

SPECIFICATION SECTION 03200 - STRUCTURAL EXCAVATION

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SPECIFICATION SECTION 03200 - STRUCTURAL EXCAVATION

1. DESCRIPTION

1.1 General

- a) This Specification Section prescribes the execution and completion of Structural Excavation to all required areas of the Site.
- b) Structural Excavation comprises excavation in all classes of material including but not limited to all clays, sands, silts, running sand, mud, rock, boulders, paved areas and old foundations.
- c) Structural Excavation shall include supports to the sides of excavations or additional excavation to form sloped sides, working space, disposal of all water (including surface water and ground water), segregation of material suitable for backfilling or embankments, all necessary handling, stockpiling, disposal, shaping and trimming completed excavation in accordance with the locations, lines, levels, grades and dimensions shown on the Drawings and as specified herein.
- d) This Specification Section includes the supply and placing of approved foundation fill material to replace unsuitable material encountered below the foundation level of structures.
- e) Structural Excavation is defined as particular excavation, commencing after Common Excavation for below ground structures including foundations, bases, retaining walls, ditches, culverts and the like.
- f) Prior to commencement of Structural Excavation the Contractor shall obtain the Engineer's written instructions regarding work area and depth limits and approval for the equipment and materials to be used and the method of work execution.
- g) The method of work shall include the provision of an earthworks/excavation balance schedule or plan which set out details of all Structural Excavation, in particular the locations and volumes for both excavation and placement of materials. The plan shall be updated on a weekly basis, in accordance with the progress of the Works and submitted with the Contractor's weekly work schedule until completion of this work.
- h) All materials arising from Structural Excavation shall remain the property of the Employer and the Engineer will direct the Contractor where the

surplus materials are to be transported and deposited. Materials generally shall be set aside for reuse or transported and deposited by the Contractor to locations on the Site or off the Site.

- i) Where instructed by the Engineer that materials are not required to be retained by the Employer the materials shall be removed by the Contractor from the Site to a disposal area to be selected by the Contractor.
- j) Structural Excavation also shall include the supply (or production), hauling, all necessary handling, placing and compaction of suitable material from; excavation works or granular backfill (from borrow pits) adjacent to structures in accordance with the locations, lines, levels, grades and dimensions shown on the Drawings and as specified herein.
- k) Structural Excavation also shall include the supply and placing of approved foundation fill material to replace unsuitable material encountered below the foundation level of structures.
- l) Structural Excavation shall include all necessary diversion of live streams, rivers and tidal rivers, bailing, pumping, draining, sheeting, bracing, necessary construction of cribs and cofferdams and supply of materials required and subsequent removal of cribs, cofferdams and remaining unsuitable material and placing of all necessary backfill.

1.2 Structural Excavation Classification

Structural excavation shall be deemed to include for all required equipment, labor, incidentals, temporary materials and works necessary for and associated with the excavation, including but not necessarily limited to:

- i) The Contractor's observance of all rules and regulations of Competent Authorities regarding the interference with or maintenance of flow in the relevant canals, water courses, channels or pipes;
- ii) Provisions for underwater works;
- iii) Provisions for pumps and dewatering by submersible pumps;
- iv) Provisions for any necessary underwater concrete, Class C10 or blinding concrete;
- v) Providing cofferdams (regardless of their type or material), braced sheet piling or any other methods proposed by the Contractor which are subject to the approval of the Engineer;
- vi) Provisions for, driving of and removal of sheet piles including providing

- certification by an professional/certified engineer;
vii) Provisions for placement and removal of temporary bridges.

2. MATERIAL REQUIREMENTS

The most recent edition of the following standards shall apply to the Works covered by this Specification Section:

Vietnamese Standards:

22TCN346-06	Testing Procedure on Definition of Compaction of Road Foundation and Embankment by Sand Cone Method.
TCVN4197-95	Soil Methods of Laboratory Determination of Plastic Limits and Liquid Limits
22TCN266-200	Specification for Construction and Acceptance of Culverts and Bridges

3. CONSTRUCTION REQUIREMENTS

3.1 Groundwater

Whenever groundwater is encountered or the excavation is taking place adjacent to free surface water, the Contractor shall take such measures as necessary to ensure that the excavation and footing are kept free of water and in a stable condition. All such measures shall be included in his method statement and are subject to the approval of the Engineer.

3.2 Cofferdams

- a) Suitable and practically watertight cofferdams shall be used wherever water bearing strata are encountered above the elevation of the bottom of the excavation.
- b) The Contractor shall submit to the Engineer for his approval drawings showing his proposed method of cofferdam construction together with calculations based on; 50% water level (H_{50}) for the dry season or the annual average water level in cases where there is insufficient monthly hydrological survey data in the Hydrological Report, with allowances for local and general scour of the river bed and the minimum ship impact requirements. All designs shall be checked by a professional/certified engineer who shall certify the adequacy and safety of the proposed details.
- c) Cofferdams or cribs for foundation construction shall extend well below

the bottom of the foundations and shall be well braced and as nearly watertight as practicable.

- d) The interior dimensions of cofferdams shall be such as to give sufficient clearance for the construction of formwork and the inspection of their exteriors and to permit pumping outside the forms.
- e) Cofferdams or cribs that have tilted or moved laterally during the process of sinking shall be righted or enlarged so as to provide the necessary clearance.
- f) When conditions are encountered which render it impractical to dewater the foundation before placing the footing the construction of a concrete foundation seal of such dimensions as shown on approved shop drawings may be permitted all subject to the approval of the Engineer. The foundation shall then be dewatered and the footing placed. When weighted cribs are employed and the weight is utilized to partially overcome the hydrostatic pressure acting against the bottom of the foundation seal, special anchorages such as dowels or keys shall be provided to transfer the entire weight of the crib to the foundation seal. Where a foundation seal is placed under water, the cofferdam shall be vented or ported at low water level. Pumping for dewatering shall not commence until the seal has set sufficiently to withstand the hydrostatic pressure.
- g) Cofferdams shall be constructed so as to protect young concrete against damage from sudden rises in the water level and to prevent damage to the foundation by erosion. No timber or bracing shall be left in cofferdams or cribs without the approval of the Engineer.
- h) Any pumping that may be permitted from the interior of any foundation enclosure shall be done in such a manner as to preclude the possibility of any portion of the concrete materials being removed. Any pumping required during concrete placing or for a period of at least 24 hours afterwards shall use a suitable pump located outside the concrete forms.
- i) Unless otherwise provided the Contractor shall remove cofferdams or cribs, together with all associated sheets and braces, after the completion of the substructure. Removal shall be effected in such a manner as not to disturb or damage any finished work.
- j) The Contractor may propose a suitable alternative method to coffer dam construction. The details of any such alternative shall be complete with all

necessary drawings and calculations certified by an independent professional engineer and shall be subject to the approval of the Engineer. All costs associated with making such a proposal, whether it is accepted or rejected by the Engineer, shall be born by the Contractor.

3.3 Preservation of Channel

Unless otherwise permitted no excavation shall be made outside cribs, cofferdams or sheet piles and the natural stream bed adjacent to the structure shall not be disturbed without the approval of the Engineer. If any excavation or dredging is made at the site of the structure before caissons, cribs, or cofferdams are sunk in place the Contractor shall backfill all such excavations to the original ground surface or stream bed with material satisfactory to the Engineer after the foundation base has been completed. Material deposited within the stream area from the foundation or other excavation or from the filling of cofferdams shall be removed and the stream area kept free from obstruction.

3.4 Excavation

- a) Prior to starting excavation operations in any area, the Contractor shall :
 - i) Ensure that all necessary site clearance and demolition in that area has been approved by the Engineer.
 - ii) Ensure that all cross sectional elevations and measurements have been taken of the undisturbed ground and submitted to the Engineer for his approval.
 - iii) Take steps on his own initiative to regulate the natural drainage of the surface water in the area to prevent flooding of excavations.
- b) Excavations for structures or structural footings shall be of sufficient size to permit the placing of foundations of the full width and length shown indicated on the Drawings. The sides of excavations shall be adequately supported at all times. The elevations of the bottoms of footings as shown on the Drawings shall be considered as approximate only and the Engineer may order, in writing, such changes in dimensions or elevations of footings as may be deemed necessary to secure a satisfactory foundation.
- c) Boulders, logs and any other unsuitable materials encountered in excavation shall not be used for backfilling purposes and shall be disposed of.

- d) After each excavation has been completed the Contractor shall submit the foundation to the Engineer for his approval. No foundation or bedding material shall be placed until such approval has been given.
- e) All rock or other hard material encountered in foundations shall be cleaned of all loose material and cut to a firm surface, either level, stepped or serrated and all seams or crevices shall be cleaned out and grouted, all subject to the approval of the Engineer.
- f) Where the foundation is to rest on material other than rock, excavation to the final level shall not be carried out until just before the foundation is to be placed. Where the foundation material is soft or otherwise unsuitable, the Contractor shall remove the unsuitable material and replace it with granular backfill (borrow material) to the approval of the Engineer. The granular fill shall be placed and properly compacted in layers not exceeding 15cm up to the foundation elevation. However where the foundation material has been rendered unsuitable for reasons attributable to the Contractor he may replace the unsuitable material with granular material as described above or suspend works on the foundation until such time as the material becomes suitable. Either solution shall be at the Contractor's expense without revision to the Contract period.
- g) Where pile foundations are used the excavation of pile driving pits shall be completed before pile driving begins and any blinding stone required shall be placed after piles have been driven. Where it is not possible to drive piles after excavation, piles shall be driven from the natural ground level subject to the approval of the Engineer. In such case surplus pile lengths will not be measured for payment.
- h) After both the excavation and the driving have been completed all loose and displaced material shall be removed to leave a smooth, solid bed on which to place the foundation.
- i) Where a box culvert is to be located in embankment the excavation shall be performed after the embankment has been constructed to the proposed subgrade level and properly compacted subject to the approval of the Engineer.

3.5 Backfilling

On completion of the structure, excavated areas shall be backfilled with approved material to the level of the finished ground surface.

a) Soil Backfilling

Backfill shall be placed in layers not exceeding 15 cm and compacted to 95% of the maximum dry density determined according to Vietnamese Standard 22TCN 333-06, Method 2D.

b) Non Structural Soil Backfilling

Nonstructural backfilling will be used in locations where the purpose is nonstructural such as footings of bridge piers. Suitable material arising from the excavation shall be used as non structural backfill. Suitable material is defined as common excavation or Structural Excavation material that complies with the Specification.

c) Granular Backfilling

Granular backfilling (borrow material) required for specific structures or other locations detailed in the Drawings or as required by the Engineer shall be placed in layers not exceeding 15 cm and compacted to 95% (for K95) or 98% (for K98) of the maximum dry density determined according to Vietnamese Standard 22TCN 333-06, Method 2D.

The material shall be well graded crushed or uncrushed gravel, stone, rockfill or natural sand or a well mixed combination of any of these. Grading requirements for granular backfill shall be as follows:

Table 2: Grading Requirements for Granular Backfill

Item	Requirement
Maximum size	5 cm
Passing 4.75 mm sieve	25% to 90%
Passing 0.075 mm sieve	0% to 10%
Liquid limit TCVN4197-95	30% max.

3.6 Blinding Stone (Blinding Crushed Stone, Bedding Granular Material)

- a) Blinding stone for use in foundations for structures as shown on the Drawings or as instructed by the Engineer shall be provided as detailed below.
- b) Blinding stone shall be approved cobblestone or crushed rock of the maximum size compatible with the thickness of the layer shown on the Drawings subject to the approval of the Engineer. Large stones shall have a minimum dimension of 7 cm. Large stones shall be closely packed by hand to the dimensions shown on the Drawings and then rammed by mechanical rammer. Smaller stones with a minimum dimension of 3 cm

shall then be placed between the larger stones and the surface brought to the finished level shown on the Drawings or as required by the Engineer. The final surface shall be thoroughly compacted to the satisfaction of the Engineer using a mechanical rammer or vibrating roller.

- c) The Contractor may propose an alternative to the above process based on the use of graded, crushed stone of a maximum size less than 5 cm. The proposal shall include; the maximum thickness of one layer, the proposed compaction methods and the suitability of the proposal for use in a restricted working area, all subject to the approval of the Engineer.

3.7 Reuse of Suitable Material

- a) Suitable material arising from the Structural Excavation shall be used as backfill to structures or in the embankment works. No additional payment shall be made for removing from temporary stockpiles of excavated materials whether they are intended for reuse in structural backfilling or incorporation in the embankment.
- b) Suitable material is defined as Structural Excavation material that complies with the Specification Section 03400 Embankment.
- c) Where the excavation reveals a combination of suitable and unsuitable materials the Contractor, unless otherwise instructed by the Engineer, shall carry out the excavation in such a manner that the suitable material is excavated separately for use in the Works without being contaminated by the unsuitable material.
- d) Material that becomes unsuitable as the result of incorrect handling or construction methods or contamination by the Contractor shall be disposed of and replaced at the expense of the Contractor.

3.8 Disposal of Unsuitable or Surplus Structural Excavation Material

- a) All other excavated materials, either within or beneath the design excavation limits, that do not meet the specification for embankment material or are liable, in the opinion of the Engineer, to be detrimental to the Permanent Works shall be designated “unsuitable material”.
- b) Unsuitable materials shall also include soils which:
 - i) Contain unacceptable quantities of peat, roots or organic matter, or
 - ii) Have a low natural density less than 800kg/m³, or

- iii) Are highly expansive, or
- iv) Have hazardous chemical or physical properties.
- c) All disposal sites provided and used by the Contractor shall comply with the relevant Vietnamese laws and regulations concerning the protection of the environment.
- d) Unsuitable or surplus material shall only be removed from the Site following the written instruction of the Engineer.
- e) The Contractor shall comply with all local environmental regulations when disposing of unsuitable material and shall include in his environmental management plan all relevant details for the hauling and disposal of unsuitable materials.
- f) Structural Excavation comprises excavation in all classes of material including but not limited to all clays, sands, silts, running sand, mud, rock, boulders, paved areas, old foundations.

4. MEASUREMENT AND PAYMENT

4.1 Method of Measurement

- a. Structural Excavation shall be measured as the number of cubic meters (m^3) of material measured in its original position after the completion of clearing and grubbing and the removal of topsoil.
- b. For the purposes of measurement and payment Structural Excavation comprises excavation in all types of material, including but not limited to any material likely to be encountered such as all clays, sands, silts, running sand, mud, rock, boulders, paved areas and old foundations with no differentiation between the materials. The pay item set out under subsection 4.2 of this Specification Section and in the Bill of Quantities for Structural Excavation cover excavation in all classes of materials. The Contractor shall allow in his unit rates for pay item 03200-01 for excavating in all types of material.
- c. For the purposes of measurement and payment Structural Excavation comprises excavation in; waterlogged ground, swamps, water, running water, rivers, streams, irrigation canals, etc.. The pay item set out under subsection 4.2 of this Specification Section and in the Bill of Quantities for Structural Excavation covers excavation in waterlogged ground, swamps, water, running water, rivers, streams, irrigation canals, etc.. The Contractor shall allow in his unit rates for pay item

- 03200-01 for keeping the excavations free from water including but not limited to the provision of cofferdams, pumping and/or any other Works or precautions necessary to enable the excavation to proceed in safety and in accordance with the Specification.
- d. The volume of Structural Excavation in all types of materials shall be calculated in accordance with specific details shown in the Drawings based on the net horizontal plan area of the foundation projected vertically up to ground level taken after the completion of clearing and grubbing and the removal of topsoil. The net horizontal plan area shall be considered to include blinding concrete where this is shown on the Drawings.
 - e. Where the Drawings require excavation in excess of the size of the structural member for the placing of granular backfill the net horizontal plan area shall be that required for the complete works as detailed on the Drawings (e.g. cast insitu box culverts).
 - f. Unless otherwise specifically approved by the Engineer or as required for the placing of granular material or blinding stone measurement for Structural Excavation shall not include any material removed from below the footing grade or from beyond the specified limits of excavation or material considered to compensate for anticipated swell or as a result of effective swell during pile driving or additional material resulting from slides, slips, cave ins, silting or filling.
 - g. The volume of granular material and blinding stone measured for payment shall be the number of cubic meters (m^3) of material completed in accordance with this specification and calculated using the nominal dimensions shown on the Drawings or as approved by the Engineer. Materials placed in excess of the requirements and dimensions given on the Drawings or as required by the Engineer shall not be measured for payment.
 - h. All granular material required as a consequence of the Contractor's method of working or due to his convenience shall be placed and compacted at the Contractor's expense.
 - i. Structural Excavation, granular backfill, backfill and blinding stone for precast pipe culverts and precast box culverts are included in; Specification Section 04100 Precast RC Pipe Culverts and Box Culverts and shall not be measured or paid for under this Specification

Section.

- j. All requirements for dealing with water flows shall be deemed included in the rates and unit prices for Structural Excavation and shall include all necessary provisions for dealing with ground water.
- k. The unit rate of the pay item for Structural Excavation shall include the costs of setting aside material for reuse, disposing surplus or unsuitable common excavation on or off Site, in accordance with the Engineer's instruction. No separate pay item will be measured or paid for this work.
- l. No allowance will be made in the quantities of retained material or disposal for bulking or shrinkage
- m. The unit rates shall not be adjusted to take cognizance of different haul distances, whether within the Site or off the Site
- n. The volume of Structural Excavation, suitable for reuse in the embankment or other parts of the Works, will be instructed by the Engineer on Site, according to the actual ground conditions encountered
- o. The Structural Excavation provisions, material requirements and construction requirements identified in this Specification Section shall be measured for payment in pay items 03200-01, 03200-04, 03200-05, 03200-06, 03200-07, and 03200-08.
- p. Any Structural Excavation Works not specifically indentified in this Specification Section but which are necessary for the performance of the Works shall be deemed to be included in pay items 03200-01, 03200-04, 03200-05, 03200-06, 03200-07, and 03200-08.
- q. Seal concrete (used in the construction of caps to the piers, under water,) is deemed to be Indirectly Paid Work. The costs of the seal concrete shall be included in the unit rates for the pay item 03200-01 of this Specification Section.

4.2 Basis of Payment

- (a) The work under this Specification Section shall be paid for in accordance with the applicable unit prices indicated in the Bill of Quantities and given below. Payment shall constitute full compensation for performing the requirements of the Contract for the item of work as specified including furnishing all necessary labor,

materials, tools, equipment, incidentals and tests.

(b) Unit prices for Structural Excavation shall include for:

Payment shall be full compensation for the work prescribed in this Specification Section including all preparation, assembly, installation, excavation, pumping, cofferdams, keeping excavations free from water, removal, ripping, blasting, haulage, multiple handling, temporary spoil heaps, placing and compaction of backfilling, reuse on Site, disposal off Site, for shaping and completion of all surfaces, works for planning and updating and for furnishing all labor, materials, tools, equipment and any incidentals to complete the work as shown on the Drawings and as required in accordance with the Specification or as required by the Engineer. The unit rates shall not be adjusted to take cognizance of different haul distances whether within the Site or off the Site.

<u>Pay Item</u>	<u>Description</u>	<u>Unit</u>
03200	Structural Excavation	
03200-01	Structural Excavation in all Materials	m ³
03200-04	Non-structural Soil Backfill (Arisen from Excavation)	m ³
03200-05	Soil Backfill (Arisen from Excavation, K95)	m ³
03200-06	Granular Backfill, Type I (K95) Borrow Material	m ³
03200-07	Granular Backfill ,Type II (K98) Borrow Material	m ³
03200-08	Blinding Stone	m ³