South African

Road Federation

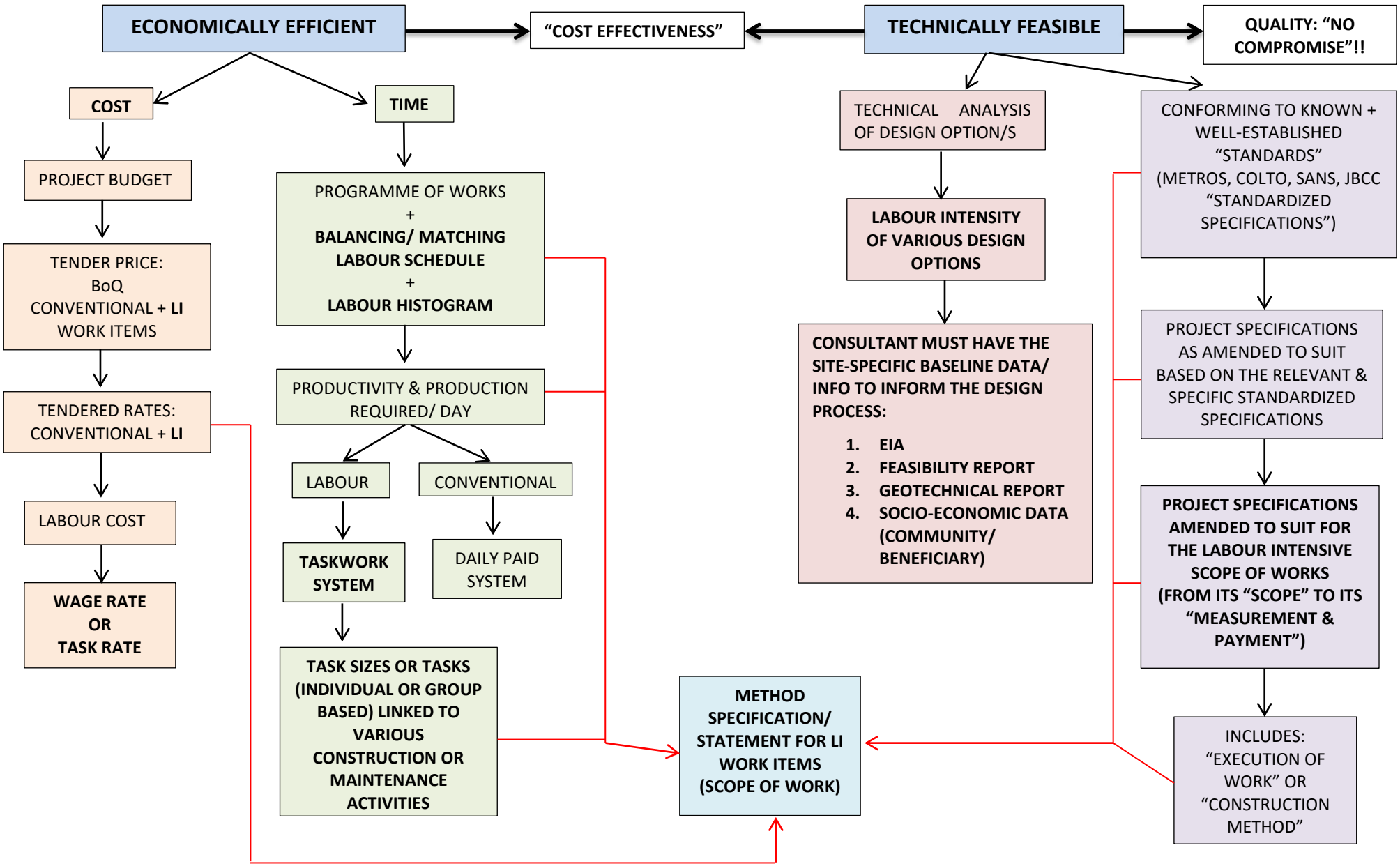
SUPPLEMENTARY HANDOUTS

MANAGE LABOUR INTENSIVE CONSTRUCTION PROJECTS

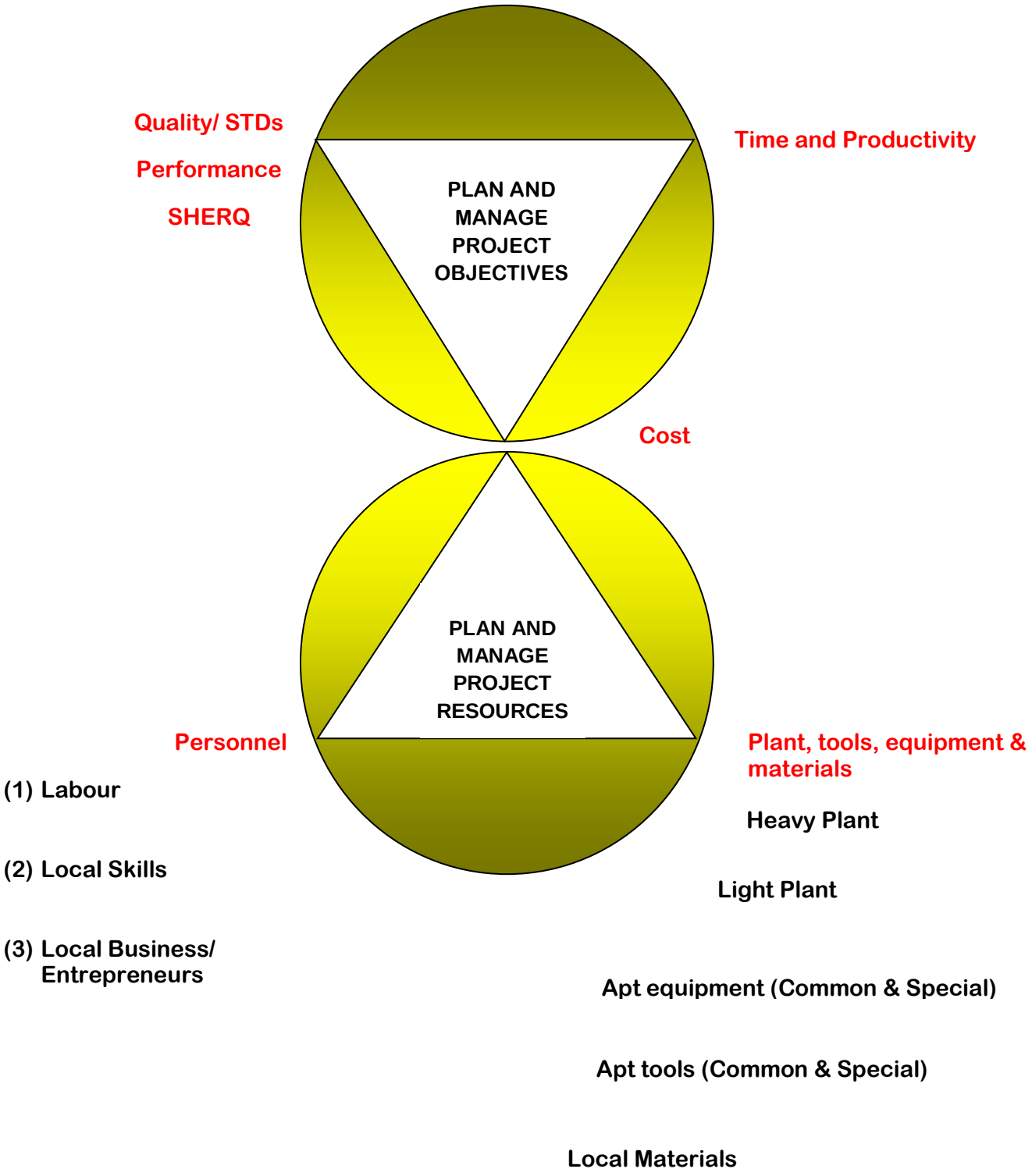
LIC 5 Course - Manage Labour Intensive Construction Projects

FILES for Memory Stick [Available on Request]

Sub-Folder	Folder Description	Content Summary
1	CIDB Labour-based Best Practice	39 no. manuals (duplicated versions) + 2 document CIDBs EPWP Contribution & NCDP
2	CIDB Docs General	9 documents and 2 e-files
3	EPWP documents	22 documents, 4 PPt presentations & 2 e-files
4	General	5 documents
5	LIC – Toolbox/toolkit (draft)	Basic examples of recording ProFormas/ Templates
6	ProForma Tender Document – CIDB Format	7 documents
7	Roads Capex documentation	1 tender document
8	SANS 1921 part 5	1 document
9	DWAF LIC Guidelines	2 documents
10	LIC Case Studies & Articles	2 documents
11	COLTO Standardized Specification	4 documents
12	SPWP labour legislation	3 documents
13	LIC Roads Info	2 video clips, 1 PPt presentation, 6 documents and 1 internet document
14	LIC Tasks or Production Rates	1 document
15	Labour Balancing Tool Exs	1 document
16	EPWP design & EPWP requirements	1 PPt presentation + 3 documents
17	EPWP Learnerships & estimations for workers training	1 PPt presentation + 1 document
18	Pricing EPWP projects	11 documents (PPt, PDF & excel)


ECONOMICALLY EFFICIENT
"COST EFFECTIVENESS"
TECHNICALLY FEASIBLE
QUALITY: "NO COMPROMISE"!!
COST
TIME
PROJECT BUDGET
TENDER PRICE: BoQ CONVENTIONAL + LI WORK ITEMS
TENDERED RATES: CONVENTIONAL + LI
LABOUR COST
WAGE RATE OR TASK RATE
PROGRAMME OF WORKS + BALANCING/ MATCHING LABOUR SCHEDULE + LABOUR HISTOGRAM
PRODUCTIVITY & PRODUCTION REQUIRED/ DAY
LABOUR
CONVENTIONAL
TASKWORK SYSTEM
DAILY PAID SYSTEM
TASK SIZES OR TASKS (INDIVIDUAL OR GROUP BASED) LINKED TO VARIOUS CONSTRUCTION OR MAINTENANCE ACTIVITIES
METHOD SPECIFICATION/ STATEMENT FOR LI WORK ITEMS (SCOPE OF WORK)
TECHNICAL ANALYSIS OF DESIGN OPTION/S
LABOUR INTENSITY OF VARIOUS DESIGN OPTIONS
CONSULTANT MUST HAVE THE SITE-SPECIFIC BASELINE DATA/ INFO TO INFORM THE DESIGN PROCESS:
1. EIA
2. FEASIBILITY REPORT
3. GEOTECHNICAL REPORT
4. SOCIO-ECONOMIC DATA (COMMUNITY/ BENEFICIARY)
CONFORMING TO KNOWN + WELL-ESTABLISHED "STANDARDS" (METROS, COLTO, SANS, JBCC "STANDARDIZED SPECIFICATIONS")
PROJECT SPECIFICATIONS AS AMENDED TO SUIT BASED ON THE RELEVANT & SPECIFIC STANDARDIZED SPECIFICATIONS
PROJECT SPECIFICATIONS AMENDED TO SUIT FOR THE LABOUR INTENSIVE SCOPE OF WORKS (FROM ITS "SCOPE" TO ITS "MEASUREMENT & PAYMENT")
INCLUDES: "EXECUTION OF WORK" OR "CONSTRUCTION METHOD"

The philosophy of LIC in the planning and management of projects is summarised in the following figure:



LIC considerations for the contract document framework

Contract doc framework	LIC considerations
Conditions of Tender/ Tender Data	• Eligibility requirements • Information to be submitted with the tender • Targeted procurement policy (SANS 1914-5) • Rating of Contractor (LIC training experience)
Agreement Forms/ Form of Offer & Acceptance	• Agreement form to clearly stipulate that it is a LI project • Schedule of Deviations where LI considerations can apply
GCC or other approved CIDB forms of contract	Special Conditions/ Contract data: • Payment for the LI component of the works • Linkage of payment for the labour intensive component of works to submission of project data • Applicable labour laws • Amendments to the various clauses of the conditions of contract should the liabilities, obligations or procedures change or be altered depending on the contractual arrangements/ EPWP implementation approaches/ Delivery model used
Schedule of Prices/ Bill of Quantities including the preamble to BoQ or pricing instructions	• Items to be indicated with prefix 'LI' in BoQ • Payment for LI items will not be made unless they are constructed using LI methods • Specific payment items to be included to suit for LIC • Training allowance paid to targeted labour • Extra over for the administration of payment of training allowances • Transport and accommodation of workers for training
Works Information/ Project Specification/ Scope of Works	Portion 1 or Part A: • Employers objectives • Labour intensive scope of works (BoQ summary) • LI competencies of supervisory and management staff • Employment of unskilled and semi-skilled workers in LI works • List of applicable parts of the standardized specification applicable to the project and the Generic LI specification • Penalties/ compliance issues for LIC Portion 2 or Part B: • SANS 1921 (5) Specification data • Project Specification clauses as amendments to the standardized specifications to make it work labour intensively
Site Information & general information	• Distance to sources of local materials and source/s of water • Ground conditions for material classification to set task sizes • Availability of local workers, local industry and local skills for the project • Task rates (if prescribed) • Relevant community information
Appendices	• EPWP reporting requirements • Any additional info to support small/ emerging Contractor for tendering purposes • List of project staff and their contact details including evidence of having met the eligibility requirements to engage on the EPWP • Specific/ special provisions for LIC nature of work included in the standard proformas to be completed by the Tenderer
Types of specification ❖ **Method specifications** ❖ **End result specifications** ❖ **Standardized specifications** ❖ **Particular specifications**	• Specifications put together for at least each LI operation • Built within the standardized specification • Project Specification clauses as amendments to the standardized specifications to make it work labour intensively • Generic LI Specification
Drawings	• Produced and presented in a clear and understandable way • Avoid cluttering and repetition of information • Easily readable drawings in A3 format preferable • Use of orthophotos maps for design overlay & easy identification of surrounding features on site

PROJECT SPECIFICATIONS FOR LIC PROJECTS

NOTES ON CHANGING SABS 1200 SPECIFICATIONS TO BE COMPATIBLE WITH LABOUR INTENSIVE WORK METHODS

A standardised specification is defined as being "a specification that is published by the SABS and that so covers a particular class of civil engineering construction that the specification is generally applicable throughout the Republic of SA." (Ref. SABS 0120 part 1). A project specification "describes the works in general terms" and "may include clauses that amend or amplify or add to any requirement(s) of a standardised specification".

In the practise of civil engineering it has become apparent that the SABS 1200 series of standardised specifications are too broad to be used without amendment. Hence it has becomes good practice to issue project specifications with every SABS 1200 specification. The project specifications are used to reduce the broad scope of the standardised specification to the specific project requirements. In particular, materials always need to be addressed: sometimes to relax the requirements to allow the use of locally indigenous materials that have been proved to be successful; sometimes to choose one from a long list of approved materials (e.g., the use of uPVC piping for a specific job).

In LIC there are many more items in a standardised specification that must be addressed by the project specification. The main headings of a standardised specification will be used to illustrate the process of amending a machine based specification to one which can be used in LIC.

For each SABS 1200 specification, Clause 1 Scope, Clause 2 Interpretations, Clause 6 Tolerances, and Clause 7 Testing should be considered. Particular attention should be given to Clause 3 Material, Clause 4 Plant, Clause 5 Construction, and Clause 8 Measurement and Payment. Project Specification Clauses should be drafted in accordance with the following principles and guidelines:

Clause 1. Scope: The scope of the specification must be amended to clearly state the intention of using LIC methods.

Clause 2. Interpretation: The definitions given in the standardised specification must be closely scrutinised and amended where needed to be relevant to the chosen construction methods. Often additional definitions have to be given of new terms and concepts, e.g. task, task rate, LIC definition, etc.

Clause 3. Materials: The specific project requirements with regard to materials need to be spelled out. Additional or altered material specifications are sometimes required. Classification of materials to be excavated must take into account the limitations in strength of the human frame, i.e. materials which because of their size or mass are inapt for manual handling or for LIC should be prohibited. Where suitable materials are not covered by the standardised specification, they should be included by way of appropriate Project Specification Clauses. Where material products are to be manufactured on site, e.g. kerbs, channels, masonry units, etc., the contributing local materials to be used should be listed and the quality required of these local materials should be specified. The classification of materials for LIC activities are to adhere to the particular material classification as contained in the “Generic LI Specification”. Haulage limits may be specified for appropriate types of haulage means.

Clause 4. Plant: Limitations on the use of contractor's machinery & equipment have to be set. This may need to be cross-referenced to the excavation material classification. LIC is best achieved by restricting/ reducing the use of heavy plant on the contract. Where the distance to be travelled, hardness of the excavation, finish or quality to be achieved, time constraints, etc., the work required is beyond the physical capabilities of a single person or team/group, then conventional heavy plant should be permitted. Light plant, hand held and hand powered tools and equipment should be given first consideration in lieu of heavy plant only where it is technically feasible and economically viable to do so. Other than in small or restricted areas or non-load bearing areas, or where quality may be compromised, restriction on the use of conventional compaction plant should not be considered.

Clause 5. Construction: In a LI project it may be necessary to severely limit the options open to a Contractor in the execution of certain tasks. This approach is preferable to exhortations to use labour "wherever possible", as excuses can always be found to evade the issue. In addition, all processes need to be scrutinised for bias towards machinery and this bias must then be removed. Specified limits, such as layer thickness and excavation widths and depths, can be amended in exceptional cases where the quality will not be compromised or the end-result specification standard will

not be lowered. The method of construction using an LI methodology or approach must be specified in detail, and this should form the basis of the work method to be included in the method specification.

Clause 6. Tolerances: In general the levels of tolerance prescribed in the standardised specifications will be found to be achievable by LI methods. However, realistic tolerances must be set, as the cost of complying with unrealistically tight tolerances is prohibitive.

Clause 7. Testing: Just like the tolerances, the test requirements need to be realistically evaluated and reset where necessary. For example, density requirements for trench backfill are quoted as 90% of Mod AASHTO maximum density (SABS 1200 DB clause 5.7.1) whereas popular theory on pipe support and earth loading is based on Proctor densities (which are lower than Mod AASHTO). In addition, Proctor densities can be readily achieved by the use of hand stampers in trenches, whereas Mod AASHTO densities usually require mechanical compactors to ensure compliance.

Clause 8. Measurement and Payment: Measurement clauses in the standardised specifications are frequently coupled to the use of specific plant. All of these items need to be identified and changed to suit LIC techniques. Revised material classifications also must be carried across to the measurement and payment clauses and these clauses made relevant. With the exception, as contained in Clause 5 above, the limits specified in various measurements and payment items can be amended accordingly to suit, and the standard items should be used. It should be left for the Contractor to translate the standard items into tasks and to set the tasks for the workers that are to carry out the work. What makes up the NEW LIC tendered rates may require selective amendments to suit for the envisaged scope of work that is to be costed out.

PROJECT SPECIFICATION EXAMPLE 1: SANS 1200 DM

VARIATIONS AND ADDITIONS TO SABS 1200 DM - EARTHWORKS (ROADS, SUBGRADE) FOR LABOUR INTENSIVE CONSTRUCTION OF LIGHTLY TRAFFICKED ROADS USING CHEMICAL STABILISERS

NOTE: The numbering of the clauses follows the numbering of SABS 1200 DM

VA-DM 3 MATERIALS

VA-DM 3.1 CLASSIFICATION FOR EXCAVATION PURPOSES

Delete this clause entirely and replace with:
Excavation will be classified for payment as follows:

VA-DM 3.1.1 Soft

Soft material shall be loose soil which can be efficiently excavated with a flat spade not exceeding 250 mm in width.

VA-DM 3.1.2 Firm

Firm material shall be soil which can be efficiently loosened with a fork or a forked hoe.

VA-DM 3.1.3 Hard

Hard material shall be soil which can only be loosened with many blows of a sharp pickaxe or mattock.

VA-DM 3.1.4 Soft Rock

Soft rock shall be material which is too hard to pick loose by hand and requires pneumatic tools to loosen it sufficiently for subsequent excavation with hand tools.

VA-DM 3.1.5 Hard Rock

Hard rock shall be rock which cannot be efficiently loosened with pneumatic tools and normally requires blasting.

VA-DM 3.1.6 Boulders

Boulders shall be hard rocks over 0.01 cubic metre and up to 0.20 cubic metre in volume. Larger boulders shall be classified as hard rock.

VA-DM 3.2 CLASSIFICATION FOR PLACING PURPOSES

VA-DM 3.2.3 Selected layer

c) 1) and **2)** Delete from both clauses the words:
"for natural material and 30 for stabilised material"
d) Change the value of the plasticity index to 25.
Add new clause:
e) at least 20% passing the 0.075 mm sieve.

Add new clause:

VA-DM 3.4 STABILISERS

VA-DM 3.4.1 Prescribed product

Where a particular product is prescribed, only this product shall be used. Should the Contractor wish to offer an alternative, the provisions of clause 3.4.2 shall apply.

VA-DM 3.4.2 Proposed by Contractor

The stabiliser that the Contractor proposes to use shall be a liquid ion-exchange type of chemical stabiliser. The suitability of the stabiliser shall be proved to the Engineer by means of standard soaked CBR tests performed on samples of all the soils which are to be stabilised. The CBR results shall equal or exceed the values laid down for the layer in which the material is to be used.

VA-DM 4 PLANT

Add new clause:

VA-DM 4.2 LIMITATIONS ON USE OF PLANT

VA-DM 4.2.1 Excavation

As the project is contractually required to be labour based, the only excavation equipment allowed will be (an) air compressor(s) and appropriate hand held pneumatic tools.

VA-DM 4.2.2 Transport of excavated materials

For hauls up to 200 m wheelbarrows shall be used. For hauls over 200 m, mechanical equipment is permitted with the stipulation that it shall be hand loaded. Off-loading may be by mechanical means.

VA-DM 4.2.3 Compaction

No limitations are placed on the Contractor in his choice of compaction equipment.

VA-DM 5 CONSTRUCTION

VA-DM 5.1 PRECAUTIONS

VA-DM 5.1.1 Safety, existing services, stormwater, etc and nuisance

Change the requirements for barricading to a barrier or fence of height at least 1200 mm, sufficiently strong to contain pedestrians and prevent them from falling into the excavations at times when visibility is low.

VA-DM 5.2 METHODS AND PROCEDURES

In general the words 'rip', 'ripped' or 'scarified' shall be taken to mean "loosened" and the words 'blade', 'blading' or 'bladed' shall be taken to mean "removed" or "smoothed" as the text requires.

VA-DM 5.2.7 Stabilisation

Delete and replace with:

The layerwork scheduled to be stabilised shall be placed and roughly shaped. The material shall be loosened where needed to the full depth of the layer.

The moisture content of the soil shall be measured and a calculation made of the quantity of water to be added to bring the soil to about 2% wet of the laboratory OMC. The number of tanks or bowsers required to apply this quantity of water shall be calculated.

The surface area of the section to be stabilised shall be calculated. The amount of stabiliser concentrate shall be calculated on the basis of applying 20 ml/m^2 for a 100 mm layer or 30 ml/m^2 for a 150 mm layer. The total volume of stabiliser shall then be divided over the number of tanks of water or water bowsers needed. The dilution of the stabiliser shall be calculated and recorded. The stabiliser shall be applied at dilutions in the range of 1:200 to 1:1000.

No stabilisers shall be applied when rain is falling or is imminent.

The water containing the stabiliser shall be applied uniformly across the full width and length of the section. The soil shall be mixed by turning over once with spades or shovels and shall then be left to soak up the water and chemicals for at least 2 hours, although overnight soaking is preferred.

At the end of the soaking period, the soil shall be thoroughly mixed by turning over at least twice with spades or shovels. The layer shall then be carefully shaped to the specified shape and level. After shaping, the layer shall be lightly rolled with one pass of a roller and reshaped. All bumps and hollows shall be taken out and large stones removed or broken down. Once smooth, the layer shall be fully compacted. The roller chosen shall be matched to the soil type and density requirement.

After compaction the layer shall be kept damp for at least three days either by frequent watering or by placing damp soil for the next layer over it.

Construction equipment should be encouraged to drive over the stabilised layer during the curing period.

VA-DM 6 TOLERANCES

VA-DM 6.2 DIMENSIONS, LEVELS, ETC.

VA-DM 6.2.1 General

To this clause add:

Degree of Accuracy III shall apply.
Add the values of permissible deviations for Degree of Accuracy III as follows:

VA-DM 6.2.2 Cut

c) Width of cut
1) in cuttings other than rock cuttings -0 +100
2) in rock cuttings -0 +500

VA-DM 6.3 SELECTED LAYER

a) Formation level +0 -60
b) Thickness -20 +10

VA-DM 6.4 GRAVEL SURFACE LAYER

a) Finished surface level +40 -40
b) Thickness -10 +25

VA-DM 7 TESTING

VA-DM 7.3 ROUTINE INSPECTION AND TESTING

Add new clause:

VA-DM 7.3.3 Field density control

Density control shall be either by the sand replacement method or by an approved nuclear density meter. To obtain approval of the nuclear density meter, the Contractor will be required to provide a certificate from the supplier of the machine stating that the machine is in good working order. The machine must be properly and regularly calibrated and the results correlated with sand replacement tests on a fortnightly basis.

Sand replacement density test holes must be backfilled with material treated with the stabiliser (in stabilised layers) and properly compacted with hand rammers.

VA-DM 8 MEASUREMENT AND PAYMENT

VA-DM 8.3 SCHEDULED ITEMS

VA-DM 8.3.5 Selected layer compacted to 93% of Mod.AASHTO maximum density

Delete and replace with:

a) Excavate in road prism in soft material and trim to required profile..... Unit: cubic metre.
b) Excavate in borrow in soft material .....Unit: cubic metre.
c) Excavate in stockpile .....Unit: cubic metre.

The rate shall cover the cost of complying with the precautions required in clause 5.1, selection, loading, transporting within the freehaul distance, offloading, spreading, watering, shaping, compacting and complying with tolerances.

VA-DM 8.3.6 Extra-over items 8.3.4 and 8.3.5 for excavating and breaking down material in:

Delete items a) to d) and replace with:

a) Firm Unit: cubic metre
b) Hard Unit: cubic metre
c) Soft rock Unit: cubic metre
d) Hard rock Unit: cubic metre
e) Boulders Unit: cubic metre

VA-DM 8.3.7 Cut to spoil or stockpile from:

Delete items a) to e) and replace with:

a) Soft Unit: cubic metre
b) Firm Unit: cubic metre
c) Hard Unit: cubic metre
d) Soft rock Unit: cubic metre
e) Hard rock Unit: cubic metre
f) Boulders Unit: cubic metre

Add:

Cut to spoil and cut to stockpile will be scheduled separately.

VA-DM 8.3.8 Removal of oversize material

Delete this clause.

VA-DM 8.3.9 Overbreak of excavation in:

Delete items a) to d) and replace with:

a) Soft rock Unit: square metre
b) hard rock Unit: square metre
c) Boulders Unit: square metre

VA-DM 8.3.12 Overhaul

Delete and replace with:

The rates shall cover the cost of transporting materials beyond the freehaul distance as follows:
a) Over 100 m up to 200 m Unit: cubic metre
b) Over 200 m Unit: cubic metre km.

VA-DM 8.3.13 Surface finishes

a) Topsoiling Unit: square metre

Delete and replace with:

The rate shall cover the costs of excavating from stockpiles formed in terms of 8.3.2a) and loading, hauling within the freehaul distance, offloading, spreading, lightly compacting and trimming to the specified levels. The final thickness shall be at least 75 mm.

PROJECT SPECIFICATION EXAMPLE 2: PSD EARTHWORKS: SANS 1200 D

PSD1 SCOPE

The following work in this Section 1200 D shall be ***carried out using LI methods*** and for such work it shall be held that this specification covers earthworks ***carried out by light plant, hand tools and equipment*** or, where so permitted in the project specification, by ***restricted plant usage in accordance with PSD4***:

(a) Clear and strip site
(b) Restricted excavation and backfilling
(c) Remove, stockpile and spread excavated material
(d) Filling and compacting holes where trees and stumps have been cleared
(e) Selecting and removing unsuitable material
(f) Spreading and compacting surplus excavated material on Site
(g) Shaping of areas such as parking areas and sportsfields
(h) Hauling of material under (a) to (g) above up to 100m by wheelbarrow
(i) Treatment of public open spaces

PSD2 INTERPRETATIONS

PSD2.3 DEFINITIONS

For ***LI methods the definition for "restricted excavation"*** shall read:
"An excavation required to be carried out using only light plant, hand tools and equipment or, where so permitted in the project specification carried out with restricted use of plant".

PSD3 MATERIALS

PSD3.1.1 Method of Classifying

For ***LI methods*** add at the beginning:
"Subject to the restrictions on the use of plant …."

PSD3.1.2 Classes of Excavation

For ***LI methods the excavation of material will be classified*** as follows:

a) **"Soft excavation"**: Soft excavation shall be excavation in material that can be efficiently removed or loaded by manual operations with a pick and shovel, without the use of handheld pneumatic (compressor driven) tools such as paving breakers or prior ripping, and boulders up to 25 kg in mass.
b) **"Intermediate excavation"**: Intermediate excavation shall be excavation (excluding soft excavation) in material that requires to be broken up by the use of handheld pneumatic excavation and boulders of mass more than 25 kg up to 50 kg, or material that requires to be loosened and broken up by a back-acting excavator of flywheel power exceeding 0,10 mass with a single-tine ripper and flywheel power of 220kW, for the material to be removed or loaded as soft material.
c) **"Hard rock excavation"**: Hard rock excavation shall be excavation in material that requires to be broken up by drilling and blasting with explosives and/or wedging and splitting before removal or loading by equipment equivalent to that specified for soft excavation, and boulders of mass more than 50 kg.

In the event of the Engineer instructing that boulders in excess of 30 kg mass or isolated ridges of rock be broken up by sledgehammer or by heating and cooling (fire and water), such operations will be measured and paid for separately from other excavations.

PSD3.2.1 Material Suitable for Embankment and Terraces

For ***LI methods*** in paragraph (b) "300 mm" shall read "150 mm".

PSD3.4 IMPORTED TOPSOIL

The topsoil shall be fertile, friable natural loam, reasonably free from objectionable weeds, roots, litter and clay lumps, stones or other objects larger than 40 mm in size. The soil shall be free from toxic substances, which might be harmful to vegetation growth.

The topsoil shall be tested at the Contractor's expense for chemical and organic content and pH value.

PSD4 PLANT

PSD4.1 GENERAL

There shall be no restrictions on the use of mechanical plant and equipment for work identified in the Bill of Quantity as "Bulk" or "Mass" earthworks.

Where it is required that the work be carried out ***using LI methods*** (refer PSD1) the first two sentences of 4.1 shall read:
"Except where permitted in the project specification, the Contractor shall use only light plant, hand tools and equipment such as picks, shovels, sledgehammers and wheelbarrows. Although, for the purpose of classifying excavations, particular items of plant are specified in PSD3.1.2, the Contractor is not obliged to provide or use those specified items of plant for carrying out the work but he may use such plant for the excavation that is so classified as an exception to the restriction on plant."

PSD4.2 COMPACTION PLANT

For ***LI methods*** the Contractor shall, save by arrangement with the Engineer, not use compaction plant larger than manually-operated self-driven "pedestrian" compactors (light plant).

PSD4.3 HAUL VEHICLES

Although, for the purpose of classifying haulage, particular items of plant are identified in PSD5.2 the Contractor ***shall not be obliged to use wheelbarrows for the haul of materials over terrain where it may be impracticable to push a wheelbarrow manually***.

PSD5 CONSTRUCTION

PSD5.1.2 Existing Services

Refer PS5.3.3

PSD5.1.3.2 Disposal of surplus and unsuitable material from excavation (Sub-clauses 5.1.4.3 and 5.2.2.3)

Refer PS 4.1.1

Surplus material from excavations which is suitable to use in fills shall be placed and spread in fills or placed in embankments in areas on the Site designated by the Engineer and compacted to at least 90%

Mod AASHTO density (98% for cohesion less materials).
Unsuitable material from excavations shall be disposed of by spreading as uncompacted fill or by placing in embankments in areas designated by the Engineer during the Contract. When ordered by the Engineer, the material shall be compacted to at least 90% Modified AASHTO maximum density (98% for cohesion less materials), or to such greater density as directed by the Engineer.

PSD5.3 PREPARATION OF EARTH FOUNDATIONS

PSD5.3.1 General

Materials obtained from excavations should be used as far as possible provided the material requirements are met. The Engineer may choose to compact or stabilize the in-situ material or remove and replace with other suitable material.

Selected granular fill is required for the construction of terraces. Tests carried out on samples from test pits excavated on the plateau classify the colluvial gravels and the residual granites as G5 to G7 which are suitable for use as selected granular fill.

PSD5.3.2 Placing of Layer

Materials must be placed in continuous horizontal layers with a compacted thickness not exceeding 200 mm. The distribution and graduation of such materials should be free of pockets or layers of material differing substantially in textures, grading or moisture content from surrounding material.

PSD5.3.3 Compaction

Materials used in terraces shall have:-

- A CBR of at least 15% at 93% of MDD Mod AASHTO
- Swell not exceeding 1.5% at 100% of MDD Mod AASHTO
- A PI not exceeding 12 or the value equal to 3 times the grading modulus plus 10, whichever is the higher value
- The maximum size of uncrushed material shall be two thirds of the compacted layer thickness
- A grading modulus not less than 0.75 and not more than 2.7

The moisture content of all materials to be compacted shall lie within the limits of optimum moisture content (OMC) – 4% and OMC + 2% and shall be uniform throughout each constructed layer. The minimum degree of compaction of the compacted layer shall be 95% of MDD Mod AASHTO.

PSD5.3.4 Testing Procedure

PSD5.4.5.1 General

The compaction of the terrace is of vital importance. A minimum of 5 moisture/density tests are to be carried out per layer or per daily lot, whichever is the greater. In any event, there shall not be less than a single test done per 500 m^2 of the layer to be tested.

Testing of the density of the compacted layer may be carried out using sand replacement techniques or a nuclear device with the following limitations: The nuclear device shall be calibrated against at least 10 (ten) sand replacement tests per soil type. The Engineer reserves the right to call for the calibration of the nuclear device against sand replacement tests at his discretion. In the event of any dispute the sand replacement method shall be the only recognized method of density testing.

PSD5.4.5.2 Acceptance and Rejection of a Layer

Assessing of failures is based on both average and minimum single in relation to the specified minimum value below, which vary according to the number of tests for each layer or lot submitted for approval.

Specified Dry Density % Mod AASHTO	Minimum mean value % Mod AASHTO	No of tests per section or lot	Minimum single value % Mod AASHTO
95% Unstabilised	95.7 95.9 96.0	3 and 4 5 6	91.9 91.6 91.4

PSD5.4.5.3 Plate Load Bearing Tests

If requested to do so, the Contractor shall carry out plate load bearing tests on the compacted material in order to verify the materials load bearing capacity.

PSD6 TOLERANCES

PSD6.1 POSITION, DIMENSIONS AND LEVELS FOR BULK EARTHWORKS

Except that finished levels shall comply with Sub-clause 6.1 (b) (3) for degree of accuracy II, a degree of accuracy III shall be applicable to bulk earthworks.

PSD8 MEASUREMENT AND PAYMENT

PSD8.1 BASIC PRINCIPLES

PSD8.1.1 Overhaul

For ***LI methods***, amend the last sentences to read:
"Where overhaul is payable, the additional distance will be measured as specified in PS8.3.6, and volumes will be computed as specified in Sub-clauses 8.2.1 and 8.2.2."

PSD8.2 COMPUTATION OF QUANTITIES

PSD8.2.2 Volume Computed by Capacity

In the second sentences, the word "vehicles" and "vehicle" shall be substituted by the words "***vehicles or wheelbarrows", and "vehicle or wheelbarrow***".

PSD8.3 SCHEDULED ITEMS

PSD8.3.3 Restricted Excavation

For ***LI methods***, the sub-items of Sub-clause 8.3 (b) shall read as follows:
"(b) Extra-over for:
(1) Intermediate excavation……Unit : m^3
(2) Hard rock excavation …….... Unit : m^3

PSD8.3.3.1 Filling and Compacting Holes

The filling with soil and compaction of holes and depressions on Site as designated by the Engineer will be measured per cubic meter (m^3), as compacted fill according to the volume of the holes.

The tendered rate shall cover the cost of placing the material, watering where required and compaction to 93% AASHTO density (100% for sand).

The cost of excavation and hauling of material will be measured under the relevant scheduled items.

PSD8.3.4(d) Imported Topsoil…….....Unit : m^3

The placing of imported topsoil will be measured per square metre (m^2) placed to a minimum thickness of 75 mm after compaction.

The tendered rate shall include all costs for the supply from a commercial source, sampling, testing and placing of topsoil, the supply and mixing of compost super phosphates, ***all labour*** and transport for the proper execution of the work as specified.

PSD8.3.6 Overhaul

Refer PSD5.2.5.2

For ***LI methods***, the item of sub-clause 8.3.6 shall read as follows:
"Overhaul (Provisional):
(a) ***Wheelbarrow haul*** ……..……Unit : m^3.m
(b) ***Tractor and trailer haul***…….....Unit : m^3
(c) Truck haul…….……Unit : m^3 . km"

Volumes will be computed from the designated dimensions. No allowance will be made for bulking. Distances will be measured to the nearest 3 m for (a) above and to the nearest 0.1 km for (c) above, from the end of the free haul distance, in one direction only by the shortest practicable route. Material will only be measured under one of the above categories, i.e. under (a), (b) or (c).

PSD8.3.14 Placing and Compaction of Disposed (Spoil) Material from Excavation (Sub-Clauses 8.3.2 and 8.3.3)

Except when disposed material is not to be compacted, the placing and compaction of disposed material shall be measured per m^3 of compacted material in fill or embankment, notwithstanding any contradiction with the provisions of Sub-clause 8.2.1

The rate for the placing and compaction of the material shall cover the additional cost of complying with the requirements of PSD5.1.4.3, **extra-over** the costs for disposal of surplus or unsuitable materials from excavations. Measurement and payment shall only distinguish for the type of work and the degrees of compaction as scheduled.

METHOD SPECIFICATIONS FOR LIC PROJECTS

The method specification is a useful design and site management tool that contains information in an established framework and presented in an A4 or A3 format. The method specification is a living and dynamic site management and training tool that is always tailor-made to suit for the specifics of any given project (aligned to the tender document, the standard specification, labour balancing tool, construction programme, labour histogram, drawings, etc).

It may contain a select combination of the following categories or headings in a framework established to suit as follows:

1. Work item or activity description and/or definition: The 'Work Definition' refers to the amended scope of the work item/s as included in the project specification. The construction activity/ies refer to one or more work items/s reflected in the BoQ with the prefix "LI" in the tender document. The priority maybe should be replaced by the relevant LI work item/s numbering system aligning it to the BoQ
2. WBS reference/ code, BoQ work item or maintenance priority
3. Specification or Standard: The 'Standards' would make reference to the particular parts of the Standardized and Project specifications relevant to these work item/s and the relevant drawing/s, and SANS 1921 Part 5. A Contractors method specification may include the essentials, e.g. tolerances and deviations, end-result specification/s, testing requirements, Standard/Typical drawing or cross-section, etc
4. Work or construction method (can include sketch or graphic for functionally-linked set of activities): The "Work Method" is the construction procedure or sequence or execution of work as amended to suit for LIC in the project specification.
5. Resource requirements quantified: The resource base has to tie in with your LIC tendered rate breakdown sheets; your labour balancing tool used for calculation proposes to establish your labour cost, and finally your labour histogram for the project.
    a. Human resources (supervisory staff, labour, etc.)
    b. Plant, equipment and tools
    c. Materials
6. Task sizes or Production rates or Production required/day: The productivities will come from the task sizes you have allocated to your construction activity/ies – the same baseline you used to put together your labour balancing tool, establishing your labour cost on your LIC tendered rate sheet/s, and finally your production required per day as determined from you duration indicated on your construction programme.

[**Note:** The format, framework and content of a method statement may vary from company to company based on their specific requirements and preferences for planning, monitoring and control purposes].

The method specifications are to be analysed and revised, as relevant, for every BoQ work item and related activity/ies to be undertaken labour intensively on the project. The company should have a database of method specifications for LI work items or LI activities to draw from to avoid unnecessary or repetitive work.

Method specifications should be specifically put together when:

1. work is to be undertaken by relatively inexperienced small or emerging Contractors;
2. a different construction approach is adopted (e.g., labour intensive construction);
3. a different choice of technology has been specified contractually (e.g., rubble masonry construction, waterbound macadam base construction, ferrocement, inter alia);
4. where an alternative method that is in conflict with the relevant parts of the standardised specification, is to be offered; and
5. when work operations or activities may sit on the critical path on the construction programme, or have a high level of risk associated with them.

If no method specification exists (no project database records), or has not been specified in the contract document, or requested to be made provision for when submitting the tender document, then the method specification must be put together afresh, i.e. from 'zero base first principles'.

METHOD SPECIFICATION EXAMPLE: SANS 1200 DK

Construction Activities

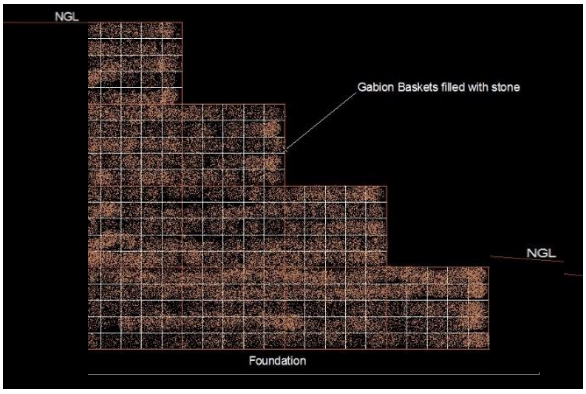
1. Setting Out
2. Clear area
3. Excavation
4. Placing of Gabion Mesh
5. Filling Gabions with stone
6. Placing Gabions
7. Backfilling

Scope

Activities to clear the area and excavate the footing of the Gabion foundation. Filling the Gabion baskets with stone and placing in position and backfill. Gabions to act as stormwater dissipater and to prevent erosion.

Standards

1. Foundation excavation to be in accordance with SANS 1200DB.
2. Placing of Gabion mesh in accordance with SANS 1200 DK.
3. Filling of Gabions with stone in accordance with SANS 1200 DK and the manufacturer's specifications.
4. Backfilling according to the engineer's instruction



Work Method

1. Supervisor to set-out the area where the foundation needs to be constructed. (Dumpy Level and Measuring tape)
2. Clear area and remove the topsoil and place at a place where it will not be disturbed. (Shovel, Wheelbarrows, Rakes and PPE).
3. Excavate the rest of the material to foundation level and close the site of so that the rain water can be redirected and that it will not disturb the activity. (Shovel, Wheelbarrow, rakes and PPE).
4. Placing gabion baskets as per the manufacturer's specification. (Gloves)
5. Filling the gabions with stone as per the manufactures specification. Stones must be free of dust and dirt and it is advisable to clean then with a brush (Gloves & Brushes)
6. Backfilling around the gabions as per the engineer's specifications. (Shovel, Wheelbarrow and PPE)
7. Reinstate the topsoil from the stockpile and finish. (Shovel, Wheelbarrow, Rakes, watering can and PPE)

Personnel

Supervisor – Setting out activity, Allocate activities to be employees

10 Labourers – Clear area, Excavate, placing of gabions, filling of gabions, placing of gabions, backfilling and reinstate topsoil.

Plant, Tools & Equipment

5 Shovels
3 Picks
3 Brushes
2 Wheelbarrows
2 Hand Stampers
1 Measuring Tape
10 PPE (Gloves, Dust Masks Goggles, Helmets, safety shoes and Overalls).

Materials

Building line, Pegs, Gabion baskets, Stone to fill Gabions.

Productivity

Placing of gabions and filling them are the critical path thus: 2.5 – 3 m3/task/day