

## **B – EXCAVATION**

### **1.0 GENERAL**

Excavation work shall include site clearing, the removal, hauling, proper utilization or disposal of all excavated materials and the construction, shaping and finishing of all excavations and embankments over the entire extent of the Works in conformity with the Drawings and this Specification.

### **2.0 SITE CLEARING**

The Contractor shall remove and dispose off trees and bushes within the site of the Works as and wherever directed by the S.O. However, all trees and bushes within 2 metres of either side of all pipelines to be laid under the Contract shall be removed and disposed off. Site clearing shall include clearing, grubbing, demolishing, breaking up and removing all trees, shrubs, vegetation, stumps, structures such as walls, fences and other obstruction within the Site except those which have been designated to be retained. Materials suitable for disposal by burning shall be burnt at locations and on periods as approved by the S.O.

### **3.0 EXCAVATION GENERALLY**

The Contractor shall carry out all excavations in such manner and order as approved by the S.O and in whatever material as may be found. All excavated materials shall be deposited so that it will cause as little damage and inconvenience as possible.

All excavations shall be carried out to the required lengths, breadths, depths, inclinations or curvatures as may be necessary for the proper construction of the Works or as shown on the Drawings. All excavations shall be sufficient to provide for the necessary working space, shuttering and any other temporary structures required during construction. Where so directed by the S.O. the turf and top sub-soil shall be reserved and stacked separately until required for re-use in reinstatement.

Top soil shall mean the top layer of soil which can support vegetation.

Unless otherwise stated, the excavation, whether in open cut or in trench, shall be proceed in such portions at a time as the S.O. may approved and shall not in the first instance be carried down to a depth nearer than 150mm above formation level. The last 150mm of depth to formation level shall be carried out by manual labour immediately in advance of placing concrete screed, concrete or pipe laying.

The bottom of all excavations shall be carefully trimmed and leveled, well rammed and consolidated to ensure good solid foundations.

The contractor shall be responsible for keeping dry all excavations, whether in open cut or in trench, so as not to interfere with the work in progress. He shall without extra cost to SYABAS provide, form, fix, maintain and work as and where directed by the S.O. such pumps, wells, drains, bunds, and other thing necessary to effectively deal with all water which may collect or find its way into the excavations from any cause whatsoever. Nevertheless, all methods employed for dealing with

the water shall be to the approval of the S.O. Such approval shall not relieve the Contractor from his liability for any damages to the Works or adjoining land and property or water courses due to his operations.

The Contractor shall be responsible for the stability of the excavations at all times. He shall, without extra cost to SYABAS and to the approval of the S.O., slope the sides of the excavations and or provide and fix strong and sufficient timbering to support the sides and or bottom of the excavations to prevent against collapse, and shall maintain the same until, in the opinion of the S.O., the construction work is sufficiently advanced to permit the timbering to be withdrawn. Timbering shall be removed only under the personal supervision of the competent foreman.

The Contractor shall be responsible for any injury to the Works or consequential damages caused by or arising out of the removal of timbering and any advice, permission or approval given by the S.O. relating to the removal of the timbering shall not relieve the Contractor from his responsibility under the Contract.

The Contractor shall carry out any diversion and subsequent restoration of such existing river, water-courses, land springs, ditches etc. wherever encountered during the execution of the Works, whether shown on the Drawings or not.

## **4.0 EXCAVATION FOR PIPE TRENCHES**

Before commencing the excavation of pipe trenches, the routes of the pipelines shall be pegged out accurately. Strong sight rails shall be fixed and maintained at each change of gradient, and at as many intermediate points as may be necessary but not exceeding 100 metres apart. On these rails shall be marked the centre line and level to which the pipes are to be laid, and such rails shall be maintained in position and at the correct level from the time the excavation commences until backfilling is completed. The run of pipe trenches opened up ahead of pipe-laying operations at any one time shall not be more than:-

- 100 metres if the pipe-laying operations are in an urban area,
- 300 metres if the pipe-laying operations are in the side-tables of a trunk road, or
- 600 metres if the pipe-laying operations are in unoccupied land schemes or housing estates under development or are in the side-tables of minor rural roads.

The S.O. may, at his absolute discretion, vary the distances stated above if he considers that traffic, road or weather conditions or road side-table limitations warrant the variation.

Unless the S.O. permits otherwise, the trenches shall be excavated to the widths given in Table B1 below.

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**TABLE B1 – Widths of Pipe Trenches.**

<b>External Pipe Diameter, D (mm)</b>	<b>Width of Trench (mm)</b>
Not exceeding 460	D + 450
Exceeding 460	D + 600* or 900*

\*600 for pipe 500mm – 750mm

\*900 for pipe > 750mm

Where pipes are to be laid on a concrete bed, the width of the excavation at the bottom of the trench shall be the width of the underside of the concrete bed. At all joints the trench shall be so excavated as to give a working space of not less than 300mm all round the joint. Where bends are made by deflecting pipes at joints the trench shall be widen to permit this operation. The sides of the trench shall be cut vertical, and where necessary, shall be protected against caving in by timbering to the approval of the S.O.

The trench shall be excavated to the depths intended or shown in the Drawings and shall be finished and trimmed accurately to level and grade.

Where no invert levels are shown or indicated the bottom of the trench shall be graded so that the pipe invert slopes evenly between the adjacent invert levels.

Should the ground be so wet or soft that, in the opinion of the S.O. it does not from a firm base for the pipe, or should rock be encountered at the bottom of the trench, the trench shall be excavated 250mm below the level intended or shown in the Drawings and then brought back to the correct level with good selected earth or

sand well rammed into place. Such deepening of pipe trench and filling back shall be treated as a variation under the terms of the Contract. Should the bottom of the trench be inadvertently excavated below the specified level, it shall be bought back, at the Contractor's expense, to the correct level with good selected earth or sand carefully rammed into place.

## **5.0 ROCK EXCAVATION**

Rock shall mean those geological strata of hard material which necessitate the use of blasting or approved pneumatic tools for their removal. Solid boulders found in trench excavation and foundation pits shall be considered as rock if such boulder is of size each exceeding 0.08 cubic metre or each exceeding 0.17 cubic metre if occurring in general excavations.

Shale and clay boulders shall not be classified as rock. The S.O.'s decision as to whether or not the material of the excavation is to be classified as rock shall be final.

Notwithstanding the above, rock shall not include materials which in the judgment of the S.O. can be loosened with a tractor mounted and drawn ripper of the following description:

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The Contractor shall be entitled to extra payment for rock excavation only if reasonable notice is given to the S.O. to examine and measure such material prior to breaking up. The volume of rock excavated shall be taken as its volume in-situ before it is broken up.

## 6.0 USE OF EXPLOSIVES

The Contractor shall not use any explosives without the written approval of the S.O. In the event where the approval for the use of explosives cannot be given or where an existing approval is withdrawn by the S.O. due to whatever reason the Contractor shall carry out the Works using other means approved by the S.O.

Where written approval is given by the S.O. for the use of explosives, the Contractor shall comply strictly with all rules and regulations laid out by the relevant authorities pertaining to the use of these explosives and shall be solely responsible for procuring any permit required from the relevant authorities for the use of explosives.

The greatest care shall be taken by the Contractor during all blasting operations is to ensure that no injury be done to persons or damage to property or finished work. All blasting shall be performed at the entire risk and responsibility of the Contractor.

## 7.0 WEATHERED ROCK EXCAVATION

Weathered rock shall mean those geological strata of hard material, which necessitate the use of tractor mounted and drawn ripper as specified below:-

- Tractor Unit : Plant with a minimum weight of 20 tonnes and net horsepower rating of 200 h.p. The tractor unit is to be in good condition and operated by experienced personnel skilled in the operation of ripping equipment.
- Ripper Unit : The ripper to be attached to the tractor shall be the most efficient parallelogram type recommended by the tractor or ripper manufacturer. The ripper shall have shanks in good condition with sharpened cutting point.

to loosen the material sufficiently to permit a bulldozer to remove the material. Weathered rock shall be residual rock altered by physical and chemical processes to the extent that it is decomposed or disintegrated or fractured or loosely laminated or jointed, but retains sufficient strength to necessitate ripping.

The Contractor shall give reasonable notice to the S.O. to examine any weathered rock prior to breaking up and to allow the S.O. to measure the extent and depth before further excavation.

The S.O.'s decision as to whether or not the materials of the excavation is classified as weathered rock shall be final.

## 8.0 UNAUTHORIZED EXCESSIVE EXCAVATION

Unless otherwise directed or approved by the S.O., if any excavation including rock excavation is carried beyond the limits on or against which permanent work is to be

supported in accordance with the Drawings, the Contractor shall at his own expense be required to fill the excess excavation with Grade 20 mix concrete or other suitable materials acceptable to the S.O.

## **9.0 ADDITIONAL EXCAVATION ORDERED BY THE S.O.**

If after excavating the sites on which the various parts of the Works are to be constructed, it is found that any part of the formation is unsuitable to provide a satisfactory foundation, such portion shall be further excavated to such depths as the S.O. may direct and refilled to the correct formation level with Grade 20 concrete or other selected materials acceptable to the S.O. Such extra excavation and refilling shall be treated as a variation under the terms of the Contract.

## **10.0 TIMBER LEFT IN EXCAVATION**

If, in the opinion of the S.O., it is necessary to leave in position any timbering, the Contractor shall be paid at the rate stated in the Bill of Quantities provided that, in the opinion of the S.O., the necessity of leaving the timbering has not arisen from carelessness or negligence on the part of the Contractor.

## **11.0 EXCAVATION IN ROADS**

No trench is to be excavated in the carriageway unless specific approval has been given by JKR Road Section or the local authority. The whole operation of excavation and reinstatement of the trench shall be completed as quickly as possible. The Contractor shall ensure that minimum interference to traffic flow is maintained at all times.

A joint site inspection shall be arranged by the Contractor before commencement of work if so requested by JKR Road Section or the local authority. After pegging out, the Contractor shall inform the local JKR office or the local authority and the police of the actual date of commencement at least one week in advance of and on the day of commencement.

If specific approval has been given to lay services across the road by open excavation, the required width specified by JKR or local authorities and to ensure that the top edges of the excavation are neat and straight.

All materials from the excavation, if accepted for backfilling shall be neatly stacked outside the carriageway. Where there is no place to stack the excavated materials outside the carriageway, all excavated materials shall be removed from the work site immediately after excavation.

Where specific approval has been given by JKR for half width construction, the traffic lines may be reduced to not less than 4.0 metres wide and where necessary, the shoulder should be strengthened by the Contractor to accommodate traffic load to the satisfaction of the S.O. and at the Contractor's cost.

Trenches shall be provided with adequate shuttering, walling and struts to prevent the adjoining road pavement from cracking and subsiding.

If a road diversion is required, the Contractor shall build it to the specifications of JKR Road Section or the appropriate local authority. It shall be maintained in good motorable condition until the reinstatement is completed.

Carriageway excavation across important and busy road and junctions shall be carried out during off-peak hours e.g. Saturday afternoons, Sunday or at night. The S.O. will specify the appropriate times based on the merits of each case and such conditions shall be strictly adhered to by the Contractor.

## **12.0 CROSSING WATER-COURSES ETC.**

Where the pipeline crosses underneath streams, culverts and other water-courses, the Contractor shall be deemed to have allowed for all additional measures necessary for the proper construction of the pipeline especially maintaining the flow of water.

## **13.0 INSPECTION**

Until the S.O. has inspected and approved the excavation, no concrete shall be placed and no pipes shall be laid upon the surface prepared by excavation. Any work built on foundations which have not been approved by the S.O., shall on the order of the S.O., be uncovered or removed by the Contractor and the foundations reinstated all at the Contractor's own expense.

## **14.0 BACKFILLING OF EXCAVATIONS OTHER THAN PIPE TRENCHES**

Backfilling of all excavations shall not be carried out until the works therein have been inspected and approved by the S.O. In backfilling excavations other than pipe trench excavations, approved portions of the excavated materials shall be employed. Where required, approved materials shall be brought to site for backfilling works. The materials shall be deposited and spread in layers of not more than 300 mm deep, and each layer shall be thoroughly rammed by a mechanical vibrating tamper or smooth wheel roller and watered if required.

If so directed by the S.O., the backfilling shall be finished off slightly proud of the surrounding ground to allow for settlement, but the contractor shall make good any settlement, which may occur during the construction of the works and during the Defects Liability Period of the Contract at his own expense.

## **15.0 BACKFILLING OF PIPE TRENCHES**

After the pipe laying has been approved by the S.O. and before the pipelines are tested, only sufficient backfilling of the trenches to prevent "snaking " and to maintain the pipes in position will be permitted, but all joints shall be left exposed. However, in the case of uPVC pipes, complete backfilling is required before testing. In low lying ground or any other locality where the trench may be filled with water and cause floatation of the pipes, or elsewhere as may be decided by the S.O. , the backfilling shall follow the pipe laying as closely as possible.

In backfilling pipe trenches, only approved materials free from stones or rocks or other hard materials shall be carefully spread along the trench bottom between the pipes and the trench walls to a depth of about 150 mm and shall be hand rammed.

Further layers each of about 150 mm thick of the same materials shall then be spread and rammed in the same manner up to the top of the pipes. The remainder of the backfilling may consist of coarse materials free from boulders and large earth clods. It shall be placed in layers each of 150mm thickness and hand or mechanically rammed until the backfill is 300mm above the top of the pipes. The rest of the trench backfill shall be in layers each of 300mm thickness and compacted by a mechanical vibrating tamper to finish off slightly proud of the surrounding ground. The degree of compaction of each layer shall not be less than 95 percent of the dry density obtainable using the BS Standard Compaction Test. The Contractor shall have to make good any settlement to avoid formation of drains at gulleys within the refilled trenches.

## **16.0 APPROVED FILL MATERIAL**

Approved fill material to be used as backfill to the top of the pipes shall be uniform low plasticity granular material. The material shall be free from all organic or other materials subject to decay. Highly plastic or expansive soils or clay shall not be used. The filling material shall be readily compactable to its maximum density and must not form mud, or otherwise breakdown when wet.

Should the material being placed as fill or backfill while acceptable at the time of section, become unacceptable to the S.O. or his representatives due to exposure to weather conditions or due to flooding or have become puddled, soft or segregated during the process of the works, the Contractor shall, at his own expense, removed such damaged, softened or segregated material and replaced it with fresh approved material.

Where the pipeline crosses a road, approved sand shall be used as fill material up to the road formation level.

## **17.0 ROAD REINSTATEMENT**

Road reinstatement works shall be carried out by the Contractor to a standard equivalent or superior to the road condition existing prior to excavation and to the approval of the S.O.

All backfilling shall be done by the Contractor with approved sand. No organic soil, broken pre-mix or stones are to be used. The sand shall be compacted 150mm layers. The degree of compaction of each layer below the pavement course shall not be less than 95 percent of the dry density obtainable using the BS Heavy Compaction Test. The Contractor shall bear the cost of such tests and shall make good any works which are found to be unsatisfactory.

Sand material shall be deposited in layers on both sides of the pipe simultaneously and thoroughly compacted and around the pipe working alternately on either side of the pipe until the trench have been filled up to 150m above the top of the pipe except for pipes laid in roads where the sand backfill shall be brought up to the base

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course formation level. The sand vibrator and/or by an approved system of water jet. The topping of the refilling for trench excavation as described above the backfill with excavated material.

Where necessary the Contractor shall adjust the moisture content of the refill material either by drying out or by adding water to assist the compaction of the material.

The Contractor shall reinstate the road pavement by replacing, in the proper sequence, any block or metalling removed, provided the block or metalling is in good condition and to the approval of the S.O. The road surface shall be reinstated with new materials of the type existing on site. Edges of the reinstated road pavement shall be straight and neatly finished to match the existing road to the satisfaction of the S.O.

For pipe trenches the Contractor shall be as required by the authorities or as follows:-

- Along major roads – Immediately after backfilling,
- Along minor roads – within 3 days after backfilling,
- Cross trench – within 24 hours after backfilling,
- Pilot pits – immediately after backfilling.

If the Contractor fails to carry out the reinstatement to the satisfaction of the S.O. or any further reinstatement that may be necessary of any trenches across roads and footpaths, the S.O. or the appropriate authority may proceed with such repairs and the cost of such reinstatement shall be deducted by the S.O. from any payments due or to become due to the Contractor.

## **18.0 REMOVAL OF SURPLUS**

The contractor shall dispose off all surplus excavated materials, earth, rubbish and waste matters to an approved tip to be provided by him unless otherwise directed by the S.O. If surplus spoil is tipped into or fill materials obtained from private property, the operations shall be executed with the approval of the owner and occupier of the same. The Contractor shall have no right of ownership to the surplus materials excavated.

## **19.0 EMBANKMENTS**

Embankments and filled areas shall be made by depositing approved soil in regular layers not more than 300 mm in loose thickness. Each layer shall be well compacted with approved mechanical rammers or rollers before the next layer is placed. Compaction shall continue until the soil is at a density not less than that of any adjacent cuttings in the in – situ state. All practical steps shall be taken to avoid the inclusion of excess water in the fill and the finished surface of each layer shall be sufficiently even to prevent the ponding of rain water in ruts and hollows. The S.O. may direct the filling to stop in inclement weather. In dry weather effective consolidation shall be assisted by watering. If the soil of the fill or the previous layer of compacted soil is too moist for further effective compaction, compaction shall be deferred until in the opinion of the S.O., it has dried sufficiently. The Contractor

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shall disk harrow the soil to aid the drying if so directed by the S.O. The fill materials shall be obtained from the surplus excavated materials at the site of the works or from approved borrow pits.

## 20.0 SOILING AND TURFING

The exposed surfaces of all embankments and cuttings as well as flat areas where directed by the S.O. shall be properly graded and covered with top soil at least 80 mm in depth before turfing. The surface shall be loosen by raking before placing of top soil. Turf shall be freshly cut, approved runner grass. For spot turfing, the slabs of grass shall not be smaller than 200 mm square and shall be set at 300 mm centres. Turf shall be firmly bedded or pegged into the earth surface to ensure satisfactory rooting.

The Contractor shall water and maintain the turf in good condition until all areas to be grassed are substantially covered with healthy, well established, firmly rooted grass and planted areas shall be free from erosion channels. All bare areas shall be made good at the Contractor 's own expense.

## 21.0 LEVELS TO BE RECORDED

Before the surface of any part of the site is disturbed or the commencement of each stage of filling the Contractor shall take and record levels of any such part, in the manner specified or as agreed with the S.O. in his presence and such levels when agreed with him shall form the basis for measurement.

The Contractor shall obtain the S.O.'s prior approval to the proposed methods of obtaining and recording this information and shall afford the S.O. all facilities to attend and check each survey and recording. The Contractor shall give to the S.O. notice of his intention to carry out such survey work at least 24 hours in advance of the commencement of the survey. The Contractor shall carry out to the S.O.'s instructions, all extra surveys required to resolve any doubts which may arise as to the correctness of any survey or record and the S.O.'s decision shall be final regarding what shall be recorded as the correct survey.

A similar procedure shall be adopted to record any rock surface limits and levels before they are blasted or excavated.

Each survey drawing with agreed data shall be referred to as a "Record Survey" which shall be signed by the Contractor and the S.O. and shall form the basis of measurement of the appropriate work. The Contractor shall supply four copies of each Record Survey to the S.O.

## 22.0 CARE OF EXISTING SERVICES

Information relating to the positions of all existing mains, cables, culverts, pipes, drains or services of any kind shall be ascertained by the Contractor. Notwithstanding any information which may be furnished by the authorities or the S.O., the Contractor shall be responsible for ascertaining from his own inspections

of the site and from the respective supply authorities and other public authorities the positions of all mains, pipes and cables whether underground or overhead, within

or near the site. Where services are shown on the drawings or where there is evidence of services in the ground, the Contractor shall also determine their exact positions. In addition the Contractor shall watch for and determine the position of any services which may not have been marked.

Where Trench Excavation is carried out close to or across the line of sewers, pipes, cables and other services the Contractor shall provide temporary adequate supports to secure the services and where such sewer, pipe, cable or other service is temporarily displaced or disturbed it shall be restored to its original state. If restoration or any service to its original state cannot be achieved then it shall be

replaced and made good. The cost of excavating around any service which crosses the trench and of temporarily supporting it while pipelaying is undertaken, shall be deemed to be included in the rates for excavation.

All damage to services shall be made good to the satisfaction of the S.O. and the authorities concerned. The cost of making good any damage shall be deemed to be included in the rates for excavation. In the event that any damaged services shall only be repaired by the authority concerned, all costs whatsoever relating to the repairing of the damaged service undertaken by the authority shall be at the Contractor's expense. Where damage to a service had already existed prior to excavation or other work, repair of the damaged service shall be undertaken by the Contractor, if so ordered by the S.O. and the Contractor shall be paid on Daywork for repairing such service.

Where in the opinion of the S.O., construction of the pipeline cannot reasonably be carried out unless the sewer, pipe, cable or other service is permanently severed or permanently diverted or permanently supported the Contractor shall undertake such work is so ordered by the S.O. Any such work if carried out shall be to the satisfaction of the S.O. and of the authority concerned and shall be paid for at Daywork where necessary and at the appropriate Contract Rates.

Where pipes are laid under culverts they shall, subject to other provisions in the Contract and to the S.O.'s instructions, be given a concrete surround extending for 600mm clear on each side of the culvert, and a concrete half haunch to the culvert shall be provided over the width of the trench cast directly on top of the concrete surround. The cost of all work in removing any piles and concrete bend under culverts and of temporarily supporting the culvert during pipelaying shall be deemed to be covered by the rates for the items in the Bills of Quantities for pipe crossing under culverts.

## **23.0 HEDGES, FENCES AND WALLS**

Where the Trench Excavation passes under barrier such as hedges, fences and walls the Contractor shall, as a temporary measure during construction of the pipeline, provide temporary fencing for any parts of such barriers as have had to be removed.

After trenches have been refilled and surfaces reinstated, the Contractor shall carry out work as the S.O. may order for permanent restoration of such barriers. In the case of a hedge the section removed shall be replaced by new plants of the appropriate variety and where ordered by the S.O. the plants shall be protected from livestock on both sides by an adequate post and barbed wire fenced. During

the Defects Liability Period all hedges replanted in the above manner shall be inspected and any dead plant replaced by the Contractor.

#### **24.0 MACKINTOSH PROBES**

The apparatus used shall be the standard JKR probes or the normal Mackintosh probes.

Probing shall stop when the resistance has reached 400 blows/0.30m penetration or the depth has reached 15 metres, whichever is reached earlier, unless directed otherwise by the S.O.'s representative.

Mackintosh probes shall be measured by the penetration depth in to the ground.

#### **25.0 UTILITY SURVEYING AND MAPPING**

The Contractor shall carry out utility surveying and mapping as required by the authorities and also part of the contractor's duty to locate buried utilities and structures at the work area. The survey and mapping work shall determine locations of underground utilities and shall present the information on drawing to S.O. for approval.

Surveying technique shall be:-

- The Pulse Ekko System or
- The Radio Detection Method

The following information shall be made available to the S.O. for each area:

- A plan showing all the utilities's provision
- Depth, type and size of utilities below ground
- Manhole or opening position
- Other relevant and useful information

The service shall cover all costs associated with sourcing of information from utilities or relevant parties, prospecting, trenching, field works and plotting works.

#### **26.0 MEASUREMENT OF GENERAL EXCAVATION**

Items in the Bill of Quantities for General Excavation except where expressly indicated otherwise, shall apply to excavation whether Bulk or Incidental Excavation in any material and shall include not only for all work in connection with excavation but also for disposing of the excavated material on the Site as backfill or to permanent spoil tips or to embankments or backfilling as specified or off the Site to the Contractor's disposal tips and any necessary double handling. No separate payment shall be made in respect of forming spoil tips as indicated in the Drawings or at designated areas as directed by the S.O. on site.

Items for "Excavation in Rock" measured extra over General Excavation Items, shall include for any allowance the Contractor considers necessary to cover overbreak and the making good thereof.

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All work in connection with excavation and subsequent disposal of excavated material as specified shall be valued by measurement of such items as are set forth in the Bills of Quantities for "excavation" and, where appropriate, of the further extra over items for Rock. All such measurements unless otherwise specified shall be excavated to the specified levels and limits described herein or shown on the Drawings, no allowance being made for bulking. No separate measurement shall be made in respect of Excess Excavation or the backfilling thereof.

Incidental Excavation for removal of unsuitable material shall (unless it is held to be Excess Excavation) be measured as the volume ordered by the S.O. to be excavated beyond the nominal dimensions of general excavation and shall include for the disposal of the excavated material off the Site and for refilling the excavation with approved material emanating from excavation elsewhere.

Quantities against items in the Bill of Quantities are based on ground levels obtained from survey data. Existing ground levels shall be determined from joint surveys carried out by the Contractor at the present of the S.O. at the commencement of construction.

Excess Excavation and the backfilling shall not be measured for payment.

## **27.0 MEASUREMENT OF TRENCH EXCAVATION**

Items for Trench Excavation shall apply to excavation in any material and shall include not only for all work in connection with excavation but also for refilling of trenches spreading and compacting excavated material over pipeline reserve as directed and for disposal of surplus material, for temporary fencing and, in fields, for the stripping and subsequent reinstatement of the top surface all as specified.

Trench Excavation shall be measured by length along the centre line of the pipeline at the various depths stated in the Bill of Quantities and the Contractor shall be deemed to have made his own assessment (subject to any specific requirements of the Contractor) of the widths of Trench Excavations necessary for the proper construction of the works including all allowances to provide support for the excavations, to accommodate joints and bends in the pipeline and to provide working space. The length of Trench Excavation shall be measured through and including any space occupied by manholes, chambers, thrust blocks and the like. No extra payment shall be made for trenches which are curved in plan or elevation.

The depth of Trench Excavation for pipes shall be measured normal to the profile of the ground along the centre line of the trench from the original ground level of where appropriate from the ground level remaining after the completion of any general excavation down to the specified invert level of the pipe plus the thickness of the pipe barrel and plus, where appropriate, the specified thickness of bedding for the pipe.

The sides of Trench Excavation shall be deemed to be vertical in all materials and the nominal widths defined in Clause 4 shall apply to any depth of trench and whether or not bedding or surround to the pipe is specified.

Trench Excavation and all work in connection therewith as specified shall be valued by the measurement only of such items as are set forth in the Bill of Quantities,

except where expressly provided for otherwise by the inclusion in the Bill of Quantities of any of the following further items :-

**Incidental Excavation for Structures** situated in the pipeline shall be measured only to the extent that the net excavation required to accommodate the structures falls outside the nominal dimensions of the Trench Excavation.

**Incidental Excavation for removal of unsuitable material** shall (unless it is held to be excess Excavation) be measured as the volume ordered by the S.O. to be excavated beyond the nominal dimensions of Trench Excavation and shall include for the disposal of the excavated material off the site and for backfilling the excavation with approved material emanating from Trench Excavation elsewhere or for backfilling the excavation with the grades of concrete ordered by the S.O.

**Rock**, measured E.O. Trench Excavation items, shall be measured as the volume of Rock within the nominal limits of Trench Excavation in Rock. When measured E.O. Incidental Excavation items it shall be measured as for those items.

**Excess Excavation** and the backfilling thereof shall not be measured for payment. Trench Excavations in roads and in footpaths as specified shall be measured (E.O. Trench Excavation) as the area calculated by multiplying the length of trench so excavated by its nominal width. The stripping of the top surface and the surface reinstatement of Trench Excavation in road verges, fields, etc. shall be included in Trench Excavation and shall not be separately measured.

**Crossing hedges, fences and walls** shall include for all temporary measures for dealing with such barriers as specified and shall be measured as the length of such barriers so dealt with within the nominal width of Trench Excavation. Any permanent measures required by the S.O. shall be ordered by him as additional work.

Crossing rivers culverts and other watercourses shall include for all additional measures necessary to make the crossings as specified. Only such crossings as may be itemised in the Bill of Quantities will be measured (E.O. Trench Excavation) for additional payment. The length of measured for payment for crossing natural watercourses shall be defined as the width of the waterway along the pipeline at the time of construction of the crossing (except flash floods and floods).

**Overhaul of refill or excavated materials** (E.O. Trench Excavation or Excavation in borrow areas) shall apply in cases where the S.O. orders material to be transported from locations of excavation which are more than five thousand metres from the areas to be filled.

## 28.0 MEASUREMENT OF FILLING

Items in the Bill of Quantities for filling shall include not only work in connection with working and supplying of fill materials, within or outside the site transporting, placing, spreading, watering, drying, compacting and grading approved fill materials but also field tests, supervision, disposing of reject material and condemned material at spoil tips on or off the site and construction and maintenance of necessary access roads, bridges and drainages.

Fill material shall be measured as the volume placed after filling has completed. Joint measurement of fill levels shall be taken once the required level has reached. No allowance shall be made in the measurement for filling for settlement during construction.

The Contractor shall be deemed to have made due allowance for any delays to filling occasioned by sampling and testing materials from fill and borrow areas as specified by the installation and testing of measuring instruments for fill.

The earthworks and all work in connection therewith as specified shall be valued by the measurement of only such items as are set forth in the Bill of Quantities. No separate measurement for payment shall be made in respect of any part of this work unless separate items are expressly provided for in the Bill of Quantities.

Excavation of reject material in borrow areas shall be measured as the volume lying between the surface recorded after stripping topsoil but before excavation of unsuitable material starts, and the surface recorded before excavation of suitable material starts.

If the Contractor excavates unsuitable material from the ground surface with the intention of later using the underlying material as a borrow area, and then does not work the area as a borrow area to the extent required by the S.O., then such excavation of unsuitable materials shall not be measured for payment.

## **29.0 PAYMENT FOR TRENCH EXCAVATION AND RESTORATION**

Payment for trench excavation shall be made in two stages, as follows :-

- (a) 75% of the total amount due will be paid on completion of pipe-laying.
- (b) The remaining 25% for any length, will be due on completion of restoration of the final surface, including reinstatement of all surface damage, completion of chambers, thrust blocks, etc.

Payment for the second stage shall be due only after restoration of any length has been inspected and approved by the S.O. and by any relevant authority. Payment for the separate items in roads, footpaths, etc. will be made at the same time as the second stage payment for excavation.

## **30.0 MEASUREMENT OF TOP SOILING AND TURFING**

Items where included in the Bill of Quantities for spreading topsoil shall include for obtaining topsoil from spoil tips on the site, hauling and spreading all as specified.

The rate shall include spreading a layer of fertilizer with N : P : K of 10 :15 :10% prior to turfing.

Items where included for turfing shall include for all work in connection with turfing as specified, and for cutting and trimming and weeding at least once a month until the end of the Defects Liability Defects.

# SYABAS' STANDARD SPECIFICATION FOR PIPE LAYING WOKS

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Topsoil shall be measured as the areas so treated, and except where expressly indicated otherwise items shall apply to sloping as well as to horizontal surfaces.

Topsoil and turfing of re-filled trenches shall be included in items for Trench Excavation and shall not be separately measured for payment.

## **31.0 PAYMENT FOR TURFING**

Payment for continuous turfing shall be the area covered by the turves provided. Where spot turfing is required the distance between the centre lines of divots in the form of a triangular pattern shall not exceed 500 mm and the percentage of the area covered shall be agreed and payment made on the total area spot turfed multiplied by the percentage.

Turfing will be paid for in two parts :-

- (a) at fifty percent of the Contract Rate when the turfing has been carried out;
- (b) at fifty percent of the Contract Rate at the issuance of the Certificate of Practical Completion when the S.O. is satisfied that the grass has established itself.

Where grass fails to establish itself, the Contractor shall turf the relevant area again at no extra cost to the S.O.

## **32.0 PAYMENT OF FEES TO AUTHORITIES**

The Contractor shall pay to all Authorities or developers all deposits, fees and charges required to be paid in relation to the execution of the works or to any temporary works.

If after due notice to the Contractor calling his attention to the necessity for the payment of fees and/or charges to the Authorities the Contractor has failed to make payment, the S.O shall be entitled to pay such fees and/or charges direct to the Authorities concerned out of any moneys at any time due to the Contractor under the contract and such payment shall be deemed to be payment made to the Contractor under and by virtue of the Contract.

The cost of all fees and charges payable by the Contractor shall be deemed to be included in the Contract Rates unless otherwise expressly provided for in the Bill of Quantities.