduction will be made for valves, specials and the like	m	Rate cover cost of excavation and removal of the pipes, valves and fittings from the trench, the handling and transporting to the Contractor's store on site, the cleaning and listing of the salvaged recovered materials and the backfilling of the trench			
	SABS1200AAC	Remove old pipeline	8.2.8	Remove old pipeline (depth range stated)	Total length of pipeline ordered to be removed will be measured by length for each stated depth range and no deduction will be made for valves, specials and the like	m	Rate cover cost of excavation and removal of the pipes, valves and fittings from the trench, the handling and transporting to the Contractor's store on site, the cleaning and listing of the salvaged recovered materials and the backfilling of the trench			
	SABS1200	Test and relay pipeline	8.2.9a	Test recovered pipes on site before relaying		No	Rate cover cost of provision of suitable testing equipment and the carrying out of the specified test	Couplings and bolts that have to be replaced will be paid for at daywork rates unless a suitable item such as c below has been provided in the schedule or, in the opinion of the Engineer, the need for their replacement arose from the fault or negligence of the Contractor		
			8.2.9b	Relay pipeline		m	Rate cover cost of transporting, handling, laying and bedding as well as the provision of new rubber rings or insertions, as the case may be			
			8.2.9c	Joints and couplings for recovered pipeline (provisional)		No	Rate cover cost of provision of complete sets, each comprising a new rubber ring or insertion, as the case may be, as well as all elements of the coupling and bolts that need replacement			
	SABS1200AAC	Test and relay pipeline	8.2.9a	Test recovered pipes on site before relaying		No	Rate cover cost of provision of suitable testing equipment and the carrying out of the specified test	Couplings and bolts that have to be replaced will be paid for at daywork rates unless a suitable item such as c below has been provided in the schedule or, in the opinion of the Engineer, the need for their replacement arose from the fault or negligence of the Contractor		
			8.2.9b	Relay pipeline		m	Rate cover cost of transporting, handling, laying and bedding as well as the provision of new rubber rings or insertions, as the case may be			
			8.2.9c	Joints and couplings for recovered pipeline (provisional)		No	Rate cover cost of provision of complete sets, each comprising a new rubber ring or insertion, as the case may be, as well as all elements of the coupling and bolts that need replacement			

PIPES

VALVES	SMM2	Valves and cocks	Q32	Valves, cocks, taps and other special fittings	State type and size	No	Those with extended spindles shall be so described stating the length of the spindle and detail of integral locking devices and remote operating gear	Those with hose-unions shall be so described	Connecting ends of valves, cocks and the like to pipes and appliances shall be given in descriptions stating the kind and type of pipework and appliance and the method of jointing thereto	
	MMBZ	Valves and cocks	S37	Valves, cocks, taps and other special fittings	State type and size	No	Those with extended spindles shall be so described stating the length of the spindle and detail of integral locking devices and remote operating gear	Those with hose-unions shall be so described	Connecting ends of valves, cocks and the like to pipes and appliances shall be given in descriptions stating the kind and type of pipework and appliance and the method of jointing thereto	
	SABS1200	Valves	8.1.3	Extra over pipes for supplying, fixing and bedding of valves	Measured by number of each type, class and size	No	Rate cover cost of provision of each special or valve, complete with couplings and the cost of handling, fixing, bedding and testing of the special or valve, as applicable, and the cutting of the pipes	No extra payment over and above the rates will be made n respect of any additional cutting, turning and jointing of pipes required for the location of valves, specials, etc. in the positions given on the drawings	Unless specific provision is made in the schedule, no separate payment will be made for the supply and fitting of any additional joints and jointing materials which may be required for the connection of shortened pipe lengths	
	SABS1200AAC	Valves	8.1.3	Extra over pipes for supplying, fixing and bedding of valves	Measured by number of each type, class and size	No	Rate cover cost of provision of each special or valve, complete with couplings and the cost of handling, fixing, bedding and testing of the special or valve, as applicable, and the cutting of the pipes	No extra payment over and above the rates will be made n respect of any additional cutting, turning and jointing of pipes required for the location of valves, specials, etc. in the positions given on the drawings	Unless specific provision is made in the schedule, no separate payment will be made for the supply and fitting of any additional joints and jointing materials which may be required for the connection of shortened pipe lengths	
	SABS1200	Temporary valves, etc.	8.2.10	Temporary valves , etc.	Payment for supply or loan of temporary valves, end caps, blank flanges, or other isolating devices ordered by the Engineer will be made at daywork rates or at a price to be agreed by the Engineer, unless method of payment has been dealt with in project specification and suitable item included in schedule	No/Sum				
	SABS1200AAC	Temporary valves, etc.	8.2.10	Temporary valves , etc.	Payment for supply or loan of temporary valves, end caps, blank flanges, or other isolating devices ordered by the Engineer will be made at daywork rates or at a price to be agreed by the Engineer, unless method of payment has been dealt with in project specification and suitable item included in schedule	No/Sum				

PIPES

	CESMM3	Valves and penstocks	8.1 8.2 8.3 8.4 8.5 8.6 8.7 8.8	Gate valves: hand operated Gate valves: power operated Non-return valves Butterfly valves: hand operated Butterfly valves: power operated Air valves Pressure reducing valves Penstocks		Nr				Materials, nominal bores and any additional requirements such as joints, draincocks, extension spindles and brackets shall be stated in description and reference give to applicable standard specifications and specified qualities Valves and penstocks to reline water mains measured in class Y shall be so described
PIPE SUPPORTS	BESMM3	Pipe supports which differ from those given with pipelines			Nominal size of pipe, type and size of support, method of fixing pipe and supports stated	nr	Lined with insulation details stated Spring compensated loading and movement accommodated stated Background stated	Fabricated supports and supports carrying more than one service are measured in section for trenches		
	SMM2	Pipe supports	Q12.d Q12.e Q12.f	Brackets, rollers, chairs and hangers, back-plates, girder-lugs, anchors and guides for supporting pipes Pipe-stays and collars Pylons and other pipe supports	State size of component and the size and kind of pipe State size and kind of pipe and length of stay State size, method of fixing and nature of the structure	No No No	Spring compensated components shall be so described stating loading and movement to be accommodated	Particulars of method of fixing shall be given in description of pipe-support		
	MMBZ	Pipe supports	S12.d S12.e S12.f	Brackets, rollers, chairs and hangers, back-plates, girder-lugs, anchors and guides for supporting pipes Pipe-stays and collars Pylons and other pipe supports	State size of component and the size and kind of pipe State size and kind of pipe and length of stay State size, method of fixing and nature of the structure	No No No	Spring compensated components shall be so described stating loading and movement to be accommodated	Particulars of method of fixing shall be given in description of pipe-support	Ears cast, soldered or welded on to pipes shall be given in the description of the pipe	
	CESMM3	Other isolated pipe supports	8.1 8.2 8.3 8.4 8.5 8.6 8.7	Height: not exceeding 1m 1 - 1.5m 1.5 - 2m 2 - 3m 3 - 4m 4 - 5m 5 - 6m	Nominal bore: not exceeding 200mm 200 - 300mm 300 - 600mm 600 - 900mm 900 - 1200mm 1200 - 1500mm 1500 - 1800mm	Nr		Height shall be measured from the ground or other supporting surface to the invert of the highest pipe where pies are supported from below and of the lowest pipe where pipes are supported from above Where two or more pipes are carried by one support, item shall be classified by aggregate bore of the pipes supported		Principal dimensions and materials shall be stated in descriptions

PIPES

			8.8	stated exceeding 6m	stated exceeding 1800mm					
ANCHORS, BLOCKS, ETC.	BESMM3	Pipe anchors and guides			Nominal size of pipe, type, size and composition, method of fixing pipe and anchors or guide stated	nr				
	SABS1200	Anchor/Thrust blocks and pedestals	8.2.11 8.2.11a 8.2.11 b	Anchor/Thrust blocks and pedestals Dimensions stated or given on drawing Concrete Formwork Reinforcement	At tender stage no detailed drawings or dimensions are given or where only typical drawings are given	 No/Sum m3 m2 t	Rate cover cost of excavation and trimming, formwork, reinforcement (if any) and screeding of top surfaces			
	SABS1200AAC	Anchor/Thrust blocks and pedestals	8.2.11 8.2.11a 8.2.11 b	Anchor/Thrust blocks and pedestals Dimensions stated or given on drawing Concrete Formwork Reinforcement	At tender stage no detailed drawings or dimensions are given or where only typical drawings are given	 No/Sum m3 m2 t	Rate cover cost of excavation and trimming, formwork, reinforcement (if any) and screeding of top surfaces			
	CESMM3	Concrete stools and thrust blocks	7.1 7.2 7.3 7.4 7.5 7.6 7.7 7.8	Volume: not exceeding 0.1m3 0.1 - 0.2m3 0.2 - 0.5m3 0.5 - 1m3 1 - 2m3 2 - 4m3 4 - 6m3 stated exceeding 6m3	Nominal bore: not exceeding 200mm 200 - 300mm 300 - 600mm 600 - 900mm 900 - 1200mm 1200 - 1500mm 1500 - 1800mm stated exceeding 1800mm	Nr		Volume shall exclude the volumes occupied by pipes	Include pipe fixings	State specification of concrete and whether it is reinforced
SLEEVES	BESMM3	Pipe sleeves through walls, floors and ceilings	1 2	Length ≤ 300mm and thereafter in 300mm stages	Type and nominal size of pipe stated	nr	Method of fixing and type of packing stated Handed to others for fixing			
	SMM2	Pipe-sleeves and plates	Q13.a Q13.b	Pipe sleeves Wall-plates, floor-plates and ceiling plates	State length, size and kind of pipe passing through and type of packing required State size and size and kind of pipe passing through	No No	Where plates are fitted to pipe-sleeves they shall be given in description of sleeve stating whether to one or both ends			
	MMBZ	Pipe-sleeves and plates	S13.a S13.b	Pipe sleeves Wall-plates, floor-plates and ceiling plates	State length, size and kind of pipe passing through and type of packing required State size and size and kind of pipe passing through	No No	Where plates are fitted to pipe-sleeves they shall be given in description of sleeve stating whether to one or both ends			
	SMM2	Sleeves and holes	Q33	Sleeves for pipes not exceeding 100mm diameter Separate in stages of 100mm, separated in successive lengths of 250m long		No No				
PLATES	BESMM3	Wall, floor and ceiling plates				No				

PIPES

CHAMBERS, MANHOLES, ETC.	SABS1200	Valve and hydrant chambers	8.2.13	Valve and hydrant chambers, etc.	Measured as complete units	No	Rate cover cost for additional excavation, materials, plant and labour necessary for the complete construction including the installation of the surface boxes or covers			
	SABS1200AAC	Valve and hydrant chambers	8.2.13	Valve and hydrant chambers, etc.	Measured as complete units	No	Rate cover cost for additional excavation, materials, plant and labour necessary for the complete construction including the installation of the surface boxes or covers			
	SABS1200	Manholes	8.2.14a	Manholes	Measured as complete units for which separate items will be scheduled for each type of manhole of overall depth not exceeding 1.5m	No	Rate cover cost for additional excavation, materials, plant and labour necessary for the complete construction including the installation of the covers Rate cover cost of complete construction of each extra 0.25m additional depth or where the unit is a sum, such sum shall cover the complete construction to the total extra depth stated or given on a designated drawing			
			8.2.14 b	Extra-over manholes for manholes of depth exceeding 1.5m	Additional depths of manholes in excess of 1.5m will be measured or given in increments of 0.25m depth for each type of manhole	0.25m/ Sum				
	SABS1200AAC	Manholes	8.2.14a	Manholes	Measured as complete units for which separate items will be scheduled for each type of manhole of overall depth not exceeding 1.5m	No	Rate cover cost for additional excavation, materials, plant and labour necessary for the complete construction including the installation of the covers Rate cover cost of complete construction of each extra 0.25m additional depth or where the unit is a sum, such sum shall cover the complete construction to the total extra depth stated or given on a designated drawing			
			8.2.14 b	Extra-over manholes for manholes of depth exceeding 1.5m	Additional depths of manholes in excess of 1.5m will be measured or given in increments of 0.25m depth for each type of manhole	0.25m/ Sum				
	CESMM3	Manholes	1.1	Brick	Depth: not exceeding 1.5m	Nr		Depths of manholes and other chambers shall be measured from the tops of covers to channel inverts or tops of base slabs, whichever is the lower Drawpits shall be classed as other stated chambers	Item for manholes, other stated chambers and gullies shall be deemed to include all items of metalwork and pipework, other than valves, which occur within or at the surface of the item Items for manholes with backdrops shall be deemed to include pipework and associated fittings comprising the backdrop	Type of mark numbers shall be stated in item for manholes, other stated chambers and gullies, of which details are given elsewhere in contract Type and loading duties of covers shall be stated in item description Item descriptions shall identify separately those which are expressly required to be excavated by hand
			1.2	Brick with backdrop	1.5 - 2m					
			1.3	In situ concrete	2 - 2.5m					
			1.4	In situ concrete with backdrop	2.5 - 3m					
			1.5	Precast concrete	3 - 3.5m					
			1.6	Precast concrete with backdrop	3.5 - 4m					
					stated exceeding 4m					
		Other stated chambers	2.1	Brick		Nr				
			2.3	In situ concrete						
			2.5	Precast concrete						

PIPES

		Gullies	3.1 3.2 3.3 3.4 3.5 3.6 3.7 3.8	Clay Clay trapped In situ concrete In situ concrete trapped Precast concrete Precast concrete trapped Plastics Plastics trapped		Nr				
	CESMM3	Ducts and metal culverts	5.1 5.2 5.3 5.4 5.5 5.6 5.7 5.8	Cable ducts: 1 way Cable ducts: 2 way Cable ducts: 3 way Stated number of ways exceeding 3 Sectional corrugated metal culverts, nominal internal diameter: not exceeding 0.5m 0.5 - 1m 1 - 1.5m exceeding 1.5m	Not in trenches In trenches, depth: not exceeding 1.5m 1.5 - 2m 2 - 2.5m 2.5 - 3m 3 - 3.5m 3.5 - 4m exceeding 4m	m	Rules in class I for pipes shall apply to ducts and metal culverts except that the lengths measured for ducts and metal culverts not in trenches shall include lengths occupied by fittings	Non-circular metal culverts shall be classified by their maximum nominal internal cross-sectional dimension Rules in class I for pipes shall also apply	Items for ducts and metal culverts shall be deemed to include cutting and fittings	Rules in class I for pipes shall also apply
	CESMM3	Crossings	6.1 6.2 6.3 6.4 6.5 6.6 6.7 6.8	River, stream or canal, width: 1 - 3m 3 - 10m stated exceeding 10m Hedge Wall Fence Sewer or drain unless protection of services is expressly required Other stated underground service	Pipe bore: not exceeding 300mm 300 - 900mm 900 - 1800mm stated exceeding 1800mm	Nr	Crossings shall be measured for pipes, ducts and metal culverts under this item Crossings of streams shall be measured only where their width exceeds 1m	Shall be classified by their widths measured along pipe, duct or culvert centre lines when the water surface is at the level (or the higher level of fluctuation if applicable) shown on drawing to which reference is given in the pricing assumptions Dimension used for classification of bore shall be the maximum nominal distance between the inside faces of the outer walls of the pipe, duct or culvert to be installed	Items shall be deemed to include reinstatement unless otherwise stated	Where linings to rivers, streams or canals are to be broken through and reinstated the type of lining shall be stated in item
	BESMM3	Screwed sockets Tappings Bosses	1	Type, nominal size, method of jointing stated	Nominal size and kind of pipe stated					Screwed sockets, tapping and bosses are deemed to include perforating the pipe
		Pipework ancillaries	1	Type, nominal size, method of jointing, type, number and method of fixing supports all stated	Type of pipe stated	nr	Integral controls or indicators stated Remote controls or indicators and connections between stated Background stated In ducts In trenches			Cutting and jointing pipes to ancillaries is deemed to be included

PIPES

ANCILLARIES	CESMM3	Other pipework ancillaries	8.1	Reinstatement of field drains		m	Shall be measured for pipes, ducts and metal culverts Lengths measured for reinstatement of field drains shall be the nominal trench width defined with rule D1, class L	Dimension used for classification of bore shall be the maximum nominal distance between the inside faces of the outer walls of the pipe, duct or culvert to be installed	Items for reinstatement of field drains shall be deemed to include connections to existing field drains	Sizes and types of marker posts shall be stated in item description
			8.2	Marker posts		Nr				
			8.3	Timber support left in excavations		m2	Area measured for supports left in excavations shall be undeveloped area in contact with the surfaces for which the supports are expressly required to be left in			
			8.4	Metal support left in excavations		m2				
			8.5	Connections to existing manholes and other chambers	Pipe bore: not exceeding 200mm	Nr				Description for connections to existing manholes and other chambers and to existing pipes, ducts, culverts shall identify the nature of the existing service and the extent of the work to be included
			8.6	Connections to existing pipes, ducts and culverts	200 - 300mm 300 - 600mm 600 - 900mm 900m-1200m 1200 - 1500mm 1500 - 1800mm stated exceeding 1800mm	Nr				
TESTING	SMM2	Testing the installations	Q38	Testing	Fully described	No				
	MMBZ	Testing the installations	S43	Testing	Fully described	No				

ROADS

GENERAL RULES

BESMM3	FMW means as specified in the specification for roads and bridge works or similarly approved Items for work in this class involving insitu concrete shall be deemed to include formwork and finishes to concrete Item description for courses of paving, road making materials and pavement slabs shall identify the material and state the depth of each course or slab and spread rate of applied surface finis Item description for work in this class which is applied to surfaces inclined at an angle exceeding 10° to the horizontal shall so state
SMM2	Roadworks shall be classified according to 1. Type of material 2. Construction 3. Finishings Excavation, filling bases, etc. shall be given in accordance with rules for Excavation and Earthwork Concrete work shall be given in accordance with rules for Concrete Work
SABS1200	Measurements will be to finished shapes, sections and profiles as shown on the drawings or as ordered and no material outside the specified lines and levels will be included in the measurement unless extra material has been placed and compacted on writte instructions of the Engineer Waterbound Macadam: Volume of waterbound macadam and filler will be computed from the widths shown on the drawings or ordered, the length and the actual compacted dept Engineer may accept any thickness of waterbound macadam in excess of specified thickness but no measurement or payment will be made for any material placed that is more than 15mm in excess of the specified total thicknes Material added to filler will be measured at the point of delivery on the road by mass (in tons) in the case of cement and slaked lime and by volume (m3) in case of other fine material, and only that amount actually added and accepted will be measured for payme Bituminous surface treatment: Price for various operations scheduled shall cover cost of application of the aggregate, bituminous binder or slurry at the nominal rate specifie Nominal rate of application of prime coat shall be 0.7l/m2 Nominal rate of application of curing coat shall be 0.5l/m2 of 60% emulsion or 0.4l/m2 of 70% emulsion, the grade of emulsion (60 or 70%) being as schedule Nominal rates of application of double surface treatment shall be as set out in tables 4 and 5 Bituminous surface treatment with aggregate and slurry seal applications shall be as set out in tables 7 and 7 Variations within the tolerance for rates of application specified in 6.1 will not be taken into account for the purpose of measuremen Engineer may at any time instruct the Contractor to vary the rate of application specified to suit local conditions and materials at the time of construction. Adjustment of compensation will be made as follow a) as a payment to the Contractor in respect of each increase in rate of application above that specifie b) as a refund by the Contractor in respect of each decrease in quantity below that specifie In case of an increase or decrease in rate of application owing to faulty workmanship on the part of the Contractor, the Engineer may condemn the work, require the Contractor to rectify the work or agree to a refund by the Contractor to cover the cost to th Employer of earlier maintenance which will be require Rates for all operations cover costs of testing Asphalt base and surfacing: Price for various operations scheduled shall cover cost of application of the prime, the asphalt and the pre-coated chips at the nominal rate of application specifie Nominal rates of application of road tar shall be 0.7l/m2; MX-30 bitumen shall be 0.7l/m2; Spray type emulsion shall be 0.8l/m2; Invert bitumen emulsion shall be 08.l/m Nominal rate application of curing coat of spray type emulsion on a stabilized base shall be 0.3l/ of residual bitumen per m2 Nominal rate of application of tack coat shall be 0.2l/m2 Bituminous binder content by mass of each mix shall be as follows: Base: continuously graded - 4% and gap-graded - 5% Surfacing: continuously graded - 5%; gap-graded - 6%; open-graded - 4%; pre-coated chips - 1% Mineral filler content shall be approved Nominal rates of application of pre-coated chips shall be as follows 13.2mm and 16mm chips - 8kg/m2 19mm chips - 9kg/m2 Variations within the tolerance for bituminous binder content specified in 6.1 will not be taken into account for the purpose of measuremen Engineer may at any time instruct the Contractor to vary the rate of application specified to suit local conditions and materials at the time of construction. Adjustment of compensation will be made as follow a) as a payment to the Contractor in respect of each increase in rate of application above that specifie b) as a refund by the Contractor in respect of each decrease in quantity below that specifie Rates for all operations cover costs of testing Primed surface and tack coat will be measured by actual area covered within the specified widths and length Asphalt will be measured by mass determined from weightbridge tickets. Weighbridge shall be checked at regular intervals under supervisio Only material that complies with specification will be measured for payment No payment will be made for excess width, for wastage, or for asphalt laid in excess of the mean rate of applicatio Mean rate of application (t/m2) will be calculated from the total thickness specified or ordered, plus 15% for specified thickness up to and including 50mm or plus 10% for specified thicknesses over 50mm, and the average density of the material laic The mean rate of application will be calculated for each day's run Quantity of mineral filler used will be measured by mass where such an item is scheduled and the mineral filler content has been approve Quantity of pre-coated chips applied at specified or ordered rate of application will be measured by mas Segmented paving: Preparation, including trimming to designated level of the top subbase as specified and all other work necessary to carry out before the layer of bedding sand is place and paving is laid, will be measured and paid for in terms of SABS1200 Kerbing and channelling: Each type, shape and size of kerb and channel will be measured linearly along the face. No deductions will be made for catchpits, etc Rates shall cover cost of all operations necessary to complete the item scheduled
SABS1200AAC	Measurements will be to finished shapes, sections and profiles as shown on the drawings or as ordered and no material outside the specified lines and levels will be included in the measurement unless extra material has been placed and compacted on written instructions of the Engine Waterbound Macadam: Volume of waterbound macadam and filler will be computed from the widths shown on the drawings or ordered, the length and the actual compacted dept Engineer may accept any thickness of waterbound macadam in excess of specified thickness but no measurement or payment will be made for any material placed that is more than 15mm in excess of the specified total thicknes Material added to filler will be measured at the point of delivery on the road by mass (in tons) in the case of cement and slaked lime and by volume (m3) in case of other fine material, and only that amount actually added and accepted will be measured for payme

ROADS

		Bituminous surface treatment: Price for various operations scheduled shall cover cost of application of the aggregate, bituminous binder or slurry at the nominal rate specifie Nominal rate of application of prime coat shall be 0.7l/m2 Nominal rate of application of curing coat shall be 0.5l/m2 of 60% emulsion or 0.4l/m2 of 70% emulsion, the grade of emulsion (60 or 70%) being as schedule Nominal rates of application of double surface treatment shall be as set out in tables 4 and 5 Bituminous surface treatment with aggregate and slurry seal applications shall be as set out in tables 7 and 7 Variations within the tolerance for rates of application specified in 6.1 will not be taken into account for the purpose of measuremen Engineer may at any time instruct the Contractor to vary the rate of application specified to suit local conditions and materials at the time of construction. Adjustment of compensation will be made as follows a) as a payment to the Contractor in respect of each increase in rate of application above that specifiec b) as a refund by the Contractor in respect of each decrease in quantity below that specifiec In case of an increase or decrease in rate of application owing to faulty workmanship on the part of the Contractor, the Engineer may condemn the work, require the Contractor to rectify the work or agree to a refund by the Contractor to cover the cost to th Employer of earlier maintenance which will be required Rates for all operations cover costs of testing Asphalt base and surfacing: Price for various operations scheduled shall cover cost of application of the prime, the asphalt and the pre-coated chips at the nominal rate of application specifie Nominal rates of application of road tar shall be 0.7l/m2; MX-30 bitumen shall be 0.7l/m2; Spray type emulsion shall be 0.8l/m2; Invert bitumen emulsion shall be 08.l/m Nominal rate application of curing coat of spray type emulsion on a stabilized base shall be 0.3l/ of residual bitumen per m2 Nominal rate of application of tack coat shall be 0.2l/m2 Bituminous binder content by mass of each mix shall be as follows: Base: continuously graded - 4% and gap-graded - 5% Surfacing: continuously graded - 5%; gap-graded - 6%; open-graded - 4%; pre-coated chips - 1% Mineral filler content shall be approved Nominal rates of application of pre-coated chips shall be as follows 13.2mm and 16mm chips - 8kg/m2 19mm chips - 9kg/m2 Variations within the tolerance for bituminous binder content specified in 6.1 will not be taken into account for the purpose of measuremen Engineer may at any time instruct the Contractor to vary the rate of application specified to suit local conditions and materials at the time of construction. Adjustment of compensation will be made as follows a) as a payment to the Contractor in respect of each increase in rate of application above that specifiec b) as a refund by the Contractor in respect of each decrease in quantity below that specifiec Rates for all operations cover costs of testing Primed surface and tack coat will be measured by actual area covered within the specified widths and lengths Asphalt will be measured by mass determined from weightbridge tickets. Weighbridge shall be checked at regular intervals under supervisior Only material that complies with specification will be measured for payment No payment will be made for excess width, for wastage, or for asphalt laid in excess of the mean rate of applicatior Mean rate of application (t/m2) will be calculated from the total thickness specified or ordered, plus 15% for specified thickness up to and including 50mm or plus 10% for specified thicknesses over 50mm, and the average density of the material laid The mean rate of application will be calculated for each day's rur Quantity of mineral filler used will be measured by mass where such an item is scheduled and the mineral filler content has been approvec Quantity of pre-coated chips applied at specified or ordered rate of application will be measured by mas Segmented paving: Preparation, including trimming to designated level of the top subbase as specified and all other work necessary to carry out before the layer of bedding sand is place and paving is laid, will be measured and paid for in terms of SABS1200 Kerbing and channelling: Each type, shape and size of kerb and channel will be measured linearly along the face. No deductions will be made for catchpits, etc Rates shall cover cost of all operations necessary to complete the item scheduled									
	CESMM3	Base types G1-G9 and C1-C4 refer to those specified in scope of work Work involving in situ concrete shall be deemed to include formwork and finishes to concrete Descriptions for all courses of paving, road marking materials and pavement slabs shall identify the material and state the depth of each course or slab and the spread rate of applied surface finishe Descriptions for work which is applied to surfaces inclined at an angle exceeding 10° to the horizontal shall so state									
	BESMM3	Sub-base, flexible road bases and surfacing	1 2 3 4 5 6	Granular material FMW or similar specified type Soil cement Cement boung granular material Lean concrete strength stated Hardcore Geotextiles	Depth stated	m2		Width of each course of materials shall be measured at the top surface of that course The areas of manhole covers and other intrusions into a course shall not be deducted where the are of the intrusion is less than 1m2 The area of additional geotextiles in laps shall not be measured		

ROADS

			7 Additional depth of stated material 8 Wet mix macadam 9 Dry bound macadam 10 Dense bitumen macadam 11 Open textured macadam 12 Dense tarmacadam 13 Open texture tarmacadam 14 Dense tar surfacing 15 Cold asphalt wearing course 16 Rolled asphalt 17 Slurry sealing 18 Surface dressing 19 Bituminous spray 20 Removal of flexible surface 21 Regulating course of stated material		t		Type and grade of materials shall be stated in item descriptions for geotextiles		
SUBBASE	SABS1200	Subbase	8.3.1 Construct subbase course/shoulders/gravel wearing course with material excavated in all materials from borrow pits		m3	Rate cover cost of locating material, complying with all precautions required in terms of opening up, operating and rehabilitating borrow pits (with exception of dealing with overburden), excavation, basic selection, transporting, spreading, watering, compacting, final grading, complying with the tolerances and testing			
			8.3.2 Construct subbase course/shoulders/gravel wearing course with material from designated excavations:						
			8.3.2a Excavate in all materials from designated excavations, select and stockpile or place on the road for the subbase course/shoulders/gravel wearing course		m3	Cover cost of excavating from road prism in various classes of excavation, loading, transporting, offloading, disposing of material to site as directed and of shaping and grading smoothly any piles of spoil material so that they can free draining			
			8.3.2b Construct subbase course/shoulders/gravel wearing course with material from the stockpile under a)		m3	Rate cover cost of basic selection, loading from stockpiles, transporting, spreading, watering, compacting, final grading, complying with the tolerances and testing			
			8.3.2c Construct the subbase course/shoulders/gravel wearing course with material placed on the road under a)		m3	Rate cover cost of spreading, watering, compacting, final grading, complying with tolerances and testing			
			8.3.3 Construct subbase course/shoulders/gravel wearing course with material from commercial sources or designated borrow areas		m3	Rate cover cost of locating source, complying with all the relevant precautions required, procuring material, basic selections, transporting from source in point of deposition on the road, spreading, watering, compacting, final grading, complying with the tolerances and testing			

ROADS

	SABS1200AAC	Subbase	8.3.1	Construct subbase course/shoulders/gravel wearing course with material excavated in all materials from borrow pits		m3	Rate cover cost of locating material, complying with all precautions required in terms of opening up, operating and rehabilitating borrow pits (with exception of dealing with overburden), excavation, basic selection, transporting, spreading, watering, compacting, final grading, complying with the tolerances and testing			
			8.3.2	Construct subbase course/shoulders/gravel wearing course with material from designated excavations:						
			8.3.2a	Excavate in all materials from designated excavations, select and stockpile or place on the road for the subbase course/shoulders/gravel wearing course		m3	Cover cost of excavating from road prism in various classes of excavation, loading, transporting, offloading, disposing of material to site as directed and of shaping and grading smoothly any piles of spoil material so that they can free draining			
			8.3.2b	Construct subbase course/shoulders/gravel wearing course with material from the stockpile under a)		m3	Rate cover cost of basic selection, loading from stockpiles, transporting, spreading, watering, compacting, final grading, complying with the tolerances and testing			
			8.3.2c	Construct the subbase course/shoulders/gravel wearing course with material placed on the road under a)		m3	Rate cover cost of spreading, watering, compacting, final grading, complying with tolerances and testing			
			8.3.3	Construct subbase course/shoulders/gravel wearing course with material from commercial sources or designated borrow areas		m3	Rate cover cost of locating source, complying with all the relevant precautions required, procuring material, basic selections, transporting from source in point of deposition on the road, spreading, watering, compacting, final grading, complying with the tolerances and testing			
	CESMM3	Sub-base, shoulders and gravel wearing course		Material from:						
			1.1	Borrow pits		m3	Width of each course of materials shall be measured at the top surface of that course		Items shall be deemed to include procurement	
			1.2	Designated excavations		m3	Areas of manhole covers and other intrusions into a course shall not be deducted where the are of the intrusion is less than 1m2		Should the material for base be obtained from a designated cutting, the volume of base in the compacted layer shall be deducted from the volume of the excavated cutting	
			1.3	Imported		m3				
			1.7	Geotextiles		m2	Area of additional geotextiles in laps shall not be measured			Type and grade of materials shall be stated for geotextiles
			1.8	Additional depth of stated material		m2				

ROADS

BASE	SABS1200	Base	8.3.1	Construct base with gravel material from borrow pits	Separate items will be scheduled for designated borrow pits and borrow pits to be located by the Contractor	m3	Rate cover cost of locating material, complying with all precautions required, operating the borrow pits, excavation, basic selection, transporting, spreading, watering, compacting, final grading, complying with the tolerances and testing all in accordance with specifications			
			8.3.2	Construct base with material from designated excavations:			Rate cover cost of basic selection, loading from stockpiles, transporting, spreading, watering, compacting, final grading, complying with the tolerances and testing			
			8.3.2a	Excavate from designated excavations, select and stockpile for base		m3				
			8.3.2b	Construct base with material from stockpile and compact to specified density:						
				Gravel material		m3				
				Graded crushed stone		m3				
				Graded crushed stone and soil fines		m3				
			8.3.3	Construct base with material from commercial sources or designated borrow area and compact material to specified density:			Rate cover cost of locating source, complying with all relevant precautions, procuring material, basic selection, transporting from source to point of deposition on the road, spreading, watering, compacting, final grading, complying with tolerances and testing			
			8.3.3a	Gravel material		m3				
			8.3.3b	Graded crushed stone		m3				
			8.3.3c	Graded crushed stone and soil fines		m3				
	SABS1200AAC	Base	8.3.1	Construct base with gravel material from borrow pits	Separate items will be scheduled for designated borrow pits and borrow pits to be located by the Contractor	m3	Rate cover cost of locating material, complying with all precautions required, operating the borrow pits, excavation, basic selection, transporting, spreading, watering, compacting, final grading, complying with the tolerances and testing all in accordance with specifications			
			8.3.2	Construct base with material from designated excavations:			Rate cover cost of basic selection, loading from stockpiles, transporting, spreading, watering, compacting, final grading, complying with the tolerances and testing			
			8.3.2a	Excavate from designated excavations, select and stockpile for base		m3				
			8.3.2b	Construct base with material from stockpile and compact to specified density:						
				Gravel material		m3				
				Graded crushed stone		m3				
				Graded crushed stone and soil fines		m3				
			8.3.3	Construct base with material from commercial sources or designated borrow area and compact material to specified density:			Rate cover cost of locating source, complying with all relevant precautions, procuring material, basic selection, transporting from source to point of deposition on the road, spreading, watering, compacting, final grading, complying with tolerances and testing			
			8.3.3a	Gravel material		m3				
			8.3.3b	Graded crushed stone		m3				
			8.3.3c	Graded crushed stone and soil fines		m3				
	CESMM3	Base	2.1	Crushed stone type G1-G3	Depth: not exceeding 30mm	m3				Descriptions shall state type of base
				Natural gravel or partially crushed material type						
			2.2	D4-D9	30 - 60mm					
			2.3	Chemically stabilized type G1-G4	60 - 100mm					
			2.4	Waterbound macadam	100 - 150mm					
					150 - 200mm					
					200 - 250mm					
					250 - 300mm					

ROADS

					exceeding 300mm					
ROCK	SABS1200	Intermediate and rock	8.3.4 8.3.4a 8.3.4b	Extra over excavated material for class of excavation: Intermediate excavation Hard rock excavation		 m3 m3	Rate cover additional costs applicable to the relevant class of excavation			
	SABS1200AAC	Intermediate and rock	8.3.4 8.3.4a 8.3.4b	Extra over excavated material for class of excavation: Intermediate excavation Hard rock excavation		 m3 m3	Rate cover additional costs applicable to the relevant class of excavation			
PROCESS MATERIAL	SABS1200	Process material	8.3.5 8.3.5a 8.3.5b 8.3.5c 8.3.5d	Process subbase/base material by the following processes, as relevant, and use in the subbase: Screening Heavy grid rolling Mechanical modification Stabilization	No allowance made in measurement for any reduction in volume of the combined mixture over that of the individual materials compacted to the specified density	 m3 m3 m3 m3	Rate cover cost of processing the material in accordance with specified, ordered or agreed method Rate shall not cover the supply of the stabilizing agent			
	SABS1200AAC	Process material	8.3.5 8.3.5a 8.3.5b 8.3.5c 8.3.5d	Process subbase/base material by the following processes, as relevant, and use in the subbase: Screening Heavy grid rolling Mechanical modification Stabilization	No allowance made in measurement for any reduction in volume of the combined mixture over that of the individual materials compacted to the specified density	 m3 m3 m3 m3	Rate cover cost of processing the material in accordance with specified, ordered or agreed method Rate shall not cover the supply of the stabilizing agent			
	CESMM3	Process granular material and rock	1.1 1.2 1.3 1.4 1.5 1.6 1.7	Screening Heavy grid rolling Mechanical modification Stabilization Single stage crushing Two-stage crushing Stabilizing agent	Sub-base Base Road lime Cement Ground granulated blastfurnace slag Fly ash	m3 m3 m3 m3 m3 m3 t t t t	Processing of materials is only measured where expressly required such as in the case of material excavated from cuttings and borrow pits for use as subbase or possibly base			
	SABS1200	Screening plant	8.3.6 8.3.6a 8.3.6b 8.3.6c	Screening plant (provisional item): Provide, erect and commission on site Dismantle, remove from site and clean up site Move screening plant on site from one location to another and clean up site	Only measured on written order of the Engineer	 Sum Sum No	Rate cover cost of provision, erection and commissioning of screening plant on site, dismantling and removing the plant from the site and cleaning up the area of the site and dismantling, shifting and re-erecting (or shifting by other means) and cleaning up the area previously occupied			
	SABS1200AAC	Screening plant	8.3.6	Screening plant (provisional item):	Only measured on written order of the Engineer		Rate cover cost of provision, erection and			

ROADS

SCREENING			8.3.6a	Provide, erect and commission on site		Sum	commissioning of screening plant on site, dismantling and removing the plant from			
			8.3.6b	Dismantle, remove from site and clean up site		Sum	the site and cleaning up the area of the site and dismantling, shifting and re-erecting (or shifting by other means) and			
			8.3.6c	Move screening plant on site from one location to another and clean up site		No	cleaning up the area previously occupied			
	SABS1200	Screened-out material not used	8.3.7	Screened-out material not used in the subbase:	Measurements will be made in the stockpile or in trucks					
			8.3.7a	Screened-out oversize		m3	Rate cover cost of excavating and			
			8.3.7b	Screened-out fines		m3	disposing of the screened-out material			
			8.3.7c	Screened-out oversize and fines		m3	within the freehaul distance of 2km			
	SABS1200AAC	Screened-out material not used	8.3.7	Screened-out material not used in the subbase:	Measurements will be made in the stockpile or in trucks					
			8.3.7a	Screened-out oversize		m3	Rate cover cost of excavating and			
			8.3.7b	Screened-out fines		m3	disposing of the screened-out material			
			8.3.7c	Screened-out oversize and fines		m3	within the freehaul distance of 2km			
	CESMM3	Screened out material	2.1	Oversize		m3				
			2.2	Fines		m3				
			2.3	Oversize and fines		m3				
STABILIZING	SABS1200	Stabilizing agent	8.3.8	Stabilizing agent:	Measurements based on quantity ordered by Engineer or actually incorporated within the layer concerned, whichever is the lesser		When mixture of slag and cement or lime are used, quantity of each consistent will be measured separately			
			8.3.8a	Road lime		t				
			8.3.8b	Portland cement		t				
			8.3.8c	Portland blastfurnace cement		t				
			8.3.8d	Milled blastfurnace slag		t	Rate cover cost of providing agent within	Rate for milled blastfurnace		
			8.3.8e	Granulated unslaked lime		t	the works irrespective of the rate of application specified and shall allow for	slag or fly ash shall cover work of any premixing of agents if		
			8.3.8f	Fly ash		t	the variations in mixing and compaction times of the various stabilizing agents	any mixtures of this and other agents are specified or		
	SABS1200AAC	Stabilizing agent	8.3.8	Stabilizing agent:	Measurements based on quantity ordered by Engineer or actually incorporated within the layer concerned, whichever is the lesser		When mixture of slag and cement or lime are used, quantity of each consistent will be measured separately			
			8.3.8a	Road lime		t				
			8.3.8b	Portland cement		t				
			8.3.8c	Portland blastfurnace cement		t				
			8.3.8d	Milled blastfurnace slag		t	Rate cover cost of providing agent within	Rate for milled blastfurnace		
			8.3.8e	Granulated unslaked lime		t	the works irrespective of the rate of application specified and shall allow for	slag or fly ash shall cover work of any premixing of agents if		
			8.3.8f	Fly ash		t	the variations in mixing and compaction times of the various stabilizing agents	any mixtures of this and other agents are specified or		
OVERHAUL	SABS1200	Overhaul	8.3.9	Overhaul (haul exceeding 2km)(provisional)	Volumes computed from designated dimensions and no allowance will be made for bulking	m3.km	Rate cover cost of transporting material for the overhaul distance	Distances will be measured to the nearest 0.1km from the end of the 2km freehaul, in one direction only, by the shortest practicable route		
	SABS1200AAC	Overhaul	8.3.9	Overhaul (haul exceeding 2km)(provisional)	Volumes computed from designated dimensions and no allowance will be made for bulking	m3.km	Rate cover cost of transporting material for the overhaul distance	Distances will be measured to the nearest 0.1km from the end of the 2km freehaul, in one direction only, by the shortest practicable route		

ROADS

BORROW PITS	SABS1200	Overburden	8.3.10	Overburden	Volumes as measured in place by the method of average end areas. Quantity will be calculated either from the area and depth of material measured by means of trial holes spaced at intervals of 10m or by surveying before and after its removal	m3	Rate cover cost of digging trial pits, removing overburden to stockpile and spreading the overburden evenly over the floor of the borrow pit			
	SABS1200AAC	Overburden	8.3.10	Overburden	Volumes as measured in place by the method of average end areas. Quantity will be calculated either from the area and depth of material measured by means of trial holes spaced at intervals of 10m or by surveying before and after its removal	m3	Rate cover cost of digging trial pits, removing overburden to stockpile and spreading the overburden evenly over the floor of the borrow pit			
	SABS1200	Borrow pits	8.3.10 8.3.10a 8.3.10 b	Borrow pits: Opening up Rehabilitation	Terms of 8.3.6b of SABS 1200D applies	 Sum Sum				
	SABS1200AAC	Borrow pits	8.3.10 8.3.10a 8.3.10 b	Borrow pits: Opening up Rehabilitation	Terms of 8.3.6b of SABS 1200D applies	 Sum Sum				
	SMM2	Coated macadam asphalt roads pavings	Y4.a Y4.b	Surfacing Movement joints	Sate thickness of each coat	m2 m	Give kind, composition and mix of material Method of application Nature of surface treatment Special curing of finished work Nature of base Prepatory work where bonding is included with the finish	No deductions for voids not exceeding 1m2	Works to falls shall be so stated Works to falls and crossfalls and to slope not exceeding 15° from horizontal shall be grouped together Those exceeding 15° from horizontal shall be grouped together	
	SABS1200	Prime coat	8.4.1	Prime coat	Type and grade of prime will be stated	m2	Rate cover cost of preparing the base, sprinkling with water, and supplying and spraying the prime			
	SABS1200AAC	Prime coat	8.4.1	Prime coat	Type and grade of prime will be stated	m2	Rate cover cost of preparing the base, sprinkling with water, and supplying and spraying the prime			
	SABS1200	Curing coat	8.4.2	Curing coat	Type and grade of emulsion will be stated	m2	Rate cover cost of brooming the surface, if necessary and supplying and spraying the emulsion			
	SABS1200AAC	Curing coat	8.4.2	Curing coat	Type and grade of emulsion will be stated	m2	Rate cover cost of brooming the surface, if necessary and supplying and spraying the emulsion			

ROADS

	SABS1200	Double surface treatment	8.4.3 8.4.3a 8.4.3b	Double surface treatment using: 19mm and 9.5mm aggregate (types of binder to be used will be stated) 13.2mm and 6.7mm aggregate (types of binder to be used will be stated)		m2 m2	Rate cover cost of cleaning primed surface, protecting kerbs, placing guide lines, controlling dust, supplying all materials, spraying the binder, spreading the aggregate, rolling as necessary and all other incidentals necessary for completing the work, except the application of fog spray and the pre-coating of aggregate, which will be scheduled separately			
	SABS1200AAC	Double surface treatment	8.4.3 8.4.3a 8.4.3b	Double surface treatment using: 19mm and 9.5mm aggregate (types of binder to be used will be stated) 13.2mm and 6.7mm aggregate (types of binder to be used will be stated)		m2 m2	Rate cover cost of cleaning primed surface, protecting kerbs, placing guide lines, controlling dust, supplying all materials, spraying the binder, spreading the aggregate, rolling as necessary and all			
	CESMM3	Surfacing	4.1 4.2 4.3 4.4 4.5 4.6	Double surface treatment Aggregate and slurry seal Single surface treatment Sand seal Precoated aggregate Asphalt		m2 m2 m2 m2 m2 t				
	SABS1200	Bituminous surface treatment	8.4.4	Bituminous surface treatment with aggregate and slurry seal (size of aggregate stated)	Type and grade of bituminous binder will be stated	m2	Rate cover cost of cleaning primed surface, protecting the kerbs, placing guide lines, controlling dust, supplying all materials, spraying the binder, spreading the aggregate, mixing and spreading of slurry seal and rolling			
	SABS1200AAC	Bituminous surface treatment	8.4.4	Bituminous surface treatment with aggregate and slurry seal (size of aggregate stated)	Type and grade of bituminous binder will be stated	m2	Rate cover cost of cleaning primed surface, protecting the kerbs, placing guide lines, controlling dust, supplying all materials, spraying the binder, spreading the aggregate, mixing and spreading of slurry seal and rolling			
	CESMM3	Bitumen sprays	3.1 3.2 3.3 3.4	Prime Curing coat Tack coat Fog spray		m2 m2 m2 m2				
	SABS1200	Single surface treatment	8.4.5	Single surface treatment with …. Aggregate	Nominal size of aggregate and type and grade of bituminous binder will be stated	m2	Rate cover cost of cleaning the primed surface, protecting the kerbs, placing guide lines, controlling dust, supplying all materials, spraying of binder, spreading of aggregate and rolling			
	SABS1200AAC	Single surface treatment	8.4.5	Single surface treatment with …. Aggregate	Nominal size of aggregate and type and grade of bituminous binder will be stated	m2	Rate cover cost of cleaning the primed surface, protecting the kerbs, placing guide lines, controlling dust, supplying all materials, spraying of binder, spreading of aggregate and rolling			
	SABS1200	Tack coat	8.5.3	Tack coat	Type and grade of emulsion will be stated	m2	Rate cove cost of brooming the surface, if necessary and supplying, diluting as specified and spraying the emulsion			

ROADS

SURFACE TREATMENTS	SABS1200AAC	Tack coat	8.5.3	Tack coat	Type and grade of emulsion will be stated	m2	Rate cove cost of brooming the surface, if necessary and supplying, diluting as specified and spraying the emulsion			
	SABS1200	Asphalt	8.5.4	Asphalt (nominal thickness indicated)	Type of asphalt and the type and grade of bituminous binder will be stated	t	Rate cover cost of supplying, hauling, heating and mixing various ingredients, hauling, placing and compacting the asphalt and control testing, protecting and maintaining the work as specified			
	SABS1200AAC	Asphalt	8.5.4	Asphalt (nominal thickness indicated)	Type of asphalt and the type and grade of bituminous binder will be stated	t	Rate cover cost of supplying, hauling, heating and mixing various ingredients, hauling, placing and compacting the asphalt and control testing, protecting and maintaining the work as specified			
	SABS1200	Variations in quantities	8.4.6 8.4.7 8.4.8	Variations in quantities of prime and bituminous binders Variations in quantities of aggregate (size of aggregate stated) Variation in the rate of application of slurry seal	Separate items will be scheduled for each type and grade of prime and bituminous binder stated Volume of aggregate will be measured in the truck Every load of saturated fine aggregate used shall be struck off with a straightedge at the stockpile, and the volume measured. The volume will be corrected for bulking	l m3 m3		Volume of the additional or reduced quantity of bituminous binder ordered will be measured at spraying temperature		
	SABS1200AAC	Variations in quantities	8.4.6 8.4.7 8.4.8	Variations in quantities of prime and bituminous binders Variations in quantities of aggregate (size of aggregate stated) Variation in the rate of application of slurry seal	Separate items will be scheduled for each type and grade of prime and bituminous binder stated Variation in quantities of aggregate will be scheduled and measured in increments of 0.001m3/m2 Every load of saturated fine aggregate used shall be struck off with a straightedge at the stockpile, and the volume measured. The volume will be corrected for bulking	l m2 m3		Volume of the additional or reduced quantity of bituminous binder ordered will be measured at spraying temperature		
	SABS1200	Variations in quantities	8.5.5	Variations in quantities of prime, curing and tack coats, and bituminous binders	Separate items will be scheduled for each type and grade of prime, emulsion in the curing and tack coats and bituminous binder stated	l	Rate cover cost for additional or reduced amount of prime, emulsion in the curing and tackcoat and bituminous binder and the rates will be added to or deducted from the rates			
	SABS1200AAC	Variations in quantities	8.5.5	Variations in quantities of prime, curing and tack coats, and bituminous binders	Separate items will be scheduled for each type and grade of prime, emulsion in the curing and tack coats and bituminous binder stated	l	Rate cover cost for additional or reduced amount of prime, emulsion in the curing and tackcoat and bituminous binder and the rates will be added to or deducted from the rates			
	SABS1200	Cationic stable mix	8.4.9	Extra over bituminous surface treatment for cationic stable-mix type 60% bitumen emulsion		l	Rate cover cost per litre of 60% emulsion when a cationic instead of an anionic emulsion is used in the slurry seal			

ROADS

SABS1200AAC	Cationic stable mix	8.4.9	Extra over bituminous surface treatment for cationic stable-mix type 60% bitumen emulsion		l	Rate cover cost per litre of 60% emulsion when a cationic instead of an anionic emulsion is used in the slurry seal			
SABS1200	Fog spray	8.4.10 8.4.10a 8.4.10 b	Fog spray (in double surface treatment) consisting of: Spray type cationic emulsion (percentage grade will be stated) Spray type anionic emulsion (percentage grade will be stated)	Volume of emulsion ordered will be measured at spraying temperature	 l l	Rate cover cost of supplying the binder and applying the fog spray			
SABS1200AAC	Fog spray	8.4.10 8.4.10a 8.4.10 b	Fog spray (in double surface treatment) consisting of: Spray type cationic emulsion (percentage grade will be stated) Spray type anionic emulsion (percentage grade will be stated)	Volume of emulsion ordered will be measured at spraying temperature	 l l	Rate cover cost of supplying the binder and applying the fog spray			
SABS1200	Pre-coated aggregate	8.4.11	Pre-coated aggregate	Measured in hauling vehicles or in stockpiles	m3	Rate cover cost of furnishing equipment and materials and pre-coating the aggregate, including handling, stockpiling and protecting stockpiles against inclement weather			
SABS1200AAC	Pre-coated aggregate	8.4.11	Pre-coated aggregate	Measured in m2	m2	Rate cover cost of furnishing equipment and materials and pre-coating the aggregate, including handling, stockpiling and protecting stockpiles against inclement weather			
CESMM3	Precoated aggregate	4.1 4.2	19.0mm 13.2mm		t t				
SABS1200	Bituminous binder	8.4.12	Bituminous binder for sand seal surface treatment	Type and grade of bituminous binder and number of sprays will be stated	l	Rate cover cost of supplying material and applying bituminous binder for each spray ordered including all preparatory work to surface prior to the application of bituminous binder	Volume applied will be measured at spraying temperature		
SABS1200AAC	Bituminous binder	8.4.12	Bituminous binder for sand seal surface treatment	Type and grade of bituminous binder and number of sprays will be stated	l	Rate cover cost of supplying material and applying bituminous binder for each spray ordered including all preparatory work to surface prior to the application of bituminous binder	Volume applied will be measured at spraying temperature		
CESMM3	Process bituminous material	3.1 3.2	Additional fines Mineral filler	 Cement Road lime Other fine material	m3 t t t				
SABS1200	Sand seal aggregate	8.4.13	Sand seal aggregate		m3	Rate cover cost of supplying aggregate, washing, screening, preparing and applying the aggregate as specified, and brooming the aggregate back onto the surface as often as necessary			
SABS1200AAC	Sand seal aggregate	8.4.13	Sand seal aggregate		m2	Rate cover cost of supplying aggregate, washing, screening, preparing and applying the aggregate as specified, and brooming the aggregate back onto the surface as often as necessary			

ROADS

	SABS1200	Mineral filler	8.5.6	Mineral filler		t	Rate cover cost of supplying, hauling and mixing-in of the mineral filler			
	SABS1200AAC	Mineral filler	8.5.6	Mineral filler		t	Rate cover cost of supplying, hauling and mixing-in of the mineral filler			
	SABS1200	Pre-coated chips	8.5.7	Pre-coated chips (nominal size indicated)		t	Rate cover cost of supplying, heating and mixing the chips and bituminous binder and the hauling, spreading and rolling of the chips			
	SABS1200AAC	Pre-coated chips	8.5.7	Pre-coated chips (nominal size indicated)		m2	Rate cover cost of supplying, heating and mixing the chips and bituminous binder and the hauling, spreading and rolling of the chips			
	SABS1200	Variations in quantities	8.5.8	Variations in quantities of pre-coated chips	Separate items will be scheduled for each nominal size stated	t	Rate cover cost of additional or reduced amount of pre-coated chips			
	SABS1200AAC	Variations in quantities	8.5.8	Variations in quantities of pre-coated chips	Separate items will be scheduled for each nominal size stated	t	Rate cover cost of additional or reduced amount of pre-coated chips			
GABIONS	SMM2	Embankments and gabions	Y9	Embankments and gabions	Measured per trades					
	BESMM3	Concrete pavements	1	Carriageway slabs of FMW specified quality concrete	Depth, thickness stated	m2			Items for reinforcement shall be deemed to include supporting reinforcement other than steel supports to top reinforcement	Item description for steel fabric reinforcement shall state sizes and nominal mass per m2 or reference to specification
			2	Other carriageway slabs of stated strength						
			3	Other in situ concrete slabs of stated strength						
			4	Steel fabric reinforcement	Nominal mass (kg/m2) stated		Areas of additional fabric reinforcement in laps shall not be measured			
			5	Other fabric reinforcement of stated material						
			6	Plain round steel bar reinforcement		t	Mass of steel reinforcement shall be 0.785kg/m2 per 100mm			
			7	Deformed high yield steel bar reinforcement			Mass of other reinforcing materials shall be taken as stated in the contract Mass of reinforcement measured shall include the mass of steel supports to top reinforcement			
			8	Waterproof membranes below concrete pavement		m2	Areas of additional membranes in laps shall not be measured			Item description for water proof membranes shall state the gauge and extent of laps
	BESMM3	Light duty pavements	1	Granular base		m2		Width of each course of materials shall be measured at the top surface of that course. Areas of manholes covers and other intrusions into a course shall not be deducted where the are of the intrusion is less than 1m2		
			2	Hardcore base						
			3	Tarmacadam						
			4	Rolled asphalt						
			5	Bitumen macadam						
			6	Dense tar						
			7	Insitu concrete of stated strength						
			8	Precast concrete flags to stated specification						

ROADS

PAVING	SMM2	Gravel, murram and pavings	Y5.a	Gravel, murram and pavings	State compacted thickness	m2	Kind and quality of materials and method of compaction shall be given	Works to slope shall be measured per rule W22b ii		
	SMM2	Interlocking bricks, concrete blocks road pavings	Y6	Interlocking bricks, concrete blocks, road pavings	State nominal thickness, pattern and if laid in bays, average size of each bay	m2	Particulars of following shall be given: Kind an quality of materials including bedding Size, shape and thickness of units Nature of surface finish Bedding or other method of fixing Treatment of joints Layout of joints Nature of base Preparatory work	Works to slope shall be measured per rule W22b ii		
	SABS1200	Paving	8.2.2	Construction of paving complete	Separate items for each type of material, class and shape of unit, depth of paving, type of laying bond and if applicable colour	m2	Rate cover cost of supplying units and sand, placing bedding layer, laying units, compacting pavement, filling gaps, filling joints, locking up the pavement and removing excess sand	Area measured will be that to be paved as shown on the drawings		
	SABS1200AAC	Paving	8.2.2	Construction of paving complete	Separate items for each type of material, class and shape of unit, depth of paving, type of laying bond and if applicable colour	m2	Rate cover cost of supplying units and sand, placing bedding layer, laying units, compacting pavement, filling gaps, filling joints, locking up the pavement and removing excess sand	Area measured will be that to be paved as shown on the drawings		
	CESMM3	Surfacing	4.7	Segmental paving	Edge restraints Paving Lock-up rolling	m m2 m			Paving shall include the sand bed and the supply, cutting as necessary, placing and compaction of the paving units and gap filling with concrete	Items shall identify the class and type of paving unit and the laying pattern
	CESMM3	Concrete pavements	5.1	In situ concrete of stated strength	Depth: not exceeding 30mm	m2	Width of each course of materials shall be measured at top surface of that course The areas of manhole covers and other intrusions into a course shall not be deducted where the area of the intrusion is less than 1m2 Area of additional geotextiles in laps shall not be measured		Shall include curing with curing compound at the specified rate of application	If not specified elsewhere the rate of application of curing compound shall be stated
			5.2	Formwork	30 - 60mm 60 - 100mm 100 - 150mm 150 - 200mm 200 - 250mm 250 - 300mm stated exceeding 300mm	m				
			5.3	Steel fabric reinforcement to SANS...	Nominal mass: not exceeding 2kg/m2	m2	Areas of additional fabric reinforcement in laps shall not be measured		Items shall include supporting reinforcement other than steel supports to top reinforcement	Descriptions shall state the fabric reference in SANS... or the wire and mesh arrangement in SANS Item descriptions for other fabric reinforcement shall state the sizes and nominal mass per square metre
			5.4	Other fabric reinforcement to stated material	2 - 3kg/m2 3 - 4kg/m2 4 - 5kg/m2 5 - 6kg/m2 6 - 7kg/m2	m2				

ROADS

					7 - 8kg/m2 stated exceeding 8kg/m2			Nominal size stated in descriptions shall be the cross-sectional size defined in SANS...		
			5.5	Plain round steel bar reinforcement to SANS...	Nominal size: 6mm	t	Mass of steel reinforcement shall be taken as 0.785kg/m2 per 100mm of cross-section (7.85t/m3)			
			5.6	Deformed high yield steel bar reinforcement to SANS...	8mm	t	Mass of other reinforcing materials shall be taken as stated in contract Mass of reinforcement measured shall include the mass of steel supports to top reinforcement			
					10mm 12mm 16mm 20mm 25mm 32mm or greater					
			5.7	Waterproof membranes below concrete pavements		m2	Areas of additional waterproof membranes in laps shall not be measured			Descriptions shall state their materials and thickness
JOINTS IN PAVING	BESMM3	Joints in concrete pavements	1 2 3 4 5 6	Longitudinal joints Expansion joints Contraction joints Wrapping joints Butt joints Construction joints	Depth of joints stated in mm			Construction joints shall be measured only where they are at locations where construction joints are expressly required	Dimensions, spacing and nature of sealed grooves and rebates, waterstops, dowels and other componencts shall be stated in item descriptions for joints in concrete pavements	
	SMM2	Jointing	Y10	Movement joints		m				
	CESMM3	Joints in concrete pavements	6.1 6.2 6.3 6.4 6.5 6.6	Longitudinal joints Expansion joints Contraction joints Warping joints Butt joints Construction joints	Depth of joint: not exceeding 30mm 30 - 60mm 60 - 100mm 100 - 150mm 150 - 200mm 200 - 250mm 250 - 300mm exceeding 300mm	m	Construction joints shall be measured only where they are at locations where construction joints are expressly required			Dimensions, spacing and nature of sealed grooves and rebates, waterstops, dowels and other components shall be stated in item description
OTHER	SABS1200	Cutting units	8.2.3	Cutting units to fit edge restraints	Separate items will be scheduled for straight, raking and circular cutting	m	Rate cover cost of cutting, waste of material, delays and disruption of the program	Length measured will be the length of that part of the edge restraint where it is necessary to cut units to fit		
	SABS1200AAC	Cutting units	8.2.3	Cutting units to fit edge restraints	Separate items will be scheduled for straight, raking and circular cutting	m	Rate cover cost of cutting, waste of material, delays and disruption of the program	Length measured will be the length of that part of the edge restraint where it is necessary to cut units to fit		
	SABS1200	Rolling	8.2.4	Rolling to locked-up condition (provisional)	Applicable only where rolling is required	m2	Rate cover cost of complying with additional specifications			
	SABS1200AAC	Rolling	8.2.4	Rolling to locked-up condition (provisional)	Applicable only where rolling is required	m2	Rate cover cost of complying with additional specifications			

ROADS

	SABS1200	Trial section	8.2.5	Trial section, not part of permanent work (size stated) (Provisional)	Applicable only where a trial section is ordered and is found to be acceptable but does not form part of the works	Sum/m2	Rate cover cost enumerated for construction of paving together with the cost of obtaining approval and of delays and disruption of the program			
	SABS1200AAC	Trial section	8.2.5	Trial section, not part of permanent work (size stated) (Provisional)	Applicable only where a trial section is ordered and is found to be acceptable but does not form part of the works	Sum/m2	Rate cover cost enumerated for construction of paving together with the cost of obtaining approval and of delays and disruption of the program			
	BESMM3	Kerbs, channels and edgings	1 2 3 4 5 6	Precast concrete kerb to reference stated Precast concrete edgings to reference stated Other precast concrete, kerbs, channels, edgings, dimensioned description Insitu concrete kerbs, channels, edgings, dimensioned description Asphalt kerbs, dimensioned description Asphalt channels, dimensioned description		m2	Straight or curved to radius > 12m Curved to radius < 12m Quadrants Drops Transitions	Excavation and filling for kerbs, channels and edgings shall be measured in accordance with Earthworks	Items for kerbs, channels and edgings shall be deemed to include beds, backings, reinforcement, joints and cuttings	Materials and cross-sectional dimensions of kerbs, channels and edgings and their beds and backings shall be stated in item descriptions
	SMM2	Road kerbs, channelling, edging, humps and shoulders	Y7	Kerbs, channelling, edging, humps and shoulders	Measured per trades					
	SABS1200	Edge restraints	8.2.1	Provision of edge restraints	Length measured will be that of the outside perimeter of the paving units as shown on drawings	m				
	SABS1200	Concrete kerbing	8.2.1	Concrete kerbing (grade of concrete for cast-in-situ concrete and type and figure or drawing number stated)	Straight and curved measured separately	m	Rate for precast kerbing shall cover supply of all materials for kerbing and bedding and for bedding, jointing, excavation, compacting, testing and for all labour in laying and jointing, together with all backfilling, compacting and removal of excess material Rate for cast-in-situ concrete, whether used with precast kerbing or machine placed extruded-in-situ kerbing, shall cover cost of formwork in addition Rate for brick-on-edge kerbing shall cover cost of supply of all bricks and concrete for bedding in addition Rate for extruded-in-situ kerbing cover cost of additional subbase, if any, required for the operation of the kerbing machine, excavation and trimming o subbase, supply and delivery of concrete to site, placing of extruded kerbing section, provision and use of kerbing machine, finishing with slurry topping where required, cutting of joints, testing, curing, backfilling, compacting and removal of excess material			

ROADS

KERBING	SABS1200AAC	Edge restraints	8.2.1	Provision of edge restraints	Length measured will be that of the outside perimeter of the paving units as shown on drawings	m				
	SABS1200AAC	Concrete kerbing	8.2.1	Concrete kerbing (grade of concrete for cast-in-situ concrete and type and figure or drawing number stated)	Straight and curved measured separately	m	Rate for precast kerbing shall cover supply of all materials for kerbing and bedding and for bedding, jointing, excavation, compacting, testing and for all labour in laying and jointing, together with all backfilling, compacting and removal of excess material Rate for cast-in-situ concrete, whether used with precast kerbing or machine placed extruded-in-situ kerbing, shall cover cost of formwork in addition Rate for brick-on-edge kerbing shall cover cost of supply of all bricks and concrete for bedding in addition Rate for extruded-in-situ kerbing cover cost of additional subbase, if any, required for the operation of the kerbing machine, excavation and trimming o subbase, supply and delivery of concrete to site, placing of extruded kerbing section, provision and use of kerbing machine, finishing with slurry topping where required, cutting of joints, testing, curing, backfilling, compacting and removal of excess material			
	SABS1200	Kerbing and channelling combined	8.2.2	Concrete kerbing and channelling combined (grade of concrete indicated for cast-in-situ concrete and type and figure or drawing number stated)	Straight and curved kerbing and channelling will be measured separately in the categories set out in 3.2	m	Rate cover cost of all applicable operations specified			
	SABS1200AAC	Kerbing and channelling combined	8.2.2	Concrete kerbing and channelling combined (grade of concrete indicated for cast-in-situ concrete and type and figure or drawing number stated)	Straight and curved kerbing and channelling will be measured separately in the categories set out in 3.2	m	Rate cover cost of all applicable operations specified			
	CESMM3	Kerbs, channels and edgings	7.1	Precast kerbs	Straight or curved to radius exceeding 12m	m	Excavation and filling shall be classed as earthworks class E		Include beds, backings, reinforcement, joints and cutting	Materials and cross-sectional dimensions and their beds and backings shall be stated Use items R7 1-5 to give drawing numbers of standard kerb and channel design contained in scope of work
			7.2	Precast channels	Curved to radius not exceeding 12m	m				
			7.3	Precast edgings	Quadrants	Nr				
			7.4	Precast kerb and channel	Drops	Nr				
			7.5	Precast kerb and edging	Transitions	Nr				
			7.6	In situ concrete kerbs and edgings						
			7.7	Asphalt kerbs						
			7.8	Asphalt channels						
	SABS1200	Variation of tests	8.2.3	Variation of tests on extruded kerbing:	If test result show kerb fails to comply with requirements, it will not be measured for payment		Rate cover costs of preparing a test specimen or a set of 3 specimens, as applicable, testing and making good			
			8.2.3a	Transverse strength test (provisional)		No				
			8.2.3b	Set of 3 cubes (provisional)		No				
			8.2.3c	Set of 3 cores (provisional)		No				

ROADS

SABS1200AAC	Variation of tests	8.2.3 8.2.3a 8.2.3b 8.2.3c	Variation of tests on extruded kerbing: Transverse strength test (provisional) Set of 3 cubes (provisional) Set of 3 cores (provisional)	If test result show kerb fails to comply with requirements, it will not be measured for payment	 No No No	Rate cover costs of preparing a test specimen or a set of 3 specimens, as applicable, testing and making good			
SABS1200	Depressed kerbs	8.2.4	Extra over kerbing for depressed kerbs	Measured linearly from the start of depression to the point at which the kerb returns to its normal height	m	Rate cover cost of all labour, material and other things necessary for the extra depth of excavation, concrete and special setting			
SABS1200AAC	Depressed kerbs	8.2.4	Extra over kerbing for depressed kerbs	Measured linearly from the start of depression to the point at which the kerb returns to its normal height	m	Rate cover cost of all labour, material and other things necessary for the extra depth of excavation, concrete and special setting			
SABS1200	Chutes	8.2.5	Chutes	Measured linearly on the slope	m	Rate cover cost of all applicable operations			
SABS1200AAC	Chutes	8.2.5	Chutes	Measured linearly on the slope	m	Rate cover cost of all applicable operations			
SABS1200	Ancillaries	8.2.6.1 8.2.6.2 8.2.6.2 a 8.2.6.2 b 8.2.6.2 c 8.2.6.2 d 8.2.6.2 e 8.2.6.2 f	Inlet, outlet, transition and similar structures (measured as unit structures - refer to type drawing for structure and grade of concrete) Inlet, outlet, transition and similar structures (measured by components): Excavation, restricted in all materials Extra-over for intermediate material Extra-over for hard rock material Concrete (grade stated) Formwork (surface finish stated) Other components (named)	No extra payment for any soil or gravel backfilling, additional concrete or mass concrete backfilling required because of overbreak or unavoidable unevenness of excavations in difficult ground and the cost thereof shall be covered by the rate for excavation	No m3 m3 m3 m3 m2 No	Rate cover cost of all excavation, trimming, formwork, concrete, backfilling and removal of excess material and also such accessories as grids, etc. as may be detailed on the type drawing			
SABS1200AAC	Ancillaries	8.2.6.1 8.2.6.2 8.2.6.2 a 8.2.6.2 b 8.2.6.2 c 8.2.6.2 d 8.2.6.2 e 8.2.6.2 f	Inlet, outlet, transition and similar structures (measured as unit structures - refer to type drawing for structure and grade of concrete) Inlet, outlet, transition and similar structures (measured by components): Excavation, restricted in all materials Extra-over for intermediate material Extra-over for hard rock material Concrete (grade stated) Formwork (surface finish stated) Other components (named)	No extra payment for any soil or gravel backfilling, additional concrete or mass concrete backfilling required because of overbreak or unavoidable unevenness of excavations in difficult ground and the cost thereof shall be covered by the rate for excavation	No m3 m3 m3 m3 m2 No	Rate cover cost of all excavation, trimming, formwork, concrete, backfilling and removal of excess material and also such accessories as grids, etc. as may be detailed on the type drawing			

ROADS

CHUTES, DRAINS, ETC.	SABS1200	Trimming	8.2.7 8.2.7a 8.2.7b 8.2.7c	Trimming of excavation for concrete-lined open drain in: Soft material Intermediate material Hard material	No extra payment for any soil or gravel backfilling, additional concrete or mass concrete backfilling required because of overbreak or unavoidable unevenness of excavations in difficult ground and the cost thereof shall be covered by the rate for trimming	 m2 m2 m2				
	SABS1200AAC	Trimming	8.2.7 8.2.7a 8.2.7b 8.2.7c	Trimming of excavation for concrete-lined open drain in: Soft material Intermediate material Hard material	No extra payment for any soil or gravel backfilling, additional concrete or mass concrete backfilling required because of overbreak or unavoidable unevenness of excavations in difficult ground and the	 m2 m2 m2				
	SABS1200	Cast-in-situ lining	8.2.8	Cast-in-situ concrete lining to open drains (concrete grade and type of drain stated)		m3	Rate cover costs per concrete (SABS1200C) and also painting of open joint surfaces where so specified			
	SABS1200AAC	Cast-in-situ lining	8.2.8	Cast-in-situ concrete lining to open drains (concrete grade and type of drain stated)		m3	Rate cover costs per concrete (SABS1200C) and also painting of open joint surfaces where so specified			
	SABS1200	Formwork to cast-in-situ lining	8.2.9 8.2.9a 8.2.9b 8.2.9c	Formwork to cast-in-situ concrete lining of open drains (smooth surface finish): To sides with formwork on the internal face only To sides with formwork on both internal and external faces (each face measured) To ends of slabs	Should contractor select to use precast side slabs, payment will be made for formwork as if cast-in-situ concrete had been used	 m2 m2 m2				
	SABS1200AAC	Formwork to cast-in-situ lining	8.2.9 8.2.9a 8.2.9b 8.2.9c	Formwork to cast-in-situ concrete lining of open drains (smooth surface finish): To sides with formwork on the internal face only To sides with formwork on both internal and external faces (each face measured) To ends of slabs	Should contractor select to use precast side slabs, payment will be made for formwork as if cast-in-situ concrete had been used	 m2 m2 m2				
	SABS1200	Joints to lining	8.2.10	Sealed joints to concrete lining of open drains (refer to type drawing)	Length measured will be that of the completed joint of each size and type	m	Rate cover cost of supplying materials, labour, formwork and incidentals necessary to complete the joint as shown on the drawings			
	SABS1200AAC	Joints to lining	8.2.10	Sealed joints to concrete lining of open drains (refer to type drawing)	Length measured will be that of the completed joint of each size and type	m	Rate cover cost of supplying materials, labour, formwork and incidentals necessary to complete the joint as shown on the drawings			
	SABS1200	Concrete screed or backfill below chute	8.2.11	Concrete screed or backfill below chute (grade of concrete stated)	Volume measured will be that of the concrete screed or backfill ordered by the Engineer and placed below chutes	m3	Rate cover cost of procuring, furnishing and placing the concrete screed or backfill as applicable			
	SABS1200AAC	Concrete screed or backfill below chute	8.2.11	Concrete screed or backfill below chute (grade of concrete stated)	Volume measured will be that of the concrete screed or backfill ordered by the Engineer and placed below chutes	m3	Rate cover cost of procuring, furnishing and placing the concrete screed or backfill as applicable			
	SABS1200	Steel reinforcement	8.2.12	Steel reinforcement	As per SABS 1200G	t				

ROADS

	SABS1200AAC	Steel reinforcement	8.2.12	Steel reinforcement	As per SABS 1200G	t				
	SABS1200	Bitumen emulsion primer or polyethylene sheeting for open drains	8.2.13	Sprayed bitumen emulsion primer or polyethylene sheeting for concrete-lined open drains	Area measured will be that of the open drain to be concreted	m2	Rate cover cost of procuring, furnishing and applying sprayed bitumen emulsion primer or polyethylene sheeting			
	SABS1200AAC	Bitumen emulsion primer or polyethylene sheeting for open drains	8.2.13	Sprayed bitumen emulsion primer or polyethylene sheeting for concrete-lined open drains	Area measured will be that of the open drain to be concreted	m2	Rate cover cost of procuring, furnishing and applying sprayed bitumen emulsion primer or polyethylene sheeting			
GRAVEL	SABS1200	Gravel surface layer	8.3.16	Gravel surface layer	Measurement will be by volume calculated by the method of average end areas	m3	Cover cost of locating, excavating, hauling, placing and compacting material			
GRAVEL	AACSABS1200	Gravel surface layer	8.3.16	Gravel surface layer	Measurement will be by volume calculated by the method of average end areas	m3	Cover cost of locating, excavating, hauling, placing and compacting material			
	BESMM3	Ancillaries	1	Traffic signs	Non-illuminated	nr		Lengths measured for linear surface markings shall take account of the gaps in intermittent markings Items for support gantries and other substantial structures associated with traffic signs which are constructed in concrete structural metalwork or other materials shall be measured under the appropriate work sections	Items for traffic signs, other than traffic signs measured in accordance with rule M10 shall be deemed to include foundations, supporting posts, excavation, preparation of surfaces, disposal of excavated material, removal of existing services, upholding sides of excavation, backfilling, concrete, reinforcement and joints Shape and colour of aspects shall be stated in item descriptions for reflecting studs	Material, size and diagram number taken from traffic sings, regulations and general directions issued by FMW shall be stated in item descriptions for traffic sings and surface markings
			2	Surface markings	Illuminated Non reflective studs Reflecting studs Letters and shapes Continuous lines Intermittent (broken) lines	nr m				
	SMM2	Road signs and crash barriers	Y8	Road signs and crash barriers	Measured per trades					
	SABS1200	Signs	8.3.1 8.3.1a	Sign faces with painted or galvanized background, with painted symbols, characters, legend and borders and with signboards constructed from: Aluminium sheet (1.0mm thick) of area: 0 - 2m2 2m2 - 10m2 10m2 and upwards in increments of 5m2 Aluminium extrusions (alloy and temper condition stated) all sizes Sheet steel (1.6mm thick) of area: 0 - 2m2 2m2 - 10m2	Area measured will be that of the painted front face of the sign	 m2 m2 m2 m2 m2 m2	Rate cover cost of supplying and erecting the completed signboard face, frame and fixing brackets, including painting or galvanising as specified, reflective characters, symbols, legend and border and brackets, bolts, nuts, etc.			

ROADS

			8.3.1d	10m2 and upwards in increments of 5m2 Weather-resistant particle board (12.7mm thick) of area: 0 - 2m2 2m2 - 10m2		m2 m2 m2				
	SABS1200AAC	Signs	8.3.1 8.3.1a 8.3.1b 8.3.1c 8.3.1d 	Sign faces with painted or galvanized background, with painted symbols, characters, legend and borders and with signboards constructed from: Aluminium sheet (1.0mm thick) of area: 0 - 2m2 2m2 - 10m2 10m2 and upwards in increments of 5m2 Aluminium extrusions (alloy and temper condition stated) all sizes Sheet steel (1.6mm thick) of area: 0 - 2m2 2m2 - 10m2 10m2 and upwards in increments of 5m2 Weather-resistant particle board (12.7mm thick) of area: 0 - 2m2 2m2 - 10m2	Area measured will be that of the painted front face of the sign	 m2 m2 m2 m2 m2 m2 m2 m2 m2	Rate cover cost of supplying and erecting the completed signboard face, frame and fixing brackets, including painting or galvanising as specified, reflective characters, symbols, legend and border and brackets, bolts, nuts, etc.			
	SABS1200	Retro-reflective material	8.3.2 8.3.2a 8.3.2b 8.3.2c	Provision and application of retro-reflective material: Engineering grade retro-reflective background, characters, symbols, legend and borders High intensity grade retro-reflective background, characters, symbols, legend and borders High intensity grade characters, symbols, legend and borders and engineering grade retro- reflective background	Area measured will be in the case of boarders, the area covered with retro-reflective material; case of background, area of the whole sign; case of symbols, characters and legend the are of a square, rectangle or circle as appropriate that encloses the whole of such symbol, character or legend	 m2/Sum m2/Sum m2/Sum	Rate cover cost of providing retro-reflective background, symbols, characters, legend, and borders of the types specified or scheduled or shown on the drawing			
SIGNS	SABS1200AAC	Retro-reflective material	8.3.2 8.3.2a 8.3.2b 8.3.2c	Provision and application of retro-reflective material: Engineering grade retro-reflective background, characters, symbols, legend and borders High intensity grade retro-reflective background, characters, symbols, legend and borders High intensity grade characters, symbols, legend and borders and engineering grade retro- reflective background	Area measured will be in the case of boarders, the area covered with retro-reflective material; case of background, area of the whole sign; case of symbols, characters and legend the are of a square, rectangle or circle as appropriate that encloses the whole of such symbol, character or legend	 m2/Sum m2/Sum m2/Sum	Rate cover cost of providing retro-reflective background, symbols, characters, legend, and borders of the types specified or scheduled or shown on the drawing			

ROADS

SABS1200	Sign supports	8.3.3 8.3.3a 8.3.3b 8.3.3c	Sign supports: Structural steel (protective treatment, if any stated) Steel tubing (protective treatment, if any stated) Timber (diameter and type indicated)		No/t No/t m	Rate cover supplying and erecting the supporting structures including all bolts, screw, rivets, welding and accessories together with the painting required and the provision for breakaway in accordance with details given			
SABS1200AAC	Sign supports	8.3.3 8.3.3a 8.3.3b 8.3.3c	Sign supports: Structural steel (protective treatment, if any stated) Steel tubing (protective treatment, if any stated) Timber (diameter and type indicated)		No/t No/t m	Rate cover supplying and erecting the supporting structures including all bolts, screw, rivets, welding and accessories together with the painting required and the provision for breakaway in accordance with details given			
SABS1200	Excavation, backfilling and concreting sign supports	8.3.4	Excavation, backfilling and concreting (if any) for sign supports (material to be used for backfill stated)	Measurement calculated from neat dimensions of the foundations given on drawings	m3	Rate cover cost of excavating, provision of concrete or mixing of backfill material with cement, backfilling and compacting the backfill material as applicable and the disposal of all surplus excavated material	In case of poles not in concrete, plan are of each excavated hole will be taken as 0.15m2 regardless of actual size of the excavated hole		
SABS1200AAC	Excavation, backfilling and concreting sign supports	8.3.4	Excavation, backfilling and concreting (if any) for sign supports (material to be used for backfill stated)	Measurement calculated from neat dimensions of the foundations given on drawings	m3	Rate cover cost of excavating, provision of concrete or mixing of backfill material with cement, backfilling and compacting the backfill material as applicable and the disposal of all surplus excavated material	In case of poles not in concrete, plan are of each excavated hole will be taken as 0.15m2 regardless of actual size of the excavated hole		
CESMM3	Ancillaries	8.1	Traffic signs	Non-illuminated Illuminated	Nr Nr	Items for support gantries and other substantial structures associated with traffic signs which are constructed in concrete, structural metalwork of other materials shall be given in the appropriate classes		Items for traffic signs measured in accordance with rule M10 shall be deemed to include foundations, supporting posts, excavation, preparation of surfaces, disposal of excavated material, removal of existing services, upholding sides of excavation, backfilling, concrete, reinforcement and joints	Material, size and diagram number taken from traffic sings, regulations and general directions, issued by Department of transport, shall be stated in item description
SABS1200	Distance markers	8.3.5	Distance markers		No	Rate cover cost of all labour and materials, painting, supports, excavation, backfilling with soil, necessary to complete the work as detailed on drawings			

ROADS

	SABS1200AAC	Distance markers	8.3.5	Distance markers		No	Rate cover cost of all labour and materials, painting, supports, excavation, backfilling with soil, necessary to complete the work as detailed on drawings			
	SABS1200	Statutory signs, street names, etc.	8.3.6	Statutory signs, street names, and the like, supplied and erected complete		No	Rate cover cost of supplying with legend painted as specified, erection and all other painting complete and shall include the cost of excavation, foundations, etc. and backfilling and disposal of surplus material			
	SABS1200AAC	Statutory signs, street names, etc.	8.3.6	Statutory signs, street names, and the like, supplied and erected complete		No	Rate cover cost of supplying with legend painted as specified, erection and all other painting complete and shall include the cost of excavation, foundations, etc. and backfilling and disposal of surplus material			
	SABS1200	Dismantling and re-erection of road signs	8.3.7 8.3.7a 8.3.7b 8.3.7c 8.3.7d	Dismantling and re-erection of road signs 0 - 2m2 2m2 - 5m2 5m2 - 10m2 10m2 - 15m2	Separate further items in increments of 5m2	 No No No No	Rate cover cost dismantling road signs and supporting structures, transporting material to the new site(s), re-erecting road signs, including the cost of new bolts and nuts if required for re-erection			
	SABS1200AAC	Dismantling and re-erection of road signs	8.3.7 8.3.7a 8.3.7b 8.3.7c 8.3.7d	Dismantling and re-erection of road signs 0 - 2m2 2m2 - 5m2 5m2 - 10m2 10m2 - 15m2	Separate further items in increments of 5m2	 No No No No	Rate cover cost dismantling road signs and supporting structures, transporting material to the new site(s), re-erecting road signs, including the cost of new bolts and nuts if required for re-erection			
	SABS1200	Guardrails	8.2.1 8.2.1a 8.2.1b	Guardrails on posts (materials to be used for posts, spacer blocks, guardrails and backfill will be stated): Galvanised Painted		 m m	Rate cover cost of supplying and erecting the guardrails, completely painted or galvanised, with posts (spaced to suit the standard length of guardrail), spacer blocks, bolts, nuts, washers, reinforcing plates and excavating and backfilling post holes and disposing of surplus excavated material			
	SABS1200AAC	Guardrails	8.2.1 8.2.1a 8.2.1b	Guardrails on posts (materials to be used for posts, spacer blocks, guardrails and backfill will be stated): Galvanised Painted		 m m	Rate cover cost of supplying and erecting the guardrails, completely painted or galvanised, with posts (spaced to suit the standard length of guardrail), spacer blocks, bolts, nuts, washers, reinforcing plates and excavating and backfilling post holes and disposing of surplus excavated material			

ROADS

GUARDRAILS	SABS1200	Curved guardrails	8.2.2	Extra over for horizontally curved guardrails factory-bent to a radius of less than 150m		m	Rate cover additional cost of supplying and erecting curved sections			
	SABS1200AAC	Curved guardrails	8.2.2	Extra over for horizontally curved guardrails factory-bent to a radius of less than 150m		m	Rate cover additional cost of supplying and erecting curved sections			
	SABS1200	End units	8.2.3 8.2.3a 8.2.3b 8.2.3c 8.2.3d	End units: End wings (type stated) Terminal sections as per drawing …. Using single guardrail sections Terminal sections as per drawing …. Using double guardrail sections Cable stays complete with anchor blocks		 No No No No	Rate cover cost of supplying and erecting end wings and terminal units including posts, fittings and the bending of turned-down sections, painting or galvanizing as applicable, excavations, concrete work, backfilling and the disposal of surplus backfilling			
	SABS1200AAC	End units	8.2.3 8.2.3a 8.2.3b 8.2.3c 8.2.3d	End units: End wings (type stated) Terminal sections as per drawing …. Using single guardrail sections Terminal sections as per drawing …. Using double guardrail sections Cable stays complete with anchor blocks		 No No No No	Rate cover cost of supplying and erecting end wings and terminal units including posts, fittings and the bending of turned-down sections, painting or galvanizing as applicable, excavations, concrete work, backfilling and the disposal of surplus backfilling			
	SABS1200	Additional guardrail posts	8.2.4	Additional guardrail posts (material to be used for posts, spacer blocks and backfill will be stated)		No	Rate cover cost of supplying and erecting additional posts, including excavating and backfilling of post holes and disposing of surplus material			
	SABS1200AAC	Additional guardrail posts	8.2.4	Additional guardrail posts (material to be used for posts, spacer blocks and backfill will be stated)		No	Rate cover cost of supplying and erecting additional posts, including excavating and backfilling of post holes and disposing of surplus material			
	SABS1200	Reflector plates	8.2.5	Reflector plates		No	Rate cover cost of supplying all materials and labour required to manufacture, paint and fix reflector plates as specified			
	SABS1200AAC	Reflector plates	8.2.5	Reflector plates		No	Rate cover cost of supplying all materials and labour required to manufacture, paint and fix reflector plates as specified			
	SABS1200	Dismantling existing guardrails	8.2.6	Dismantling existing guardrails		m	Rate cover cost of dismantling existing guardrails, removing all posts, transporting material to designated storage and stacking and excavating and backfilling post holes			
	SABS1200AAC	Dismantling existing guardrails	8.2.6	Dismantling existing guardrails		m	Rate cover cost of dismantling existing guardrails, removing all posts, transporting material to designated storage and stacking and excavating and backfilling post holes			
	SABS1200	Repainting existing guardrails	8.2.7	Repainting existing guardrails		m	Rate cover cost of cleaning existing guardrails and of supplying materials and repainting the guardrails as specified			

ROADS

	SABS1200AAC	Repainting existing guardrails	8.2.7	Repainting existing guardrails		m	Rate cover cost of cleaning existing guardrails and of supplying materials and repainting the guardrails as specified			
PAINTING	SMM2	Painting	Y11	Painting	Measured per rules for Painting and Decorations					
	SABS1200	Non-reflectorized paint	8.4.1 8.4.1a 8.4.1b 8.4.1c 8.4.1d 8.4.1e	Non-reflectorized paint applied at nominal rate of 0.42l/m2 (of proprietary brand road-marking material (nominal rate of application and particulars stated)) as scheduled White lines (broken or unbroken)(width of line indicated) Yellow lines (broken or unbroken)(width of line indicated) White characters and symbols Yellow characters and symbols Traffic island markings (any colour)	Lines: length measured will be actual length of line painted, excluding length of gaps in broken lines Characters and symbols: are measured will be that of the characters, symbols or other markings painted	 km km m2 m2 m2	Rate cover cost of supplying all materials and equipment necessary and for painting and protection, including setting out of characters, symbols and traffic island markings but excluding the setting out and premarking of lines			
	SABS1200AAC	Non-reflectorized paint	8.4.1 8.4.1a 8.4.1b 8.4.1c 8.4.1d 8.4.1e	Non-reflectorized paint applied at nominal rate of 0.42l/m2 (of proprietary brand road-marking material (nominal rate of application and particulars stated)) as scheduled White lines (broken or unbroken)(width of line indicated) Yellow lines (broken or unbroken)(width of line indicated) White characters and symbols Yellow characters and symbols Traffic island markings (any colour)	Lines: length measured will be actual length of line painted, excluding length of gaps in broken lines Characters and symbols: are measured will be that of the characters, symbols or other markings painted	 km km m2 m2 m2	Rate cover cost of supplying all materials and equipment necessary and for painting and protection, including setting out of characters, symbols and traffic island markings but excluding the setting out and premarking of lines			
	CESMM3	Ancillaries	8.2	Surface markings	Non-reflecting road studs Reflecting road studs Letters and shapes Continuous lines Intermittent lines	Nr Nr Nr m m	Lengths measured for linear markings shall exclude gaps in intermittent markings			Shape and colour of aspects shall be stated in item
	SABS1200	Road studs	8.4.3	Road studs (type will be stated)	Actual number of approved road studs placed	No	Rate cover cost of supplying all material, labour and equipment necessary, and of fixing the studs			
	SABS1200AAC	Road studs	8.4.3	Road studs (type will be stated)	Actual number of approved road studs placed	No	Rate cover cost of supplying all material, labour and equipment necessary, and of fixing the studs			
	SABS1200	Setting out and premarking	8.4.4	Setting out and premarking			Rate cover cost of setting out and premarking the lines or special markings including all material			

ROADS

			8.4.4a 8.4.4b	Lines (excluding traffic island markings, characters and symbols) Special markings (details stated)	Where two or three lines are to be applied next to each other, setting out of lines will be measured once only along the centre in the case of two lines or on the centre line in the case of three lines	km Sum/No				
	SABS1200AAC	Setting out and premarking	8.4.4 8.4.4a 8.4.4b	Setting out and premarking Lines (excluding traffic island markings, characters and symbols) Special markings (details stated)	 Where two or three lines are to be applied next to each other, setting out of lines will be measured once only along the centre in the case of two lines or on the centre line in the case of three lines	 km Sum/No	Rate cover cost of setting out and premarking the lines or special markings including all material			
	SABS1200	Guide blocks	8.5.1	Guide blocks supplied and erected		No	Rate cover cost of supplying all materials, equipment and labour for making, painting, transporting, setting out and placing the blocks for excavating and backfilling all holes and for the disposal of surplus material			
	SABS1200AAC	Guide blocks	8.5.1	Guide blocks supplied and erected		No	Rate cover cost of supplying all materials, equipment and labour for making, painting, transporting, setting out and placing the blocks for excavating and backfilling all holes and for the disposal of surplus material			
VARIATION	SABS1200	Variation in rate	8.4.2 8.4.2a 8.4.2b 8.4.2c 8.4.2d	Variation in rate of application from that stated in 8.4.1 White paint Yellow paint Glass beads Proprietary brand road-marking material		 l l kg l				
	SABS1200AAC	Variation in rate	8.4.2 8.4.2a 8.4.2b 8.4.2c 8.4.2d	Variation in rate of application from that stated in 8.4.1 White paint Yellow paint Glass beads Proprietary brand road-marking material		 l l kg l				
	CESMM3	Variation in quantities	5.1 5.2 5.3 5.4 5.5 5.6 5.7 5.8	Prime Curing coat Tack coat Fog spray Bitumen binder Slurry seal Aggregate Precoated aggregate	 6.7mm 9.5mm 13.2mm 19.0mm	 m3				Descriptions for surfacing should state the spray rates, aggregate application rates and bitumen content on which the price for surfacing is deemed to be based

ANNEXURE B: COPY OF ONLINE SURVEY QUESTIONNAIRE

INTEGRATED ENGINEERING STANDARD METHOD OF MEASURING SYSTEM FOR AFRICA: ANALYSIS OF ROLE PLAYERS' KNOWLEDGE OF EXISTING SYSTEMS AND FUTURE EXPECTATIONS

Respondent number:

Please answer all questions by using your mouse to point and insert "x" in appropriate box.

SECTION 1: BACKGROUND INFORMATION

1. Gender.

Male	
Female	

2. Age group.

20 – 30 years	
31 – 40 years	
41 – 50 years	
51 – 60 years	
Above 60 years	

3. Residing country.

4. What is your current **main** function or line of business?

Quantity Surveyor	
Architect	
Engineer	
Contractor	
Other (specify):	

5. What **type** of company are you currently working for?

Consulting company	
Contracting company	
Financial Institution	
Mining company	
Other (specify):	

SECTION 2: LEVEL OF KNOWLEDGE OF EXISTING STANDARD METHOD OF MEASURING SYSTEMS

1. Which of the following standard method of measuring systems do you **know exist**?

Nigerian: Building and Engineering Standard Method of Measurement 2008	
Standard Method of Measurement of Building Works in Zambia 2010	
Kenya: Standard Method of Measurement of Building and Associated Civil Works for Eastern Africa 2008	
South African Bureau of Standards Standardized Specification for Civil Engineering Construction (SABS1200) 1986	
South African Bureau of Standards Standardized Specification for Civil Engineering Construction (SABS1200) with Anglo American Amendments 2004	
Civil Engineering Standard Method of Measurement – Southern African Edition (CESMM3) 2011	
Association of South African Quantity Surveyors Standard System of Measuring Building Work 2013	

2. Which of the following standard method of measuring systems have you **personally used**?

Nigerian: Building and Engineering Standard Method of Measurement 2008	
Standard Method of Measurement of Building Works in Zambia 2010	
Kenya: Standard Method of Measurement of Building and Associated Civil Works for Eastern Africa 2008	
South African Bureau of Standards Standardized Specification for Civil Engineering Construction (SABS1200) 1986	
South African Bureau of Standards Standardized Specification for Civil Engineering Construction (SABS1200) with Anglo American Amendments 2004	
Civil Engineering Standard Method of Measurement – Southern African Edition (CESMM3) 2011	
Association of South African Quantity Surveyors Standard System of Measuring Building Work 2013	

3. How would you **rate** your **knowledge** of the following standard method of measuring systems?

	Very low	Low	Average	High	Very high
	1	2	3	4	5
Nigerian: Building and Engineering Standard Method of Measurement 2008					
Standard Method of Measurement of Building Works in Zambia 2010					
Kenya: Standard Method of Measurement of Building and Associated Civil Works for Eastern Africa 2008					
South African Bureau of Standards Standardized Specification for Civil Engineering Construction (SABS1200) 1986					

	Very low	Low	Average	High	Very high
	1	2	3	4	5
South African Bureau of Standards Standardized Specification for Civil Engineering Construction (SABS1200) with Anglo American Amendments 2004					
Civil Engineering Standard Method of Measurement – Southern African Edition (CESMM3) 2011					
Association of South African Quantity Surveyors Standard System of Measuring Building Work 2013					

SECTION 3: EXPECTATION OF STANDARD METHOD OF MEASURING SYSTEMS

1. Which of the following formats do you **prefer** a standard method of measuring system to be published in?

Book format	
Tabular format	

2. Do you **think** references to standard specifications should be included in a standard method of measuring system?

Yes	
No	

3. **Rate** each of the following information that you believe should be included in a standard method of measuring system.

	Very low	Low	Average	High	Very high
	1	2	3	4	5
Contents					
Sections divided by trades					
General instructions					
General rules applicable to each trade/section					
Measurement rules for each item					
Coverage rules for each item					
Short, concise items with enough information to avoid ambiguities					
References to standard specifications					
Other (specify):					

SECTION 4: **POSSIBLE SOLUTION TO IMPROVE CURRENT PROJECTS IN AFRICA**

1. The Association of South African Quantity Surveyors recently published a standard method of measuring system for **building works** for Africa, accepted by the African Association of South African Quantity Surveyors. In your **opinion** to what extent do you agree that this system adds value to your profession?

I absolutely disagree	
I disagree somewhat	
I agree somewhat	
I absolutely agree	

2. To what extent do you **agree** that one concise, easy to read, standard method of measuring system for **engineering works** should be developed for the whole of Africa?

I absolutely disagree	
I disagree somewhat	
I agree somewhat	
I absolutely agree	

3. If you **disagreed** with question 2 above, which of the following alternatives would you prefer?

Keep using system currently used in your residing country	
Keep all current systems and use at own discretion	
Other (specify):	

4. If a new standard method of measuring system for **engineering works for Africa** is developed will you:

Start using it immediately	
Study it intensely and if acceptable start using it	
Wait and see how the market react to it and then use it	
Not even look at it	
Other (specify):	

5. If a new standard method of measuring system for **engineering works for Africa** is developed will you:

Recommend it to your clients	
Study it intensely and if acceptable recommend it to your clients	
Wait and see how the market react to it and then recommend it to your clients	
Other (specify):	

6. If a new standard method of measuring system for **engineering works for Africa** is developed in your opinion do you think it should be incorporated in the Tertiary Institutions' curriculums?

Yes	
No	
If No, why:	

To ensure that your CPD 1/2 hour is recorded, please provide the following details in e-mail:

Name & Surname, ASAQS membership Number, ID Number and Contact Number.

Thank you for your time and co-operation

PLEASE SAVE THIS QUESTIONNAIRE, AFTER COMPLETION, ONTO YOUR DESKTOP AND MAIL IT BACK TO :

lydiac@cesgroup.co.za

or

lydia.carroll001@gmail.com

ANNEXURE C: SUGGESTED STANDARD CIVIL ENGINEERING METHOD OF MEASURING SYSTEM

INTEGRATED CIVIL ENGINEERING STANDARD

METHOD OF MEASUREMENT SYSTEM

FOR AFRICA

2015

First Edition

CONTENTS

CONTENTS

PREFACE

The *Integrated Civil Engineering Standard Method of Measurement System for Africa,* first edition, may be used with any conditions of contract for civil engineering work that includes measurement.

NOTE
Not all trades relevant to civil engineering work are covered in this edition, but will be added in future editions.

Any suggestions for amendment will be reviewed and considered in future printed editions. Revision of the document will be made when such action seems warranted.

FOREWORD TO THE FIRST EDITION

In 2014 the need for one integrated standard system of measuring civil engineering work in Africa was identified and was undertaken by Lydia C Carroll, BSc QS, under an agreement with the University of Pretoria, under a direct agreement with the Faculty of Engineering, Built Environment and Information Technology.

Beginning 2015 a questionnaire was distributed to members of the Royal Institute of Chartered Surveyors, Africa, and the Association of South African Quantity Surveyors to determine initial layout of the system. Late in 2015 a draft of the standard system was circulated for comments and the form of the present document owes much to the suggestions made by participants. Lydia C Carroll is indebted to the many people who helped in this way.

The object of the work has been to provide an integrated system taking the following six standard systems in consideration:

- Nigerian Institute of Quantity Surveyors – 2008: Building and Engineering Standard Method of Measurement
- Suveyor's Institute of Zambia – 2010: Standard Method of Measurement of Building Works in Zambia
- Architectural Association of Kenya, Quantity Surveyors Chapter – 2008: Standard Method of Measurement of Building and Associated Civil Works for Eastern Africa
- South African Bureau of Standards – 1986: South African Bureau of Standards Standardised Specification for Civil Engineering Construction
- South African Bureau of Standards and Anglo American – 2004: South African Bureau of Standards Standardised Specification for Civil Engineering Construction with Anglo American Amendments
- Joint Division of the Institution of Civil Engineers and South African Institution of Civil Engineering – 2011: Civil Engineering Standard Method of Measurement – Southern African Edition

A system of work classification has been adopted as the basis of the method of measurement so that Bills of Quantities can be compiled and used more easily. The work classification incorporates a reference number for each type of work component. These reference numbers may be used as a simple code for identification of work. Their use as part of the item numbers in Bills of Quantities is suggested. The coding is sufficiently flexible not to inhibit description of the particular work in each contract.

DEFINITIONS

1.1 In this document and in Bills of Quantities prepared according to the procedure set forth herein the following works and expressions have the meanings hereby assgined to them, except where the context otherwise requires

1.2 '**Additional rules**' provide additional information required for an item.

1.3 '**Authorised person**' may be the employer, employer's representative, engineer, project manager, principal agent, etc. authorised to prescribe conditions in the contract.

1.4 '**Bill of Quantities**' means a list of items giving brief identifying descriptions and estimated quantities of the work comprised in a contract.

1.5 '**Completion**' means a state of readiness for occupation or use of the whole works although some minor work may be outstanding.

1.6 '**Coverage rules**' provide that the work stated is deemed to be included in the appropriate item. A Coverage rule does not state all the work covered by an item and does not preclude any of the work stated being covered by a Method-related charge.

1.7 '**Daywork**' means the method of valuing work on the basis of time spent by the workmen, operatives, the materials and equipment used plus an agreed percentage for overheads and profit.

1.8 The expression '**expressly required**' means shown on the drawings, described in the scope of work/specifications or instructed in terms of the contract by the authorised person which modify the contents of the scope of work.

1.9 '**Free issue material**' means materials provided free of charge and shall be so described stating point of delivery, testing, storage, protection and all responsibilities provided by the contractor.

1.10 '**Measurement rules**' set out the conditions under which work shall be measured and the method by which the quantities shall be computed if other than in accordance with 2.8 and 2.9.

1.11 '**Prime cost item**' means an amount included in contract for the delivered cost price of goods, services or materials to be supplied under the contract from a specified supplier, exclusive of any profit and attendance required by the main contractor and provision shall be made for the addition thereof.

1.12 '**Provisional sum**' means an amount included in contract for work that is foreseen but cannot be specified at the time of formation of the contract or a sum included and so designated in the contract as a specific contingency for the execution of the work or the supply of goods materials or services which may be used in whole or in part or not at all at the direction and discretion of authorised person.

1.13 '**Permanent works**' means works other than temporary works to be constructed and completed in accordance with the contract.

1.14 '**Rate**' means an unit rate or price entered in the bill of quantities at which the Contractor undertakes to execute the particular work or to provide the required material, article or service, or to do any or all of these things, as set out in the item concerned.

1.15 '**Temporary works**' means temporary works of every kind required on site for the execution and completion of the permanent works and the remedy of any defects.

1.16 '**Works**' means work to be carried out, goods, materials and services to be supplied, and the liabilities, obligations and risks to be undertaken by the contractor.

1.17 '**Work Classification**' means the Work Classification set out in section 5.

1.18 '**Work in abnormal conditions**' means work executed in abnormal conditions such as under water, in restricted or dangerous environments, etc. shall be so described stating complete circumstances.

1.19 '**Work in compressed air**' means work so described stating the pressure and method of entry and exit.

SECTION 2
GENERAL PRINCIPLES

2.1 **Object**

The object of this document is to set forth the rpocedure according to which the Bill of Quantities shall be prepared and priced and the quantities of work expressed and

2.2 **Objects of the Bill of Quantities**

The objects of the Bill of Quantities are to provide information of the quantities of work as to enable tenders to be prepared efficiently and accurately and to provide the use of the priced Bill of Quantities in the valuation of actual work executed after entering a contract.

Work should be itemised in the Bill of Quantities in sufficient detail for it to be possible to distinguish between different classes of work, and between work of the same nature carried out in different locations or in any other circumstances which may give rise to different considerations of cost. The layout and content of the Bill of Quantities should be as simple and brief as possible.

All work expressly required should be covere in the Bill of Quantities.

2.3 **Mode of description**

Item descriptions for permanent works shall generally identify the component of the works and not the tasks to be carried out by the contractor, for example:

An item should be described as '20mm diameter mild steel bar reinforcement', not as 'Suply, deliver, cut, bend and fix 20mm diameter mild steel bar reinforcement'.

Where the work identified by an item is specifically limited, the limitation shall be stated in the item description, for example:

'20mm diameter steel bar reinforcement excluding supply and delivery to the Site'.

2.4 **Separate items**

Work shall be divided into items in the Bill of Quantities so that the component of work which is included in each item does not exhibit more than one feature from each division of any one class of the Work Classification, for example:

One item for joints shall not include more than one of the types of joints, neither shall it include different units whose dimensions are not within one of the classifications listed in the second division.

2.5 **Order of items**

The work shall be set out as far as possible in accordance with the following rules:
- The work shall be divided into trades and sections of trades in the order as set out in this standard system. If necessary the work may be further divided into additional sub-sections to facilitate cost analyses, cost reporting, etc.
- Ancillary work applicable to a specific trade shall be given in that trade in accordance with the principles laid down in the relevant trades
- Within each trade or section thereof the order shall be mass, volume, area, length and number.

2.6 **Units of measurement**

The unit of measurement for each item shall be that stated for the item in the Work Classification.

2.7 **Order of dimensions**

Dimensions shall as far as possible be given in the following sequence:
- Horizontal at right angles to the line of sight
- Horizontal parallel to the line of sight
- Vertical.

2.8 **Nett measurements**

Unless otherwise stated all work shall be measured net as fixed in position and no allowance shall be made for bulking, shrinkage or waste.

Each measurement shall be taken to the nearest 10mm ie. 5mm and over shall be regarded as 10mm and less than 5mm shall be disregarded. This rule shall not apply to any dimensions stated in the description.

2.9 **Fractional quantities**

Quantities shall be rounded off to the nearest whole unit, except for tonnes which shall be to the nearest two decimal places. Where the value of fractional quantities is of relative significance, quantities may be given to one decimal place.

2.10 **Provisional quantities**

Where the quantity of any work cannot be accurately determined during preparation of the bills of quantities such work shall be described as provisional and subsequently remeasured.

2.11 **Contingencies, etc.**

Sums for contingencies, provision for contract price adjustments and other expenditure which cannot be determined during the preparation of the bills shall be given in the final summary at the end of the bills of quantities.

SECTION 3
CODING AND NUMBERING OF ITEMS

3.1 **Coding**

For convenience of reference each item in the Work Classification has been assigned a code number consisting of a letter and not more than two digits. The letter correspons to the trade in the Work Classification in which the item occurs and the digits give the position of the item in the first and second divisions of the class, for example:

Code C9.1.1 identifies an item as

trade	C	Earthworks
first division	9	Restricted excavations
second division	1	Excavate for restricted foundations, footings, etc. in all materials and use for backfill or embankment or dispose of depth
third division	1	not exceeding 1m

3.2 **Item numbers**

Code numbers may be used to number the items in the bill of quantities and shall not form part of the item description.

3.3 **Coding of additional items**

Additional descriptions not covered by current items in the standard system may be added, following the existing coding system.

SECTION 4
PREPARATION OF THE BILL OF QUANTITIES

4.1 **Bill of Quantities**

Bills of quantities shall set out the work to be done as shown on the drawings or contained in the specification and scope of work in accordance with the rules laid down in this standard system.

No departure shall be made from this standard system except where no specific rule can be applied or where exceptional circumstances involving work of a different character or particular circumstances of execution required the provision of more detailed information in order to define the nature and extent of the work. In such cases separate items shall be given following the general principles contained herein and descriptions of such items shall provide all the information necessary for pricing.

Descriptions in bills of quantities shall be complete and clear. Unless otherwise stated the radii of circular, flowing, conical and spherical work need to be stated and the radius shall be measured to the centre line of the material unless otherwise stated.

Unless otherwise stated the description of each item shall be deemed to include manufacturing, conveying and delivering, unloading, storing, unpacking, hoisting, setting, fitting and fixing in position, cutting, waste, patterns, templates, plant, temporary works, return of packings, establishment charges, profit, taxes, duties and other obligations arising out of the conditions of contract.

Unless prescribed the method of execution of the work shall be at the discretion of the contractor.

4.2 **Measurement of completed work**

Appropriate provisions of this section shall also apply to the measurement of completed work.

4.3 **Sections of the Bill of Quantities**

The Bill of Quantities shall be divided into the following sections:

- List of principal quantities
- Preambles
- Daywork schedule
- Work items (grouped into parts)
- Final Summary

4.4 **List of principal quantities**

A list of principal components of the works with their approximate estimated quantities shall be given solely to assist tenderers in making a rapid assessment of the general scale and character of the proposed works prior to the examination of the remainder of the Bill of Quantities and the other contractual documents on which their tenders will be based.

4.5 **Preambles**

The Preamble shall state the methods of measurement other than included in this system, if any, which have been adopted in the preparation of the Bill of Quantities and are to be used for the measurement of any part of the works.

4.6 **Headings and sub-headings**

Each part of the Bill of Quantities shall be given a heading and groups of items within each part be given sub-headings. Headings and sub-headings shall be read as part of the item descriptions to which they apply.

4.7 **Extent of itemisation and description**

All work shall be itemised and the items shall be described in accordance with the Work Classification, but furhter itemisation and additional description may be provided if the nature, location, importance or any other special characteristic of the work is thought likely to give rised to special methods of construction or considerations of cost.

4.8 **Description**

Descriptions shall identify the work covered by the respective items, but the exact nature and extent of the work is to be ascertained from the drawings, specifications and conditions of contract, as the case may be, read in conjunction with the scope of work

Any detail of description required to be given in accordance with the Work Classification may be omitted from an item description provided that a reference is given in its place which identifies precisely where the omitted information may be found on a drawing or in the specifications.

SECTION 4
PREPARATION OF THE BILL OF QUANTITIES

4.9 **Units of measurements** The following abbrevaitions shall be used:

Unit	
Millimetre	mm
Metre	m
Kilometre	km
Millimetre square	mm2
Metre square	m2
Kilometre square	km2
Hectare	ha
Cubic metre	m3
Kilogramme	kg
Tonne	t
Sum	sum
Number	no
Hour	hr
Week	wk
Percentage	%
Item	item
Days	days
Litre	l
Sets	sets

4.10 **Final summary** The final summary shall contain a tabulation of the parts of the Bill of Quantities with provision for insertion of the total of the amounts brought forward from the section summaries.

SECTION 5
WORK CLASSIFICATION

A: PRELIMINARIES

	Item or work to be measured	Unit	Measurement rules	Coverage rules	Additional rules
GENERAL					
1	Classification				
			1 Fixed-charge: a charge for work that is executed without reference to time 2 Method-related charge: sum for item inserted by the Contractor to cover item of work relating to his intended method of executing the works 3 Time-related charge: a charge for work the cost of which is varied in proportion to the length of time taken to the execute particular item 4 Value-related charge: a charge directly proportional to the value of the contract		
2	Payment				
			1 Fixed-charge: sum tendered for each item shall be paid in one single payment in terms of the first progress certificate issued after the Contractor's obligations have, in the opinion of the authorised person, been discharged 2 Method-related charge: sum tendered for each item shall be paid in one single payment in terms of the first progress certificate issued after the Contractor's obligations have, in the opinion of the authorised person, been discharged 3 paid in direct ratio to the value of the measured work in each progress certificate issued after the Contractor's obligations have, in the opinion of the authorised person, been discharged 4 Time-related charge: payment in incremental amounts calculated by division of tendered sum by the number of months required to complete site activities		
CONTRACTS					
3	Contractual requirements				
	1 Performance security	Sum			
	2 Insurance of the works	Sum		1 Include only provision of insurance in accordance with requirements in contract	
	3 Third party insurance	Sum		2 Include only provision of insurance in accordance with requirements in contract	
	4 Programming	Sum		3 Programming per prescription in the contract	
	5 Other financial obligations	Sum		4 Other prescribed contractual financial obligations	
EMPLOYER					
4	Facilities for Employer				
	1 Accommodation	Sum		1 Accommodation, cabins, meals, etc. expressly stated in the contract to be provided by the Contractor for the Employer's employees	

A: PRELIMINARIES

	Item or work to be measured	Unit	Measurement rules	Coverage rules	Additional rules
	2 Furnished offices	Sum		2 Offices, furniture, printers, etc. expressly stated in the contract to be provided by the Contractor for the Employer's employees	
	3 Communication	Sum		3 Telephones, satellite phones, fax and e-mail facilities, etc. expressly stated in the contract to be provided by the Contractor for the Employer's employees	
	4 Nameboards	Sum		4 Nameboards complete per prescription in the contract	
	5 Protective clothing	Sum		5 Protective clothing including shoes, socks, eye and ear protection, emergency evacuation packs, hard hats, lights, etc. expressly stated in the contract to be provided by the Contractor for the Employer's employees	
	6 Survey equipment	Sum		6 Survey equipment expressly stated in the contract to be provided by the Contractor for the Employer's employees	
	7 Laboratories	Sum		7 Laboratories including laboratory equipment, etc. expressly stated in the contract to be provided by the Contractor for the Employer's employees	
	8 Attendance upon staff	Sum		8 Drivers, chainmen, laboratory assistants, survey assistants, etc. expressly stated in the contract to be provided by the Contractor for the Employer's employees	
	9 Others	Sum			
TEMPORARY WORKS					
5	Temporary works				
	1 Traffic diversions	Sum			
	2 Traffic regulations	Sum			
	3 Temporary roads	Sum			
	4 Temporary walkways	Sum			
	5 Access roads	Sum			
	6 Temporary buildings	Sum			
	7 Temporary screens	Sum			
	8 Temporary hoardings and gantries	Sum			
	9 Others	Sum			
CONTRACTOR					
6	Establishment of facilities				
	1 Laydown area	Sum		1 Earthworks, concrete works, fencing, access ways, ramps, etc. provided by the Contractor for his own laydown area	
	2 Offices and storage sheds	Sum		2 Offices, furniture, printers, etc. provided by the Contractor for his own employees	

A: PRELIMINARIES

	Item or work to be measured	Unit	Measurement rules	Coverage rules	Additional rules
	3 Workshops	Sum		3 Workshops, tools, security, access ways, etc. provided by the Contractor	
	4 Laboratories	Sum		4 Laboratories including laboratory equipment, etc. provided by the Contractor	
	5 Accommodation	Sum		5 Accommodation, cabins, meals, etc. provided by the Contractor for his own employees	
	6 Ablutions	Sum		6 Ablution facilities including temporary and/or permanent connections provided by the Contractor for his own employees	
	7 Tools and equipment	Sum		7 All tools and equipment provided by the Contractor	
	8 Plant	Sum		8 All plant provided by the Contractor	
	9 Water requirements	Sum		9 Temporary and/or permanent connections, pipes, valves, pumps, water bowsers, etc. provided by the Contractor	
	10 Electrical power	Sum		10 Temporary and/or permanent connections, cables, generators, etc. provided by the Contractor	
	11 Compressed air	Sum		11 Temporary and/or permanent connections, pipes, etc. provided by the Contractor	
	12 Communication	Sum		12 Telephones, satellite phones, fax and e-mail facilities, etc. provided by the Contractor for his own employees	
	13 Protective clothing	Sum		13 Protective clothing including shoes, socks, eye and ear protection, emergency evacuation packs, hard hats, lights, etc. provided by the Contractor for his own employees	
	14 Survey equipment	Sum		14 Survey equipment provided by the Contractor for his own employees	
	15 Environmental management	Sum		15 All people, equipment, meetings , training, etc. to comply with applicable environmental rules and regulations	
	16 Removing rubbish and cleaning	Sum		16 Removal of rubbish and cleaning site	
	17 Dealing with water	Sum		17 Earthworks, concrete works, diversions, protections, etc. to deal with storm- and rain water on the site	
	18 Access	Sum		18 Roads, ramps, diversions, etc. for access to laydown area and site	
	19 Scaffolding	Sum		19 Scaffolding as required by the work	
	20 Protection of works	Sum		20 Protection of the permanent works	
	21 Temporary works	Sum		21 Temporary works required	
	22 Security of site establishment, laydown areas and temporary works	Sum		22 Fences, guards, alarm systems, lights, communication, etc. necessary to secure the site, laydown areas, etc.	

A: PRELIMINARIES

	Item or work to be measured	Unit	Measurement rules	Coverage rules	Additional rules
	23 Others	Sum			
7	Features requiring special attention				
	1 Safety	Sum		1 Safety officers, meetings, training, etc. to comply with applicable safety rules and regulations	
	2 Security	Sum		2 Security officers, meetings, training, etc. to comply with applicable security rules and regulations	
	3 Medicals	Sum		3 Medical inductions, exit medicals, etc. to comply with applicable medical rules and regulations	
	4 Quality assurance	Sum		4 Quality assurance officers, meetings, inspections, etc. to comply with applicable quality assurance	
	5 Other contractors	Sum		5 Support, interaction, sharing of access, etc. pertaining to working with other contractors on the same site	
	6 Site transport	Sum		6 Busses, cars, light delivery vehicles, etc. fitted with prescribed accessories for site conditions to transport employees, material, etc. on site	
	7 Personnel transport	Sum		7 Busses, cars, light delivery vehicles, etc. for transporting employees from accommodation to site	
	8 Site supervision	Sum		8 Supervisors, foremen, etc.. required for works	
	9 Company and head office overhead costs	Sum		9 Head office costs including costs for head office personnel involved with contract, traveling to site of head office personnel, invoicing, printing, etc. and company overhead costs	
	10 Key personnel	Sum		10 Key site personnel and replacement when off site	
	11 Existing services and structures	Sum		11 Covering up, protection, etc. of existing services and structures	
	12 Nominated subcontractors	Sum		12 Support services to nominated subcontractors	
	13 Others	Sum			
8	Other obligations				
	1 Other obligations	Sum			
9	Removal of site establishment				
	1 Removal of site establishment and reinstatement on completion	Sum		1 Break down, take down, remove, etc. whole site establishment and reinstate site fully on completion of the works	
PRIME COST ITEMS					
10	Prime cost items				
	1 Prime cost of goods of materials to be supplied to the site	Sum	1 Authorised person to state amount required	1 Identify materials	
	2 Overheads, charges and profit on 1 above	%			

A: PRELIMINARIES

	Item or work to be measured	Unit	Measurement rules	Coverage rules	Additional rules
	3 Transport and labour to handle and install 1 above	Sum		2 Loading, transporting, handling and installing	
	4 Nominated subcontractors	Sum	2 Authorised person to state amount required	3 Identify work	
	5 Overheads, charges and profit on 4 above	%			
	6 Other prime cost items	Sum	3 Authorised person to state amount required	4 Identify work	
	7 Overheads, charges and profit on 6 above	%			
PROVISIONAL SUMS					
11	Provisional sums				
	1 Provisional work	Sum	1 Authorised person to state amount required	1 Identify work	
	2 Overheads, charges and profit on 1 above	%			
	3 Specified activities associated with 1 above	Sum		2 Identify activities	
DAYWORKS					
12	Dayworks				
	1 Various classes of labour	Sum	1 Separate items under each class of labour for normal, overtime, Sundays and Public Holidays	1 Wages, bonuses, allowances, accommodation, travelling and other emoluments payable to workmen	1 Alternatively a schedule of different categories of labour may be given
	2 Materials	Sum			2 Alternatively a schedule of different categories of material may be given
	3 Various types of plant	Sum	2 Separate items under each type of plant for working and standing time	2 Establishment, operators, consumable stores, fuel, repairs, maintenance and insurance	3 Alternatively a schedule of different categories of plant may be given
	4 Overheads, charges and profit on each sum of labour, materials or plant	%		3 Overhead charges, profit, site supervision, site staff, insurances, holidays with pay, use and maintenance of tools and equipment	4 Alternatively a schedule of different categories of plant may be given

B: SITE CLEARANCE

	Item or work to be measured	Unit	Measurement rules	Coverage rules	Additional rules
GENERAL					
1	Site clearance Principles				
			1 material (other than tree roots) at or below the original surface 2 Disposal of materials shall be included 3 Original surface means the surface of the ground before any work has been carried out 4 Freehaul distance of 2km for disposal of cleared material shall apply		
2	Demolition Principles				
			5 Materials from demolitions shall become the property of the contractor unless otherwise stated 6 Provision shall be made for a Schedule for Credits for materials from demolitions 7 Materials from demolitions permitted to be re-used in work shall be so described		
GENERAL CLEARANCE					
3	Site clearing				
	1 Site clearing	Ha or km2	1 Nature of backfilling material shall be stated	1 Boulders up to 0.15m3, trees and tree stumps (up to 1m girth 1m above ground level), cutting of trunks and branches in transportable lengths, backfilling of cavities, demolishing described structures not exceeding 50m3 and disposal of material	1 Removal of trees and bushes with roots, other vegetation, rubbish, fences and material interfering with construction included
	2 Site clearing for pipe trenches	m	2 Length measured will be length of pipeline route		
4	Trees, hedges, etc.				
	1 Remove and grub large trees of girth		1 Girth shall be measured 1m above ground level	1 Clearing and grubbing, cutting branches, backfilling holes and removing, transporting and disposing	
	1 over 1m and up to and including 2m	No	2 Nature of backfilling material shall be stated		
	2 over 2m and up to and including 3m	No			
	3 over 3m, in steps of 1m	No			
	2 Remove and grub tree stumps of diameter		1 Girth shall be measured 1m above ground level		
	1 over 150mm and up to and including 500mm	No	2 Nature of backfilling material shall be stated		
	2 over 500mm and up to and including 1m	No			
	3 exceeding 1m	No			
	3 Remove and grub trees and tree stumps regardless of girth	Ha or km2			1 Where impracticable to measure tree girth for example plantations
	4 Remove and grub hedge	Ha or m	1 Separate items for each type and size of hedge	1 Uprooting and disposing including roots	
5	Fences				
	1 Take down existing fences	m or km	1 Separate items for each type and size of fence	1 Taking down fence, coiling wire, sorting and stacking, loading, transporting and offloading	

B: SITE CLEARANCE

	Item or work to be measured	Unit	Measurement rules	Coverage rules	Additional rules
6	Reclear				
	1 Reclear surfaces	ha or km2		1 Clearing surface, grubbing, backfilling holes and removing, transporting and disposing of materials	1 Measure only if instructed by authorised person
DEMOLISHING					
7	Pipelines and electricity				
	1 Dismantle and remove pipelines of nominal bore		1 Separate items for each type	1 Dismantling, lifting and disposing pipelines including supports	
	1 not exceeding 100mm	m	2 Excavation and backfilling measured separately		
	2 over 100mm and up to and including 300mm	m	3 Pipelines within buildings and other structures measured only where nominal bore exceeds 300mm		
	3 over 300mm and up to and including 500mm	m			
	4 exceeding 500mm	m			
	2 Dismantle and remove electricity, transmission lines, cables, etc.	m	1 Separate items for each type and diameter	1 Dismantling, lifting and disposing pipelines including supports	
8	Buildings and other structures				
	1 Demolish and remove buildings with volume		1 Volume used shall be their approximate volume occupied, excluding any volume below original surface	1 Demolishing, removing and disposing	
	1 not exceeding 50m3	Sum	2 Type of building shall be identified in item		
	2 over 50m3 and up to and including 100m3	Sum			
	3 over 100m3 and up to and including 250m3	Sum			
	4 over 250m3 and up to and including 500m3	Sum			
	5 over 500m3 and up to and including 1000m3	Sum			
	6 over 1000m3 and up to and including 2500m3	Sum			
	7 over 2500m3 and up to and including 5000m3	Sum			
	8 stated exceeding 5000m3	Sum			
	2 Demolish and remove other structures with volume		1 Volume used shall be their approximate volume occupied, excluding any volume below original surface	2 Demolishing, removing and disposing	
	1 not exceeding 50m3	Sum	2 Type of other structure shall be identified in item		
	2 over 50m3 and up to and including 100m3	Sum			
	3 over 100m3 and up to and including 250m3	Sum			
	4 over 250m3 and up to and including 500m3	Sum			
	5 over 500m3 and up to and including 1000m3	Sum			
	6 over 1000m3 and up to and including 2500m3	Sum			
	7 over 2500m3 and up to and including 5000m3	Sum			
	8 stated exceeding 5000m3	Sum			

C: EARTHWORKS

	Item or work to be measured	Unit	Measurement rules	Coverage rules	Additional rules
GENERAL					
1	Classes of excavation				
			1 Soft excavation-other than in restricted excavation: shall be excavation in material that can be efficiently removed or loaded without prior ripping by a bulldozer of mass approximately 22t and flywheel power approximately 145kW or a tractor-scraper unit of total mass approximately 28t and flywheel power approximately 245kW pushed by a bulldozer or a track type front-end loader of mass approximately 22t and flywheel power approximately 145kW 2 Soft excavation in restricted excavation: shall be excavation in material that can be efficiently removed by back-acting excavator of flywheel power approximately 0.1kW per millimetre of tined-bucket width, without use of pneumatic tools such as paving breakers 3 Intermediate excavation-other than restricted excavation: shall be excavation in material that can be efficiently ripped by a bulldozer of mass approximately 35t fitted with single-time ripper suitable for heavy ripper of flywheel power approximately 220kW 4 Intermediate excavation in restricted excavation: shall be excavation in material requiring back-acting excavator of flywheel power exceeding 0.1kW per millimetre of tined-bucket width or the use of pneumatic tools before removal by equipment equivalent to that specified for soft excavation 5 Hard rock excavation-other than restricted excavation: shall be excavation in material that cannot, before removal, be efficiently ripped by a bulldozer equivalent to specified under intermediate excavation 6 Hard rock excavation in restricted excavation: shall be excavation in material that cannot be efficiently removed without blasting or without wedging and splitting 7 Boulder excavation Class A: shall be excavation in material containing more than 40% by volume of boulders of size in the range 0.03-20m3 in a matrix of soft material or smaller boulders and dolomite formations other than solid dolomite if the formation contains more than 40% by volume of lumps of hard dolomite of size in the range 0.03-20m3 in matrix of soft material or smaller lumps of hard dolomite 8 Boulder excavation Class B: shall be excavation of boulders only which are in material containing 40% or less by volume of boulders of size in the range of 0.03-20m3 in a matrix of soft material or smaller boulders and which require individual drilling and blasting in order to be loaded by a track type front-end loader or back-acting excavator		

C: EARTHWORKS

	Item or work to be measured	Unit	Measurement rules	Coverage rules	Additional rules
			9 Excavation of solid boulders or lumps of size exceeding 20m3 shall be hard rock material 10 Excavation of fissured or fractured rock shall not be classed as boulder material but as hard rock or intermediate according to the nature of the material		
2	Bulking				
			11 No allowance for bulking, shrinkage or waste in measured quantities		
3	Principles				
			12 Rates shall cover the cost of excavating and re-use of the excavated material in backfilling, forming embankments, terraces, dust control, etc. and the cost of disposal of any surplus and unsuitable material within the freehaul distance of 2km of the source 13 Where overhaul is payable the additional distance shall be measured by haul route as approved by the authorised person in one direction only, to the nearest 0.1km and volumes shall be computed as specified 14 Excavations required to be backfilled shall be measured as if taken out with vertical sides regardless of whether they have been taken out with sloping sides 15 Excavations shall be measured from the net plan of finished concrete footing, foundation, building, etc. except that in the case of conical bottomed tanks and other such structures, the volume will be measured from the finished outline of the concrete 16 Except where earthworks shall be carried out to simple geometric shapes, the volume shall be computed from cross-sectional areas at suitable intervals approved by the authorised person 17 Where above method is impracticable the volume shall be computed from predetermined capacity of the hauling vehicles, each vehicle shall be loaded to at least predetermined capacity and shall be taken as 70% of said capacity in the case of soil and gravel 17 Final surface: surface indicated on the drawings to which excavation is to be carried out 18 ordered, the removal of topsoil from the specified area will be measured as excavation and no payment will be made for clearing		

C: EARTHWORKS

	Item or work to be measured	Unit	Measurement rules	Coverage rules	Additional rules
GENERAL EARTHWORKS					
DEMOLITIONS					
4	Existing services				
	1 Supply or hire specialist equipment for detection of existing services	Hr or Sum		1 Searching including delays and disruption of progress of work caused by detection	
	2 Excavate by hand in soft material to expose service	m3 or daywork	1 State type of service	1 Excavating, temporary stockpiling, loading, transporting within freehaul distance, offloading, backfilling, watering, compacting, testing and disposing of spoil	
	3 Dealing with cables that are at risk because of construction of earthworks	No	1 Unit means one cable or more than one any number of cables so grouped that the cross-section containing them has a horizontal dimension of not exceeding 200mm	1 Location, protection, etc. as specified, delays and disruption of progress of the work due to existence of service and the cost of dealing with the service as specified	
	4 Permanent protection of services	Sum			
	5 Temporary protection of services	Sum			
	6 Clearing out and removing contents of conservancy tanks, septic tanks and the like	No	1 State volume and method of disposal		
5	Demolitions				
	1 Breaking up and removing surface concrete	m3			
	2 Breaking up and removing paving and the like	m2	1 State thickness and method of disposal		
	3 Breaking down and removing fences, boundary walls, etc.	m	1 State general description and method of disposal		
	4 Demolishing and removing buildings and other structures	m3	1 State general description and method of disposal		
PRESERVING SOIL					
6	Topsoil				
	1 Remove topsoil, stockpile and maintain	m2	1 State average depth	1 Removing, stockpiling, preventing dust nuisance, upholding sides of excavation, additional excavating to provide working space and removing of dead services	
	2 Spreading of topsoil	m3	1 State depth and spreading depth	1 Preparing site, hauling and spreading on another part of the site within freehaul distance	
CUTTINGS					
7	Cuttings				
	1 Excavation for cuttings in material other than topsoil, rock or artificial hard material and dispose, of depth		1 Item descriptions for excavation below body of open water shall identify the body of water	1 Excavating, loading, transporting and dispose	1 Excavation in or under an embankment, executed prior to placing of fill, shall be classed as excavation for cuttings
	1 up to 0.5m	m3	2 Dredging excavation measured as by dredging irrespective of method Contractor adopted		2 Excavation from within borrow pits shall be classed as general excavation
	2 over 0.5m and up to and including 1m	m3			
	3 over 1m and up to and including 1.5m	m3			
	4 over 1.5m	m3			
	2 Excavation for cuttings in intermediate material and dispose, of depth		1 Item descriptions for excavation below body of open water shall identify the body of water	1 Excavating, loading, transporting and dispose	1 Excavation in or under an embankment, executed prior to placing of fill, shall be classed as excavation for cuttings

C: EARTHWORKS

	Item or work to be measured	Unit	Measurement rules	Coverage rules	Additional rules
	1 up to 0.5m	m3	2 Dredging excavation measured as by dredging irrespective of method Contractor adopted		2 Excavation from within borrow pits shall be classed as general excavation
	2 over 0.5m and up to and including 1m	m3			
	3 over 1m and up to and including 1.5m	m3			
	4 over 1.5m	m3			
	2 Excavation for cuttings in hard rock material and dispose, of depth		1 Item descriptions for excavation below body of open water shall identify the body of water	1 Excavating, loading, transporting and dispose	1 Excavation in or under an embankment, executed prior to placing of fill, shall be classed as excavation for cuttings
	1 up to 0.5m	m3	2 Dredging excavation measured as by dredging irrespective of method Contractor adopted		2 Excavation from within borrow pits shall be classed as general excavation
	2 over 0.5m and up to and including 1m	m3			
	3 over 1m and up to and including 1.5m	m3			
	4 over 1.5m	m3			
	2 Excavation for cuttings in boulder Class A material and dispose, of depth		1 Item descriptions for excavation below body of open water shall identify the body of water	1 Excavating, loading, transporting and dispose	1 Excavation in or under an embankment, executed prior to placing of fill, shall be classed as excavation for cuttings
	1 up to 0.5m	m3	2 Dredging excavation measured as by dredging irrespective of method Contractor adopted		2 Excavation from within borrow pits shall be classed as general excavation
	2 over 0.5m and up to and including 1m	m3			
	3 over 1m and up to and including 1.5m	m3			
	4 over 1.5m	m3			
	2 Excavation for cuttings in boulder Class B material and dispose, of depth		1 Item descriptions for excavation below body of open water shall identify the body of water	1 Excavating, loading, transporting and dispose	1 Excavation in or under an embankment, executed prior to placing of fill, shall be classed as excavation for cuttings
	1 up to 0.5m	m3	2 Dredging excavation measured as by dredging irrespective of method Contractor adopted		2 Excavation from within borrow pits shall be classed as general excavation
	2 over 0.5m and up to and including 1m	m3			
	3 over 1m and up to and including 1.5m	m3			
	4 over 1.5m	m3			
EXCAVATIONS, FILLING, ETC.					
8	Bulk excavations				
	1 Excavate in all materials and use for embankment or backfill or dispose as ordered	m3	1 Separate items for each type of excavation or each structure and for each class or manner of disposal of excavated material	1 Excavating, basic selecting, loading, transporting within freehaul distance, offloading, spreading or backfilling, watering, compacting, dust control, final grading, complying with requirements for tolerances, providing testing and disposing of spoil	

C: EARTHWORKS

	Item or work to be measured	Unit	Measurement rules	Coverage rules	Additional rules
			2 Volume measured for excavation below a body of open water shall be the volume below water when the water surface is at the level (or the higher level of fluctuation if applicable) shown on drawings		
	2 Extra over for:			1 Additional costs	
	1 Intermediate excavation	m3			
	2 Hard rock excavation	m3			
	3 Boulder excavation: Class A	m3			
	4 Boulder excavation: Class B	m3			
9	Restricted excavations				
	1 Excavate for restricted foundations, footings, etc. in all materials and use for backfill or embankment or dispose of depth		1 Separate items for separate structures and for each class or manner of disposal of excavated material	1 Excavating, selecting and keeping selected material separate, temporary stockpiling, loading, transporting within freehaul distance, offloading, dust control, backfilling, watering, compacting, testing and disposing of spoil	
	1 not exceeding 1m	m3	2 Filling required to be deposited and compacted in layers shall be so described stating maximum thickness of layers and compaction standard required		
	2 over 1m and up to and including 2m	m3	3 Volume measured for excavation below a body of open water shall be the volume below water when the water surface is at the level (or the higher level of fluctuation if applicable) shown on drawings		
	3 over 2m and up to and including 5m	m3			
	4 over 5m and up to and including 10m	m3			
	5 over 10m and up to and including 15m	m3			
	6 stated exceeding 15m	m3			
	2 Extra over for:			1 Additional costs	
	1 Intermediate excavation	m3			
	2 Hard rock excavation	m3			
	3 Boulder excavation: Class A	m3			
	4 Boulder excavation: Class B	m3			
10	Excavation ancillaries				
	1 Trimming of excavated surfaces in all materials and dispose		1 Description for excavation by dredging shall be so described	1 Trimming, preparation, disposal and double handling	1 Trimming shall be measured to surfaces which receive no permanent works whether trimming is expressly required or not
	1 horizontal	m2	2 Separate items for each class or manner of disposal of excavated material		
	2 inclined at an angle of 10° to 45° to the horizontal	m2			
	3 inclined at an angle of 45° to 90° to the horizontal	m2			
	4 vertical	m2			
	2 Extra over trimming for:			1 Additional costs	
	1 Intermediate excavation	m3			
	2 Hard rock excavation	m3			
	3 Boulder excavation: Class A	m3			

C: EARTHWORKS

	Item or work to be measured	Unit	Measurement rules	Coverage rules	Additional rules
	4 Boulder excavation: Class B	m3			
	3 Preparation of excavated surfaces in all materials		1 Separate items for each class or manner of disposal of excavated material	1 Trimming, preparation, disposal and double handling	1 surfaces which are to receive permanent works whether preparation is expressly required or not except surfaces to receive filling or landscaping and surfaces for which formwork is measured
	1 horizontal	m2	2 State average depth		
	2 inclined at an angle of 10° to 45° to the horizontal	m2			
	3 inclined at an angle of 45° to 90° to the horizontal	m2			
	4 vertical	m2			
	4 Extra over preparation for:			1 Additional costs	
	1 Intermediate excavation	m3			
	2 Hard rock excavation	m3			
	3 Boulder excavation: Class A	m3			
	4 Boulder excavation: Class B	m3			
	5 Double handling of excavated material in all material	m3	1 Volume shall be the void formed in the temporary stockpile from which the material is removed		1 Double handling shall be measured only to the extent that it is expressly required
	6 Extra over double handling for:			1 Additional costs	
	1 Intermediate excavation	m3			
	2 Hard rock excavation	m3			
	3 Boulder excavation: Class A	m3			
	4 Boulder excavation: Class B	m3			
	7 Dredging to remove silt and dispose	m3	1 Separate items for each manner of disposal of excavated material		1 Dredging shall be measured only to the extent that it is expressly required by authorised person
	8 Excavation of material below the final surface and replacement with stated material	m3			
	9 Timber supports left in	m2	1 Area measured shall be the area of supported surfaces expressly required to be left in		
	10 Metal supports left in	m2	1 Area measured shall be the area of supported surfaces expressly required to be left in		
11	Working space				
	1 Extra excavation in all materials to provide working space around structure of depth		1 Area from perimeter of the structure and the depth of excavation specified		
	1 not exceeding 2m	m2			
	2 over 2m and up to 4m	m2			
	3 over 4m, in steps of 2m	m2			
	2 Extra over for backfilling to working space with imported approved material		1 Area from perimeter of the structure and the depth of excavation specified		1 When specified or ordered that the material from excavation is unsuitable for backfilling
	1 not exceeding 2m	m2			
	2 over 2m and up to 4m	m2			
	3 over 4m, in steps of 2m	m2			

C: EARTHWORKS

	Item or work to be measured	Unit	Measurement rules	Coverage rules	Additional rules
12	Overhaul				
	1 Limited overhaul	m3	1 Volumes measured shall be net volume with no allowance for bulking		1 Freehaul is defined as haulage within the first 2km
					2 Limited overhaul is haulage of material over any distance within range over 2km and up to 3km
	2 Unlimited overhaul	m3.km	1 Where unlimited overhaul is measured, limited overhaul must also be measured		1 Unlimited overhaul is haulage for a distance greater than 3km
			2 Volumes measured shall be net volume with no allowance for bulking		
			3 Volumes measured shall be the volume material multiplied by the total distance in km		
13	Disposal of water				
	1 Keeping excavations free of all water other than subterranean water	Item		1 Providing pumps and other equipment, power and attendance for pumping and standing time	
14	Additional lateral support				
	1 Lateral support between …. and …., if ordered	Sum	1 State general description	1 Designing, supplying, installing, maintaining and removing lateral support	1 When specified or ordered
	2 Shore trenches opposite structures or services	m	1 Measured along centreline of trench regardless of whether supports are placed on one or on both sides of the trench	1 Supplying, installing, maintaining and removing shoring including any inconvenience of working in supported trenches	
15	Filling				
	1 Importation of materials from commercial sources or borrow pits or waste rock dumps or stockpiles compacted	m3	1 Separate items for each designated source of supply, for each different area of use and for each type of compaction	1 Royalties, excavating, selecting and keeping selected material separate, temporary stockpiling, loading, transporting within freehaul distance, offloading, placing, watering, compacting and testing	
	2 Opening up and closing down of designated borrow pit	Sum	1 Only when new borrow pit has to be established or access to existing borrow pit has to be established	1 Opening up and restoring site	
	3 Dealing with overburden (designated borrow pits only)	m3	1 Volume shall be computed from cross-sectional areas and depths at approved suitable intervals	1 Digging trial holes, removing overburden to stockpile and spreading overburden evenly over floor and sides of borrow pit when borrowing is complete	
	4 Extra over for backfill or for fill material against structures	m3	1 Scheduled only when a particular material has been specified to be placed within defined zone against a structure	1 Supplying, placing and compacting and disposal of replaced material, if applicable	
16	Filling ancillaries				
	1 Trimming of filled surfaces in all materials and dispose		1 Separate items for each class or manner of disposal of filled material	1 Trimming, preparation, disposal and double handling	1 Trimming shall be measured to surfaces which receive no permanent works whether trimming is expressly required or not
	1 horizontal	m2			
	2 inclined at an angle of 10° to 45° to the horizontal	m2			
	3 inclined at an angle of 45° to 90° to the horizontal	m2			

C: EARTHWORKS

	Item or work to be measured	Unit	Measurement rules	Coverage rules	Additional rules
	4 vertical	m2			
	2 Extra over trimming for:			1 Additional costs	
	1 Intermediate excavation	m3			
	2 Hard rock excavation	m3			
	3 Boulder excavation: Class A	m3			
	4 Boulder excavation: Class B	m3			
	3 Preparation of filled surfaces in all materials		1 Separate items for each class or manner of disposal of filled material	1 Trimming, preparation, disposal and double handling	1 surfaces which are to receive permanent works whether preparation is expressly required or not except surfaces to receive filling or landscaping and surfaces for which formwork is measured
	1 horizontal	m2	2 State average depth		
	2 inclined at an angle of 10° to 45° to the horizontal	m2			
	3 inclined at an angle of 45° to 90° to the horizontal	m2			
	4 vertical	m2			
	4 Extra over preparation for:			1 Additional costs	
	1 Intermediate excavation	m3			
	2 Hard rock excavation	m3			
	3 Boulder excavation: Class A	m3			
	4 Boulder excavation: Class B	m3			
	5 Geotextiles	m2	1 State type and grade of material	1 Supplying, transporting, placing, jointing and making good	
			2 Area of additional geotextile in laps shall not be measured		
	6 Membranes	m2	1 State type, grade and thickness of material	1 Supplying, transporting, placing, jointing and making good	
			2 Area of additional membranes in laps shall not be measured		
LANDSCAPING					
17	Topsoilling				
	1 Topsoilling	m2		1 Excavating from stockpiles, hauling and spreading	
	2 Grassing or other vegetation cover	m2	1 Separate items for different types of cover	1 Supplying, laying, fertilizing, trimming and preparation of surfaces	
	3 Grassing or other vegetation cover upon surfaces inclined at an angle exceeding 10° from horizontal	m2	1 Separate items for different types of cover	1 Supplying, laying, fertilizing, trimming and preparation of surfaces	
	4 Plants	No	1 State species and size		
	5 Shrubs	No	1 State species and size		
	6 Trees	No	1 State species and size		
	7 Hedges in				
	1 Single row	m	1 State species, size and spacing		
	2 Double row	m	2 Lengths measured shall be developed lengths along the centre lines		

C: EARTHWORKS

	Item or work to be measured	Unit	Measurement rules	Coverage rules	Additional rules
ROAD EARTHWORKS					
GENERAL					
18	Principles				
			1 Measurements shall be to finished shapes, sections and profiles as shown on drawings or as ordered by authorised person and no material outside the specified lines and levels shall be included in measurement unless extra material has been placed and compacted on written instructions by authorised person 2 Item description for work which is applied to surfaces inclined at an angle exceeding 10° to the horizontal shall so state		
PREPARATION, TREATMENT, ETC.					
19	Treatment				
	1 Road-bed preparation and compaction of material to		1 Separate items for each compaction densities	1 Scarifying, watering, shaping and compacting including mixing of in-place and imported material if required	
	minimum of ..... maximum density	m3	2 State method and degree of compaction		
	2 In-place treatment of road-bed in intermediate material by			1 Ripping or blasting, shaping, scarifying, sizing, knapping, rolling, mixing of in-place and imported material if required	
	1 Ripping	m3			
	2 Blasting	m3			
BULK LAYER WORK, ETC.					
20	Filling				
	1 Cut to fill, borrow to fill		1 Separate items for cut to fill and borrow to fill	1 Excavating in road prism, transporting, preparing, processing shaping (including forming side channels and benching, if applicable), watering, mixing, compacting and finishing slopes of cuts and fills	
	1 compacted to ..... maximum density	m3	2 Separate items for each compaction densities		
	2 Rockfill, process and compact	m3	3 State method and degree of compaction		
	2 Selected layer compacted to ..... maximum density	m3	1 State method and degree of compaction	1 Procuring, furnishing, transporting and placing including excavating in road prism and trimming	
	3 Extra over cut to fill, borrow to fill and selected layer for excavating and breaking down material to			1 Additional cost of excavation in various materials including breaking down of material	
	1 Intermediate excavation	m3			
	2 Hard rock excavation	m3			
	3 Boulder excavation: Class A	m3			
	4 Boulder excavation: Class B	m3			

C: EARTHWORKS

	Item or work to be measured	Unit	Measurement rules	Coverage rules	Additional rules
	4 Cut to spoil or stockpile from			1 Excavating from road prism (including forming side channels and benching, if applicable) in various classes of excavation, loading, transporting, offloading and disposing of material to a site as directed, and shaping and grading smoothly any piles of spoil material so they are free draining	
	1 Soft excavation	m3			
	2 Intermediate excavation	m3			
	3 Hard rock excavation	m3			
	4 Boulder excavation: Class A	m3			
	5 Boulder excavation: Class B	m3			
	5 Removal of oversize material	m3	1 Material in excess of 5% of the loose volume of the layer on the road will be measured when removed on instruction of authorised person	1 Excavating, loading and transporting to road, placing and any breakdown treatment given or attempted, blading off the road, stockpiling alongside the road, loading and transporting and offloading and spreading all positions indicated by authorised person	
			2 Cost of removing first 5% shall be covered by the rates for constructing fill layers		
			3 No material with a maximum dimension of 600mm will be measured		
	6 Overbreak of excavation in		1 Shall not apply when in-place treatment of road bed in intermediate or hard rock material is carried out over the same area	1 Unavoidable overbreak, draining and backfilling with suitable rock material and compacting to lines and levels specified	
	1 Intermediate excavation	m2			
	2 Hard rock excavation	m2			
	3 Boulder excavation: Class A	m2			
	4 Boulder excavation: Class B	m2			
	7 Materials bladed to windrow	m3	1 Measured on instruction from authorised person, measured in its original position before blading off, by the method of average end areas	1 Temporarily removing such material and subsequently replacing and tidying up required after completion of replacement	
	8 Extra over preparation of site/cut to fill or borrow to fill/selected layer for temporary stockpiling of material	m3	1 Measured on instruction from authorised person, measured in its final position after placing and compaction	1 Extra cost, except overhaul, of clearing, light grading, temporary stockpiling, stabilizing or maintaining stockpile, removing stockpile and final shaping and tidying up of stockpile site after removal	
	9 Catchwater rounds and channels and mitre banks and channels	m3		1 Forming catchwater rounds and channels and mitre banks and channels	
REINSTATEMENT					
21	Reinstatement				
	1 Breaking up and temporary and permanent reinstate roads/footpaths/land for pipe bore		1 Separate items for temporary and permanent reinstatement and for roads, footpaths or land	1 Additional reinstatement for manholes and other chambers shall be included	
	1 up to 300mm	m	2 Dimensions for classification of bore shall be maximum nominal distance between inside faces of outer walls of pipe, duct or culvert to be installed	2 Removal and reinstatement of kerb and channels shall be included	

C: EARTHWORKS

	Item or work to be measured	Unit	Measurement rules	Coverage rules	Additional rules
	2 over 300mm and up to 900mm	m	3 State types and depths of surfacing, including base and sub-base courses		
	3 over 900mm and up to 1800mm	m	4 Lengths shall be measured along centre lines and shall include lengths occupied by manholes and other chambers		
	4 stated exceeding 1800mm	m	5 State type of land		
LAYER WORK, ETC.					
22	Filling				
	1 Construct subbase , shoulders and gravel wearing course with material from:		1 Width of each course of materials shall be measured at the top surface of that course		
	1 borrow pits	m3	2 Area of manhole covers and other intrusions into a course shall not be deducted where the area of the intrusion is less than 1m2	1 Locating material, complying with all precautions required in terms of opening up, operating and rehabilitating borrow pits (with exception of dealing with overburden), excavation, basic selection, transporting, spreading, watering, compacting, final grading, complying with the tolerances and testing	
	2 designated excavations	m3	3 State thickness of layers and compaction	2 Excavating from road prism in various classes of excavation, loading, transporting, offloading and disposing of material to site as directed and of shaping and grading smoothly and piles of spoil material so to drain freely (if applicable), transporting from stockpiles (if applicable), spreading, watering, compacting, final grading, complying with the tolerances and testing	
	3 commercial sources	m3		3 Locating material, complying with all precautions, procuring material, basic selection, transporting from source to point of deposition on the road, spreading, watering, compacting, final grading, complying with the tolerances and testing	
	2 Construct base with material from:		1 Width of each course of materials shall be measured at the top surface of that course		
	1 borrow pits	m3	2 State thickness of layers and compaction	1 Locating material, complying with all precautions required, operating the borrow pits, excavation, basic selection, transporting, spreading, watering, compacting, final grading, complying with the tolerances and testing	

C: EARTHWORKS

	Item or work to be measured	Unit	Measurement rules	Coverage rules	Additional rules
	2 designated excavations	m3	3 Separate items for designated borrow pits and borrow pits to be located by the contractor	2 Basic selection, loading from stockpiles, transporting, spreading, watering, compacting, final grading, complying with the tolerances and testing	
	3 commercial sources	m3	4 State type of base material such as gravel, graded crushed stone, graded crushed stone and soil fines, etc.	3 Locating source, complying with all precautions, procuring material, basic selection, transporting from source to point of deposition on the road, spreading, watering, compacting, final grading, complying with the tolerances and testing	
23	Rock				
	1 Extra over excavated material for class of excavation:			1 Additional costs applicable to the relevant class of excavation	
	1 intermediate excavation	m3			
	2 hard rock excavation	m3			
24	Process material				
	1 Process subbase/base material by the following processes:		1 No allowance shall be made in measurement for any reduction in volume of the combined mixture over that of the individual materials compacted to the specified density	1 Processing the material in accordance with specified, ordered or agreed method	Processing of material shall be measured only to the extent that it is expressly required by authorised person such as in the case of material excavated from cuttings and borrow pits
	1 screening	m3	2 State separate for subbase or base		
	2 heavy grid rolling	m3			
	3 mechanical modification	m3			
	4 stabilization	m3		2 Shall not include supply of stabilizing agent	
	5 single stage crushing	m3			
	6 two-stage crushing	m3			
	2 Stabilizing agent:		1 Measured based on quantity ordered by authorised person or actually incorporated within the layer concerned, whichever is the lesser	1 Providing agent within the works irrespective of the rate of application specified including variations in mixing and compaction times of the various stabilizing agents and pre-mixing (if applicable)	
	1 road lime	t	2 When mixture of slag and cement or lime are used, quantity of each consistent shall be measured separately		
	2 cement	t			
	3 blastfurnace cement	t			
	4 milled blastfurnace slag	t			
	5 granulated unslaked lime	t			
	6 fly ash	t			

C: EARTHWORKS

	Item or work to be measured	Unit	Measurement rules	Coverage rules	Additional rules
25	Screening				
	1 Screening plant:			1 Provision, erection and commissioning of screening plant on site, dismantling and removing plant from site and cleaning up the area of the site and dismantling, shifting and re-erecting (or shifting by other means) and cleaning up the area previously occupied	1 Screening plants shall be measured only to the extent that it is expressly required by authorised person
	1 provide, erect and commission on site	Sum			
	2 dismantle, remove from site and clean up site	Sum			
	3 move plant on site from one location to another and clean up site	No			
	2 Screened out material not used:		1 Measurements shall be made in the stockpile or in the trucks	1 Excavating and disposing of screened-out material within freehaul distance of 2km	
	1 oversize	m3			
	2 fines	m3			
	3 oversize and fines	m3			
PIPE EARTHWORKS					
EXCAVATION					
26	Excavation Principles				
			1 Rates shall cover the cost of excavating and re-use of the excavated material in backfilling, and disposal of any surplus material along the route of the pipeline within the freehaul distance of 2km of the source 2 Depth shall be measured from the final surface of the ground along the centre-line of the trench to the bottom of the specified bedding layer 3 Excavations shall be measured as if taken out with vertical sides, regardless of whether they have been taken out with sloping sides 4 Length will be total through-length of the pipeline, duct, etc. from end to end or from face of structure to face of structure and no deduction will be made for valves, manholes, catchpits, valve boxes and the like 5 Final surface: surface indicated on the drawings to which excavation is to be carried out		
27	Trenches				
	1 Excavate in all materials for trenches, backfill, compact and dispose of surplus material, of nominal bore	m or m3	1 State depth in increments of 1m measured to bottom of bedding layer	1 Complying with requirements, excavation, preparation of surfaces, backfilling, compacting, upholding sides of excavation and disposing or surplus matrial within freehaul distance	
	1 not exceeding 200mm		2 Separate items for trenches expressly required to be carried out by hand		
	2 over 200mm and up to 600mm		3 State where more than one pipe, duct or metal culvert is expressly required to be laid in one trench		

C: EARTHWORKS

	Item or work to be measured	Unit	Measurement rules	Coverage rules	Additional rules
	3 over 600mm and up to 900mm		4 Volume computed by multiplying together average depth measured to the underside of the pipe or culvert bedding and the trench width		
	4 over 900mm and up to 1200mm				
	5 over 1200mm and up to 1800mm				
	6 over 1800mm				
	2 Extra over for		1 State depth in increments of 1m measured to bottom of bedding layer	1 Additional cost of excavation and handling of more difficult material and disposal within freehaul distance and replacement of unsuitable material	
	1 Intermediate excavation	m3			
	2 Hard rock excavation	m3			
	3 Mass concrete excavation	m3			
	4 Reinforced concrete excavation	m3			
	5 Other artificial hard material	m3			
	3 Excavate and dispose of unsuitable material from trench bottom	m3	1 Volume computed from trench width and additional depth ordered by authorised person	1 Excavation of additional depth in any material, disposal of unsuitable material within freehaul distance and backfilling of additional depth with suitable material from side of the trench	
28	Extra excavations				
	1 Excavate in all materials for manholes and other chambers, backfill, compact and dispose of surplus material	m3	1 Volume computed from maximum plan area of the manhole or other chamber	1 Complying with requirements, excavation, preparation of surfaces, backfilling, compacting, upholding sides of excavation and disposing or surplus matrial within freehaul distance	
			2 Separate items for each type of structure and for each class or manner of disposal of excavated material		
			3 Separate items for work expressly required to be carried out by hand		
	2 Extra over for			1 Additional cost of excavation and handling of more difficult material and disposal within freehaul distance and replacement of unsuitable material	
	1 Intermediate excavation	m3			
	2 Hard rock excavation	m3			
	3 Mass concrete excavation	m3			
	4 Reinforced concrete excavation	m3			
	5 Other artificial hard material	m3			
	3 Excavate in all materials for french drains, rubble drains, ditches and trenches, backfill, compact and dispose of surplus material	m3 or m	1 Volume computed by multiplying together average depth measured to the final surface and the trench width	1 Complying with requirements, excavation, preparation of surfaces, backfilling, compacting, upholding sides of excavation and disposing or surplus matrial within freehaul distance	1 Materials and dimensions of linings to ditches shall be stated in item

C: EARTHWORKS

	Item or work to be measured	Unit	Measurement rules	Coverage rules	Additional rules
			2 Separate items for each type of drain and for each class or manner of disposal of excavated material		
			3 Separate items for work expressly required to be carried out by hand		
	4 Extra over for			1 Additional cost of excavation and handling of more difficult material and disposal within freehaul distance and replacement of unsuitable material	
	1 Intermediate excavation	m3			
	2 Hard rock excavation	m3			
	3 Mass concrete excavation	m3			
	4 Reinforced concrete excavation	m3			
	5 Other artificial hard material	m3			
EXCAVATION ANCILLARIES					
29	Make up deficiencies				
	1 Make up deficiency in backfill material from		1 Volume computed from trench width and depth from top of backfill to top of bedding as shown on drawing		
	1 other necessary excavations on site	m3		1 Selection of suitable material, moving of material to points alongside trench spaced to suit Contractor and disposal of material that is replaced all whithin freehaul distance	
	2 designated borrow pits	m3		2 Royalties, excavation and selection of suitable material, moving of material to points alongside trench spaced to suit Contractor and disposal of material that becomes surplus as a result of importation, all within freehaul distance	
	3 commercial or off-site sources selected by the Contractor	m3		3 Acquisition of material, royalties, moving of material to points alongside trench spaced to suit Contractor and disposal of material that becomes surplus as a result of importation, all within freehaul distance	
30	Shoring and temporary works				
	1 Shore trench opposite structure or service	m	1 Length measured will be centre-line of trench regardless of whether supports are place on one or on both sides of trench	1 For both sides of trench if necessary of supply, placing maintenance and removal of timbering and other support together with any cost that results from inconvenience of working in supported trench and cost of any risks inherent in the operation	
	2 Temporary works: control water inflow from ... to ...				
	1 Provide equipment	Sum		1 Providing necessary plant or materials or both, fully erected and operative on site	

C: EARTHWORKS

	Item or work to be measured	Unit	Measurement rules	Coverage rules	Additional rules
	2 Operate and maintain	Days		2 Operation and maintenance of pumps, well points, sheeting, close timbering and other equipment	
	3 Remove equipment	Sum		3 Removing goods and restoring site to original condition	
31	Compaction in road reserves				
	1 Compaction in road reserves	m3		1 Additional compactive effort required and of additional selection of material	
EXISTING SERVICES					
32	Existing services				
	1 Existing services that intersect a trench at angles between centre-line in plan of 45 to 90°	No	1 Except where water pipes are to be recovered, existing water pipes, sewers, stormwater pipes, concrete-lined channels and drains, box culverts, electric cables, ducts, kerbs, channels, erf connections and various sizes of pipes and services that intersect a trench of specified width and require various degrees of care, whether or not their presence is known before they are uncovered, will be measured separately		1 Unit refers to one service, but services that are so grouped that they can be contained within a horizontal dimension of 200mm measured at right angels to the axis of the services will be emasured as one unit
	2 Existing services that adjoin a trench parallel to or at an angle between centre-line in plan of less than 45°	m		1 Care in excavation necessitated by the presence of such service, protecting and maintaining such service in operation of meash of temporary supports or shoring, delays and disruption of the progress of work and repairs necessitated by damage caused by Contractor	1 Trench of specified width runs parallel to or at an angle in plan of less than 45° to an existing service and is such that the nearer side of the bottom of the trench lies at least partly between a vertical plane and a plane that lies at an angel of 45° below the horizontal, both planes passing through the axis of the service, the length of service within the minimum base width of the trench, will be measured for payment under this item
					2 Shoring must be measure to side of trench which is rendered liable to collapse because of existence of services
33	Reinstatement				
	1 Reinstate road surfaces complete with all courses		1 Area computed from length of finished road and the trench width	1 Temporary accommodation of traffic including signs and bypasses, excavation including equipment required to break up, remove and stockpile original surface material, subsequently reinstatement as specified including cost of delays and cost of any risk of having to repair damage	
	1 Gravel on shoulder	m2			
	2 Asphalt of thickness ...mm in parking area	m2			
	3 Asphalt of thickness ...mm in roadway	m2			

C: EARTHWORKS

	Item or work to be measured	Unit	Measurement rules	Coverage rules	Additional rules
	4 Other - state	m2			
BEDDINGS					
34	Bedding				
			1 Volume of bedding materials shall be computed from the dimensions of pipe and the side allowance determined per specification and the depth of each bedding sections shown on the drawings, as applicable 2 Material displace by the pipeline and by imporation of material from sources other than trench excavation shall be disposed of along the pipeline servitude within freehaul distance of 2km from source unless otherwise required in terms of the specification 3 Freehaul of 2km shall be applicable to selected granular material and to selected fill material		
35	Bedding from trench excavation				
	1 Provision of bedding from trench excavation of			1 Acquiring from within freehaul distance bedding that complies with specification, delivering to points alongside trench spaced to suit the Contractor and disposing of displaced material within freehaul distance	1 Rate for supply and laying of pipelines covers cost of handling bedding material from alongside the trench an placing it under and around the pipeline
	1 selected granular material	m3			
	2 selected fill material	m3			
36	Bedding by importation				
	1 Supply only of bedding by importation from other necessary excavations for			1 Acquiring from within freehaul distance bedding that complies with specification, delivering to points alongside trench spaced to suit the Contractor and disposing of displaced material within freehaul distance	
	1 selected granular material	m3			
	2 selected fill material	m3			
	2 Supply only of bedding by importation from borrow pits for			1 Acquiring including opening up and subsequently spreading surplus material, overburden and topsoil in manner specified, regardless of distance, the required bedding from borrow pits, delivering it to points alongside the trench spaced to suit Contractor and of disposing of material displaced by such importation, within freehaul distance	
	1 selected granular material	m3			
	2 selected fill material	m3			

C: EARTHWORKS

	Item or work to be measured	Unit	Measurement rules	Coverage rules	Additional rules
	3 Supply only of bedding by importation from commercial sources for			1 Acquiring, regardless of distance, delivering to points alongside trench spaced to suit Contractor and disposing material displaced by imporation, within freehaul distance	
	1 selected granular material	m3			
	2 selected fill material	m3			
37	French and rubble drain filling				
	1 Importation of materials from commercial sources or borrow pits or waste rock dumps or stockpiles compacted		1 State nature of filling material	1 Royalties, excavating, selecting and keeping selected material separate, temporary stockpiling, loading, transporting within freehaul distance, offloading, placing, compacting and testing	

D: CONCRETE

	Item or work to be measured	Unit	Measurement rules	Coverage rules	Additional rules
CONCRETE					
GENERAL					
1	Concrete Principles				
			1 Concrete shall be measured net to the dimensions shown on the drawings or to the dimensions cast, whichever is the smaller 2 No deductions shall be made for the following when measuring concrete: a) holding down bolts, reinforcement, rails and other steel sections cast in the concrete b) prestressing components c) pockets and holes which are defined as large or small voids d) rebates, grooves, throats, fillets, chamfers, chases, nibs, external or internal splays each not exceeding 0.1m2 in cross-sectional area and 0.05m3 each in volume e) cast-in components each not exceeding 0.1m3 in volume f) joints or joint components between adjacent volumes of in situ concrete g) cast in longitudinal pipes less than 200mm diameter 3 Where concrete is scheduled by volume it shall be measured on the mean thickness as cast, provided that the authorised person is satisfied that the excavation has not at any point been taken deeper or wider than necessary 4 Separate items shall be scheduled, as applicable, for each type and each grade of concrete, for each type of cement and each type of aggregate, and for each unit of the works or each element of a structure, where these could materially influence the pricing of the work and where the cost of expositing concrete is affected by it's position in the works or by the conditions of placing such as: a) slabs that are sloping, conical or horizontal and those of different thicknesses b) concrete deposited under water or between tides, the levels of demarcation being stated c) small quantities each less than 0.5m3 of formed concrete and		
2	Overbreak				
			5 No allowance shall be made for concrete required to make up overbreak in soft excavation, but payment will be made for additional concrete or formwork, ordered in writing by the authorised person to replace unsuitable material or overbreak in hard rock or in intermediate excavation		

D: CONCRETE

	Item or work to be measured	Unit	Measurement rules	Coverage rules	Additional rules
			6 Where concrete is placed against the sides or bottom of excavations in hard rock or in intermediate excavation, an item may be included for any additional concrete placed in overbreak		
3	Blinding layers				
			7 Blinding layers shall be measured to the plan size of the concrete structure resting on the layer, or the plan size of the excavation where additional excavation is provided to facilitate erection of formwork		
4	Floor slabs				
			8 Floor slabs placed on blinding layer or directly on the prepared ground surface, shall be measured to the net thickness dimensioned on the drawings 9 Thickness used for classification of all slabs shall exclude the additional thickness of integral beams, columns and other projections 10 Concrete in suspended slabs less than 1m wide shall be classed as concrete in beams		
5	Beams				
			11 Beams integral with a slab shall be measured as part of the slab, except where expressly rquired to be cast separately 12 Isolated beams shall be described 13 Ground beams, beams and special beams shall be measured below slab 14 Beams shall be classed as special beam sections where their cross-section profiles are rectangular or approximately rectangular over less than 4/5 of their length 15 Upstand beams shall be described		
6	Walls				
			16 Concrete in walls less than 1m long shall be classed as concrete in columns 17 Thickness used for classification of all walls shall exclude the additional thickness of integral beams, columns and other projections		
7	Columns				
			18 Concrete in columns supporting a reinforced concrete beam or slab structure will be measured between the top surface of the foundation, beam or slab on which the foot of the column is standing and the underside of the beam or slab supported by the column 19 Columns integral with a wall shall be measured as part of the wall, except where expressly required by authorised person to be cast separately 20 Projecting columns shall be described		
8	Roofs				

D: CONCRETE

	Item or work to be measured	Unit	Measurement rules	Coverage rules	Additional rules
			21 Curved roofs, conical roofs, spherical roofs and elliptical roofs shall each be so described irrespective of radius		
CONCRETE					
9	Blinding layer in … concrete:				
	1 …mm minimum thickness	m2		1 Provision of concrete, mixing, testing, placing, levelling, curing and repairing where necessary	
10	Mass concrete, grade … in:				
	1 Elements such as filling, footings, bases, cavities and holes	m3		1 Provision of concrete, mixing, testing, placing, levelling, curing and repairing where necessary	
11	Strength concrete, grade … MPa/… mm aggregate in:				
	1 Elements such as footings, bases, machine bases, pile caps, surface beds, surface beds cast in panels, ground slabs, suspended slabs, roofs, walls, retaining walls, columns, ground beams, beams, special beams, lintels, stairs inclusive of landings, hollow block slabs, coffered slabs, troughed slabs, upstands and kerbs	m3	1 Except where ordinary portland cement is required, the type of cement shall be stated	1 Cost of design of the mix in the case of strength concrete, the provision of concrete, mixing, testing, placing, compacting, forming of stop-ends and unforeseen, construction joints, striking-off or levelling as applicable, and curing and repairing where necessary	1 Surface beds cast in panels shall include formwork
			2 State grade, positions and elements separate		
			3 Separate items for pouring on or against earth or unblinded hardcore		
			4 State thickness for surface beds, ground slabs and suspended slabs:		
			Not exceeding 150mm thick		
			Exceeding 150mm and up to and including 300mm thick		
			Exceeding 300mm and up to and including 500mm thick		
			Exceeding 500mm thick		
			5 State classification for surface beds, ground slabs, suspended slabs and roofs separately for:		
			Horizontal		
			Sloping not exceeding 15° from horizontal		
			Sloping exceeding 15° from horizontal		
			6 State thickness for walls:		
			Not exceeding 150mm thick		
			Exceeding 150mm and up to and including 300mm thick		
			Exceeding 300mm and up to and including 500mm thick		
			Exceeding 500mm thick		
	2 Casing to metal sections	m3	1 State type and description of metal sections separately		
12	Prescribed mix concrete, grade … in:				
	1 Elements such as footings, bases, machine bases, pile caps, surface beds, surface beds cast in panels, ground slabs, suspended slabs, roofs, walls, retaining walls, columns, ground beams, beams, special beams, lintels, stairs inclusive of landings, hollow block slabs, coffered slabs, troughed slabs, upstands and kerbs	m3	1 Measurement rules per 11: 1 to 6, Strength concrete above	1 Cost of design of the mix in the case of strength concrete, the provision of concrete, mixing, testing, placing, compacting, forming of stop-ends and unforeseen, construction joints, striking-off or levelling as applicable, and curing and repairing where necessary	1 Surface beds cast in panels shall include formwork

D: CONCRETE

	Item or work to be measured	Unit	Measurement rules	Coverage rules	Additional rules
UNFORMED SURFACE FINISHES					
13	Unformed surface finishes				
	1 Wood-floated finish	m2	1 Separate items for sloping, falls, crossfalls and soffits	1 Materials, surface treatment, joints and formwork	1 Surface treatments shall not be measured to surfaces formed at the Contractor's discretion
	2 Steel trowel finish	m2	2 Separate items for each class or type of finish		
	3 Power-floated finish	m2	3 No deduction for holes and openings each not exceeding 0.5m2		
	4 Grinding and sand-blasting finish	m2	4 Areas of tops of walls and other surfaces which are not given separate finishing treatment shall not be measured as finishing of top surfaces		
	5 Other stated surface treatment	m2			
LABOUR ON CONCRETE					
14	Channels and chases				
	1 Forming chases with depth		1 State width if specified	1 Forming chase and making good	
	1 not exceeding 50mm	m	2 State type of concrete		
	2 over 50mm and up to and including 100mm	m			
	3 over 100mm and up to and including 150mm	m			
	4 over 150mm, depth stated	m			
	2 Forming channels with depth		1 State shape and width	1 Forming channels, formwork, additional concrete and making good	
	1 not exceeding 100mm	m	2 Separate items for channels to falls, stating fall		
	2 over 100mm and up to and including 200mm	m	3 State type of concrete		
	3 over 200mm and up to and including 300mm	m	4 Should additional concrete be required item shall be so described stating size of additional concrete		
	4 over 300mm, depth stated	m	5 Formwork, end angles, intersections and outlets shall be given in description		
	3 Cutting holes of diameter		1 State type of concrete	1 Cutting holes and making good	
	1 not exceeding 100mm	m			
	2 over 100mm and up to and including 200mm	m			
	3 over 200mm and up to and including 300mm	m			
	4 over 300mm	m			
JOINTS					
JOINT GENERAL					
15	Joint Principles				
			1 Joints shall be measured only where they are expressly required by authorised person 2 Widths of joints shall be measured between the outer surfaces of concrete with no deduction or addition for widths or depths occupied by rebates, grooves, fillets or waterstops		

D: CONCRETE

	Item or work to be measured	Unit	Measurement rules	Coverage rules	Additional rules
16	Joints				
	1 Joints, average width		1 Separate items for joints of different types and sizes and involving different types, sizes and qualities of waterstops, dowels, soft board, sealers, etc.	1 Materials and labour for construction of joint as specified including formwork, reinforcement crossing joints, cutting and joining of waterstops, provision of special fittings at angels and junctions of waterstops, testing and making good	
	1 not exceeding 150mm	m			
	2 over 150mm and upt to and including 200mm	m			
	3 over 200mm and upt to and including 300mm	m			
	4 over 300mm	m			
GROUTING					
17	Grouting				
	1 Grouting under plates for area		1 State type of material 2 Formwork, if any, will be measured separately	1 Cost of scabbling, cleaning and preparing concrete surfaces, providing approved grout, placing and ramming it solidly into all voids and mitring the outside edges to a true wood-floated finish	
	1 not exceeding 0.10m2	No			
	2 over 0.10m2 and up to and including 0.50m2	No			
	3 over 0.50m2 and up to and including 1m2	No			
	4 over 1m2, stated	No			
	2 Grouting for holding down bolts	No	1 Separate items for HD bolts or pockets, as applicable, of different diameters, lengths and types and for bearings and miscellaneous metal work of different types	1 Cost of scabbling, cleaning and preparing concrete surfaces, providing approved grout, placing and ramming it solidly into all voids and pockets	
	3 Grouting for anchor bolts	No	1 Separate items for anchor bolts or pockets, as applicable, of different diameters, lengths and types and for bearings and miscellaneous metal work of different types	1 Cost of scabbling, cleaning and preparing concrete surfaces, providing approved grout, placing and ramming it solidly into all voids and pockets	
	4 Grouting in of miscellaneous metal work	No	1 Separate items for different types 2 State principal dimensions, kind and quality of materials, type of grout and size of opening grouted in 3 State if supplied by contractor or by others	1 Supplying and delivering or taking delivery (as applicable), fixing or casting into concrete and all cleaning, preparation and finishing	1 Formwork to preformed openings shall be measured separately
BOLTS AND MISCELLANEOUS METALWORK					
18	Bolts				
	1 Casting in of HD Bolts	t	1 Separate items for different diameters, lengths and types 2 State if supplied by contractor or by others	1 Supplying and delivering or taking delivery (as applicable), fixing or casting into concrete and all cleaning, preparation and finishing	

D: CONCRETE

	Item or work to be measured	Unit	Measurement rules	Coverage rules	Additional rules
	2 Casting in of anchor bolts	t	1 Separate items for different diameters, lengths and types	1 Supplying and delivering or taking delivery (as applicable), fixing or casting into concrete and all cleaning, preparation and finishing	
			2 State if supplied by contractor or by others		
19	Miscellaneous metalwork				
	1 Casting in of miscellaneous metal work	t	1 Separate items for different types	1 Supplying and delivering or taking delivery (as applicable), fixing or casting into concrete and all cleaning, preparation and finishing	
			2 State principal dimensions and kind and quality of materials		
			3 State if supplied by contractor or by others		
SLEEVES					
20	Casting/fixing in sleeves				
	1 Small, circular up to 0.35m diameter, with depth of:		1 State type of material	1 Supplying and delivering or taking delivery (as applicable), fixing or casting into concrete and all cleaning, preparation and finishing	
	1 up to and including 0.5m deep	No			
	2 over 0.5m and up to and including 1.0m deep	No			
	3 over 1.0m and up to and including 1.5m deep	No			
	4 over 1.5m and up to and including 2.0m deep	No			
	5 over 2.0m deep	No			
	2 Small, other than circular, of area up to and including 0.1m2, with depth of:		1 State type of material	1 Supplying and delivering or taking delivery (as applicable), fixing or casting into concrete and all cleaning, preparation and finishing	
	1 up to and including 0.5m deep	No			
	2 over 0.5m and up to and including 1.0m deep	No			
	3 over 1.0m and up to and including 1.5m deep	No			
	4 over 1.5m and up to and including 2.0m deep	No			
	5 over 2.0m deep	No			
	3 Large, circular over 0.35m and up to 0.7m diameter, with depths of:		1 State type of material	1 Supplying and delivering or taking delivery (as applicable), fixing or casting into concrete and all cleaning, preparation and finishing	
	1 up to and including 0.5m deep	No			
	2 over 0.5m and up to and including 1.0m deep	No			
	3 over 1.0m and up to and including 1.5m deep	No			
	4 over 1.5m and up to and including 2.0m deep	No			
	5 over 2.0m deep	No			
	4 Large, other than circular, of area over 0.1m2 and up to and including 0.5m2, with depth of:		1 State type of material	1 Supplying and delivering or taking delivery (as applicable), fixing or casting into concrete and all cleaning, preparation and finishing	
	1 up to and including 0.5m deep	No			
	2 over 0.5m and up to and including 1.0m deep	No			
	3 over 1.0m and up to and including 1.5m deep	No			
	4 over 1.5m and up to and including 2.0m deep	No			
	5 over 2.0m deep	No			

E: FORMWORK AND REINFORCEMENT

	Item or work to be measured	Unit	Measurement rules	Coverage rules	Additional rules
FORMWORK					
GENERAL					
1	Formwork Principles				
			1 Formwork shall be measured net area of the face of the concrete to be supported during the deposition of concrete 2 No deductions shall be makde for fillets and splays of size up to 50 x 50mm or for openings of diameter up to 0.7m or of area up to 0.5m2 3 Formwork in continuous lengths of narrow widths and of fillets or splays over 20 x 20mm shall be measured by length as intrusions, the width or range of widths being stated 4 Boxing-out, forming of holes and other such operations shall be measured in number, basic dimensions, perimeters or drawing reference shall be stated 5 Separate items shall be scheduled for: a) each class of finish required on the formed concrete b) different angles of inclination of formwork: horizontal - exceeding 85° and not exceeding 95° sloping - exceeding 10° and not exceeding 85° battered - not exceeding 10° vertical - 0° c) each inclination of each type of structural element, such as walls and beams, and for different prop heights for beams and slabs, and for formwork to curved (single and double), curved in plan only, arched, domical, specially moulded and other types of work 6 Radii of curved formwork shall be stated as follows: a) to one radius in one plane (cylindrical), radius stated b) to one radius in two plane (spherical), radius stated stated 7 Formwork left in, that which is not designed to remain in position but is nonetheless impossible to remove, shall be so described 8 Permanent formwork, designed to remain in position, shall be so described 9 Formwork required to be lined with particular material (wall board, hardboard, plywood, paper) shall be so described 10 Formwork shall not be measured for the following: a) edges of blinding concrete not exceeding 0.2m wide b) joints and associated rebates and grooves c) temporary surfaces formed at the discretion of the contractor d) surfaces of concrete which are expressly required by authorised person to be cast against excavated surfaces		

E: FORMWORK AND REINFORCEMENT

	Item or work to be measured	Unit	Measurement rules	Coverage rules	Additional rules
			e) surfaces of concrete which are cast against excavated surfaces inclined at an angle less than 45° to the horizontal		
2	Openings and voids				
			11 Depths of openings required in the formed concrete as follows, measured perpendicular to the surface: a) not exceeding 0.5m b) exceeding 0.5m and not exceeding 1.0m c) exceeding 1.0m and not exceeding 1.5m d) exceeding 1.5m and not exceeding 2.0m 12 Large and small voids shall be classified as follows: a) large - exceeding 0.35m and not exceeding 0.7m diameter for circular voids and exceeding 0.1m and not exceeding 0.5m2 in area for other voids b) small - not exceeding 0.35m diameter for circular voids and not exceeding 0.1m2 in are for other voids		
3	Soffits				
			13 Separate items for propping heights as follows: a) not exceeding 1.5m b) exceeding 1.5 and not exceeding 3.5m c) exceeding 3.5m, in stages of 1.5m		
4	Walls and Columns				
			14 Separate items for height above bearing level as follows: a) not exceeding 3.5m b) exceeding 3.5m, in stages of 1.5m 15 Bearing level should be stated in the item		
5	Slabs				
			16 Formwok to soffits of slabs exceeding 250mm thick shall be given separately in stages of 250mm 17 Formwork propped off sloping or stepped surfaces shall be given separately		
6	Projections and intrusions				
			18 Nibs and external splays not exceeding 0.1m2 in cross-sectional area shall be classed as projections 19 Rebates, grooves, internal splays, throats, fillets and chamfers not exceeding 0.01m2 in cross-sectional area shall be classed as intrusions		
FORMWORK					
7	Rough formwork				
	1 Elements such as footings, bases, machine bases, slabs, roofs, walls, columns, ground beams, beams, special beams, lintels, etc.	m2	1 Separate items for different structures and different inclinations	1 All parts of formwork including forming fillets or splays up to 20mm x 20mm and necessary bearers, struts and other supports plus labour and plant necessary to erect and strike formwork	
	2 Projections	m or No	1 State principal dimensions	1 All parts of formwork including supports plus labour	

E: FORMWORK AND REINFORCEMENT

	Item or work to be measured	Unit	Measurement rules	Coverage rules	Additional rules
	3 Intrusions	m or No	1 State principal dimensions	1 All parts of formwork including supports plus labour	
	4 Vertical narrow widths		1 State width range if not constant	1 All parts of formwork including supports plus labour	
	1 up to 150mm wide	m			
	2 over 150mm and up to and including 300mm	m			
8	Smooth formwork				
	1 Elements such as footings, bases, machine bases, slabs, roofs, walls, columns, ground beams, beams, special beams, lintels, etc.	m2	1 Separate items for different structures and different inclinations	1 All parts of formwork including forming fillets or splays up to 20mm x 20mm and necessary bearers, struts and other supports plus labour and plant necessary to erect and strike formwork	
	2 Projections	m or No	1 State principal dimensions	1 All parts of formwork including supports plus labour	
	3 Intrusions	m or No	1 State principal dimensions	1 All parts of formwork including supports plus labour	
	4 Vertical narrow widths		1 State width range if not constant	1 All parts of formwork including supports plus labour	
	1 up to 150mm wide	m			
	2 over 150mm and up to and including 300mm	m			
9	Special smooth, to …				
	1 Elements such as footings, bases, machine bases, slabs, roofs, walls, columns, ground beams, beams, special beams, lintels, etc.	m2	1 Separate items for different structures and different inclinations	1 All parts of formwork including forming fillets or splays up to 20mm x 20mm and necessary bearers, struts and other supports plus labour and plant necessary to erect and strike formwork	
	2 Projections	m or No	1 State principal dimensions	1 All parts of formwork including supports plus labour	
	3 Intrusions	m or No	1 State principal dimensions	1 All parts of formwork including supports plus labour	
	4 Vertical narrow widths		1 State width range if not constant	1 All parts of formwork including supports plus labour	
	1 up to 150mm wide	m			
	2 over 150mm and up to and including 300mm	m			
10	Special off-form, to …				
	1 Elements such as footings, bases, machine bases, slabs, roofs, walls, columns, ground beams, beams, special beams, lintels, etc.	m2	1 Separate items for different structures and different inclinations	1 All parts of formwork including forming fillets or splays up to 20mm x 20mm and necessary bearers, struts and other supports plus labour and plant necessary to erect and strike formwork	
			2 State whether board-marked or special pattern		
	2 Projections	m or No	1 State principal dimensions	1 All parts of formwork including supports plus labour	
	3 Intrusions	m or No	1 State principal dimensions	1 All parts of formwork including supports plus labour	

E: FORMWORK AND REINFORCEMENT

	Item or work to be measured	Unit	Measurement rules	Coverage rules	Additional rules
	4 Vertical narrow widths		1 State width range if not constant	1 All parts of formwork including supports plus labour	
	1 up to 150mm wide	m			
	2 over 150mm and up to and including 300mm	m			
HOLES/VOIDS					
11	Box out holes/form voids				
	1 Small, circular up to 0.35m diameter, with depth of:			1 All parts of formwork, labour, cleaning, preparation and finishing	
	1 up to and including 0.5m deep	No			
	2 over 0.5m and up to and including 1.0m deep	No			
	3 over 1.0m and up to and including 1.5m deep	No			
	4 over 1.5m and up to and including 2.0m deep	No			
	5 over 2.0m deep	No			
	2 Small, other than circular, of area up to and including 0.1m2, with depth of:			1 All parts of formwork, labour, cleaning, preparation and finishing	
	1 up to and including 0.5m deep	No			
	2 over 0.5m and up to and including 1.0m deep	No			
	3 over 1.0m and up to and including 1.5m deep	No			
	4 over 1.5m and up to and including 2.0m deep	No			
	5 over 2.0m deep	No			
	3 Large, circular over 0.35m and up to 0.7m diameter, with depths of:			1 All parts of formwork, labour, cleaning, preparation and finishing	
	1 up to and including 0.5m deep	No			
	2 over 0.5m and up to and including 1.0m deep	No			
	3 over 1.0m and up to and including 1.5m deep	No			
	4 over 1.5m and up to and including 2.0m deep	No			
	5 over 2.0m deep	No			
	4 Large, other than circular, of area over 0.1m2 and up to and including 0.5m2, with depth of:			1 All parts of formwork, labour, cleaning, preparation and finishing	
	1 up to and including 0.5m deep	No			
	2 over 0.5m and up to and including 1.0m deep	No			
	3 over 1.0m and up to and including 1.5m deep	No			
	4 over 1.5m and up to and including 2.0m deep	No			
	5 over 2.0m deep	No			
REINFORCEMENT					
12	Reinforcement Principles				
			1 Steel shall be measured net by mass of all bars, including supporting steel detailed with no allowance in weight for tying wire, ordinary spacers or rolling margin 2 Mass shall be computed from the nominal bar size and the nominal mass per unit length 3 Separate item will be scheduled for: a) each steel section where rails and other steel sections are used and b) steel to be fixed in different parts of the work where this could materially influence the pricing of the work		

E: FORMWORK AND REINFORCEMENT

	Item or work to be measured	Unit	Measurement rules	Coverage rules	Additional rules
			4 Steel reinforcement for precast concrete units will not be measured unless so scheduled 5 Welded mesh shall be measured by area, no allowance shall be made for cutting, waste, laps or deductions for end cover 6 Continuous units partly reinforced by mesh shall be measured by area from outside dimensions of the area covered by mesh regardless of whether additional reinforcing steel is present in the same area 7 Steel offcuts resulting from cutting and bending of reinforcement in accordance with bending schedule shall be deemed to be the property of the Contractor 8 Special joints for bar reinforcing shall be welded, swaged or screwed sleeve joints		
13	Mild steel bars				
	1 Steel bars of diameter of:		1 Bars over 12m long before bending shall be so described, stating length in further 3m stages	1 Supply, cutting, bending, placing in position and fixing of reinforcing including supporting steel scheduled and the provision of all spacer devices and binding wire, as well as tests	
	1 6mm	t			
	2 8mm	t			
	3 10mm	t			
	4 12mm	t			
	5 16mm	t			
	6 20mm	t			
	7 25mm	t			
	8 32mm	t			
	9 40mm or greater	t			
	2 Special joints	No	1 State type of joint and type and size of reinforcing bar	1 Material and labour for joint including making good	1 When specified or ordered
14	High-tensile steel bars				
	1 Steel bars of diameter of:		1 Bars over 12m long before bending shall be so described, stating length in further 3m stages	1 Supply, cutting, bending, placing in position and fixing of reinforcing including supporting steel scheduled and the provision of all spacer devices and binding wire, as well as tests	
	1 6mm	t	2 Special joints shall be stated giving type of joint		
	2 8mm	t			
	3 10mm	t			
	4 12mm	t			
	5 16mm	t			
	6 20mm	t			
	7 25mm	t			
	8 32mm	t			
	9 40mm or greater	t			
	2 Special joints	No	1 State type of joint and type and size of reinforcing bar	1 Material and labour for joint including making good	1 When specified or ordered

E: FORMWORK AND REINFORCEMENT

	Item or work to be measured	Unit	Measurement rules	Coverage rules	Additional rules
15	Fabric reinforcement				
	1 Steel fabric reinforcement reference …	m2	1 State reference type	1 Supply, cutting and placing including waste due to laps	
	2 Fabric reinforcement of other stated material with nominal mass of:		1 State material type	1 Supply, cutting and placing including waste due to laps	
	1 not exceeding 2kg/m2	m2			
	2 exceeding 2kg/m2 but not exceeding 3kg/m2	m2			
	3 exceeding 3kg/m2 but not exceeding 4kg/m2	m2			
	4 exceeding 4kg/m2 but not exceeding 5kg/m2	m2			
	5 exceeding 5kg/m2 but not exceeding 6kg/m2	m2			
	6 exceeding 6kg/m2 but not exceeding 7kg/m2	m2			
	7 exceeding 7kg/m2 but not exceeding 8kg/m2	m2			
	8 exceeding 8kg/m2, stated	m2			
RAILS					
16	Rails or other sections used as reinforcement				
	1 Rails or other sections	t	1 State material type and size of section	1 Supply, cutting and placing including waste	

F: PRE-CAST AND PRE-STRESSED CONCRETE

	Item or work to be measured	Unit	Measurement rules	Coverage rules	Additional rules
PRE-CAST CONCRETE					
GENERAL					
1	Pre-cast Principles				
			1 Where units are measured by volume, reinforcement and fixtures shall be scheduled and no deduction shall be made for small openings and holes 2 Reinforcement and fixtures shall not be measured separately where units are measured in number or where the measurement of a unit is by area or by length 3 Particulars of the following shall be given in the description: a) kind, quality and size of reinforcement b) shape of cross-section of unit c) nature and extend of surface finish d) composition and mix of jointing and bedding materials e) method of fixing 4 items		
PRE-CAST CONCRETE					
2	Pre-cast units				
	1 Provide structural pre-cast units	m3 or m2 or m or No	1 Separate items for different qualities of concrete, different types and sizes of units and small units not exceeding 0.5m3 of formed concrete	1 Labour, equipment, moulds, material including facings, reinforcement, fixtures (except where reinforcement and fixtures are measured separately), mixing, placing, compacting and floating-off of concrete and temporary stacking, curing and delivering units to and stacking on site	1 Mark or type number of each pre-cast unit shall be stated, if known
			2 State dimensions of individual units and whether reinforcement is included or measured separately		
			3 Curved units shall be so described stating mean radius		
	2 Erection of structural pre-cast units	m3 or m2 or m or No	1 Separate items for different positions of units for erection purposes	1 Removal of units from temporary stacking, all materials, plant and labour required for building units in or fixing into position including provision of hard standings, lifting gear, temporary scaffolding and supports necessary to keep units stable until the permanent support system is able to stabilize units	1 Mark or type number of each pre-cast unit shall be stated, if known
			2 State details of jointing, where applicable		
3	Paving slabs				
	1 Concrete paving slabs	m2	1 State size and thickness of slab	1 Manufacturing, delivering, laying and jointing of paving slabs, including provision and trimming of suitable sand bedding	
			2 Area of joints will be included in the area measured		
4	Load testing				
	1 Load testing of units:		1 Separate items for different shapes or sizes or types of units		
	1 Non-desctructive tests	No or Sum		1 Equipment, measuring devices and labour required	

F: PRE-CAST AND PRE-STRESSED CONCRETE

	Item or work to be measured	Unit	Measurement rules	Coverage rules	Additional rules
	2 Destructive tests	Sum		2 Equipment, materials and labour required and for replacing the unit destroyed during the test	
	3 Special tests (provisional)	Sum		3 Operations agreed between contractor and authorised person before testing the unit	
PRE-STRESSED CONCRETE					
5	Pre-stressed Principles				
			1 Where special and complicated construction is involved drawing shall be provided 2 Formwork shall be measured as per Formwork and Reinforcement section 3 Reinforcement shall be emasured as per Fromwork and Reinforcement section		
6	Establishing				
	1 Establishing on site, maintenance and dismantling of tensioning beds and equipment	Sum	1 Measured only where required to establish facilities on site as part of temporary works for tensioning in-situ concrete	1 Setting up, operating, maintaning and on completion dismantling beds and equipment	
7	Structural in-situ members				
	1 Provide structural in-situ members cast in sections	No	1 State number and average length of sections	1 reinforcing and pre-stressing steel, formwork and moulds and labour and equipment required for mixing, placing, compacting, floating off, stressing, temporary stacking and curing	1 Structural members are beams, columns, etc.
			2 Separate items for different qualities of concrete and different types and sizes of structural members		
	2 Erection and building-in of structural in-situ members including joints	No	1 State mass of each unit and details of connections	1 Removal of temporary stacking, erection (including hoistings, scaffolding and temporary supports), building-in or fixing into position and construction of all structural connections including joints	
			2 Separate items for different sizes and different positions of structural members		
8	Pre-cast pre-stressed units				
	1 Provide pre-cast pre-stressed units	No or Sum	1 State dimensions or refer to drawing number	1 reinforcing and pre-stressing steel, formwork and moulds and labour and equipment required for mixing, placing, compacting, floating off, stressing, temporary stacking and curing	
			2 Separate items for different qualities of concrete, different types and sizes of units and small units not exceeding 0.5m3 of formed concrete		
	2 Erection and building-in of units	No	1 State mass of each unit and details of connections	1 Removal of temporary stacking, erection (including hoistings, scaffolding and temporary supports), building-in or fixing into position and construction of all structural connections	
			2 Separate items for different sizes and different positions of units		

F: PRE-CAST AND PRE-STRESSED CONCRETE

	Item or work to be measured	Unit	Measurement rules	Coverage rules	Additional rules
9	Sheathing and tendons				
	1 Supply and install sheathing and tendons	t	1 State characteristic strength	1 Supplying of sheathing complete with threaded inlets and with vents, fixing complete sheathing to formwork, supplying and making up tendons (including spacers, cutting and waste) and threading tendons through the sheaths	
			2 Separate items for tendons of different materials, cross-sections and types of construction		
			3 Lenghts of tendons shall be developed lengths between the outer face of anchorages		
			4 Mass of tendons measured include the mass of any loop or fan		
10	Anchorages and couplers				
	1 Supply and install anchorages and couplers to suit tendons:			1 Supplying, fabricating, storing, handling, protecting, forming a recess for anchorage and for coupler, installing and fixing complete anchorage assembly (including coupler) to formwork, together with cost of reinforcement design for whole anchorage zone and helical reinforcement supplied as part of anchorage assembly	
	1 Anchorage at jacking end	No			
	2 Anchorage at dead end	No			
	3 Coupler at jacking end	No			
	4 Coupler at dead end	No			
11	Post-tensioning				
	1 Post-tensioning and grouting of sheathing and tendons and anchorages and couplers	No	1 Separate items scheduled for longitudinal, transverse and vertical tensioning	1 Royalties, site supervision and labour, plant and materials, pre-stressing of unit by tensioning all or a few tendons at a time, anchoring off or coupling, or both, trimming of tendon ends and flushing out, grouting and making good anchorage recesses	
12	Tests				
	1 Special tests	Sum		1 Complying with requirements for tests agreed between contractor and authorised person	

G: STEELWORKS

	Item or work to be measured	Unit	Measurement rules	Coverage rules	Additional rules
STEELWORK					
GENERAL					
1	Steelwork Principles				
			1 Mass of steelwork will be calculated from a steel density of 7850kg/m3 2 Mass of fittings such as cleats, gussets, battens and stiffeners will be added to the mass of the members 3 No deductions shall be made for holes for fasteners or for milling or planning and no additions will be made for rolling margin, waste, weld metal or shop fasteners 4 Gussets shall be measured on the basis of the minimum enclosing rectangle 5 Each large, shaped plate such as roofs, bottom to circular tanks or hopper bottoms to a bunker or a silo, shall be measured on the basis of the net size of the element		
STEELWORK					
2	Shop detail drawings				
	1 Preparation of shop detail drawings	t or Sum	1 Payment under this item shall only be made where such drawings are expressly required by authorised person	1 Preparation and submission to authorised person acceptable shop detail drawings and supporting calculations	
3	Supply and fabrication				
	1 Supply and fabrication of steelwork	t	1 Separate items for each type of member and each structural position	1 Supply, trial assembly (if required) and fabrication of steelwork complete with all necessary cleats, brackets, gusets, shop fasteners, packs, baseplates and the like, and loading ready for despatch to site	1 Curved on plan and curved on plan and cambered steelwork shall be so described
			2 Subdivide members to distinguish between different methods of jointing, e.g. welding and bolting		
			3 State type of fasteners		
			4 State if trial assembly's required		
			5 Mass of members, other than plates or flats, shall be calculated from the overall lengths of the members with no deductions for splay-cut or mitred ends		
4	Delivery to site				
	1 Normal delivery	t		1 Transportation from shop to site, including handling on and off trucks, if required, and any demurrage incurred in connection with the movement of steelwork	
	2 Extra over for abnormal loads	t	1 Separate items shall be scheduled for members that are abnormal in shape, size or mass as warrant special arrangements for their transportation in terms of road traffic ordinance	1 Transportation from shop to site, including handling on and off trucks, if required, and any demurrage incurred in connection with the movement of steelwork	

G: STEELWORKS

	Item or work to be measured	Unit	Measurement rules	Coverage rules	Additional rules
5	Erection on site				
	1 Erection on site	t or No	1 Separate items shall be scheduled for expansion bolts and other anchorages for handrailing and the like	1 Offloading steelwork from vehicles on site, stacking in designated area, moving from such area, assembly, erection, aligning, provision of erection equipment, temporary supports and safety measures	
6	Site welding				
	1 Site welding	m	1 Separate items shall be scheduled describing the extent, nature and position of site welding	1 Access, including scaffolding, preparation of weld areas, welding, including supply of consumables and equipment, and the cleaning up of the weld, including grinding, if necessary, and removal of weld spatter	1 Site welding shall be measured only to the extent that it is expressly required by authorised person
7	Site holes				
	1 Site holes	No	1 Separate items shall be scheduled for each size of hole and thickness of steel	1 including supply of consumables and equipment, including grinding, if necessary, and cleaning up	1 Site holes shall be measured only to the extent that it is expressly required by authorised person
8	Bolts				
	1 Erection bolts	t or No	1 Separate items shall be scheduled for each grade and type of bolt	1 Supplying, delivery and storage on site of bolts, washers and nuts	
	2 Holding-down bolts	t or No	1 Separate items shall be scheduled for each diameter, size and shape of bolt	1 Supplying and delivering bolt complete with washers and nuts, and all treading, shaping, anchor plates and frames and stacking on site ready for installation	
	3 Anchors	t or No	1 Separate items shall be scheduled for each diameter, size, shape and type of anchor	1 Supplying and delivering anchor complete including drilling and installing	
MISCELLANEOUS METALWORK					
9	Miscellaneous metalwork Principles				
			1 No deduction from masses or areas measured shall be made for opening and holes each not exceeding 0.5m2 in area 2 Items shall deemed to include fixing to other work, supplying of fixing components and drilling or cutting of other work		
10	Cladding and sheeting				
			3 Cladding and sheeting shall be measured as the total area covered by the cladding and sheeting, no deduction being made for openings left or cut for protrusions such as pipes, ducts, chimneys and the like, or for areas covered by overlaps, ridgeing, parts of flashings, ventilators and the like 4 Deductions will be made for doors, windows and other openings of similar dimensions		
11	Handrailing				
	1 Handrail assembly complete	Sum	1 State drawing number	1 Supplying all materials, fixing bolts, assembling, corrosion protection and grouting in	

G: STEELWORKS

	Item or work to be measured	Unit	Measurement rules	Coverage rules	Additional rules
	2 Handrail:		1 State type and material	1 Supplying rails, stanchions (with base) complete with nuts and washers, corrosion protection, assembling and installing complete with grouting in	
	1 Hand rails only	m			
	2 Knee rails only	m			
	3 Stanchions only	No			
	4 Bends, end closures and accessories	No			
	5 Holding down bolts, nuts and washers for each stanchion	Sets			
12	Ladders				
	1 Ladders, complete and installed	No or t	1 State type and length or drawing number	1 Supplying all materials including lugs or other means of fixing as shown and fabricating, installing and grouting in	
			2 State safety loops, rest platforms or returned stringers if applicable		
13	Flooring				
	1 Flooring complete and installed with frames	Sum or m2 or No	1 State drawing number	1 Supplying flooring complete with frames and all fixings, installing, fixing (including welding where applicable) and grouting in	
	2 Open grid floors	Sum or m2	1 State type	1 Supplying flooring complete with frames, supporting metalwork, installing, fixing (including welding where applicable) and grouting in	1 Item shall include supporting metalwork unless otherwise stated
	3 Floorplate floors	m2 or t	1 State type	1 Supplying flooring complete with frames, supporting metalwork, installing, fixing (including welding where applicable) and grouting in	1 Item shall include supporting metalwork unless otherwise stated
14	Cladding and sheeting				
	1 Supply and install cladding and sheeting	m2 or t	1 Separate items shall be scheduled for side cladding (to each floor level, if applicable) and roof sheeting, subdivided for each type of sheeting and finish, each profile and straight and curved sheets	1 Supplying, delivering, storing on site, handling, moving, installing and fixing sheeting (finished or prepainted as scheduled) complete with all necessary fasteners, and cutting, notching and waste, and of all scaffolding, temporary supports, hoisting facilities and safety precautions	
	2 Supply and install ancillaries	m or No	1 Ancillaries such as flashings, ridging, ventilation openings, rainwater goods, cranked or bullnosed sheets and similar lengths of constant profile shall be measure in length	1 Supplying, delivering, storing on site, handling, moving, installing and fixing with all necessary fasteners, including cutting, notching and waste and all scaffolding, temporary supports, hoisting facilities and safety precautions	
			2 Ancillaries such as separate ventilators, stop-ends, shoes and the like shall be measured in number		
			3 Cranked and bullnosed sheets shall be measured as extra-over sheeting		

G: STEELWORKS

	Item or work to be measured	Unit	Measurement rules	Coverage rules	Additional rules
			4 Separate items chall be scheduled for each type, finish, shape and when relevant profile of ancillary item		
	3 Painting on:		1 different locations and significant different heights above ground	1 Supplying all painting materials and application as well as all scaffolding and safety precautions	
	1 Cladding and sheeting	m2			
	2 Ancillaries	m			
15	Miscellaneous metalwork				
	1 Stairways and landings	t	1 State type	1 Supplying stairways and landings complete with frames, supporting metalwork, installing, fixing (including welding where applicable) and grouting in	
	2 Walkways and platforms	t	1 State type	1 Supplying walkways and platforms complete with frames, supporting metalwork, installing, fixing (including welding where applicable) and grouting in	
	3 Miscellaneous framing	m	1 State type of steel section	1 Supplying walkways and platforms complete with frames, supporting metalwork, installing, fixing (including welding where applicable) and grouting in	
			2 Lengths shall be measured along the external perimeter of framing		
	4 Duct covers	m2	1 State type	1 Supplying duct covers complete with frames, supporting metalwork, installing, fixing (including welding where applicable) and grouting in	
16	Testing and commissioning				
	1 Non-desctructive testing	Hr or No		1 Carrying out test specially required and supplying necessary test certificates	
	2 Commissioning	Sum	1 Measured only for turn key projects	1 Matrials and operations specified	
CORROSSION PROTECTION					
17	Surface preparation				
	1 Surface preparation at place of fabrication	t	1 Measured as mass of steelwork as scheduled	1 to smooth profile, chamfering or radiusing sharp edges, deburring, repairing laminations, specified preparation (if applicable), inspections, testing and testing documentation, if applicable	
			2 State type of preparation such as blast cleaning, wire brushing, flame cleaning, etc., details of application and timing if applicable		
18	Surface treatment				
	1 Surface treatment:		1 gross mass of steelwork as scheduled, including length, area of mass of the portion of steelwork not coated, such as a portion that is to be embedded and the underside of baseplates	1 Supply and application of coatings, repair of damaged areas, inspection, testing and testing documentation	
	1 in the shop	m or m2 or t	2 State materials and number of applications		

G: STEELWORKS

	Item or work to be measured	Unit	Measurement rules	Coverage rules	Additional rules
	2 on site	m or m2 or t	3 On site treatment shall state application before erection or after erection		
19	Transport and site establishment				
	1 Transport	t	1 Transport to and from coating site will be measured in terms of the mass of steelwork scheduled	1 Transporting steelwork to and from the coating site inclusive of dunnage	
	2 Establishment on site for surface treatment	Sum	1 Measurement and payment only when it is specified that surface treatment be carried out on site	1 Establishment on site and subsequent removal of all special plant and equipment used for application of surface treatment	1 which 75% shall become payable when all equipment is on site and the first item has been treated, and the remaining 25% shall become payable after surface treatment has been completed and equipment has been removed from site

H: ROADWORKS

	Item or work to be measured	Unit	Measurement rules	Coverage rules	Additional rules
ROADWORKS					
GENERAL					
1	General				
			1 Areas of manhole covers and other intrusions into a course shall not be deducted where the area of the intrusion is less than 1m2 2 Rates for all operations cover costs for testing		
2	Waterbound macadam principles				
			3 Volume of waterbound macadam and filler will be computed from the widths shown on drawings or ordered, the length and the actual compacted depth 4 macadam in excess of specified thickness but no measurement or payment shall be made for any material placed that is more than 15mm in excess of the specified total thickness 5 macadam in excess of specified thickness but no measurement or payment shall be made for any material placed that is more than 15mm in excess of the specified total thickness		
3	Bituminous surface treatment principles				
			6 Authorised person may at any time instruct the contractor to vary the rate of application specified to suit local conditions and materials at the time of construction. Adjustment of compensation shall be made as follows: a) a payment to the contractor in respect of each increase in rate of application above that specified b) a refund by the contractor in respect of each decrease in quantity below that specified 7 In case of an increase or decrease in rate of application owing to faulty workmanship in the part of the contractor, the Authorised person may condemn the work, require the contractor to rectify the work or agree a refund by the contractor to cover the cost of earlier maintenance which shall be required		
4	Asphalt base and surfacing principles				
			8 Authorised person may at any time instruct the contractor to vary the rate of application specified to suit local conditions and materials at the time of construction. Adjustment of compensation shall be made as follows: a) a payment to the contractor in respect of each increase in rate of application above that specified b) a refund by the contractor in respect of each decrease in quantity below that specified 9 Primed surface and tack coat shall be measured by actual area covered within the specified widths and lengths		

H: ROADWORKS

	Item or work to be measured	Unit	Measurement rules	Coverage rules	Additional rules
			10 No payment will be made for excess width, for wastage or for asphalt laid in excess of the mean rate of application 11 Asphalt shall be measured by mass determined from weighbridge tickets and the weighbridge shall be checked at regular intervals under supervision		
SURFACE TREATMENTS					
5	Surfacing				
	1 Surfacing to:				
	1 double surface treatment	m2	1 State size of aggregate and types of binder	1 Cleaning primed surface, protecting kerbs, placing guide lines, controlling dust, supplying all materials, spraying the binder, spreading the aggregate, rolling as necessary and all other incidentals necessary for completing the work, except the application of fog spray and the pre-coating of aggregate	
	2 aggregate and slurry seal	m2	2 State size of aggregate and type and grade of bituminous binder	2 Cleaning primed surface, protecting kerbs, placing guide lines, controlling dust, supplying all materials, spraying the binder, spreading the aggregate, mixing and spreading of slurry seal and rolling	
	3 single surface treatment	m2	3 State size of aggregate and type and grade of bituminous binder	3 Cleaning primed surface, protecting kerbs, placing guide lines, controlling dust, supplying all materials, spraying the binder, spreading the aggregate and rolling	
	4 pre-coated aggregate	m2	4 State size of aggregate and types of binder	4 Furnishing equipment and materials and pre-coating the aggregate, including handling, stockpiling and protecting stockpiles against inclement weather	
	5 sand seal aggregate	m2	5 State size of aggregate	5 Supplying aggregate, washing, screening, preparing and applying the aggregate as specified, and brooming the aggregate back onto the surface as often as necessary	
	6 pre-coated chips	m2	6 State size and type of chips	6 Supplying, heating and mixing the chip and bituminous binder and the hauling, spreading and rolling of chips	
	7 asphalt	t	7 State type of asphalt and type and grade of bituminous binder as well as nominal thickness of layer	7 Supplying, hauling, heating and mixing various ingredients, hauling, placing and compacting the asphalt and control testing, protecting and maintaining work as specified	
6	Sprays				
	1 Bitumen sprays:				
	1 prime coat	m2	1 State type and grade of prime	1 Preparing base, sprinkling with water and supplying and spraying prime	
	2 curing coat	m2	2 State type and grade of emulsion	2 Brooming the surface, if necessary and supplying and spraying emulsion	

H: ROADWORKS

	Item or work to be measured	Unit	Measurement rules	Coverage rules	Additional rules
	3 tack coat	m2	3 State type and grade of emulsion	3 supplying, diluting as specified and spraying emulsion	
	4 fog spray	m2	4 State type and grade of emulsion	4 Supplying binder and applying the fog spray	
7	Variations in quantities				
	1 Variations in quantities of prime and bituminous binders	l	1 Separate items for each type and grade of prime and bituminous binder stated	1 Additional or reduced amount of prime, binder, aggregate or rate of application of slurry seal and the rates will be added to or deducted from the rates	1 Volume of additional or reduced quantity of bituminous binder ordered shall be measured at spraying temperature
	2 Variations in quantities of aggregate	m3	1 State size of aggregate		
			2 Volume shall be measured in the truck		
	3 Variation in rate of application of slurry seal	m3	1 with a straightedge at the stockpile, and the volume measured		
			2 Volume shall be corrected for bulking		
	4 Variations in quantities of pre-coated chips	t	1 Separate items shall be scheduled for each nominal size stated	1 Additional or reduced amount of pre-coated chips	
	5 Variation in quantities of prime, curing and tack coats and bituminous binders	l	1 Separate items shall be scheduled for each type and grade of prime, emulsion in the curing and tack coats and bituminous binder stated	1 Additional or reduced amount of prime, emulsion in the curing and tackcoat and bituminous binder and the rates will be added to or deducted from the rates	
8	Bituminous material				
	1 Bituminous material:				
	1 bituminous binder for sand seal surface treatment	l	1 State type and grade of bituminous binder and number of sprays	1 Supplying material and applying bituminous binder for each spray ordered including all preparatory work to surface prior to the application of bituminous binder	1 Volume applied shall be measured at spraying temperature
	2 mineral filler	t	2 State type of filler	2 Supplying, hauling and mixing-in of mineral filler	
9	Gravel surface layer				
	1 Gravel surface layer	m3	1 Measurement shall be by volume calculated by the method of average end areas	1 Locating, excavating, hauling, placing and compacting material	
PAVINGS					
10	Paving Principles				
			1 Preparation, including trimming to designated level of the top subbase as specified and all other work necessary to carry out before the layer of bedding sand is placed and paving is laid, shall be measured and paid for in terms of section Earthworks		
11	Pavings				
	1 Construction of segmental paving complete	m2	1 Separate items for each type of material, class and shape of unit, depth of paving, type of laying bond, laying pattern and if applicable colour	1 Supplying units, plastic linings, poisoning and sand, placing bedding layer, plastic linings and poisoning, laying units, compacting pavement, filling gaps, filling joints, locking up pavement and removing excess sand	1 Trial section not part of the permanent work shall be stated if required
			2 Area measured shall be that to be paved as shown on drawings		

H: ROADWORKS

	Item or work to be measured	Unit	Measurement rules	Coverage rules	Additional rules
	2 Construction of concrete paving complete:				
	1 in situ concrete	m2	1 State concrete strength and depth of paving	1 Cost of design of the mix in the case of strength concrete, the provision of concrete, mixing, testing, placing, compacting, forming of stop-ends and unforeseen, construction joints, striking-off or levelling as applicable, and curing and repairing where necessary	
	2 formwork	m		2 All parts of formwork including supports plus labour	
	3 steel fabric reinforcement	m2	2 State type of reinforcement	3 Supply, cutting and placing including waste due to laps	
			3 Additional fabric reinforcement in laps shall not be measured		
	4 plain round steel bar reinforcement	t	4 Separate items for each nominal diameter of reinforcement	4 Supply, cutting, bending, placing in position and fixing of reinforcing including supporting steel scheduled and the provision of all spacer devices and binding wire, as well as tests	
			5 Mass of steelwork will be calculated from a steel density of 7850kg/m3		
	5 waterproof membranes below pavement	m2	6 State materials and thickness	5 Supplying and delivering, laying and all cleaning, preparation and finishing	
			7 Additional waterproof membranes in laps shall not be measured		
12	Paving joints				
	1 Joints in concrete paving:		1 State depth of joints	1 Materials and labour for construction of joint as specified including formwork, reinforcement crossing joints, cutting and joining of waterstops, provision of special fittings at angels and junctions of waterstops, testing and making good	
	1 longitudinal joints	m	2 Dimensions, spacing and nature of sealed grooves and rebates, waterstops, dowels and other components shall be stated		
	2 expansion joints	m			
	3 contraction joints	m			
	4 wrapping joints	m			
	5 butt joints	m			
	6 construction joints	m	2 Measured only where construction joints are expressly required by authorised person		
13	Cutting paving				
	1 Cutting segmental paving to fit edge restraints	m	1 Separate items shall be scheduled for straight, raking and circular cutting	1 Cutting, waste of material, delays and disruption of the programme	
			2 Length measured shall be the length of that part of the edge restraint where it is necessary to cut paving to fit		

H: ROADWORKS

	Item or work to be measured	Unit	Measurement rules	Coverage rules	Additional rules
KERBS, CHANNELS AND EDGINGS					
14	Kerbs, channels and edgings				
	1 Construction of kerbs, channels and edgings:		1 Separate items for straight or curved to radius exceeding 12m and not exceeding 12m	1 Supply of all materials for kerbing and bedding and for bedding, jointing, excavation, compacting, formwork (where applicable) testing and for all labour in laying and jointing, together with all backfilling, compacting and removal of excess material	
	1 concrete pre-cast kerbs	m	2 Materials and cross-sectional dimensions and their beds and backings shall be stated		
	2 concrete pre-cast channels	m			
	3 concrete pre-cast edge restraints	m			
	4 concrete pre-cast kerb and channel combined	m			
	5 concrete pre-cast kerb and edge restraints combined	m			
	6 in-situ concrete kerbs and edge restraints	m			
	7 continuous cast concrete kerbs	m	3 State cut distances		
	8 asphalt kerbs	m			
	9 asphalt channels	m			
	2 Extra over kerbing for depressed kerbs	m	1 Measured linearly from start of depression to the point at which the kerb returns to its normal height	1 depth of excavation, concrete and special setting	
			2 State type of kerb, material and dimension		
	3 Ancillaries:		1 Separate items for each type of ancillary	1 Excavation, trimming, formwork, concrete, backfilling and removal of excess material and also such accessories as grids, etc.	1 No extra payment for any soil or gravel backfilling, additional concrete or mass concrete backfilling required because of overbreak or unavoidable unevenness of excavations in difficult ground and the cost thereof shall be covered by the rate of the unit
	inlet, outlet, transition, quadrants, drops and similar structures	No	2 State materials, size and refer to type drawing		
OPEN DRAINS					
15	In-situ concrete lined open drains				
	1 Trimming of excavation for concrete lined open drain in:			1 Trimming of excavations	1 No extra payment for any soil or gravel backfilling, additional concrete or mass concrete backfilling required because of overbreak or unavoidable unevenness of excavations in difficult ground and the cost thereof shall be covered by the rate for trimming
	1 soft material	m2			
	2 intermediate excavation	m2			
	3 hard material	m2			

H: ROADWORKS

	Item or work to be measured	Unit	Measurement rules	Coverage rules	Additional rules
	2 Cast in-situ concrete lining to open drains	m3	1 State concrete grade and type and size of drain	1 Cost of design of the mix in the case of strength concrete, the provision of concrete, mixing, testing, placing, compacting, forming of stop-ends and unforeseen, construction joints, striking-off or levelling as applicable, and curing and repairing where necessary	
			2 Separate items for each type of drain		
	3 Formwork to cast in-situ concrete lining of open drains:		1 Should contractor select ot use precast side slabs, payment shall be made for formwork as if cast in-situ concrete had been used	1 All parts of formwork including supports plus labour	
	1 to sides with formwork on internal face only	m2	2 State type of surface finish		
	2 to sides with formwork on both internal and external faces	m2	3 Measure each face		
	3 to ends of slabs	m2			
	4 Sealed joints to concrete lining of open drains	m	1 Length measured shall be that of the completed joint of each size and type	1 Supplying materials, labour, formwork and incidentals necessary to complete the joint	
			2 Separate items for each type and size of joint stated		
	5 Steel reinforcement	t	1 Reinforcement in drains shall be measured as per Formwork and Reinforcement section		
	6 Sprayed bitumen emulsion primer or polyethylene sheeting for concrete lined open drains	m2	1 Area measured shall be that of the open drain to be concreted	1 Procuring, furnishing and applying sprayed bitumen emulsion primer or polyethylene sheeting	
ROAD SIGNS					
16	Traffic signs				
	1 Road traffic signs:		1 Separate item for each stated size, type, shape and colour of sign including type and size of supports and size and depth of footing	1 Supplying and erecting complete signboard face, frame and fixing brackets including painting or galvanising as specified, characters, symbols, legend and border and brackets, bolts, nuts, etc. and supplying and erecting supporting structures including all bolts, screws, rivets, welding and accessories together with painting required and excavating, provision of concrete or mixing of backfill material with cement, backfilling and compacting backfill material as applicable and disposal of all surplus excavated material	
	1 non-illuminated	No			
	2 illuminated	No			
	2 Dismantling and re-erection of road traffic signs	No	1 State type and size	1 Dismantling sign and supporting structures, transporting material to new site(s), re-erecting road signs, including cost of new bolts and nuts if required for re-erection	

H: ROADWORKS

	Item or work to be measured	Unit	Measurement rules	Coverage rules	Additional rules
GUARDRAILS					
17	Guardrails				
	1 Guardrails on posts:		1 State type of posts, spacer blocks, guardrails and backfill	1 Supplying and erecting guardrails completely painted or galvanised, with posts (spaced to suit the standard length of guardrail), spacer blocks, bolts, nuts, washers, reinforcing plates and excavating and backfilling post holes and disposing of surplus excavated material	
	1 galvanised	m			
	2 painted	m			
	2 Extra over for horizontally curved guardrails factory-bent to a radius of less than 150m	m		1 Additional cost of supplying and erecting curved sections	
	3 End units:			1 Supplying and erecting units including posts, fittings and bending of turned-down sections, painting or galvanizing as applicable, excavations, concrete work, backfilling and disposal of surplus backfilling	
	1 end wings	No	1 State type of wings and whether using single or double guardrail sections		
	2 cable stays complete with anchor blocks	No			
	4 Additional guardrail posts	No		1 Supplying all materials and labour required to manufacture, paint and fix reflector plates as specified	
	5 Reflector plates	No		1 Supplying all materials and labour required to manufacture, paint and fix reflector plates as specified	
	6 Dismantling existing guardrails	m		1 Dismantling existing guardrails, removing all posts, transporting material to designated storage and stacking and excavating and backfilling post holes	
	7 Repainting existing guardrails	m		1 Cleaning existing guardrails and of supplying materials and repainting as specified	
SURFACE MARKINGS					
18	Surface markings				
	1 Surface markings:			1 necessary and for painting and protection, including setting out and premarking of characters, symbols and lines and for fixing of studs	
	1 non-reflecting road studs	No			
	2 reflecting road studs	No			
	3 letters and shapes	No	1 State type and colour of paint and width of lines		
	4 continuous lines	m	2 State type and colour of paint and width of lines		
			3 Lengths measured shall be actual length of line painted		

H: ROADWORKS

	Item or work to be measured	Unit	Measurement rules	Coverage rules	Additional rules
	5 intermittent lines	m	4 State type and colour of paint and width of lines		
			5 State spacing of lines		
	2 Variation in rate of application from the stated:			1 Additional or reduced amount of material and the rates will be added to or deducted from the rates	
	1 white paint	l			
	2 yellow paint	l			
	3 glass beads	kg			
	4 proprietary brand road-marking material	l			

I: PIPEWORKS

	Item or work to be measured	Unit	Measurement rules	Coverage rules	Additional rules
GENERAL					
1	Principles				
			1 Excavation and backfilling of trenches and beddings shall be measured under section Pipe Earthworks		
PIPES					
2	Pipes				
	1 Supply, lay and bed pipes complete with couplings:		1 Separate items shall be scheduled for each diameter and each type and class of pipe laid and each type of joint and each type of lining required	1 Provision of pipes complete with couplings and cost of handling, inspecting, transporting, bedding, laying, jointing, cutting, testing and when relevant disinfecting of the pipes and the joints	1 Pipes not in trenches shall be classed as such only where pipes are expressly required not to be laid in trenches
	1 not in trenches	m	2 Pipelines shall be measured by length over all lengths as laid and no deduction shall be made for specials and valves		2 Pipes not in trenches shall include pipes suspended or supported above the ground or other surface, pipes in headings, tunnels or shafts, pipes installed by thrust boring and pipe jacking and pipes laid within volumes measured separately for excavation
	2 in trenches, depth not exceeding 1.5m deep	m	3 Lengths of pipes shall be measured along the centre lines		3 Item descriptions for pipes not in trenches shall distinguish between the different categories of pipes
	3 in trenches, depth exceeding 1.5m but not exceeding 2m deep	m	4 Depths used for classification of pipes in trenches shall be measured from surface to the inverts of pipes		
	4 in trenches, depth exceeding 2m but not exceeding 2.5m deep	m	5 Lengths of pipes entering manholes and other chambers shall be measured to the inside surface of the chambers except that pipes and fittings comprising backdrops to manholes shall be included in items for manholes		
	5 in trenches, depth exceeding 2.5m but not exceeding 3m deep	m	6 Where more than one pipe is expressly required to be laid in one trench the item description for each pipe shall so state and also identify the pipe run		
	6 in trenches, depth exceeding 3m but not exceeding 3.5m deep	m	7 Where pipes are laid in french or rubble drains, item description shall so state		
	7 in trenches, depth exceeding 3.5m but not exceeding 4m deep	m	8 Separate items for curved pipes stating mean radius		
	8 in trenches, exceeding 4m deep	m			
3	Short pipe runs				
	1 Supply and place pipes, valves and specials	No	1 Short pipe runs include frequent bends or other specials shall be measured in terms of the quantities of scheduled items such as bends, tee, reducers, valves and stated lengths (or stated approximate lengths) of straight pipe	1 Provision of each pipe, special and valve, and, as applicable, the fixing, anchoring or bedding of them in the manner shown on drawings or required in terms of the project specification	
4	Special pipe laying				
	1 Special pipe laying:		1 Shall be measured only where it is expressly required	1 Crossings, provision and removal of access pits, shafts and jacking blocks unless otherwise stated and other work associated with special pipe laying methods	

I: PIPEWORKS

	Item or work to be measured	Unit	Measurement rules	Coverage rules	Additional rules
	1 in headings	m	2 Separate items shall be scheduled for each diameter and each type and class of pipe laid and each type of joint and each type of lining required		
	2 trust boring	m	3 State run of pipe or pipes and type of packing		
	3 pipe jacking	m			
5	Joints				
	1 Extra over pipes/valves/specials for supplying and installing joints:				
	1 machined collars and special couplings	No	1 Details of special couplings required shall be stated	1 Providing pipes with machined collars and slip-on couplings and of installation complete	
	2 encasing joints	No	2 Measured only if wrapping or protection of joints are expressly required	2 Material, plant and labour necessary for completion of joint	
6	Wrapping and lagging				
	1 Special wrapping and lagging	m	1 Separate items shall be scheduled for each diameter and each type and class of pipe	1 Provision and fixing of wrapping/lagging and cost of any delay and inconvenience caused by requirement to wrap	1 Include wrapping and lagging of fittings, valves and joints
			2 State location and type of wrapping/lagging		
			3 Lengths shall be measured along each pipe centre line over all lengths as laid and no deduction shall be made for specials and valves		
FITTINGS					
7	Fittings/specials				
	Extra over pipes for supplying, laying and bedding of fittings/specials 1 complete with couplings	No	1 Separate items shall be scheduled for each diameter and each type and class of pipe, each type of joint and each type of lining required and for each type of fitting	1 Material, plant and labour necessary including cutting, fitting and jointing pipes to fittings/specials	1 Pipe fittings comprising backdrops to manholes shall be included in the items for manholes
			2 Fittings which are reducing shall be measured extra over the largest pipe in which they occur		2 Fittings to pipework not in trenches shall be so described
			3 Straight specials shall be measured only where they are expressly required		
CONCRETE WORKS					
8	Concrete bedding, casing and encasing				
	1 Concrete bedding cradle	m3	1 Separate items for each grade of concrete	1 cradle and when relevant formwork for pipes of all diameters regardless of method of construction	
			2 State concrete strength		
	2 Concrete casing	m3	1 Measured net volume to specified width and depth in excess of external volume of pipe, deducting volume of pipe	1 Formwork including stop ends at flexible joints and concrete	
			2 Separate items for each grade of concrete		
			3 State concrete strength		
	2 Concrete encasing	m3	1 Separate items for each size of pipe and for each grade of concrete	1 Dealing with excavation (in all materials including dispose of surplus) additional to that measured under item for pipe trench excavation, encasing pipe in concrete including formwork	
			2 State pipe size and grade of concrete		

I: PIPEWORKS

	Item or work to be measured	Unit	Measurement rules	Coverage rules	Additional rules
LABOUR ON PIPES					
9	Labour on pipes				
	1 Extra over pipes for labour	No	1 State type of labour such as fabricated bends, offsets, etc.	1 Making fitting on site including cutting, fitting and joining	
OLD PIPELINES					
10	Old pipelines				
	1 Remove old pipeline	m	1 Total length of pipeline expressly required to be removed shall be measured by length for each stated depth range and no deduction shall be made for valves, specials and the like	1 Excavation and removal of pipes, valves and fittings from trench, handling and transporting to contractor's store on site, the cleaning and listing of salvaged recovered materials and backfilling of trench	
			2 State depth range		
	2 Test and relay pipeline:				
	1 test recovered pipes on site before relaying	No		1 Provision of suitable testing equipment and carrying out of specified test	
	2 relay pipeline	m		2 Transporting, handling, laying and bedding as well as provision of new rubber rings or insertions, as the case may be	
	3 joints and couplings for recovered pipeline (provisional)	No	1 Joint and couplings shall not be measured if in the opinion of the authorised person the need for their replacement arose from the fault or negligence of the contractor	3 Provision of complete sets, each comprising a new rubber ring or insertion, as the case may be, as well as all elements of the coupling and bolts that need replacement	
VALVES, ETC.					
11	Valves				
	1 Extra over pipes for supplying, fixing and bedding of valves	No	1 State type, class and size	1 Provision of valve, complete with couplings and handling, fixing, bedding and testing of valve, as applicable, and cutting of pipes	1 Unless specific provision is made, no separate payment shall be made for supply and fitting of any additional joints and jointing materials which may be required for the connection of shortened pipe lengths
			2 State type of pipework and method of jointing thereto		
PIPE SUPPORTS, ANCHORS, BLOCKS, ETC.					
12	Pipe supports				
	1 Brackets, rollers, chairs and hangers, back-plates, girder-lugs, anchors, guides, etc.	No	1 Separate items for each type of support	1 to support and all labour in laying pipe on support	1 pipes shall be given in the pipe description
			2 State type and size of support, method of fixing, and size and type of pipe to be supported		
			3 State where two or more pipes are carried by one support		
13	Anchor/thrust blocks and pedestals				
	1 Anchor/thrust blocks and pedestals	No or Sum	1 Separate items for each type and size of anchor/thrust blocks and pedestals and for each size of pipe	1 Excavation and trimming, formwork, reinforcement (if any), screeding of top surfaces and fixing of pipe	
			2 State specification of concrete and whether it is reinforced		
			3 Volume shall exclude the volumes occupied by pipes		

I: PIPEWORKS

	Item or work to be measured	Unit	Measurement rules	Coverage rules	Additional rules
SLEEVES AND PLATES					
14	Pipe sleeves and plates				
	1 Pipe sleeves	No	1 State type and size of sleeve and length, size and kind of pipe passing through and type of packing required	1 Supply of all materials for sleeves, fixing, packing and all labour	
	2 Wall-plates, floor-plates and ceiling plates	No	1 State size and type of plate and size and kind of pipe passing through	1 Supply of all materials for plates, fixing and all labour	1 Where plates are fitted to pipe-sleeves, description of sleeve shall state whether to one or both ends
MANHOLES, CHAMBERS, ETC.					
15	Valve and hydrant chambers				
	1 Valve and hydrant chambers, etc.	No	1 Measured and described as complete unit	1 Additional excavation, materials, plant and labour necessary for the complete construction including installation of surface boxes or covers	
16	Manholes				
	1 Manholes	No	1 Measured and described as complete unit for which separate items shall be scheduled for each type of manhole of overall depth not exceeding 1.5m	1 Additional excavation, materials, plant and labour necessary for the complete construction including installation of covers	1 Manholes with backdrops shall be deemed to include pipework and associated fittings comprising the backdrop
	2 Extra-over manholes for manholes of depth exceeding 1.5m	Sum	2 Additional depths of manholes in excess of 1.5m shall be measured or given in increments of 0.25m depth for each type of manhole	2 Complete construction to the total extra depth stated	2 Description shall identify separately those which are expressly required to be excavated by hand
			3 Depths of manholes shall be measured from the tops of covers to channel inverts or tops of base slabs, whichever is the lower		
17	Gullies				
	2 Gullies	No	1 State type and size	1 Materials, plant and labour necessary for the complete construction including installation of covers	
ANCILLARIES					
18	Ancillaries				
	1 Reinstatement of field drains	m	1 State full description of work	1 Materials, plant and labour necessary including connections to existing field drains	
	2 Marker posts	No	1 State size and types of marker posts	1 Additional cost of supplying and erecting curved sections	
	3 Timber supports left in excavation	m2	1 Area measured shall be undeveloped area in contact with the surfaces for which the supports are expressly required to be left in	1 Supply of all materials and labour	
	4 Metal supports left in excavation	m2	1 Area measured shall be undeveloped area in contact with the surfaces for which the supports are expressly required to be left in	1 Supply of all materials and labour	
	5 Connections to existing manholes and other chambers	No	1 State nature of existing service and the extent of the work to be included	1 Supply of all materials and labour	
	6 Connections to existing pipes	No	1 State nature of existing service and the extent of the work to be included	1 Supply of all materials and labour	
			2 Separate items for each type and size of pipes		

ANNEXURE D: CERTIFICATE OF LANGUAGE-EDIT

LQA

Language Quality Assurance Practitioners

Mrs KA Goldstone

Dr PJS Goldstone

14 Erasmus Drive
Summerstrand
Port Elizabeth
6001
South Africa

Tel/ Fax: +27 41 583 2882

Cell: +27 73 006 6559

Email: kate@pemail.co.za

pat@pemail.co.za

24 October 2015

TO WHOM IT MAY CONCERN

We hereby certify that we have language-edited the dissertation by Ms L.C. Carroll entitled: THE DEVELOPMENT OF A CIVIL-ENGINEERING STANDARD METHOD OF MEASUREMENT SYSTEM FOR AFRICA.

We are satisfied that, provided the changes we have made are effected to the text, the language is of an acceptable standard, and is fit for publication.

Kate Goldstone

BA (Rhodes)

SATI No: 1000168

UPE Language Practitioner (1975-2004)

NMMU Language Practitioner (2005)

Dr Patrick Goldstone

BSc (Stell.)

DEd (UPE)