

**Part 1            General**

**1.1                SCOPE**

- .1        The work covered in this section includes all operations related to the establishment of the stone which is required in the context of the consolidation of the steel sheet piling and jetties North and South, as shown in the plan.

**1.2                RELATED SECTIONS**

- .1        Section 01 11 01 – Work Related General Information.
- .2        Section 01 33 00 – Submittal Procedures.
- .3        Section 01 45 00 – Quality Control.
- .4        Section 35 31 24 – Production of Stone.

**1.3                SUBMITTALS AND SAMPLES**

- .1        The following information shall be submitted to the Departmental Representative.
  - .1        Construction equipment and procedures  
At least ten (10) working days before work inception, the Contractor shall submit his construction procedures which must include:
    - .1        a list of all the equipment and machinery to be used;
    - .2        detailed stone placement methods for each category, and the placement sequencing;
    - .3        an example of daily stone placement report.
  - .2        Inspection techniques and surveying methods  
At least ten (10) working days before undertaking the placement of stones in the structure, the Contractor shall provide the Departmental Representative with the following information for review:
    - .1        Inspection techniques and evaluation criteria applied to the placement of the stones in the structure.
    - .2        Detailed surveying methods implemented to ensure accurate placement, including alignment, levelling and the control of transverse sections during construction.  
  
After review by the Departmental Representative, this submittal shall be included in the detailed quality control plan.
  - .3        Existing conditions and verification survey data  
A copy of the record of each verification survey, including existing conditions, shall be submitted to the Departmental Representative within one (1) working day after the survey. Provide submittal in both hard copy and digital formats.

.4 Stone placement reports

The Contractor shall submit daily stone placement reports. The reports shall display, as a minimum, the following information: an estimate of the total tonnage placed; chainings along the control line (LC) between which stones were placed; and the total placement time. The Contractor shall also update work progress drawings indicating (i) dates and locations of stone placement and (ii) verification surveys for each layer of stone, for review by the Departmental Representative at any time.

**Part 2 Products**

**2.1 NOT USED**

.1 Not Used.

**Part 3 Execution**

**3.1 QUALITY CONTROL OF STONE PLACEMENT**

.1 General

.1 The Contractor is responsible for Quality Control and shall establish and maintain a Quality Control Plan.

.2 The Contractor shall keep records of all quality control tests, surveys, inspections, including corrective measures implemented and provide copies to the Departmental Representative.

.2 Survey control

.1 The Contractor shall provide range poles, marker buoys, templates, batter-boards and/or any other means of guidance and control required to place the successive stone layers within construction tolerances.

.2 The Contractor shall provide and maintain chainage markers at 15 m intervals along the work area. Chainage markers shall be visible in both directions along the chaining.

.3 Supply, install and maintain tide scale. Install the instrument to allow direct reading of water level with reference to tidal datum. The type of instrument and its location shall be approved by the Departmental Representative.

.3 Verification surveys

.1 Object

.1 The Contractor shall carry out verification surveys as work progresses to ensure that the lines, elevations and course thicknesses of work performed are within specified tolerances.

.2 Equipment

- .1 Carry out verification surveys using a DGPS, a total station survey instrument and range pole-mounted prism, a surveyor's level, range pole and surveyor's tape; tagline and sounding basket; or other methods in accordance with this section and subject to Departmental Representative's approval. If range poles or soundings poles are used, these devices shall be fitted with a flat, durable 30 cm diameter base.
- .2 Carry out depth measurement by physical contact with the stone using, for example, sounding poles or leadlines. Sonic or electronic measurement are not authorised for depth measurement. Accuracy shall be better than 6 cm.
- .3 Other measurement methods using sonic or electronic methods may be considered subject to approval by the Departmental Representative. The Contractor shall submit evidence of the accuracy of any other method and submit detailed comparison with measurements done by physical contact for all courses of stone.
- .4 The Contractor shall provide the boats, the personnel and all the equipment required to carry out verification surveys safely.

.3 Execution

- .1 Above water surveys shall be undertaken using conventional land surveying methods. For underwater surveying, the Contractor shall move by boat or platform as needed, to each required reading location to cover the whole structure, including the tidal zone.
- .2 All survey verifications are conducted using the survey control line (LC) and chart datum (CD).
- .3 Survey verifications shall be carried out in the presence of the Departmental Representative unless the latter declines to attend.
- .4 For each verification survey carried out, the Contractor shall provide the Departmental Representative with a record of verification surveys displaying the following information:
  - .1 location of the verification survey (station along the control line);
  - .2 category of stone surveyed;
  - .3 date and time of the survey;
  - .4 weather conditions;
  - .5 tide gauge readings at the time of the survey;
  - .6 name of participants;
  - .7 field notes;
  - .8 plot on cross-section paper showing the control line, neat lines and individual elevation readings.
- .5 The exact format of the verification survey record shall be agreed upon by the Departmental Representative and the Contractor.
- .6 The verification surveys of the underlying material (i.e., the existing structure, or the previously placed course of stone) carried out by the contractor involved shall be verified by the Departmental Representative before the next course of stone is placed.

### 3.2 STONE PLACEMENT

#### .1 General

- .1 The establishment of the stone for the consolidation of piers North and South must be carried out without that no machinery or vehicle flows on the docks in Berlin wall to do not reduce their structural stability.
- .2 Stones shall be placed individually as indicated sloped and drawings within the tolerances described in this section.
- .3 Stones of the same category shall be evenly spread by size throughout the work in such way as to avoid concentrations of same size stones in the same area.
- .4 The equipment used to place the stones shall be capable of placing the stones without dropping them from more than 0.3 m above final position; the equipment shall also allow to move the stones and rework their position if need be.
- .5 Place the stones and ensure that they rest firmly onto the stones below and are in steady contact with surrounding stones; to achieve adequate lodging, it may be necessary to change the arrangement of existing adjacent stones.
- .6 Stones must be placed without regular pattern and randomly oriented in such way that joints with adjacent stones are not aligned.
- .7 Perform outer slope finish as the layer of armour stone is placed. The finished slope shall be even and without any voids that can pass the smaller stones underlying filter.
- .8 The approval of stone placement and/or of survey verifications of a course or portion of course is not a final acceptance. Stone work shall be considered final when the Departmental Representative approves the placement and the verification surveys for all the courses in the work zone.
- .9 Before final acceptance, any damage to the existing structure or to partially built or approved stone courses shall be repaired by the Contractor at own expense whether such damage results from Contractor's or subcontractors' operations, or from the action of wind, waves, tides or ice.
- .10 Place stones carefully and avoid damaging adjacent structures. In case of damage, all repair and/or replacement costs resulting from a lack of precaution shall be at Contractor's expense.
- .11 Placement using any method likely to cause segregation in a given category of stone is not authorised. Placement shall begin at the toe of the slope and proceed upward. Casting of stone or moving by drifting or manipulating down the slope is not permitted. Final slope and elevation are to be achieved as stones are placed.

- .2 Degradation/contamination of stone layers resulting from Contractor's operations.

### 3.3 DEFORMATION

- .1 In case of deformation of any part of the work during construction or after construction but before acceptance, the Contractor shall remove the displaced materials and rebuild this portion of the structure using either new materials or the displaced materials if deemed appropriate.

- .2 Stone placement prior to the installation of the outer protection shall be at Contractor's own risk.

### 3.4 TOLERANCES

- .1 Surfaces obtained shall not deviate from the lines and grades indicated on the contract drawings in a range of plus or minus the tolerances indicated below. Tolerances are measured perpendicularly to the indicated neat lines.
- .2 Extreme limits of the tolerances given below shall not be continuous in any given direction over five (5) times the average dimension of a stone and/or over more than ten (10) square metres (m<sup>2</sup>) of structure surface area.
- .3 Any section of a stone course built to the upper tolerance limit shall not be in the immediate vicinity of a section built to the lower limit and vice-versa. In other words, transitions between tolerance limits shall be smooth.

Material	Above chart datum	Below chart datum
stone 8 to 12 tons	50 cm	60 cm
stone 1 to 3 tons and stone 1 to 1.5 tons	30 cm	40 cm

- .4 In addition to the above-indicated perpendicular tolerances with reference to the slope, the horizontal position of every break in grade of finished stone courses shall be less than 60 cm the indications on the contract drawings. This variation shall not be systematic in one way or the other. Lines, arcs and curves lines shall be continuous and smooth, without visible deflection, bends or kinks.
- .5 The above tolerances aim at ensuring that the work is constructed to the required heights, slopes and levels. Placed material that would not meet these requirements shall be removed or reworked as directed by the Departmental Representative.

### 3.5 CIRCULATION ON THE NORTH AND SOUTH BREAKWATER

- .1 Circulation on the breakwater is restricted by the width and the design of the structure. Construction of a temporary access road can be considered, but only if it done and removed in order to make sure that there will be no remaining contamination of the breakwater with unacceptable materials. In all cases, the construction method of such temporary access road will have to be approved by the Departmental Representative.

### 3.6 DEBRIS

- .1 Unless otherwise indicated by the Departmental Representative, all the timbers, the unsatisfactory materials and the debris within the construction zone shall be removed and become the Contractor's property. All the materials shall be disposed.

**3.7 TURBIDITY CONTROL**

- .1 The Contractor shall control stone placement in such way as to minimize water turbidity.

**END OF SECTION**