

# How to use the NEW COTO SPECIFICATION to enhance labour on ALL projects



THE SOUTH AFRICAN ROAD  
FEDERATION





## THE SOUTH AFRICAN ROAD FEDERATION

*will present a 1 day Virtual course  
on*

**How to use the NEW COTO  
SPECIFICATION to enhance labour  
on ALL projects**

### **PRESENTER**

**Johan Hattingh**

(co-compiler of "Part B Labour  
Enhancement" of the complete  
specifications)

**12 October 2021**

**VIRTUAL via MS Teams**

**Delegates can claim  
1 ECSA CPD Point**

**Johan Hattingh (Director; PHB engineers (Pty) Ltd**  
Johan has extensive experience with the construction of labour enhanced technologies as well as the practical implementation of policies towards job creation in the construction industry.

He founded the Macadam Franchise Company in 1999 and was instrumental to the application of the Slurrybound Macadam (SBM) technology as surfacing on more than 400km roads and streets.

He completed his Master's degree in 2012, based on the research and development of the SBM technology. Apart from his leading role towards "Transforming the Industry to create job opportunities" by the NDoT under the S'Hamba Sonke Programme, he made significant contributions as a member of the COTO-committee with the drafting of labour enhanced technologies in the new COTO Specifications.

He published several papers and was co-author on "Best Practise Guidelines, Papers and a Text Book on this subject.

### **COURSE DESCRIPTION**

The new COTO Standard Specifications for Roads and Bridge Works (October 2020) will be mandatory for use in procurement documents advertised as from the 1 March 2020. The new COTO Specifications covers conventional and labour enhanced activities and technologies in one and the same document. This course will explain how to use the specifications to achieve the project labour goals. The course will cover the specifications and measurement of labour enhanced technologies and activities and explain how to compile a tender document for various degrees of labour intensity. The total spectrum (from Chapter 1 to Chapter 20 in the new COTO Specification) of road and bridge structures will be covered in the course.

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# Relevant Statistics for Job Creation:

- **Unemployment:** 30.1% of all South Africans \*
- **Construction Industry:** 3rd largest job creating industry after mining and agriculture
- **Infrastructure Sector:** Attracts 80% of the expenditure on EPWP

\* Stats SA – 23 June 2020



# GDP:

SOUTH AFRICA GDP ANNUAL GROWTH RATE



SOURCE: TRADINGECONOMICS.COM | STATISTICS SOUTH AFRICA

South Africa

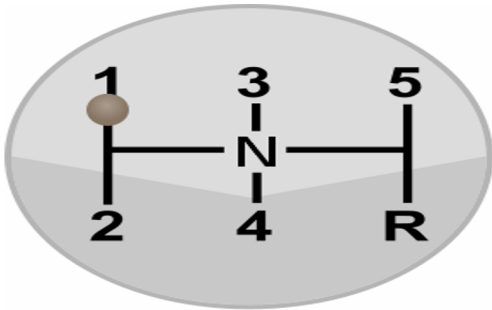
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# Overview of Governments Response to Poverty, Unemployment and Inequality



1. RDP - 1994 -
2. GEAR - 1996 -
3. EPWP - 2004 -
4. NDP - 2011 -
5. NDP - 2018 -
6. NDP - 2020 -

President Mandela  
President Mbeki  
President Mbeki  
President Zuma  
President Ramaphosa  
President Ramaphosa



Where to next ?

# Reasons for Poor Realisation of Job Opportunities

- Inability of authorities to spend allocated funds\*
- Lack of technical training\*
- Programme principles not followed\*
- Loss of “in-house” construction capacity\*
- Authorities applied a “ring fenced” approach for too long
  - Gundo Lashu - Limpopo

\*Prof. McCutcheon - SAICE Magazine, July 2018



# SESSION 1

## MODULE A

### Philosophy of Labour Optimisation



# Philosophy of Labour Optimisation

## Definitions

- **Labour Enhanced** - to improve the scope for labour
- **Labour Intensive** - involving a lot of labour
- **Optimum Labour** - the most suitable labour content to satisfy the project goals



# Philosophy of Labour Optimisation

These specifications were compiled in order to;

- **Enhance the labour component and empowerment potential of all projects.**
- **Accommodate tried and tested labour intensive technologies**
- The specification and payment items were drafted to allow for different options where **mechanisation and labour intensity are balanced to satisfy the project goals.**



# Philosophy of Labour Optimisation



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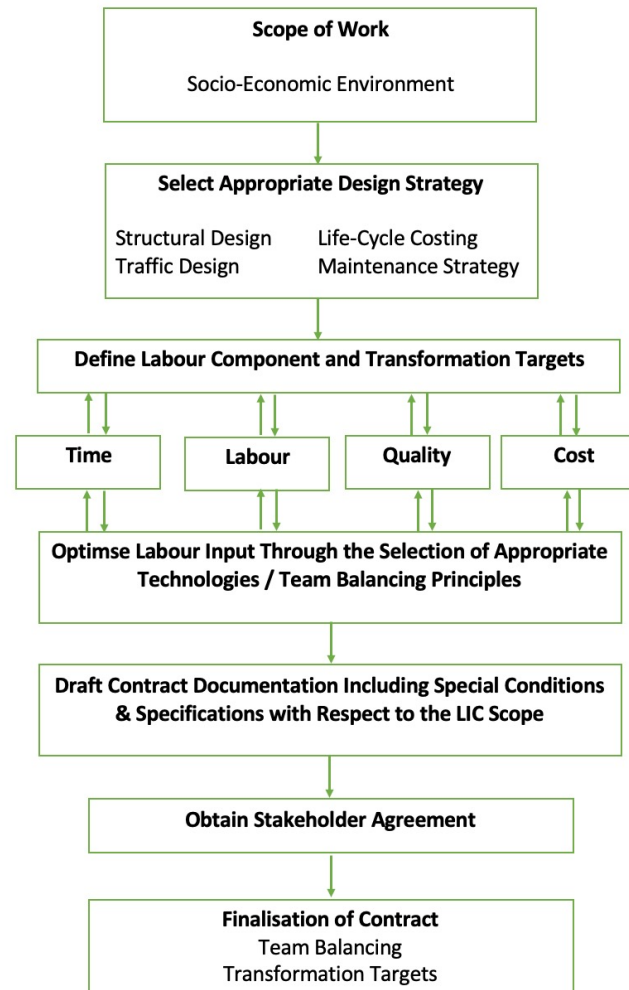
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# Philosophy of Labour Optimisation

## Ideal Project Planning



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# Philosophy of Labour Optimisation

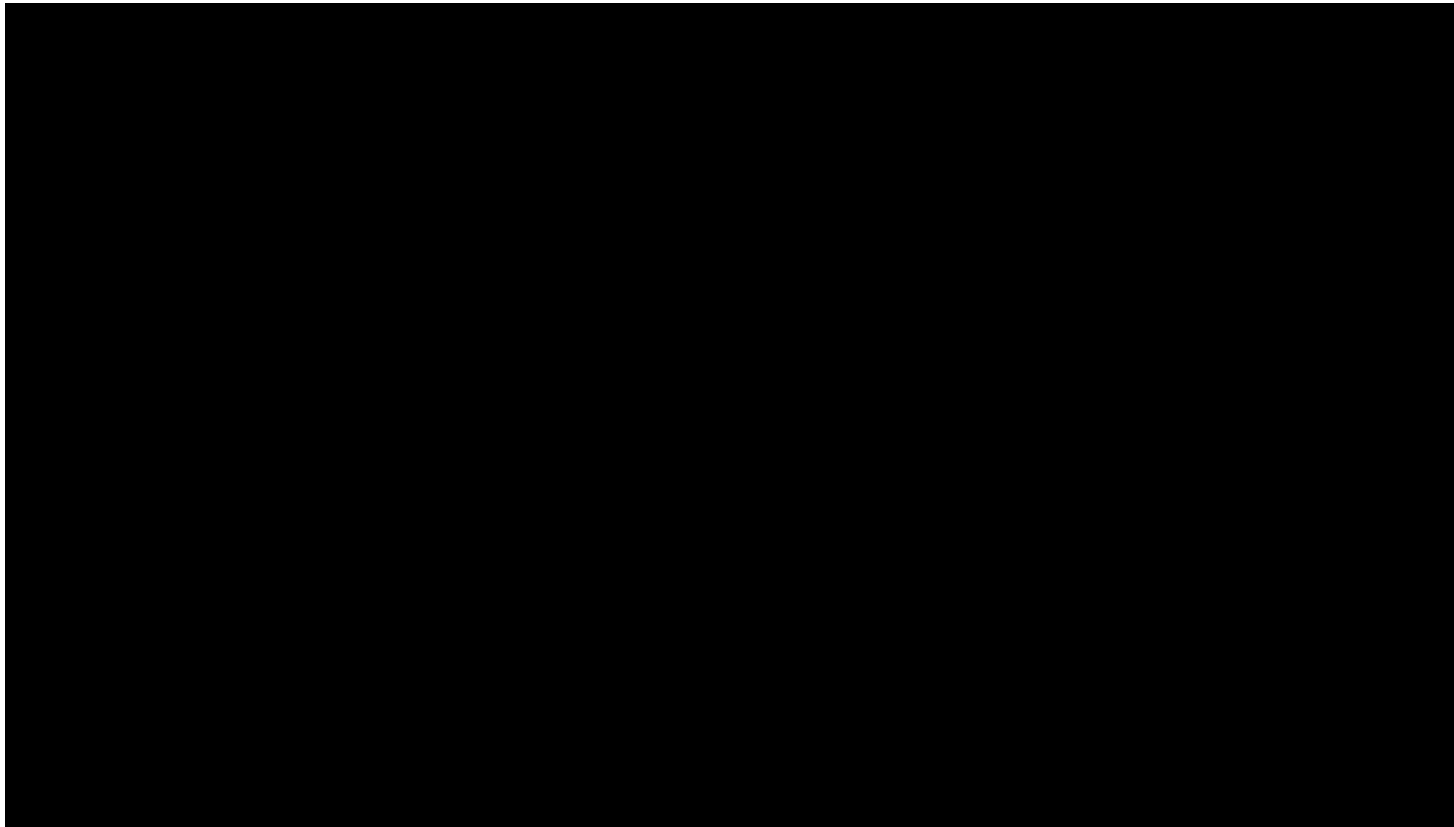
## Labour Component Targets for Project Types

Project Type	Road Category	Achievable Labour component targets	Rating (labour component)
Routine Road Maintenance	Freeways/Highways	>30% (50%)	1
	Urban arterials	>30% (60%)	1
	Low volume, low speed roads	>30% (70%)	1
Rehabilitation	Freeways/Highways	<7%	5
	Urban arterials	7 – 15%	4
	Low volume, low speed roads	20 – 30%	2
New Construction	Freeways/Highways	<7%	5
	Urban arterials	7 – 15%	4
	Low volume, low speed roads	20 – 30%	2

# Philosophy of Labour Optimisation

## Team Balancing

- Example – Cement stabilisation of a subbase layer



# SESSION 1

## MODULE B

### Relevant Features of the New COTO Specifications



# Accessing the New COTO Specification

- Visit [www.nra.co.za](http://www.nra.co.za)
  - Service Provider
- - Manuals
  - COTO Standard Specifications
  - “... 2020 Edition” will be mandatory for use in procurement documents as from 1 March 2021
- **COTO**
- Committee of Transport Officials



# COTO Revision History

- Committee commenced in 2014
- Completed new specification in October 2020
- Committee decision: Combine both the conventional and labour enhancement documents into a single document.





# COTO Specification Status

- The new COTO Standard Specifications for Road and Bridge Works for South African Road Authorities was approved by the Committee of Transport Officials (COTO) on 18 August 2020 as a Draft Standard (DS) and will be replacing the COLTO Standard Specifications for Road and Bridge Works for State Road Authorities (1998 Edition).
- Compulsory from March 2021 on all road authorities



# Relevant Features of the New COTO Specifications

- 20 Chapters divided into sections,
  - Each section divided into 4 parts:
- Part A – Specifications (Conventional Construction)
- Part B - Labour Enhancement
- Part C - Measurement and Payment
- Part D - Guarantees and Compliance Certificates



# Structure of COTO Specifications

## Part B – Labour Enhancement as an example

- Scope
- Definition
- General
- Design by Contractor/  
Performance Based  
Systems
- Materials
- Construction  
Equipment
- Execution of the  
Works
- Workmanship



# Structure of the new COTO

## Part C – Measurement and Payment

- Part C contains the payment items for both the conventional and labour enhanced options.
- A special payment item is provided to allow for the disclosure of the labour content for the full duration of the project in order to satisfy the project goals.
- These new standard specifications allows for labour enhancement on ALL projects.
- General principle is to avoid “extra over by hand” – except Chapter 8.



# SESSION 2

## MODULE C

### General Labour Intensive Technologies in Road and Bridge Construction



# Tried and Tested Labour Intensive Technologies

- Drainage Structure
- Emulsion Treated Base
- Foam Bitumen Gravel Layers
- Composite Macadam Layer
- Prime
- Cold Asphalt
- Slurrybound Macadam Surfacing
- Single Seals
- Sand Seals & Grit Seals
- Cape Seals
- Otta Seals
- Concrete (UTRO)
- Concrete Blocks
- Others\*

\* Guideline document: Job Creation Skill Development and Empowerment in Road Construction, Rehabilitation and Maintenance: GPDRT





# Tried and Tested Labour Intensive Technologies



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# SESSION 3

## MODULE D

### COTO Chapters 1, 2, 3, 4, 5 & 6



# COTO CHAPTERS

- Chapter 1 – General
- Chapter 2 – Services
- Chapter 3 - Drainage
- Chapter 4 - Earthworks and Pavement Layers: Materials
- Chapter 5 - Earthworks and Pavement Layers: Construction
- Chapter 6 - Concrete Layers
- Chapter 7 - Maintenance and Repair of Concrete Layers
- Chapter 8 - Pretreatment and Repair of Existing Layers
- Chapter 9 - Asphalt Layers
- Chapter 10 –Surface Treatments



# COTO CHAPTERS

- Chapter 11 – Ancillary Road Works
- Chapter 12 - Geotechnical Applications
- Chapter 13 – Structures
- Chapter 14 – Repair and Rehabilitation of Structures
- Chapter 15 – reserved for future use
- Chapter 16 – reserved for future use
- Chapter 17 – reserved for future use
- Chapter 18 – reserved for future use
- Chapter 19 – reserved for future use
- Chapter 20 – Quality Assurance



# COTO CHAPTER 1

## CHAPTER 1 : GENERAL



# Chapter 1: General

## B1.1 General Preamble

### Part B1.1.1: Scope

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

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





# Chapter 1: General

## B1.1 General Preamble

### Part B1.1.2: Definitions

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

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

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



# Chapter 1: General

## B1.1 General Preamble

### Part B1.1.3: General

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

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



# Chapter 1: General

## D1.1 General Preamble

### Part D1.1.1: Preamble

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

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

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

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



# Chapter 1: General

## A1.2 General Requirements and Provisions

### Part A1.2.4: Design by Contractor / Performance Based Systems

- **A1.2.4.1** - Designs and drawings for the permanent Works provided by the Contractor
- **A1.2.4.2** - Designs and drawings for temporary works provided by the Contractor

- **A1.2.4.3** - Performance Based Systems

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



# Chapter 1: General

## A1.2 General Requirements and Provisions

### Part A 1.2.5: Materials

- A1.2.5.1 - General



# Chapter 1: General

## A1.2 General Requirements and Provisions

### Part A 1.2.5: Materials

- **A1.2.5.2 - Mix Designs**

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

- Sampling and testing of construction materials to determine their properties and suitability for use in materials mixes and in the Works, all according to relevant standard methods and procedures.



# Chapter 1: General

## A1.2 General Requirements and Provisions

### Part A 1.2.5: Materials

- **A1.2.5.2 - Mix Designs –continued**
- Production of the required mix designs - in conjunction with the Engineer if required.
- Production of laboratory, production/plant and/or trial mixes.
- Adjustments to the mix designs and reproduction of the required laboratory, production/plant and/or trial mixes.



## Chapter 1: General

### A1.2 General Requirements and Provisions

#### Part A 1.2.5: Materials

- **A1.2.5.2 - Mix Designs - continued**
- Construction and testing of trial sections and/or other trials as required.
- Submission of duplicate samples and the proposed mix designs to the Engineer for review and comment, and approval if so specified in the Contract Documentation.
- Verification of the mix designs, trials and/or trial sections before commencing with the permanent Works.

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





# Chapter 1: General

## A1.2 General Requirements and Provisions

### Part A1.2.7: Execution of the Works

- **A1.2.7.1** - Programme of Work & Scheme summary (subsections)
- **Scheme 1** --- The equipment and labour resources which are compatible with the planned rates of production and activity durations should be allocated to all the major programmed activities.
- **Scheme 2** --- The labour resources required for each activity which are compatible with the planned rate of production.
- **A1.2.7.3** - Services  
The specifications relating to the location, identification, protection of and/or moving and reinstating of existing services that may be affected by the construction of the Works are given in Clause A2.1.3.2 b), c) & d) of Chapter 2



# Chapter 1: General

## B1.2 General Requirements and Provisions

### Part B1.2.1: Scope

Any requirements for the labour enhancement of some of the work activities will be stated in the Contract Documentation. The Contractor shall indicate how these specified requirements will be met in his Works programme.



# Chapter 1: General

## B1.3 Contractor's Site Establishment and General Obligations

### Part B1.3.1: Scope

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



# Chapter 1: General

## B1.4 Facilities for the Engineer

### Part B1.4.1: Scope

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



# Chapter 1: General

## B1.5 Accommodation of Traffic

### Part B1.5.1: Scope

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



# Chapter 1: General

## B1.6 Clearing and Grubbing

### Part B1.6.1: Scope

Where specified in the Contract Documentation labour enhancement methods shall be used to carry out the applicable clearing and grubbing operations or parts of these operations.



# Chapter 1: General

## C1.6 Clearing and Grubbing

### Part C.1.6: Measurement and Payment

Item	Description	Unit
C1.6.2	Grubbing	
C1.6.2.1	Grubbing with machines and some hand labour where necessary	hectare (ha)
C1.6.2.2	Grubbing with hand labour when labour enhancement work is specified or it is not practical to use a machine	hectare (ha)
C1.6.2.3	Grubbing by hand for new fence lines (over a width of 2,0 m)	kilometre (km)
C1.6.2.4	Grubbing by hand for service trenches (over the agreed width required)	square metre (m <sup>2</sup> )

The unit of measurement for items C1.6.2.1 and C1.6.2.2 is the hectare. The quantity shall be taken as the area measured in hectares (to the nearest 0,01 ha) as designated by the Engineer in writing and grubbed in accordance with these specifications.

The unit of measurement for item C1.6.1.3 is the kilometre of 2,0 m wide cleared fence line strip.

The unit of measurement for item C1.6.1.4 is the square metre of cleared area along the service trench. The area to be measured shall be calculated by multiplying the length cleared by the agreed width required to excavate the trench, temporarily stockpile the excavated material alongside and place the service materials alongside the trench prior to installation.

The contract rate shall include full compensation for all work necessary for the grubbing the area, removing all tree roots larger than 75 mm in diameter and all tree stumps, backfilling of cavities, demolishing and disposal of foundations of buildings and structures, the removal of rubbish, rubble or other unsuitable or waste material and the loading and offloading of the grubbed material. Hauling of the grubbed material to a designated spoil area will be measured from the centroid of the loading area to the centroid of the designated spoil area following the shortest practical route. Payment for haulage will be made under item C1.7.2.

No additional payment will be made for the moving of a certain amount of soil or gravel material which may be inherent in, or unavoidable, during the process of grubbing, regardless of the quantity removed.

Only the areas confirmed in writing by the Engineer to be grubbed shall be measured for payment.



# Chapter 1: General

## B1.7 Loading and Hauling

### Part B1.7.1: Scope

Where specified in the Contract Documentation, or where it is more practical to do so, the loading operations shall be carried out using hand labour instead of construction equipment.





# Chapter 1: General

## B1.7 Loading and Hauling

### Part B1.7.1: Scope



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# Chapter 1: General

## B1.7 Loading and Hauling

### Part B1.7.1: Scope



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# COTO CHAPTER 2

## CHAPTER 2 : SERVICES



## Chapter 2: Services

### B2.1 General Requirements and Trenching Services

#### Part B2.1.1: Scope

Part B covers the scope for labour enhanced construction associated with the installation of services in a road reserve. Traditionally the installation of services offers a relative high labour component especially if trenching is done by hand.

Typical activities which can be performed using labour enhanced techniques are clearing and grubbing, removal of surfacing and paving materials on the trench line, excavation, digging of pilot holes, preparing the bottom of the trench, duct or pipe installation, preparation of backfilling material and trench backfilling.

Labour enhanced construction methods shall only be used where specified in the Contract Documentation or as ordered by the Engineer.



## Chapter 2: Services

### B2.1 General Requirements and Trenching Services

#### Part B2.1.7: Execution of the Works

##### B2.1.7.1 Classes of excavation

Where excavation is done using labour enhanced construction methods, the Engineer shall classify excavated materials as either soft or intermediate for payment purposes in terms of Table B2.1.7-1 or, if the Contractor does not agree with the classification, in terms of Table B2.1.72. The decision of the Engineer regarding the classification of the excavated materials shall then be final and binding, subject to the provisions of the conditions of contract.

No hard material shall be measured under labour enhanced construction methods.



# Chapter 2: Services

## B2.1 General Requirements and Trenching Services

### Part B2.1.7: Execution of the Works

Classification	Description
Soft	Material which can be excavated by means of a suitable shovel with or without the use of a pick or other hand-swung tool.
Intermediate	Material which is difficult to excavate by hand even with the aid of a crowbar and requires the assistance of pneumatic tools for economic removal.

Materials Classification	Consistency		Number of DCP Blows to Penetrate 100 mm * 1	
	Granular Soil	Cohesive Soil	Granular Soil	Cohesive Soil * 2
Soft	Very loose to dense	Very soft to stiff	< 15	<8
Intermediate	Very dense	Very stiff	>15	>8

\*1Only applicable to materials comprising not more than 10 % gravel of size less than 10 mm and materials containing no cobbles or isolated small boulders.  
 \*2 Classification depends on the moisture content of the cohesive material.

# Chapter 2: Services

## C2.1 General Requirements and Trenching Services

### Part C2.1.6

Item	Description	Unit
<b>C2.1.6</b>	<b>Trench excavation (in soft material)</b>	
C2.1.6.1	Trenches up to 1,0 m wide	
(a)	Up to 1,0 m deep	cubic metre (m <sup>3</sup> )
(b)	Over 1,0 m and up to 2,0 m deep	cubic metre (m <sup>3</sup> )
(c)	Over 2,0 m deep etc. to be inserted, increased by additional 1,0 m depths as required	cubic metre (m <sup>3</sup> )
C2.1.6.2	Trenches over 1,0 m and up to 2,0 m wide	
(a)	Up to 1,0 m deep	cubic metre (m <sup>3</sup> )
(b)	Over 1,0 m and up to 2,0 m deep	cubic metre (m <sup>3</sup> )
(c)	Over 2,0 m deep etc., increased by additional 1,0 m depths as required	cubic metre (m <sup>3</sup> )
C2.1.6.3	Trenches over 2,0 m wide and up to 3,0 m etc., increased by additional 1,0 m widths as required	
(a)	Up to 1,0 m deep	cubic metre (m <sup>3</sup> )
(b)	Over 1,0 m and up to 2,0 m deep	cubic metre (m <sup>3</sup> )
(c)	Over 2,0 m deep etc., increased by additional 1,0 m depths as required	cubic metre (m <sup>3</sup> )

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## Chapter 2: Services

### C2.1 General Requirements and Trenching Services

#### Part C2.1.7 & C2.1.8

Item	Description	Unit
<b>C2.1.7</b>	<b>Extra over items C2.1.6, C2.1.8 and C2.1.16 for excavating in:</b>	
C2.1.7.1	Hard material irrespective of depth	cubic metre (m <sup>3</sup> )
C2.1.7.2	Stabilised material irrespective of depth	cubic metre (m <sup>3</sup> )

Item	Description	Unit
<b>C2.1.8</b>	<b>Excavations outside the normal trench profile</b>	cubic metre (m <sup>3</sup> )



# Chapter 2: Services

## C2.1 General Requirements and Trenching Services

### Part C2.1.9

#### C2.1.9 Trench excavation using labour enhanced construction methods

C2.1.9.1 Trenches up to 1,0 m wide (in soft material)

(a) Up to 1,0 m deep

cubic metre (m<sup>3</sup>)

(b) Over 1,0 m and up to 1,5 m deep

cubic metre (m<sup>3</sup>)

C2.1.9.2 Trenches over 1,0 m and up to 2,0 m wide (in soft material)

(a) Up to 1,0 m deep

cubic metre (m<sup>3</sup>)

(b) Over 1,0 m and up to 1,5 m deep

cubic metre (m<sup>3</sup>)

C2.1.9.3 Trenches up to 1,0 m wide (in intermediate material)

(a) Up to 1,0 m deep

cubic metre (m<sup>3</sup>)

(b) Over 1,0 m and up to 1,5 m deep

cubic metre (m<sup>3</sup>)

C2.1.9.4 Trenches over 1,0 m and up to 2,0 m wide (in intermediate material)

(a) Up to 1,0 m deep

cubic metre (m<sup>3</sup>)

(b) Over 1,0 m and up to 1,5 m deep

cubic metre (m<sup>3</sup>)

## Chapter 2: Services

### B2.2 Dry Services

#### Part B2.2.1: Scope

Apart from the scope for labour enhancement as described under Section B2.1 no additional scope for labour enhancement is defined under Section B2.2 for Dry Services.



## Chapter 2: Services

### B2.3 Wet Services

#### Part B2.3.1: Scope

Apart from the scope for labour enhancement as described under Section B2.1 no additional scope for labour enhancement is defined under section B2.3 for Wet Services.



## Chapter 2: Services

### B2.4 Energy and Other Services

#### Part B2.4.1: Scope

Apart from the scope for labour enhancement as described under Section B2.1, no additional scope for labour enhancement is defined under Section B2.4 for Energy and Other Services.



# COTO CHAPTER 3

## CHAPTER 3 : DRAINAGE



# Chapter 3: Drainage

## B3.1 Drains

### Part B3.1.1: Scope

This Part covers additional specifications for work to enhance the labour component of construction activities, over and above labour employed for conventional construction activities, where specified in Part A. This Section includes concrete mixed by hand and construction of banks and dykes.



# Chapter 3: Drainage

## B3.1 Drains

### Part B3.1.7: Execution of Works

#### B3.1.7.1 Concrete mixing by hand

Concrete may be mixed by hand or in hand-turned concrete mixers for small pours up to one (1) cubic metre. Larger pours greater than one (1) cubic metre shall be machine mixed with on-site mechanical mixers and/or batch plants.

The mix design shall be based upon obtaining an average concrete compressive strength sufficiently above the specified characteristic compressive strength so that, considering the expected variability of the concrete and test procedures, no more than 5 percent of strength tests will be expected to fall below the specified characteristic compressive strength.



## Chapter 3: Drainage

### B3.1 Drains

#### Part B3.1.7: Execution of Works

##### B3.1.7.1 Concrete mixing by hand - cont

All concrete mixed on the site of works shall be weigh-batched unless the Contractor can demonstrate to the Engineer that his method of proportioning the concrete ingredients consistently produces uniform concrete, which meets the strength requirements.

Concrete shall be hand-mixed on a prepared mixing floor of adequate area to facilitate proper mixing without contamination by any foreign materials.





## Chapter 3: Drainage

### B3.1 Drains

#### Part B3.1.7: Execution of Works

##### B3.1.7.1 Concrete mixing by hand – cont

The sand shall be measured off, tipped onto the mixing floor and spread in a circle. The cement (one or two whole sacks, as required by the mix design) shall then be spread evenly across the sand and mixed in with shovels, turning the mixture into the middle of the circle and out again. When the colour is even, the mix shall be shaped with a hollow in the centre.

3-8 Part of the mixing water shall be poured into the hollow and mixed in. More water shall be slowly added and mixed in until all the water has been added. The materials shall be turned into the middle of the circle and out again at least twice. The mix should be soft and even with no dry patches. The mix shall then be spread in a circle.

## Chapter 3: Drainage

### B3.1 Drains

#### Part B3.1.7: Execution of Works

##### B3.1.7.1 Concrete mixing by hand

The stone shall be measured off and spread evenly across the mortar and mixed with shovels, by turning the mixture into the middle and out again at least twice. Concrete shall be properly mixed to a uniform consistency without fatty or harsh patches. The total period between the times that the cement is placed into the mix until mixing starts shall not exceed 15 minutes.

The selection of mixing and batching locations shall be so chosen to minimise the transport of concrete placement.



# Chapter 3: Drainage

## C3.1 Drains

### Part C3.1.1: Measurement and Payment,

Item	Description	Unit
<b>C3.1.1</b>	<b>Excavation for open drains:</b>	
C3.1.1.1	Excavating all material situated within the following depth ranges below the surface level using conventional methods:	
(a)	0 m to 1,5 m	cubic metre (m <sup>3</sup> )
(b)	Exceeding 1,5 m and up to 3,0 m	cubic metre (m <sup>3</sup> )
(c)	Etc, in increments of 1,5 m	cubic metre (m <sup>3</sup> )
C3.1.1.2	Extra over sub-item C3.1.1.1 for excavation in hard and boulder material, irrespective of depth	cubic metre (m <sup>3</sup> )
C3.1.1.3	Extra over sub-item C3.1.1.1 for excavation in stabilised existing road layers, irrespective of depth	cubic metre (m <sup>3</sup> )
C3.1.1.4	Excavating soft material situated 0 m to 1,5 m below the surface level using labour enhanced construction methods	cubic metre (m <sup>3</sup> )
C3.1.1.5	Excavating intermediate material situated 0 m to 1,5 m below the surface level using labour enhanced construction methods	cubic metre (m <sup>3</sup> )

# Chapter 3: Drainage

## C3.1 Drains: Measurement and Payment

### Part C3.1.1: Excavation for open drains

Item	Description	Unit
<b>C3.1.1</b>	<b>Excavation for open drains:</b>	
C3.1.1.1	Excavating all material situated within the following depth ranges below the surface level using conventional methods:	
(a)	0 m to 1,5 m	cubic metre (m <sup>3</sup> )
(b)	Exceeding 1,5 m and up to 3,0 m	cubic metre (m <sup>3</sup> )
(c)	Etc, in increments of 1,5 m	cubic metre (m <sup>3</sup> )
C3.1.1.2	Extra over sub-item C3.1.1.1 for excavation in hard and boulder material, irrespective of depth	cubic metre (m <sup>3</sup> )
C3.1.1.3	Extra over sub-item C3.1.1.1 for excavation in stabilised existing road layers, irrespective of depth	cubic metre (m <sup>3</sup> )
C3.1.1.4	Excavating soft material situated 0 m to 1,5 m below the surface level using labour enhanced construction methods	cubic metre (m <sup>3</sup> )
C3.1.1.5	Excavating intermediate material situated 0 m to 1,5 m below the surface level using labour enhanced construction methods	cubic metre (m <sup>3</sup> )



# Chapter 3: Drainage

## C3.1 Drains: Measurement and Payment

### Part C3.1.4: Excavation and disposal of material for subsoil drainage

Item	Description	Unit
<b>C3.1.4</b>	<b>Excavation and disposal of material for subsoil drainage systems:</b>	
C3.1.4.1	Excavating in all material situated within the following depth ranges below the surface:	
(a)	0 m to 1,5 m	cubic metre (m <sup>3</sup> )
(b)	Exceeding 1,5 m and up to 3,0 m	cubic metre (m <sup>3</sup> )
(c)	Etc, in increments of 1,5 m	cubic metre (m <sup>3</sup> )
C3.1.4.2	Excavating soft material situated within 0 m to 1,5 m below the surface level using labour enhanced construction methods	cubic metre (m <sup>3</sup> )
C3.1.4.3	Excavating intermediate material situated within 0 m to 1,5 m below the surface level using labour enhanced construction methods	cubic metre (m <sup>3</sup> )
C3.1.4.4	Extra over sub-item C3.1.4.1 for excavation in hard and boulder material, irrespective of depth	cubic metre (m <sup>3</sup> )
C3.1.4.5	Extra over sub-item C3.1.4.1 for excavation through stabilised existing road layers	cubic metre (m <sup>3</sup> )
C3.1.4.6	Excavation and disposal of material for composite in-plane fin-drain type drainage systems using a trenching machine:	
(a)	Trench width of .....and depth of.....	metre (m)
(b)	Etc for width of.....and depth of.....	metre (m)

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## Chapter 3: Drainage

### B3.2 Culverts

#### Part B3.2.1: Scope

This Part covers additional specifications for work to enhance the labour component of construction activities, over and above labour employed for conventional construction activities, where specified in Part A.



## **Chapter 3: Drainage**

### **B3.3 Concrete Kerbing and Channeling, Asphalt Berms, Chutes. Downpipes, as well as Concrete, Stone Pithed and Gabion Linings for Open Drains**

#### **Part B3.3.1: Scope**

This part covers additional specifications for work to enhance the labour component of construction activities, over and above labour employed for conventional construction activities, where specified.



## Chapter 3: Drainage

### C3.3 Concrete Kerbing and Channeling, Asphalt Berms, Chutes. Downpipes, as well as Concrete, Stone Pithed and Gabion Linings for Open Drains

#### Part C3.3.1: Concrete kerbing:

Item	Description	Unit
<b>C3.3.1</b>	<b>Concrete kerbing:</b>	
C3.3.1.1	Prefabricated kerbing (description of type of kerb and bedding with reference to drawing)	
(a)	State type of kerb and bedding with reference to drawing	metre (m)
(b)	Etc for other types	metre (m)
C3.3.1.2	Cast in situ kerbing	
(a)	State type of kerb, class of concrete with reference to drawing	metre (m)
(b)	Etc for other types	metre (m)

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## Chapter 3: Drainage

### B3.3 Concrete Kerbing and Channeling, Asphalt Berms, Chutes. Downpipes, as well as Concrete, Stone Pithed and Gabion Linings for Open Drains



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# COTO CHAPTER 4

## CHAPTER 4 : EARTHWORKS AND PAVEMENT LAYERS: MATERIALS



# Chapter 4: Earthworks and Pavement Layers: Materials

## B4.1 Borrow Materials

### Part B4.1.1: Scope

This Section covers the work involved in sourcing materials from borrow pits and quarries that are developed and operated to supply materials for a specific road construction project or projects.

A relatively small proportion of activities as defined in Part A under the various sections are considered suitable for labour enhancement.

Part B only provides additional specifications, not contained in Part A.



# Chapter 4: Earthworks and Pavement Layers: Materials

## B4.2 Cut Materials

### Part B4.2.1: Scope

This Section covers the sourcing of materials that can be used for the construction of earthworks and pavement layers from cuttings, box cuts and designated excavations.

A relatively small proportion of activities as defined in Part A under the various Sections are considered suitable for labour enhancement.



# Chapter 4: Earthworks and Pavement Layers: Materials

## B4.3 Existing Road Materials

### Part B4.3.1: Scope

This Section covers existing road construction materials that are obtained from reclaiming or reconstructing existing road earthworks, pavement layers and asphalt materials (whether used as a pavement layer or used as the wearing course).

A relatively small proportion of activities as defined in Part A under the various sections are considered suitable for labour enhancement. Therefore, Part B only provides additional specifications not contained in Part A.



# Chapter 4: Earthworks and Pavement Layers: Materials

## B4.4 Commercial Materials

### Part B4.4.1: Scope

This Section covers the supply of materials for a specific road construction project or projects which are procured from commercial and other private sources. It includes information on the requirements for providing commercial materials for earthworks and pavement layers as an alternative to sourcing these materials from borrow pits, from quarries, from cuttings, box cuts and designated excavations or from existing roads and that can be used for the construction of the road earthworks and pavement layers.

A relatively small proportion of activities as defined in Part A under the various sections are considered suitable for labour enhancement. Therefore, Part B only provides additional specifications, not contained in Part A.



# Chapter 4: Earthworks and Pavement Layers: Materials

## B4.5 Alternative Materials

### Part B4.5.1: Scope

This Section covers the work requirements for sourcing alternative materials that can be used for the construction of road earthworks and pavement layers, and which are obtained from sources other than from borrow pits and quarries, or from cuttings, box cuts and designated excavations, or from the existing road or from commercial sources.

Part B only provides additional specifications, not contained in Part A.



# COTO CHAPTER 5

## CHAPTER 5 : EARTHWORKS AND PAVEMENT LAYERS: CONSTRUCTION





# Chapter 5: Earthworks and Pavement Layers: Construction

## B5.1 Roadbed

### Part B5.1.1: Scope

This Section covers the work requirements for normal roadbed treatment, which is all work in connection with the preparation and compaction of the roadbed, the removal to spoil of material not approved for use in the roadbed and for the replacement of the spoiled roadbed material.

This Section therefore includes work with a component of labour. This work is included in Part A of this specification as well as the specification of other sections.

This Part therefore only covers additional specifications for work to enhance the labour component of construction activities where specified.



# Chapter 5: Earthworks and Pavement Layers: Construction

## B5.2 Fill

### Part B5.2.1: Scope

This Section covers the work requirements for off-loading and the subsequent processing of compliant fill material. The work requirements for loading and hauling the fill material is specified in Section A1.7 of Chapter 1.

This Section therefore includes work with a component of labour. This work is included in Part A of this specification. This Part therefore only covers additional specifications for work to enhance the labour component of construction activities where specified.

# Chapter 5: Earthworks and Pavement Layers: Construction

## C5.2 Fill

### Part C5.2.5: Fill in sidewalk:

Item	Description	Unit
<b>C5.2.5</b>	<b>Fill in sidewalk</b>	
C5.2.5.1	Fill material in sidewalk compacted to 93 % of MDD	cubic metre (m <sup>3</sup> )
C5.2.5.2	Fill material in sidewalk compacted to 93 % of MDD using labour enhanced methods of construction and light hand equipment.	cubic metre (m <sup>3</sup> )

# Chapter 5: Earthworks and Pavement Layers: Construction

## A5.3.5 Material

### Part A5.3.5.3: Bound Macadam Layers

There are various BM layers that can be constructed, each with different material usage and different methods of construction.

The Contract Documentation shall specify which BM shall be constructed.



# Chapter 5: Earthworks and Pavement Layers: Construction

## A5.3.5 Material

### Part A5.3.5.3: Bound Macadam Layers

BM layer description	Key layer characteristics
Dry-bound macadam (DBM)	Single size rock matrix, usually 63 mm, filled with dry fine filler aggregate using compaction equipment only. Smooth swept surface.
Water-bound macadam (WBM)	A DBM slushed afterwards by saturating the filled rock matrix, usually 63 mm, and rolling with a steel drum roller. Where the climate does not allow the fine filler aggregate to dry sufficiently, it may be washed into the coarse aggregate. Smooth swept surface.
Partially penetrated macadam (PPM)	Construct a DBM or WBM. Broom away excess aggregate fines and some of the fine filler aggregate in the exposed open voids. Rough swept surface. Apply slurry which will therefore only penetrate partially.
Slurry-bound macadam (SBM)	Construct a PM followed by the application of a slurry using a crusher-sand/sand with emulsion. All voids to be completely filled with the emulsion slurry
Composite macadam (CM)	Construct the lower portion of the layer as a DBM or WBM. Construct the upper portion of layer of SBM using 50 mm or 37,5 mm aggregate. See Table A4.1.5-8.

Table describes the different BM layers.

# **Chapter 5: Earthworks and Pavement Layers: Construction**

## **A5.3 Road Pavement Layers**

### **A5.3.7 Execution of Works**

#### **A5.3.7.10 Construction of Bound Macadam Layers**

#### **A5.3.7.11 Brooming and priming of BM layer**

#### **A5.3.7.12 Construction of trial sections**



# Chapter 5: Earthworks and Pavement Layers: Construction

## B5.3 Road Pavement Layers

### Part B5.3.1: Scope

This Section covers the preparation of the roadbed/subgrade on an existing alignment, the construction of selected subgrade layers (where applicable), subbase, bases (unstabilised and treated/stabilised in accordance with Section A5.4: Stabilisation), wearing courses and shoulders with natural and crushed gravel using labour enhanced methods of construction and light plant.

Material for the road pavement layers is produced as specified in the relevant Sections of Chapter 4. The addition and mixing of stabilising agents either as an integral part of the PMPL process or for some of the conventionally placed road pavement layers that require treatment and/or stabilisation is specified in Section A5.4.

The reconstruction of existing road pavement layers is specified in Section A5.5.



## **Chapter 5: Earthworks and Pavement Layers: Construction**

### **Part A5.3.8.3: Bound Macadam Layers Compaction Requirement**

The density of the completed BM layer shall be tested using the 'Rondavel' test described in NITRR Technical Note TP/52/83. Density tests shall be carried out at a frequency of approximately one test per 50 m<sup>3</sup> of compacted BM layer.

In addition, a proof rolling test shall be carried out to establish if there is any audible grinding of the coarse aggregate or visible movement in the layer as the roller passes over. Audible grinding indicates that full interlock of the stone has not been achieved, nor has maximum density been attained. Additional 'Rondavel' tests shall then be done to further investigate any suspect areas detected during this inspection.

The density requirements shall be deemed to have been satisfied provided that the test results of the section tested exceed the apparent density (AD) as achieved in the successful trial section.



# Chapter 5: Earthworks and Pavement Layers: Construction

## C5.3 Material

### Part C5.3.2: Construction of pavement layers

Item	Description	Unit
<b>C5.3.2</b>	<b>Construction of pavement layers</b>	
C5.3.2.1	Construction of layers using conventional construction methods:	
(a)	Lower selected subgrade layer (layer thickness indicated) compacted to 93 % of MDD	cubic metre (m <sup>3</sup> )
(b)	Lower selected subgrade layer (layer thickness indicated) compacted to 95 % of MDD	cubic metre (m <sup>3</sup> )
(c)	Upper selected subgrade layer (layer thickness indicated) compacted to 95 % of MDD	cubic metre (m <sup>3</sup> )
(d)	Upper selected subgrade layer (layer thickness indicated) compacted to 97 % of MDD	cubic metre (m <sup>3</sup> )
(e)	Sand layer (layer thickness indicated) compacted to 97 % of MDD	cubic metre (m <sup>3</sup> )
(f)	Sand layer (layer thickness indicated) compacted to 100 % of MDD	cubic metre (m <sup>3</sup> )
(g)	Gravel wearing course layer (layer thickness indicated) compacted to 95 % of MDD	cubic metre (m <sup>3</sup> )
(h)	Gravel shoulder layer (layer thickness indicated) compacted to 95 % of MDD	cubic metre (m <sup>3</sup> )
(i)	Lower subbase gravel layer (unstabilised) (layer thickness indicated) compacted to 95 % of MDD	cubic metre (m <sup>3</sup> )
(j)	Lower subbase gravel layer (chemically stabilised) (layer thickness indicated) compacted to 95 % of MDD	cubic metre (m <sup>3</sup> )
(k)	Upper subbase gravel layer (unstabilised), (layer thickness indicated) compacted to 97 % of MDD	cubic metre (m <sup>3</sup> )
(l)	Upper subbase gravel layer (chemically stabilised), (layer thickness indicated) compacted to 95 % of MDD	cubic metre (m <sup>3</sup> )

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# Chapter 5: Earthworks and Pavement Layers: Construction

## C5.3 Material

### Part C5.3.2: Construction of pavement layers - cont

(m)	Gravel base layer (unstabilised), (layer thickness indicated) compacted to 100 % of MDD	cubic metre (m <sup>3</sup> )
(n)	Gravel base layer (chemically stabilised), (layer thickness indicated) compacted to 97 % of MDD	cubic metre (m <sup>3</sup> )
(o)	G5B crushed rock/boulder subbase layer (layer thickness indicated) compacted to 97 % of MDD	cubic metre (m <sup>3</sup> )
(p)	G5B crushed rock/boulder base layer (layer thickness indicated) compacted to 100 % of MDD	cubic metre (m <sup>3</sup> )
(q)	G5A crushed rock/boulder subbase layer (layer thickness indicated) compacted to 97 % of MDD	cubic metre (m <sup>3</sup> )
(r)	G5A crushed rock/boulder base layer (layer thickness indicated) compacted to 100 % of MDD	cubic metre (m <sup>3</sup> )
(s)	G4A crushed rock/boulder lower subbase layer (unstabilised or chemically stabilised) (layer thickness indicated) compacted to 95 % of MDD	cubic metre (m <sup>3</sup> )
(t)	G4A crushed rock/boulder upper subbase layer (unstabilised or chemically stabilised) (layer thickness indicated) compacted to 97 % of MDD	cubic metre (m <sup>3</sup> )
(u)	G4A crushed rock/boulder subbase layer compacted to 97 % of MDD	cubic metre (m <sup>3</sup> )
(v)	G3 crushed stone subbase layer (unstabilised or chemically stabilised) (layer thickness indicated) compacted to 97 % of MDD	cubic metre (m <sup>3</sup> )
(w)	G3 crushed stone base layer (layer thickness indicated) compacted to 85 % of BD	cubic metre (m <sup>3</sup> )
(x)	G2 crushed stone base layer (layer thickness indicated) compacted to 88 % of BD	cubic metre (m <sup>3</sup> )

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# Chapter 5: Earthworks and Pavement Layers: Construction

## C5.3 Material

### Part C5.3.2: Construction of pavement layers - cont

(y)	G2 crushed stone base layer (layer thickness indicated) compacted to 88 % of AD	cubic metre (m <sup>3</sup> )
(z)	G1 crushed stone base layer (layer thickness indicated) compacted to 86 % of AD	cubic metre (m <sup>3</sup> )
(aa)	G1 crushed stone base layer (layer thickness indicated) compacted to 88 % of AD	cubic metre (m <sup>3</sup> )
(bb)	Bound macadam layer (layer thickness indicated) compacted to 90 % of AD	cubic metre (m <sup>3</sup> )
(cc)	PMPL wet lean-mix concrete layer (Cube crushing strength and layer thickness indicated)	cubic metre (m <sup>3</sup> )
C5.3.2.2 Construction of layers using labour enhancement:		
(a)	Lower selected subgrade layer (layer thickness indicated) compacted to 93 % of MDD	cubic metre (m <sup>3</sup> )
(b)	Upper selected subgrade layer (layer thickness indicated) compacted to 95 % of MDD	cubic metre (m <sup>3</sup> )
(c)	Sand layer (layer thickness indicated) compacted to 97 % of MDD	cubic metre (m <sup>3</sup> )

# Chapter 5: Earthworks and Pavement Layers: Construction

## C5.3 Material

### Part C5.3.2: Construction of pavement layers - cont

(d)	Sand layer (layer thickness indicated) compacted to 100 % of MDD	cubic metre (m <sup>3</sup> )
(e)	Gravel wearing course layer (layer thickness indicated) compacted to 95 % of MDD	cubic metre (m <sup>3</sup> )
(f)	Gravel shoulder layer (layer thickness indicated) compacted to 95 % of MDD	cubic metre (m <sup>3</sup> )
(g)	Lower gravel subbase layer (layer thickness indicated) compacted to 95 % of MDD	cubic metre (m <sup>3</sup> )
(h)	Upper gravel subbase layer (layer thickness indicated) compacted to 97 % of MDD	cubic metre (m <sup>3</sup> )
(i)	Gravel base layer (layer thickness indicated) compacted to 98 % of MDD	cubic metre (m <sup>3</sup> )
(j)	Gravel base layer (layer thickness indicated) compacted to 100 % of MDD	cubic metre (m <sup>3</sup> )
(k)	Bound macadam layer (layer thickness indicated) compacted to 90 % of AD	cubic metre (m <sup>3</sup> )
(l)	Soil cement or soilcrete (layer thickness indicated) wet mixture as per clause A4.1.5.14	cubic metre (m <sup>3</sup> )
(m)	Soil cement or soilcrete (layer thickness indicated) stiff mixture as per clause A4.1.5.14	cubic metre (m <sup>3</sup> )
(n)	Emulsion treated base material (G1 or G2 material and layer thickness indicated) as per clause A4.1.5.15	cubic metre (m <sup>3</sup> )

# COTO CHAPTER 6

## CHAPTER 6 : CONCRETE LAYERS



# Chapter 6: Concrete Layers

## B6.1 Paver Laid Concrete Layers

### Part B6.1.1: Scope

This Section covers all the material requirements and work pertaining to the construction of concrete layers utilising predominantly labour enhanced methods for the following pavement types:

- Jointed concrete pavement (JCP- Plain), with or without dowels
- Continuously reinforced concrete (CRCP)

It includes, inter alia, the specifications for materials, manufacture and construction requirements as relevant to the specific pavement as prescribed.

This Chapter does not apply to the large-scale rehabilitation of concrete pavements, which is covered in Chapter 7: Maintenance and Repair of Concrete Layers.



# Chapter 6: Concrete Layers

## B6.2 Paver Segmental Block Layers

### Part B6.2.1: Scope

The provisions of Part A shall apply.



# SESSION 3

## MODULE E

### COTO Chapters 7, 8, 9, & 10





# COTO CHAPTER 7

## CHAPTER 7 : MAINTENANCE AND REPAIR OF CONCRETE LAYERS



# Chapter 7: Maintenance and Repair of Concrete Layers

## B7.1 Replacement of Existing Joint Sealant

### Part B7.1.1: Scope

The provisions of Part A shall apply.



# **Chapter 7: Maintenance and Repair of Concrete Layers**

## **B7.2 Replacement of Existing Joint and Uncontrolled Cracks in Concrete Pavements**

### **Part B7.2.1: Scope**

The provisions of Part A shall apply.



# **Chapter 7: Maintenance and Repair of Concrete Layers**

## **B7.3 Removal and Reinstatement of Existing Concrete Layers**

### **Part B7.3.1: Scope**

The provisions of Part A shall apply.



# Chapter 7: Maintenance and Repair of Concrete Layers

## B7.4 Reinstatement of Slab Support by Grout Injection

### Part B7.4.1: Scope

The provisions of Part A shall apply.



# Chapter 7: Maintenance and Repair of Concrete Layers

## B7.5 Reinstatement of Riding Quality

### Part B7.5.1: Scope

The provisions of Part A shall apply.



# Chapter 7: Maintenance and Repair of Concrete Layers

## B7.6 Reinstatement of Surface Texture

### Part B7.6.1: Scope

The provisions of Part A shall apply.



# COTO CHAPTER 8

## CHAPTER 8 : PRETREATMENT AND REPAIR OF EXISTING LAYERS





# Chapter 8: Pretreatment and Repair of Existing Layers

## B8.1 Prime Coat

### Part B8.1.1: Scope

A large proportion of activities as defined in Part A under the various sections are considered labour intensive. Therefore, Part B only provides additional specifications, not contained in Part A.



# Chapter 8: Pretreatment and Repair of Existing Layers

## B8.2 Cover Sprays, Fog Sprays and Rejuvenation Sprays

### Part B8.2.1: Scope

A large proportion of activities as defined in Part A under the various sections are considered labour intensive. Therefore, Part B only provides additional specifications, not contained in Part A.



# Chapter 8: Pretreatment and Repair of Existing Layers

## B8.3 Texture Treatment

### Part B8.3.1: Scope

A large proportion of activities as defined in Part A under the various sections are considered labour intensive. Therefore, Part B only provides additional specifications, not contained in Part A.



# Chapter 8: Pretreatment and Repair of Existing Layers

## B8.4 Rut and Depression Correction

### Part B8.4.1: Scope

A large proportion of activities as defined in Part A under the various sections are considered labour intensive. Therefore, Part B only provides additional specifications, not contained in Part A.

# Chapter 8: Pretreatment and Repair of Existing Layers

## B8.5 Standard Crack Sealing

### Part B8.5.1: Scope

A large proportion of activities as defined in Part A under the various sections are considered labour intensive. Therefore, Part B only provides additional specifications, not contained in Part A.

# Chapter 8: Pretreatment and Repair of Existing Layers

## B8.6 Geosynthetic Crack Sealing

### Part B8.6.1: Scope

A large proportion of activities as defined in Part A under the various sections are considered labour intensive. Therefore, Part B only provides additional specifications, not contained in Part A.



# Chapter 8: Pretreatment and Repair of Existing Layers

## B8.7 Planing

### Part B8.7.1: Scope

Except for application of the fog spray, if required, this activity is not suitable for labour enhanced work.



# Chapter 8: Pretreatment and Repair of Existing Layers

## B8.8 Patching and Edge Break Repair

### Part B8.8.1: Scope

A large proportion of activities as defined in Part A under the various sections are considered labour intensive. Therefore, Part B only provides additional specifications, not contained in Part A.



# Chapter 8: Pretreatment and Repair of Existing Layers

## B8.9 Repair of Surface Defects

### Part B8.9.1: Scope

A large proportion of activities as defined in Part A under the various sections are considered labour intensive. Therefore, Part B only provides additional specifications, not contained in Part A.



# COTO CHAPTER 9

## CHAPTER 9 : ASPHALT LAYERS



# Chapter 9: Asphalt Layers

## B9.1 Asphalt Layers

### Part B9.1.1: Scope

This Section covers the labour enhancement activities associated with the placing of asphalt layers as specified in Part A.



# Chapter 9: Asphalt Layers

## C9.1 Asphalt Layers

### Part C9.1.5.1: Asphalt Surfacing

#### C9.1.5.1 New construction

- |     |   |                                |
|-----|---|--------------------------------|
| (a) | Stone skeletal mix – continuously graded as defined (state layer thickness, binder type and design class/ level)  | square metre (m <sup>2</sup> ) |
| (b) | Stone skeletal mix – SMA as defined (state layer thickness, binder type)  | square metre (m <sup>2</sup> ) |
| (c) | Stone skeletal mix - open graded as defined (state layer thickness and binder type)   | square metre (m <sup>2</sup> ) |
| (d) | Stone skeletal mix- gap graded as defined (state layer thickness and binder type)   | square metre (m <sup>2</sup> ) |
| (e) | Sand skeletal mix – continuously graded as defined (state layer thickness, binder type, design class/ level)  | square metre (m <sup>2</sup> ) |
| (f) | Semi gap mix – as defined (state layer thickness, binder type and design level)   | square metre (m <sup>2</sup> ) |
| (g) | Sand skeletal mix – gap graded mix (state layer thickness, binder type design class/level)  | square metre (m <sup>2</sup> ) |
| (h) | Any of the above mix types where the use of reclaimed asphalt has been specified (indicate maximum % reclaimed asphalt or binder replacement limits)        | square metre (m <sup>2</sup> ) |
| (i) | Certified: any mixes certified for specific applications by an approved agency as being fit for the purpose and as specified in the Contract Documentation. | square metre (m <sup>2</sup> ) |

*In all cases state placing technique (hand/paver)*

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# Chapter 9: Asphalt Layers

## C9.1 Asphalt Layers

### Part C9.1.5.2: Asphalt Surfacing

#### C9.1.5.2 Rehabilitation

- |     |   |         |
|-----|---|---------|
| (a) | Stone skeletal mix – continuously graded as defined (state layer thickness, binder type and design class/ level)  | ton (t) |
| (b) | Stone skeletal mix – SMA as defined (state layer thickness, binder type)  | ton (t) |
| (c) | Stone skeletal mix – gap graded as defined (state layer thickness and binder type)  | ton (t) |
| (d) | Stone skeletal mix- open graded as defined (state layer thickness and binder type)  | ton (t) |
| (e) | Sand skeletal mix – continuously graded as defined (state layer thickness, binder type, design class/ level)  | ton (t) |
| (f) | Sand skeletal mix – gap graded mix (state layer thickness, binder type design class/level)  | ton (t) |
| (g) | Any of the above mix types where the use of reclaimed asphalt has been specified (indicate maximum % reclaimed asphalt or binder replacement limits)        | ton (t) |
| (h) | Certified: any mixes certified for specific applications by an approved agency as being fit for the purpose and as specified in the Contract Documentation. | ton (t) |

*In all cases state placing technique (hand/paver)*

# COTO CHAPTER 10

## CHAPTER 10 : SURFACE TREATMENTS



# Chapter 10: Surface Treatments

## A10.1 General Requirements for Surface Treatments

### Part A10.1.1: Scope

This Chapter covers all the material requirements and work in connection with the construction of surface treatments incorporating single seals, multiple stone seals, sand seals, Cape seals, graded aggregate seals, slurry seals and microsurfacings.



# Chapter 10: Surface Treatments

## A10.1 General Requirements for Surface Treatments

### Part A10.1.3: General

A10.1.3.1 Requirements pertaining to all surface treatments

A10.1.3.2 Weather limitations

A10.1.3.3 Areas inaccessible to mechanical equipment

A10.1.3.4 Protection of kerbs, channels, etc.

A10.1.3.5 Moisture content

A10.1.3.6 Pretreatment

A10.1.3.7 Demarcation of working area

A10.1.3.8 Dust control

A10.1.3.9 Spray joints

A10.1.3.10 Traffic limitations





# Chapter 10: Surface Treatments

## A10.1 General Requirements for Surface Treatments

### Part A10.1.3: General

A10.1.3.11 Opening to traffic

A10.1.3.12 Trial sections

A10.1.3.13 Maintenance

A10.1.3.14 Nominal rates of application for tender purposes

A10.1.3.15 Precoating fluid



# Chapter 10: Surface Treatments

## A10.1 General Requirements for Surface Treatments

### Part A10.1.3: General

Table A10.1.3-8: Nominal application rates of aggregate and Slurry for Slurry-bound Macadam

Layer Thickness (mm)	Nominal size of aggregate (mm)	Aggregate spread rate (m <sup>2</sup> /m <sup>3</sup> )	Slurry Spread rate (m <sup>2</sup> /m <sup>3</sup> )
25	14	40	16
30	14	33	13
30	20		
40	20	25	10
50	20		
50	28	20	10

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# Chapter 10: Surface Treatments

## A10.1 General Requirements for Surface Treatments

### Part A10.1.4: Design By Contractor/ Performance Based Systems

#### A10.1.4.1 Scope

This Section covers the requirements of surface treatments when the selection and design of the surfacing seal is executed by the Contractor in accordance with the Contract Documentation or when the Contractor's alternative is accepted.



## **Chapter 10: Surface Treatments**

### **A10.1 General Requirements for Surface Treatments**

#### **Part A10.1.4: Design By Contractor/ Performance Based Systems**

##### **A10.1.4.2 Performance Period**

A performance period of two years after issuing of the Taking-over certificate, or any other period as specified in the Contract Documentation, shall apply.



# **Chapter 10: Surface Treatments**

## **A10.1 General Requirements for Surface Treatments**

### **Part A10.1.4: Design By Contractor/ Performance Based Systems**

#### **A10.1.4.3 Contractor's obligation before tendering**



# Chapter 10: Surface Treatments

## B10.1 General Requirements for Surface Treatments

### Part B10.1.1: Scope

All the preparation activities are suitable components for labour enhancement (sweeping and watering). The stone spray application is divided into two main activities namely the binder spray application and the stone spreading. The binder spray application is suitable only if bitumen emulsions are used, whilst the stone spreading is reasonably suitable using walk behind chip spreaders. Rolling the stone is a reasonably suitable labour component using pedestrian rollers.

In the interest of limiting the exposure of workers to the burns and inhalation of fumes associated with the application of penetration bitumen by hand, only bitumen emulsions are considered for labour intensive methods for spray seal work. Only emulsion products are suitable for binder applications by hand methods.



# Chapter 10: Surface Treatments

## C10.1 General Requirements for Surface Treatments

### Part C10.1: Measurements and Payments

<b>C10.1.1</b>	<b>Single seals including a cover spray, if specified (indicate grade of aggregate and type of binder):</b>	
C10.1.1.1	Using 5,0 mm aggregate	square metre (m <sup>2</sup> )
C10.1.1.2	Using 7,1 mm aggregate	square metre (m <sup>2</sup> )
C10.1.1.3	Using 10 mm aggregate	square metre (m <sup>2</sup> )
C10.1.1.4	Using 14 mm aggregate	square metre (m <sup>2</sup> )
C10.1.1.5	Using 20 mm aggregate	square metre (m <sup>2</sup> )

Item	Description	Unit
<b>C10.1.2</b>	<b>Single seals including a cover spray, if specified (indicate grade of aggregate and type of binder) spreading the aggregate by (state: walk behind spreader or by hand):</b>	
C10.1.2.1	Using 5,0 mm aggregate	square metre (m <sup>2</sup> )
C10.1.2.2	Using 7,1 mm aggregate	square metre (m <sup>2</sup> )
C10.1.2.3	Using 10 mm aggregate	square metre (m <sup>2</sup> )
C10.1.2.4	Using 14 mm aggregate	square metre (m <sup>2</sup> )
C10.1.2.5	Using 20 mm aggregate	square metre (m <sup>2</sup> )

# Chapter 10: Surface Treatments

## C10.1 General Requirements for Surface Treatments

### Part C10.1.23 : Measurements and Payments

Item	Description	Unit
<b>C10.1.23</b>	<b>Slurry-bound macadam seal:</b>	
C10.1.23.1	Slurry-bound macadam seal with 14 mm aggregate and slurry (indicate thickness and grade of aggregate)	square metre (m <sup>2</sup> )
C10.1.23.2	Slurry-bound macadam seal with 20 mm aggregate and slurry (indicate thickness and grade of aggregate)	square metre (m <sup>2</sup> )
C10.1.23.3	Slurry-bound macadam seal with 28 mm aggregate and slurry (indicate thickness and grade of aggregate)	square metre (m <sup>2</sup> )



## Chapter 10: Surface Treatments



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# SESSION 4

## MODULE F

### COTO Chapters 11, 12, 13 & 14



# COTO CHAPTER 11

## CHAPTER 11 : ANCILLARY ROAD WORKS



# Chapter 11: Ancillary Road Works

## B11.1 Pitching, Stonework, Cast In Situ Concrete for Protection Against Erosion

### Part B11.1.1: Scope

This Section covers the furnishing of materials and the construction of gabion aprons for constructing minor non-structural retaining walls, lining channels, revetments and other anti-erosion and containment structures.

The construction of gabion boxes and mattresses shall be deemed to be a labour enhanced construction process.

This Section therefore includes work with a large component of labour.

This Part B therefore only covers additional specifications for work to enhance the labour component of construction activities where specified in Part A. This Section includes concrete mixed by hand.



# Chapter 11: Ancillary Road Works

## B11.2 Non-Structural Gabions

### Part B11.2.1: Scope

This Section covers the furnishing of materials and the construction of gabion aprons for constructing minor non-structural retaining walls, lining channels, revetments and other anti-erosion and containment structures.

The construction of gabion boxes and mattresses shall be deemed to be a labour enhanced construction process.

This Section therefore includes work with a large component of labour.

This Part B therefore only covers additional specifications for work to enhance the labour component of construction activities where specified in Part A..



# Chapter 11: Ancillary Road Works

## B11.3 Guide Blocks and Kilometer Markers

### Part B11.3.1: Scope

This Section covers the manufacturing, supply and erection of guide blocks and kilometre markers, mainly constructed of precast concrete, in positions and in accordance with the dimensions specified and/or shown on the drawings.

This Section therefore includes work with a large component of labour.

This Part B therefore only covers additional specifications for work to enhance the labour component of construction activities where specified in Part A. This Section includes concrete mixed by hand.



# Chapter 11: Ancillary Road Works

## B11.4 Road Restraint Systems

### Part B11.4.1: Scope

This Section covers the supplying, installing and maintaining of Road Restraint Systems at locations and in accordance with the specifications and details, dimensions and design shown on the drawings.

The construction of guardrails on timber posts shall be deemed to be a labour enhanced construction process.

This Section therefore includes work with a large component of labour.

This Part B therefore only covers additional specifications for work to enhance the labour component of construction activities where specified in Part A.



# Chapter 11: Ancillary Road Works

## B11.5 Fencing

### Part B11.5.1: Scope

This Section covers the erecting of new fences, the repair or improvement of existing fences and moving of existing fences where necessary along the boundaries of the road reserve and elsewhere as indicated on the drawings or as specified by the Engineer. It shall also include the erection of temporary fences as well as the removal of fencing where specified by the Engineer.

The construction and removal of fencing shall be deemed to be a labour enhanced construction process.

This Section therefore includes work with a large component of labour.

This Part B therefore only covers additional specifications for work to enhance the labour component of construction activities where specified in Part A.





# Chapter 11: Ancillary Road Works

## B11.6 Road Signs

### Part B11.6.1: Scope

This Section covers the supply of permanent and temporary road signs and the erection of permanent traffic signs alongside and over the carriageway, ramps and crossroads at intersections, and interchanges, and at the locations indicated on the drawings or as directed by the Engineer. The construction of road signs shall be deemed to be a labour enhanced construction process.

This Section therefore includes work with a large component of labour.

This Part B therefore only covers additional specifications for work to enhance the labour component of construction activities where specified in Part A.



# Chapter 11: Ancillary Road Works

## B11.7 Road Markings and Road Studs

### Part B11.7.1: Scope

This Section covers the marking of the road surface with painted lines and symbols and the supply and fixing of retro-reflective road studs as indicated on the drawings. This section also covers the removal of existing road studs, and the supply and fixing of temporary road studs as specified by the Engineer, and the removal of existing road markings. Also included is the painting by hand of kerbs to the colours specified.

This Section therefore includes work with a large component of labour.

This Part B therefore only covers additional specifications for work to enhance the labour component of construction activities where specified in Part A



# Chapter 11: Ancillary Road Works

## B11.8 Landscaping and Planting Plants

### Part B11.8.1: Scope

This Section includes all areas affected by construction activities but may also extend to other areas requiring landscaping and planting. It includes landscaping, grassing, rehabilitation, erosion protections and planting trees and shrubs.

Landscaping and planting shall be deemed to be a labour enhanced construction process.

This Section therefore includes work with a large component of labour.

This Part B therefore only covers additional specifications for work to enhance the labour component of construction activities where specified in Part A.



# Chapter 11: Ancillary Road Works

## B11.9 Finishing the Road Reserve and Treating Old Roads

### Part B11.9.1: Scope

This Section covers the final finishing and cleaning up of the road and road reserve after construction and scarifying and treating old roads and temporary deviations.

This Section includes work with a large component of labour.

This Part B therefore only covers additional specifications for work to enhance the labour component of construction activities where specified in Part A.



# COTO CHAPTER 12

## CHAPTER 12 : GEOTECHNICAL APPLICATIONS



# Chapter 12: Geotechnical Applications

## B12.1 Piling

### Part B12.1.1: Scope

The provisions of Part A shall apply.



# Chapter 12: Geotechnical Applications

## B12.2 Ground Anchors

### Part B12.2.1: Scope

The provisions of Part A shall apply.



# Chapter 12: Geotechnical Applications

## B12.3 Ground Improvement

### Part B12.3.1: Scope

The provisions of Part A shall apply.





# Chapter 12: Geotechnical Applications

## B12.4 Lateral Support

### Part B12.4.1: Scope

The provisions of Part A shall apply.



# Chapter 12: Geotechnical Applications

## B12.5 Shotcrete

### Part B12.5.1: Scope

The provisions of Part A shall apply.



# Chapter 12: Geotechnical Applications

## B12.6 Mechanically Stabilised Earth and Gabions

### Part B12.6.1: Scope

For MSE the provisions of Part A shall apply.

The construction of segmental block walls shall be deemed to be a labour enhanced construction process and this Section therefore includes work with a large component of labour. This work is included in Part A of this specification. This Part therefore only covers additional specifications for work to enhance the labour component of construction activities where specified.

The construction of gabions shall be deemed to be a labour enhanced construction process and this Section therefore includes work with a large component of labour. This work is included in Part A of this specification. This Part therefore only covers additional specifications for work to enhance the labour component of construction activities where specified.



# Chapter 12: Geotechnical Applications

## B12.7 Trenchless Methods

### Part B12.7.1: Scope

The provisions of Part A shall apply.



# Chapter 12: Geotechnical Applications

## B12.8 Ground Drainage

### Part B12.8.1: Scope

The provisions of Part A shall apply.



# Chapter 12: Geotechnical Applications

## B12.9 Slope Protection Measures

### Part B12.9.1: Scope

The provisions of Part A shall apply.



# Chapter 12: Geotechnical Applications

## B12.10 Hard Excavation by Blasting

### Part B12.10.1: Scope

The provisions of Part A shall apply.



# Chapter 12: Geotechnical Applications

## B12.11 Geosynthetics

### Part B12.11.1: Scope

The provisions of Part A shall apply.





# Chapter 12: Geotechnical Applications

## B12.12 Construction Dewatering

### Part B12.12.1: Scope

The provisions of Part A shall apply.



# COTO CHAPTER 13

## CHAPTER 13 : STRUCTURES



# Chapter 13: Structures

## B13.1 Foundations

### Part B13.1.1: Scope

This Section covers foundation and foundation related work and relates to the additional specification Clauses for the labour enhanced excavation and backfilling of foundations.



# Chapter 13: Structures

## B13.2 Falsework, Formwork and Concrete Finish

### Part B13.2.1: Scope

This Section covers the design, supply and erection of all falsework and formwork used in the construction of permanent work. This Section also describes the classes of surface finishes on formed and unformed concrete surfaces. Most of the activities are executed by labour at various skill levels, therefore the specifications derived in Part A can be deemed suitable for labour enhanced work..



# Chapter 13: Structures

## B13.3 Steel Reinforcement

### Part B13.3.1: Scope

This Section covers the furnishing and placing of reinforcing steel in concrete structures. This is deemed to be ideally suited for labour enhanced work at varying skill levels, therefore provisions in Part A shall apply.



# Chapter 13: Structures

## B13.4 Concrete

### Part B13.4.1: Scope

This Section covers the labour enhanced work in minor bridges, culverts and miscellaneous structures.

This Section covers the supply and storage or stockpile of all materials, manufacture, transport, placing, finishing, curing, protection and testing concrete in bridges, culverts and miscellaneous structures. The completed concrete elements shall conform to the lines, grades, and dimensions shown on the drawings and as specified in Section A13.2. The work includes elements of structures constructed by cast-in-place and precast methods using either plain (unreinforced), reinforced, or prestressed concrete or any combination thereof. This work is appropriately suited for labour enhanced construction activities.



# Chapter 13: Structures

## C13.4 Concrete: Measurement and Payment

### Part C13.4.2: Labour enhanced cast in situ concrete

N/A

Item	Description	Unit
C13.4.2	Labour enhanced cast in situ concrete (class of concrete and use or position in structure stated)	
C13.4.2.1	Commercially- Sourced concrete	cubic metre (m <sup>3</sup> )
C13.4.2.2	Contractor-mixed concrete on site	cubic metre (m <sup>3</sup> )

# Chapter 13: Structures

## B13.5 Prestressing

### Part B13.5.1: Scope

This Section covers the materials, equipment and work required for prestressing structural concrete members. Due to the specialised skills level that is required for this activity, it is deemed not suitable for labour enhanced construction methods.





# Chapter 13: Structures

## B13.6 Bearings

### Part B13.6.1: Scope

This Section covers various items of work associated with the construction, supply and installation of bearings for structures. This Section is of a specialist nature and is not suitable for labour enhanced work.



# Chapter 13: Structures

## B13.7 Joints

### Part B13.7.1: Scope

This Section covers the supply and installation of all permanent joints which will permit relative movement between contiguous structural members. Complex joints are deemed to be of a specialist nature and hence not suitable for labour enhanced work.



# Chapter 13: Structures

## B13.8 Ancillary Structural Elements

### Part B13.8.1: Scope

This Section covers:

- a) The construction of barriers, parapets, railings and sidewalks on structures.
- b) The construction and installation of drainage works such as weep holes, drainage pipes and gulley's, no-fines concrete blocks, filter lining and concrete channels; and.
- c) The installation of bolt groups for electrification brackets.
- d) The installation of service ducts

Part A is suitable for labour enhanced work.



# Chapter 13: Structures

## B13.9 Structural Steelwork for Minor Structures

### Part B13.9.1: Scope

This Section covers the manufacture, transport and erection of structural steelwork for minor structures, e.g. overhead road-sign structures. It does not apply to major steel structures such as steel and composite steel bridges, which is covered in Section A13.12. Part A is suitable for labour enhanced work at varying skill levels.



# Chapter 13: Structures

## B13.10 Painting of Minor Structures

### Part B13.10.1: Scope

This Section covers the painting of structural steel to minor structures, guard rails, overhead road sign supports and other minor structures. Painting of steel and composite steel bridges is covered in Section A13.12.

It excludes the corrosion protection of steel work exposed to aggressive or severe conditions.

This Section is suitable for labour enhanced construction activities and is subject to the Occupational, Health and Safety requirements, particularly related to zinc chromate primers.



# Chapter 13: Structures

## B13.11 Structural Steelwork for Major Structures

### Part B13.11.1: Scope

This Section covers the manufacture, transport and erection of structural steelwork for major steel structures, e g steel bridge decks, composite steel decks, and steel and composite steel cable-stay towers. It does not apply to minor steel structures such as sign gantries, which is covered in Section A13.9. Due to the specialist nature of the activities associated with this work, it is deemed unsuitable for labour enhanced work.



## Chapter 13: Structures

### B13.12 Structural Steel Protective Treatment for Major Structures

#### Part B13.12.1: Scope

This Section covers the protective treatment of structural steelwork for major steel structures, e g steel bridge decks, composite steel decks, and steel and composite steel cable-stay towers. It does not apply to protective treatment of minor steel structures such as sign gantries, which is covered in Section A13.10. Due to the specialised application and skill levels, Part A is not suitable for labour enhanced work.



## Chapter 13: Structures

### B13.13 Incremental Launching of Bridge Decks

#### Part B13.13.1: Scope

This Section covers the requirements for the incremental launching method of construction for bridge decks, and includes temporary work (i.e. all works temporary in nature and required for construction of the permanent works), launching of the deck segments and the permanent work not covered elsewhere in the Standard Specifications. Although the labour component associated with the various construction activities is high, it is deemed to be of a specialist nature and therefore not suitable for labour enhanced work.





# Chapter 13: Structures

## B13.14 Specialist Structures

### Part B13.14.1: Scope

N/A



# COTO CHAPTER 14

## CHAPTER 14 : REPAIR AND REHABILITATION OF STRUCTURES



# Chapter 14: Repair and Rehabilitation of Structures

## B14.1 Access for Bridge Rehabilitation

### Part B14.1.1: Scope

Access for bridge rehabilitation through mechanised means, is deemed to be specialised activity and generally not suitable for labour enhanced work, however the traffic accommodation related to access requirements can be considered to be a labour enhanced activity and is covered under Section B1.1 of Chapter 1. The temporary works associated with scaffolding and platform erection is executed by labour with the relevant skills set and is deemed to be a labour enhanced activity.



# Chapter 14: Repair and Rehabilitation of Structures

## B14.2 Corrosion Survey Methods and Testing of Near Surface Concrete Properties

### Part B14.2.1: Scope

This Section covers the test methods and requirements to determine cover over reinforcement and to evaluate specific concrete properties. Due to the specialised nature of the activities it is not suitable for labour enhanced work.



# Chapter 14: Repair and Rehabilitation of Structures

## B14.3 Demolition and Removal of Structural Concrete and Steelwork

### Part B14.3.1: Scope

A This Section covers the work in connection with the demolition of entire members of a concrete structure as well as cutting back concrete to expose reinforcement and the initial preparation of the exposed surface. Surface and structural repair of concrete members is covered in Section A14.4. This Section also covers the demolition and removal of steel structures and members. It is suitable for labour enhanced work. This part covers additional specifications to optimise the labour component of construction activities.

The removal of concrete for labour enhanced activities is limited to a surface area of 2,0 m<sup>2</sup> .

# Chapter 14: Repair and Rehabilitation of Structures

## B14.4 Surface and Structural Repair of Concrete Members

### Part B14.4.1: Scope

This Part covers items to enhance the labour component of construction activities

This Section covers the requirements for the surface and structural repair of structural concrete members. It covers the preparation of the exposed concrete surface and reinforcement for the rehabilitation of the member, and the repair or replacement of concrete with cementitious mortars, epoxy systems and proprietary concrete repair compounds. This work is deemed to be labour enhanced activities, but of a specialised skills level.



# Chapter 14: Repair and Rehabilitation of Structures

## B14.5 Anchoring of Reinforcement, Grouting and Crack Injection

### Part B14.5.1: Scope

This Section covers the requirements for the anchoring of reinforcing bars, the filling of gaps, holes and pockets with grout systems and the injection of cracks and cavities with adhesive systems. The work activities have a high labour competent of a specialist nature and is deemed to be ideal for labour enhanced construction.



# Chapter 14: Repair and Rehabilitation of Structures

## B14.6 Sprayed Concrete for Structures

### Part B14.6.1: Scope

This Section covers the supply and application of sprayed concrete in the rehabilitation of structures and miscellaneous work requiring cast concrete-like finish as shown on the drawings. It shall include the supply and application of the sprayed concrete by either the dry-mix or wet-mix method and the preparation required prior to- and post-spraying, protection and treatment of the sprayed concrete. This specification is deemed to be activities associated with specialist skills level, and is suitable for labour enhanced work.





# Chapter 14: Repair and Rehabilitation of Structures

## B14.7 Protective Coating and Treatment for Concrete

### Part B14.7.1: Scope

This Section covers the material, equipment and work required for applying protective coatings and treatments to concrete surfaces. deemed to require specialised skills level and is suitable for labour enhanced construction.



# Chapter 14: Repair and Rehabilitation of Structures

## B14.8 External Bonding of Steel and Carbon Fibre

### Part B14.8.1: Scope

The specification covers the external bonding of steel plates, carbon fibre plates, carbon fibre fabric, structural steel sections, reinforcement bars and carbon fibre bars to structural concrete surfaces with adhesive. Due to the specialised nature of these applications, the work activities are deemed to be not focused at labour enhanced construction.



# Chapter 14: Repair and Rehabilitation of Structures

## B14.9 Repair and Replacement of Ancillary Structural Elements

### Part B14.9.1: Scope

This Section covers the requirements for the removal of debris from expansion gaps, clearing of drainage elements, repair of expansion joints, repair of handrails, removal and rebuilding of brickwork on bridges, provision of drainage to deck void formers and the refurbishment or replacement of bridge bearings. All elements of the scope are suited to labour enhanced construction with the exception of bridge bearings repair and replacement, which is deemed to be specialised work.



# Chapter 14: Repair and Rehabilitation of Structures

## B14.10 Jacking of Bridge Structures

### Part B14.10.1: Scope

This Section covers the requirements for the jacking of structural elements in both the vertical and horizontal directions. This is deemed to be specialised activities and hence not suitable for labour enhanced construction.



# Chapter 14: Repair and Rehabilitation of Structures

## B14.11 Repair of Steel Elements

### Part B14.11.1: Scope

This Section covers the requirements for removal, refurbishment and re-attachment of corroded or damaged steel items on bridges. It is suitable for labour enhanced construction.



# SESSION 4

## MODULE G

### COTO Chapters 20



# COTO CHAPTER 20

## CHAPTER 20 : QUALITY ASSURANCE



# Chapter 20: Quality Assurance

## Contents of Section 20.1

- Definitions
- Cost of testing
- Testing methods
- Statistical judgement
- Measurement and payment





## Chapter 20: Quality Assurance

### Cost of Testing

1. Contractor process and acceptance control testing. Cost to be included in rates
2. Contractor process control, Engineer acceptance control testing. Process control cost by Contractor, acceptance control cost by Employer
3. Process and acceptance control testing by independent site/off-site laboratory. Employer pays lab, Contractor contributes by monthly deduction
4. Method to be specified in Contract Documentation



## Chapter 20: Quality Assurance

### Time for Testing new Mixes

- Concrete – 8 weeks
- Asphalt 10 – 16 weeks
- Stabilisation – 8 weeks
- BSM – 4 weeks
- Seals – 2 weeks
- Binders – 4 weeks



Thank You



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