

## 1.0 GENERAL

### 1.1 MEASUREMENT SYSTEM

- .1 This section specifies the measurement rules that will generally be used for payment purposes unless otherwise specified in the Contract Documents. In case of conflict between the method of measurement specified in this section and the requirements specified in Section 01280 – Measurement Schedule, the latter will govern.
- .2 Work will be measured in the International System of Units (SI) in accordance with CAN/CSA-Z234.1-89 Canadian Metric Practice Guide.
- .3 When used in the Contract, the following abbreviations and symbols have the meaning assigned to them.

<b>Abbreviation/Symbol</b>	<b>Meaning</b>
µm.....	micrometre or micron
mm.....	millimetre
m.....	metre
mm <sup>2</sup> or mm2.....	square millimetre
m <sup>2</sup> or m2.....	square metre
ha.....	hectare
kPa.....	kilopascal
MPa.....	megapascal
m <sup>3</sup> or m3.....	cubic metre
l (or where clarity is needed L).....	litre
L.S.....	lump sum
g.....	gram
kg.....	kilogram
N.....	newton
kN.....	kilonewton
t.....	tonne
no.....	number (quantity)
min.....	minute (time)
h.....	hour
d.....	day
wk.....	week
%.....	percent
>.....	greater than
≥.....	greater than or equal to
<.....	less than
≤.....	less than or equal to
\$.....	Canadian dollars
°.....	degree (angle)
°C.....	degree Celsius

**1.2 METHOD OF MEASUREMENT**

.1 Unless otherwise indicated in the Contract Documents:

- .1 earthwork materials will be measured net in place after compaction, with no allowance for bulking, shrinkage, compression, foundation settlement, or waste;
- .2 products will be measured net, with no allowance for waste;
- .3 dimensions used in calculating quantities will be rounded to the nearest unit of dimension as follows:

<b>Quantity</b>	<b>Dimension</b>
[Volume of earth.....	centimetre
Volume of concrete.....	millimetre
Length of pipe.....	centimetre
Area of land.....	decimetre
[.....	]

- .4 the survey [station line] [station grid] system adopted will be at [10] [15] [20] [30] [100] linear metres spacing for measuring [ ], respectively;
  - .5 contours may be based on aerial photograph interpretation and are approximate only. Actual ground elevations and location co-ordinates will be determined in the field during the course of the Work for measurement purposes; and
  - .6 measurement and payment will not be made for work carried out beyond measurement and payment lines and limits specified in the Contract Documents.
- .2 When boundaries between different items of Work are not specified in the Contract Documents, such boundaries will be established by the Minister.
- .3 Mass:
- .1 Mass will be measured by weigh scale or by estimated or theoretical mass taken from reference documents, as specified.
  - .2 Mass will be measured to 3 decimal places.

- .4 Length:
  - .1 Length will be measured at the item centreline or mean chord.
  - .2 Items to be measured by linear dimension will be measured [parallel] [horizontal] to the base or foundation upon which such items are placed.
  - .3 Items to be measured by station will be measured horizontal to the base or foundation upon which such items are placed.
  - .4 Centre line for pipes, ducts, culverts, and similar items will be the line equidistant between inside faces of pipe walls.
- .5 Area:
  - .1 For rectangular and regular shaped objects, area will be measured using mean length and width or radius.
  - .2 For irregular objects, area will be measured by the sum of squares, triangles, and circles, etc., as selected by the Minister.
- .6 Volume:
  - .1 Unless otherwise indicated, volume will be measured using mean length, width, and height or thickness.
  - .2 Excavation and fill volumes will be computed using [the average end area method] [the prism method] [survey data input to [EMXS] software program].
- .7 Time:
  - .1 Construction Equipment to be paid for on a time basis will be measured in hours of actual working time, and necessary travelling time, when under its own power to the nearest tenth thereof.
  - .2 Hauling equipment to be paid for on a time basis will be measured in hours of actual working time to the nearest tenth thereof.
- .8 Number of items will be measured on a per item basis.
- .9 Lump Sum items will not be measured for payment.
- .10 When standard manufactured items are identified by their physical characteristics, such characteristics will be considered as nominal. Unless more stringently controlled by specified tolerances, manufacturing tolerances established by the industry involved will be accepted.
- .11 Overhaul:
  - .1 Haul Distance will be the shortest distance, calculated as the difference between stations along the design centreline of the canal, between the centre of volume of the material in-place before excavation and the centre of volume of this material at its final point of deposition.
  - .2 Overhaul Distance means the Haul Distance minus the specified Freehaul Distance.

- .3 The Haul Distance is not the actual distance along the haul route used by the Contractor. The actual haul distance used by the Contractor will not be measured for payment.
- .12 Borrow Overhaul:
  - .1 Borrow Haul Distance will be the calculated by adding the shortest perpendicular distance between the centre of volume of the material in-place before Borrow Excavation and the intersection point with the design centreline of the canal and the shortest distance between the intersection point and the centre of volume of this material at its final point of deposition, calculated as the difference between stations along the design centreline of the canal.
  - .2 Borrow Overhaul Distance means the Borrow Haul Distance minus the specified Freehaul Distance.
  - .3 The Borrow Haul Distance is not the actual distance along the haul route used by the Contractor. The actual haul distance used by the Contractor will not be measured for payment.

### **1.3 MEASUREMENT COMPUTATION**

- .1 Formulae and computer programs used for measurement computation will be as specified or, when not specified, as selected by the Minister.

### **1.4 MEASUREMENT OF WORK**

- .1 Unless otherwise specified, the Minister will measure the Work for the purpose of determining payment to the Contractor.
- .2 The Minister will request the Contractor to attend with the Minister in making measurements.
- .3 If the Contractor does not attend pursuant to clause 1.4.2, measurements made or approved by the Minister will be considered to be the correct measurement for such part of the Work.
- .4 The Minister will prepare survey records and drawings for payment purposes as the Work progresses. The Minister will request the Contractor to attend, within 14 days, to examine and verify such records and drawings. If the Contractor does not attend to examine and verify such records and drawings, they will be considered to be correct.
- .5 If, after attending pursuant to clause 1.4.2 or 1.4.4, the Contractor disagrees with such measurements or records or drawings, they will nevertheless be considered correct until the Contractor notifies the Minister of the aspects in which they are considered incorrect. On receipt of such notice, the Minister will review the measurements or records or drawings and either confirm or vary them.

### **1.5 QUANTITIES**

- .1 Unless otherwise indicated, quantities specified in the Schedule of Prices for Unit Price Work are estimated quantities and will not be considered as actual quantities of Work to be performed. Subject to the Contract terms, unit prices stated in the Schedule of Prices will be applied to actual quantities of Work performed as measured in accordance with the Contract Documents.

- .2 When it is stated that the Contractor will be paid only for the quantity specified for an item of Work, such quantity will be considered as a fixed quantity and the Contractor will be paid for the quantity specified, regardless of the actual quantity performed. If a change in the Work directed by the Minister results in a change in a fixed quantity, the quantity will be adjusted in accordance with the Contract Documents and payment will be made for the adjusted quantity.

## **1.6 SCALES**

- .1 Unless otherwise indicated, provide weigh scales, certified by Industry Canada, for measurement purposes.
- .2 Provide scales that are accurate to within 0.5% of correct mass throughout the range of use. Spring balances will not be permitted.
- .3 Prior to use and at anytime requested by the Minister, provide the services of a qualified independent person, acceptable to the Minister, for the testing and servicing of weigh scales. Perform baseline tests and record results. Service and adjust weigh scales to meet requirements of Industry Canada and the Contract Documents. Submit a final report of weigh scale tests, services, and adjustments.
- .4 Scales indicating more than true mass will not be permitted to operate and material measured subsequent to the last previous correct accuracy test will be reduced by the percentage of error in excess of 0.5%.
- .5 Scales indicating less than true mass will be adjusted and no additional payment will be made for materials previously scaled and recorded.

## **1.7 SCHEDULE OF PRICES**

- .1 The Schedule of Prices is divided into items for purposes of measurement and payment of Work. Price each item in accordance with the methods of measurement specified in the Contract.
- .2 Item names in the Schedule of Prices identify the work covered by the respective item, but do not define the size or nature of the unit.
- .3 Read item names in the Schedule of Prices as part of the item scope, measurement, and payment requirements to which they apply in the Measurement Schedule.
- .4 For each price specified in the Schedule of Prices include all costs and charges required to perform the Work including overhead charges and profit, and all costs of all related Work for which payment is not specified elsewhere.
- .5 Subject to the provisions of the Contract Documents, the total amount of the Schedule of Prices shall cover all of the Contractor's obligations under the Contract and all matters and things necessary for performance of the Work in accordance with the Contract Documents.
- .6 Payment will be made only for items specified in the Schedule of Prices. Costs and charges not directly provided for in the Schedule of Prices will be deemed to be included therein.
- .7 Work or material included in any one item will not also be measured for payment under another item. No item will be paid for more than once.

- .8 Omissions or errors in any item including quantities in the Schedule of Prices will not invalidate the Contract nor release the Contractor from any of his obligations or liabilities under the Contract.

**1.8 LUMP SUM ITEMS**

.1 Breakdown of Lump Sum Items

.1 If requested, submit to the Minister a breakdown of each Lump Sum item included in the Schedule of Prices, within 21 days after the commencement date of the Contract.

.2 Provide sufficient details as may be required by the Minister to identify the principal components of the Work and to permit ready valuation of Work performed.

.2 Lump Sum Items Paid in Accordance with a Schedule

.1 For [Mobilization and Demobilization, Existing and Temporary Roads, and Care of Water] [ ] where a progress payment of the respective Lump Sum amount will be made in accordance with a schedule as specified in Section 01280 – Measurement Schedule, the measurement of the Work will include the amount of work performed for [Mobilization and Demobilization, Existing and Temporary Roads, and Care of Water] [ ].

**2.0 PRODUCTS – NOT USED**

**3.0 EXECUTION – NOT USED**

**END OF SECTION**