# PORT OF PORT ELIZABETH

## DOM PEDRO QUAY REFURBISHMENT

# ANNEXURE A2 – SCOUR PROTECTION

## DOCUMENT NUMBER: 2138436-ENG-SPEC-03

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## 1. SCOPE

This specification covers the provision and installation of scour protection in front of the existing Dom Pedro Quay in the Port of Port Elizabeth

The specification provides definitions and requirements for the construction, production, testing, transport, placement and survey of quarried stone materials to be sourced from local quarries or from alternative sources where applicable, for use in the construction of the rock scour protection.

It is the responsibility of the *Contractor* to satisfy himself that the available quarries are capable of supplying rock of the sizes, quality and quantity required.

The construction of the scour protection includes for the procurement of specified gradings of rock from quarries in the Durban area or alternative quarry sites.

## 2. INTERPRETATIONS

### 2.1. Standard specifications

This specification is read in conjunction with the following standardised specifications:

| | |
|---|---|
| SANS 1200 A | General |
| SANS 1200 C | Site Clearance |
| SANS 1200 D | Earthworks |

### 2.2. Definitions

| | |
|---|---|
| *Quarried stone:* | Broken, natural stone. |
| *Graded quarry stone:* | Quarried stone which is graded by sieve sizes or by weight of the stone. |
| *Fine-graded quarry stone:* | A grading which is determined with the aid of sieve sizes. |
| *Light-graded quarry stone:* | A quarried stone grading which is determined by weight or size of stone for mean weights less than 300 kg per stone. |
| *Heavy-graded quarry stone:* | A quarried stone grading which is determined by weight for stones of mean weight of at least 300 kg. |
| *Stone fragment:* | A piece of stone in a grading with a lesser weight or size than the extreme lower class limit (ELCL) for that particular grading class. |
| *Effective mean weight $W_{em}$:* | The arithmetic average weight of all blocks in a sample excluding any stone fragments. |
| *Nominal stone diameter $D_n$:* | The nominal stone diameter, $D_n$, is calculated as the cube root of the volume of the stone. The volume is calculated by dividing the mass of the stone by the saturated surface dry density. Where a numbered subscript is given to $D_n$, this refers to the percentage by weight of stones in the grading having a smaller nominal stone diameter. |
| *Load of quarried stone:* | The quantity of quarried stone per unit of transport. |
| *Class limits:* | The size (or weight) defined for each rock grading together with the allowable percentage of a sample that can lie beyond that limit, is as follows:<br>Extreme lower class limit (ELCL) |

Lower class limit (LCL)
Upper class limit (UCL)
Extreme upper class limit (EUCL)

## 3. MATERIALS

### 3.1. Rock to be provided by Contractor

Gradings

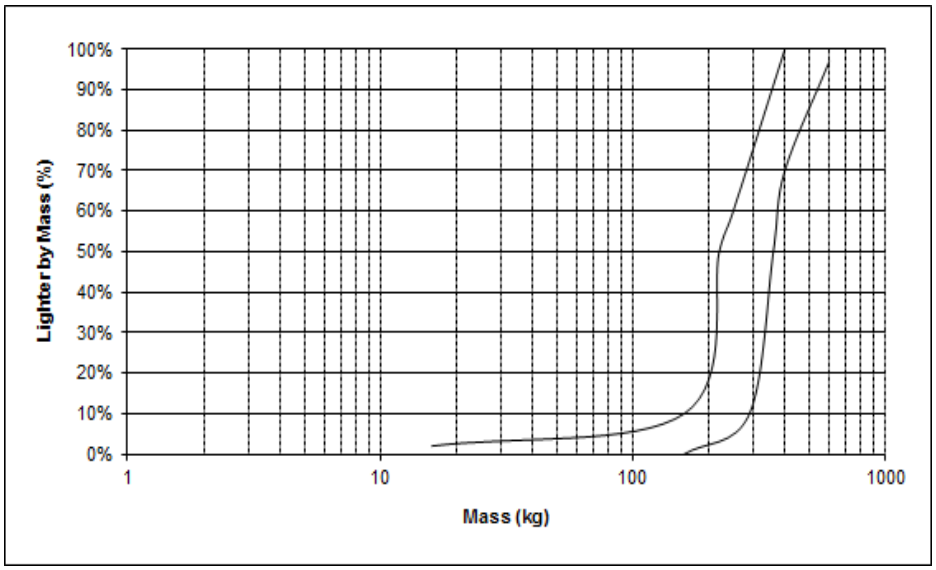
Gradings are determined in accordance with 7.3.1

The following rock gradings are required in the Works:

| CATEGORY | GROUP | DESIGNATION |
|---|---|---|
| Scour Protection | Light Grading | 160 kg – 400 kg |

Scour Protection

| Class Limit | Definitions | % by Weight Smaller |
|---|---|---|
| ELCL | 16 kg | < 2% |
| LCL | 160 kg | 0 – 10% |
| UCL | 400 kg | 70 – 100% |
| EUCL | 600 kg | >97% |




Shape

Sampling is carried out in accordance with 7.2, using at least 50 pieces taken at random from stones greater in weight than the ELCL. Measurement and reporting is in accordance with 7.3.2.

The quarry stone sample does not contain more than 5% of stones with length to thickness ratio (l/d) greater than 3, where the length, l, is defined as the greatest distance between

two points on the stone and the thickness, d, as the minimum distance between two parallel straight lines through which the stone can just pass.

## 3.2. Rock quality requirements

3.2.1. General

All results for rock quality tests refer to samples taken in accordance with 7.2

3.2.2. Density

The average density of quarry stone is at least 2 700 kg/m$^3$ with 90% of the stones having a density of at least 2 600 kg/m$^3$. For sampling, testing and reporting in accordance with 7.3.3, ten density determinations are made, each determination being carried out on a different randomly selected stone, which has a volume of at least 50 ml. If any stone is too large, a representative part of at least 50 ml is taken.

3.2.3. Water absorption

The average water absorption of quarry stone is less than 2%, and the water absorption of nine of the individual stones less than 2.5%. For sampling, testing and reporting in accordance with 7.3.4, ten water absorption determinations are made, each determination being carried out on a different randomly selected stone, which has a volume between 50 and 150 ml. If any stone is larger than 150 ml, a representative part of between 50 and 150 ml is taken.

3.2.4. Resistance to impact and mineral fabric breakage

The average point load index (in the planar direction of the most pronounced layering, should any visible anisotropy exist) done in accordance with the ISRM 1985 recommended method for sampling, testing and reporting is at least 4,0 MPa with the average minus the standard deviation of the point load index being at least 3,0 MPa.
The average and standard deviation is calculated from at least ten valid results obtained from pieces of randomly selected stones after the largest and smallest valid test results have been excluded from the calculation. In practice this will mean that at least twelve test results will be required.

3.2.5. Impurities

Quarried rock does not contain visually observable or chemically detectable impurities or foreign matter in such quantities as are damaging to the constructive application of the quarried stone, or for the environment in which the quarried stone is applied.

## 3.3. Filter Fabric

Filter fabric for placement underneath the scour protection may be of woven or non-woven construction, and conforms to the following requirements:

| Property | Units | Value | Test Method |
|---|---|---|---|

| | | | |
|---|---|---|---|
| Trapezoidal Tear Strength | N | >1 050 | ASTM D4533-85 |
| Tensile Strength | kN/m | >40 | SANS 0221-88 |
| CBR Puncture | kN | >6,0 | SANS 0221-88 |
| Pore size (apparent opening size) $O_{95H}$ | □m | 50 - 150 | NFG 38.C17 |
| Permeability | m/s | $>1*10^{-5}$ | SANS 0221-88 |
| Porosity (non-woven fabrics) | % | >60 | Calculation |
| Percentage open area (woven fabrics) | % | >5 | Measurement |

## 4. PLANT AND EQUIPMENT

### 4.1. General

The *Contractor* provides for all the necessary equipment to deliver the specified rock quality and gradings, transport the rock to the site and place the scour protection, as shown on the drawings, to the required tolerances. The *Contractor* further provides equipment for the accurate control of placing the rock and for surveying of the scour protection layers, to prove compliance with the relevant tolerances.

The requirements of SANS 1200 D (clause 4.3) apply to all vehicles that are required to operate over any public road. Spillage of materials, generation of dust, or contamination of public roads with mud from the site is controlled.

Audible reversing warning signals are provided for all transport vehicles exceeding 3 t GVM.

### 4.2. Marine Equipment

The *Contractor* complies with the Harbour Master requirements for marine activities.

### 4.3. Survey Equipment

Survey equipment for undertaking in-surveys and out-surveys is specified in Particular Specification A1 – Dredging.

## 5. EXECUTION

### 5.1. Scour Protection

Scour protection seaward of the existing sheet piled quay walls is provided in the form of unconfined stone laid in a single lift of a 0.8 m layer of 60 kg – 100 kg scour protection on filter fabric as shown on the drawings.

Prior to placing the scour protection, the filter fabric is made continuous either by firmly stitching together using double stitching with 500 mm overlap, or by providing overlaps of not less than 1 500 mm. The fabric is laid with care to avoid overstretching or puncturing of the fabric during and after laying thereof. When un-stitched laps are used, acceptable measures are implemented to ensure that the 1 500 mm overlaps are maintained until the scour protection is in position.

## 5.2. Transport and Placing of Rock

Quarried rock, placed in the Works in bulk, is transported and handled in such a manner as to minimise segregation and breakage of the rock.

For placing below water level, techniques such as end tipping and dumping from barges may be used, providing the work is organised in such a way as to minimise segregation of the stone grading and to ensure the specified dimensions or weight per unit area.

# 6. TOLERANCES

## 6.1. Rock Quality

The allowable tolerances for rock grading, shape, density and resistance to impact are given in 3.1

## 6.2. Placement of Scour Protection

The top of the scour protection layer is constructed to a tolerance of +0 mm to -100 mm on average from the levels shown on the drawings. Local deviations over areas not exceeding 4 $m^2$ in plan are within tolerances of +50 mm to – 250 mm.

# 7. TESTING AND SURVEYS

## 7.1. Inspection

The requirements of 3.1 inclusive, apply to inspection at or near the site.

For inspections carried out at the quarry, the interpretation of inspection results considers the possible influence of storage, loading, transporting and unloading on the quality requirements in 3.1 inclusive.

## 7.2. Sampling

### 7.2.1. General

Samples for the grading of quarried stone are taken at random and must be representative. The sampling, transport and transfer of the samples are carried out so that breakage is limited to a minimum.

The pieces of one stone, which, according to observation, were broken during sampling, will be considered to comprise one stone at the inspection.

### 7.2.2. Homogeneity of the batch

When, on the basis of visual judgement of the quarried rock batch to be inspected, non-homogeneity or possible non-homogeneity of the batch is considered to exist with regard to one or more of the relevant qualities, that batch is divided into parts considered to be homogeneous. Sampling is then carried out on the individual parts.

When one of the parts does not satisfy the requirements, the whole batch of quarried stone is considered unsatisfactory.

If separation of the divided part(s), which does (do) not satisfy the requirements, is possible without difficulty, the remaining part of the batch may be regarded as a separate batch.

7.2.3. Size and composition of samples

*7.2.3.1. Samples for determining particle distribution*

For the determination of the particle distribution of a fine-graded quarry stone, at least six sub-samples are taken if the sampling takes place from a stockpile or a ship's load. In all other cases the number of sub-samples is at least three.

The numerical value of the weight in kilograms of each sub-sample is at least equal to the numerical value of the upper limit in millimetres of the designation of the grading concerned, if that upper limit is less than or equal to 100 mm. The numerical value of the weight of each sub-sample, in kilograms, is at least twice the numerical value of the upper limit in millimetres of the grading designation if the upper limit is greater than 100 mm.

*7.2.3.2. Samples for determining weight distribution*

For the determination of the weight distribution of the light or heavy graded quarry stone, at least six sub-samples are taken if the sampling takes place from a stockpile or a ship's load. In all other cases the number is at least three.

The sub-samples, including all the rock fragments, together constitute one sample. This sample must contain at least 200 pieces of stone heavier than the extreme lower class limit of the designated grading class.

When the determination of the weight distribution concerns a ship's load containing less than 200 pieces of stone, the whole load is taken to be one sample.

*7.2.3.3. Samples for determining shape and rock quality*

The numbers of stones of specified sizes constituting samples for rock shape and quality tests are as enumerated in 7.2.3.1 and 7.2.3.2.

The stones are chosen at random from the sub-samples, which have been taken for the particle and weight distributions. Where such samples are not available, the stones are taken at random from the batch to be inspected. If the chosen pieces of stone are too large for the test descriptions in force, it will be necessary to break from each stone a representative piece of the required dimensions.

*7.2.3.4. Samples for determining grading designated by size and average weight*

At least four sub-samples are taken if sampling is from a ship's load or from a stockpile. In all other cases, the number is at least two.

The sub-samples, including all rock fragments, together constitute one sample. This sample must contain at least 100 pieces of stone retained on the L square hole of size 500 mm x 500 mm for the Light Grading class.

7.2.4. Method of recovering samples

7.2.4.1. *General*

It is ensured that, during sampling, the degree of filling of the grab, or other extraction equipment, does not adversely affect the representivity of the sample recovered.

7.2.4.2. *Sampling from a belt conveyor*

Prior to sampling material on the belt conveyor, the belt is allowed to transport for a period which is sufficient to ensure that deviations from the composition of the material due to the starting up of the installation are excluded from the sample. A sample of a sufficient quantity is taken by collecting it from the end of the belt, or by stopping the belt and recovering material from the belt.

The required number of sub-samples is taken at approximately equal intervals during the transportation of the batch.

7.2.4.3. *Sampling from a silo*

The required number of sub-samples is taken at approximately equal intervals during discharge from the whole batch to be sampled.

If during the sampling, segregation is observed, the number of samples is adjusted accordingly.

7.2.4.4. *Sampling from a stockpile*

When sampling from a stockpile, the necessary care is exercised to ensure that representative samples are recovered, taking into account possible segregation in the stockpile, and avoiding distortion of the sample grading by the method of recovery used.

7.2.4.5. *Sampling from floating equipment*

Samples are taken generally at the mid-height and on both sides of the cones of rock in the barge in such a way as to ensure that a representative sample is obtained

When sampling during unloading, the required number of sub-samples are taken at approximately equal intervals from the whole of the load to be sampled

7.2.4.6. *Sampling from wheeled transport*

The necessary care is exercised to ensure that representative samples are recovered. This may entail the tipping and distribution of the load in such a way that representative samples may be recovered, or by such other method as may be approved by the *Supervisor*.

7.2.4.7. *Splitting of samples (light and fine gradings)*

Where the splitting of samples is required, such splitting is undertaken in such a way that the sample grading is similar to the grading of the material being sampled, to the satisfaction of the *Supervisor.*

7.2.4.8. *Transportation and identification of the samples*

For the transportation of a sample, precautions are taken to avoid loss or deterioration of the material, and to ensure that the sample is not contaminated. All samples are accompanied by a certificate which contains the following information:

- A reference to this specification;
- The name of the producer and location of the quarry;
- The description and class designation of the grading;
- The number of stone pieces in the sample;
- Details on location and method of sampling, including the date of sampling;
- The name of the individual who took the sample.

## 7.3. Testing procedures

### 7.3.1. Determination of gradings

#### *7.3.1.1. Equipment and other aids required*

- Weighing equipment, accurate to 2% of the LCL
- Lifting equipment and lifting aids for pieces that cannot be moved manually.

#### *7.3.1.2. Weighing*

Weigh each stone heavier than the ELCL separately ($W_i$), and all pieces lighter than the ELCL (the stone fragments) together ($W_s$), accurate to 2% of the LCL. Record the total weights falling in each weight fraction together with the total number of stones ($n$), heavier than the ELCL

.

#### *7.3.1.3. Calculation*

Calculate the total weight $\Sigma W_i$, of pieces equal to or heavier than the ELCL.

To obtain the cumulative curve where $W_y$ is the weight for which the fraction $y$ is lighter, calculate the successive points on the curve at weight intervals given below:

**Weight intervals for the cumulative weight plot**

| Weight interval (kg) |
|---|
| Less than 5 |
| 5 – 50 |
| 50 – 100 |
| 100 – 200 |
| 200 – 500 |
| 500 – 1000 |
| 1000 – 1500 |
| 1500 – 2000 |
| 2000 – 3000 |
| 3000 – 4500 |
| greater than 4500 |

To obtain only those values of $y$ for which a requirement has been set, i.e. the fractions corresponding to $W_y$ at the ELCL, LCL, UCL and EUCL, calculate the total weight $W_n$, for $W_y$ corresponding to each of the four class limits, with the formula:

$$y = \frac{W_n}{W_s + \Sigma W_i} * 100$$

where:

$W_n$ = the total weight of stones lighter than $W_y$ (kg).
$\Sigma W_i$ = the total weight of all pieces heavier than the ELCL (kg).
$W_s$ = the total weight of pieces lighter than the ELCL (kg).

Calculate the effective mean weight, $W_{em}$, to the nearest kilogram, using the formula:

$$W_{em} = \frac{\Sigma W_i}{n}$$

where:

$W_{em}$ = the effective mean weight of the stone sample which equals the average weight of stones heavier than the ELCL.,
$N$ = the number of stones heavier than the ELCL.

7.3.1.4. *Report*

The following data is included in the report:

- The measured cumulative percentage by weight passing the EL, L and EU holes;
- The average weight of pieces not passing the L hole;
- The rock density tested according to Section 7.3.3;
- A reference to this specification;
- A description of the sample; including its weight;
- The source of the sample;
- The date of the inspection.

7.3.2. Determination of shape

7.3.2.1. *Sample for analysis*

The sample contains at least 50 pieces taken at random from above the ELCL weight.

7.3.2.2. *Equipment and other aids*

Measurement apparatus required for the determination of length and thickness of stones with an accuracy of 3% or better.

Weighing equipment is accurate to within 2% of the lightest piece to be weighed.

7.3.2.3. *Execution*

Measure the length of each stone as the maximum distance between two points on the stone to within 3% accuracy. Measure the thickness of each stone defined as the minimum distance between two parallel straight lines through which the stone can just pass to within 3% accuracy. Weight the total weight ($W_3$), of the stones with a length-to-thickness ratio of greater than 3 to within 2% accuracy. Determine the total weight ($W_t$), of the stones accurately to within 2%. Determine the number of stones with length-to-thickness

ratio greater than 3 ($n_3$), and the number of stones with length-to-thickness ratio greater than 2 ($n_2$). Count the total number of stones, *n*.

7.3.2.4. *Calculations*

Calculate the weight in percentage, rounded to the nearest 1%, of stones with length-to-thickness ratio of greater than 3 using the formula:

$$C_{w3} = \frac{W_3}{W_t} * 100$$

Calculate the number per cent of stones with length-to-thickness ratio greater than 3 and 2 using the formula:

$$C_{n3} = \frac{n_3}{n} * 100$$

$$C_{n2} = \frac{n_2}{n} * 100$$

7.3.2.5. *Report*

The report provides the following data:

- The percentage by weight of stones with length-to-thickness ratio greater than 3
- The percentage by number of stones with length-to-thickness ratio greater than 3, and greater than 2
- A reference to this specification
- A description of the sample, including the weight and the number of stones
- The source of the sample
- Date of the test

7.3.3. Determination of rock density

7.3.3.1. *Subject and area of application*

This method is for the density determination of natural stone and stone-type material with a volume of at least 50 ml.

7.3.3.2. *Sample for analysis*

If the stones have a volume substantially in excess of 50 ml, a representative part can be used, subject to a minimum volume of 50 ml.

7.3.3.3. *Equipment and other aids*

- Drying oven, adjustable to (110 ± 5)°C.

- Weighing scales, accurate to 0.05% of the stone weight, suitable for weighing in air and under water.
- Water-bath, filled with tap water at room temperature and suitable for weighing stones under water.
- Thermometers, suitable for recording temperature in the water bath, accurate to 1°C.
- Moist chamois leather.

7.3.3.4. *Execution*

Remove loose grit and clean the stone by brushing with water. Measure the water temperature in the water-bath to 1°C accuracy. Keep the stone submerged in water at room temperature for at least 5 min and weigh it submerged ($m_1$), to an accuracy of 0.05%.

Dry the stone using a moist chamois leather to the point that no shiny-wet surface remains. Weigh the stone ($m_2$) again to 0.05% accuracy.

Dry the stone in the oven to a constant (steady) weight, which is reached when two consecutive weighings with a 24-hour interval show less than 0.05% loss of total weight.

Weigh the stone again after cooling to room temperature ($m_3$) to 0.5% accuracy.

7.3.3.5. *Calculation*

Calculate the density of the stone in kg/m³, rounded to 1 kg/m³ using the formula:

$$\rho_r = \frac{m_3 * \rho}{m_2 - m_1}$$

where $\rho_r$ = the density of the stone

$\rho$ = water density (g/ml) at the test temperature of the water-bath;

$m_1$ = apparent weight of the stone submerged (g),

$m_2$ = weight of the damp stone (g).

$m_3$ = weight of the dry stone (g).

7.3.3.6. *Report*

The report includes the following:

- Density of the stone
- Reference to this specification
- A description, including the weight of the stone
- Source of the stone
- Date of testing

7.3.4. Determination of water absorption at atmospheric pressure

7.3.4.1. *Subject and area of application*

This method is for the determination of the water absorption at atmospheric pressure of a natural stone or other stone-type material, having a volume of at least 50 ml.

7.3.4.2. *Sample for analysis*

The stone has a volume of between 50 ml and 150 ml.

7.3.4.3. *Equipment and other aids*

- Drying oven or other appropriate apparatus, adjustable to (110 ± 5)°C.
- Weighing scales, accurate to 0.05% of the weight of the stone.
- Water-bath filled with tap water at room temperature.
- Moist chamois leather.

7.3.4.4. *Method of operation*

Remove loose grit and clean the stone by brushing with water. Submerge the stone in the water-bath for 24 hours, or until the weight over a period of 24 hours does not increase by more than 0.1%.

Dry the stone using chamois leather until it leaves a dull surface. Weigh it ($m_1$) to an accuracy of 0.05%. Dry the stone in the oven to a constant weight ($m_2$), which is reached when the stone's weight over an interval of 24 hours does not reduce by more than 0.05%.

7.3.4.5. *Calculation*

Calculate the water absorption of the stone in percentage, rounded to 0.1%, using the formula:

$$c = \frac{m_1 - m_2}{m_2} * 100$$

where: $c$ = water absorption at atmospheric pressure,
$m_1$ = weight of a moist stone after absorption (g),
$m_2$ = weight of a dry stone (g).

7.3.4.6. *Report*

The report contains the following:

- The water absorption at atmospheric pressure
- Reference to this specification
- A description of the stone and its weight
- Source of the stone
- Date of testing

7.3.5. Determination of the drop test breakage index

7.3.5.1. *Subject and area of application*

This method is used to determine the percentage of stone loss from heavy gradings of quarried stone in a standard drop test. This percentage is termed the Drop Test Breakage Index.

7.3.5.2. *Sample for analysis*

The sample contains at least 50 pieces taken at random from the ELCL weight of the grading class in question.

7.3.5.3. *Equipment and other aids*

- Suitable hydraulic grab (e.g. orange-peel type).
- Weighing equipment, accurate to within 2% of the lightest piece to be weighed.
- Bed of rocks of same grading as the sample to be tested.
- Sufficient volume of crushed rock aggregate to give a 0.5 m thick layer covering an area to support the bed of rocks.

7.3.5.4. *Execution*

Determine the individual weights of the rock sample prior to the test in accordance with Section 7.3.1. Prepare the bed of rocks by laying them out in a single compact layer on a 0.5 ± 0.05 m thick, layer of crushed rock aggregate. Subject each block in the test sample in turn to a drop of fall height 3 m ± 0.1 m onto the bed of rocks. Record the result of each drop test. This record to include the number and type of visible flaws in each block, and the number and type of blocks resulting.

Remove the block, or broken parts thereof, from the bed of rocks. Set aside all resulting pieces with weight in excess of the ELCL weight, or of weight close to the ELCL weight, for further weighings. Clear all rock fragments from the bed of rocks, leaving clean surfaces prior to dropping the next block in the test sample.
Weigh individually, to an accuracy of 2%, each stone piece in the test sample heavier than the ELCL on completion of drop testing. Record the total weights in each weight fraction.

7.3.5.5. *Calculation*

Calculate the cumulative weight distribution curves for the sample prior to drop testing and after drop testing for all pieces heavier than the ELCL, and calculate the median sample weight before testing ($W_{50i}$, and after testing ($W_{50f}$), all in accordance with PW 7.3.1. Calculate the drop test breakage index, $I_d$, as: $I_d = [(W_{50i} - W_{50f})/W_{50i}] * 100\%$

7.3.5.6. *Report*

The following is included in the report:

- The Drop Test Breakage Index

- A reference to this specification
- A description of the sample, including its weigh
- The source of the sample
- Date of test

The weight distributions before and after testing is provided on a single graph.

## 7.4. In-Survey

The approved out–survey of the scour shelf specified in Particular Specification A2 - Dredging will be accepted as the in–survey for the scour shelf, provided the scour protection is placed within 2 weeks after the date of the abovementioned out–survey. If the time constraint cannot be achieved then the *Contractor* carries out a new survey of the scour shelf as described in the out survey of Particular Specification A2 – Dredging.

This survey is carried out in collaboration with the *Supervisor*. The levels are approved by the *Supervisor*, before proceeding with the construction of the scour protection.

Levels are taken on a 3 m x 3 m grid and the levels are recorded to one decimal of a metre.

The results are recorded on a drawing to a scale of 1:1000, which is submitted to the *Supervisor*. This drawing, called the scour protection in-survey, forms the basis of calculations for measured quantities of the materials placed. Relevant features such as design depths, buoys, identification of ground survey control stations and quay numbers are shown on the drawing. The orientation (north point) is indicated together with the drawing scale. The datum to be used is Chart Datum Port (CDP), which is 0,9 m below MSL.

## 7.5. Out-Surveys

On completion of placing the stone layer, the *Contractor* carries out a survey of the scour protection. This survey is carried out in collaboration with the *Supervisor* who delegates staff to check the *Contractor's* work and to undertake spot checks as necessary.

The Contractor is required to undertake a dip survey of the scour protection to ensure compliance with the required tolerances. The stone levels are taken on a 3 m x 3 m grid and the levels are recorded to an accuracy of 50 mm. The Contractor is also required to undertake underwater video inspections of the scour protection.

The results are recorded on a drawing to a scale of 1:1000, which is submitted to the *Supervisor*. Relevant features such as design depths, buoys, identification of ground survey control stations and quay numbers are shown on the drawing. The orientation (north point) is indicated together with the drawing scale. The datum to be used is Chart Datum (Port), which is 0,7 m below MSL.

The out-surveys are used for checking tolerances only and do not form the basis for re-measurement.

## 7.6. Timing of Surveys

Surveys are carried out as follows:

- In-surveys: no more than two weeks before commencing placement of the scour protection in any area of the side slopes.
- Out-surveys: as soon as the relevant stone layer has been completed and the required tolerances have been achieved.