

## SECTION 402

### PERMANENT RELOCATION OF STREAMS

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#### **402.01 SCOPE**

The purpose of this specification is to state the general requirements for the provision of various types of work and features which may be required for the permanent relocation of streams.

#### **402.02 ENVIRONMENTAL REQUIREMENTS**

Contractors are reminded that Division 8 applies to all work associated with this specification.

#### **402.03 CUTTING TREES AND BRUSH FOR RELOCATION**

The proposed stream relocation site shall be cut to the limits as flagged by the Owner's Representative. This work shall be carried out and paid for according to the provisions of Section 202. Care shall be taken not to cut those particular trees and bushes designated for saving as cover for fish. Such trees and bushes shall be marked for saving by the Owner's Representative.

#### **402.04 GRUBBING FOR STREAM RELOCATION**

The Contractor shall only grub within the limits flagged by the Owner's Representative. In order to prevent possible future erosion and siltation, grubbing shall be strictly confined to within those areas that are to be excavated. The limits for grubbing will normally be from the proposed stream bank on one side to the proposed stream bank on the other side. Where possible, a buffer strip (minimum of 15 metres) shall be left between the existing stream channel and the new channel.

The grubbing shall be carried out and paid for in accordance with Section 203.

#### **402.05 EXCAVATION OF CHANNEL**

The channel shall be excavated to the lines, cross sections and grades staked by the Owner's Representative. The channel shall be excavated in the dry. Channel side slopes shall not be steeper than 2:1. The natural vegetated cover including grasses, low lying shrubs and bushes shall not be disturbed adjacent to the banks so to prevent erosion and siltation. The excavated material shall be removed from the site and used as construction fill. If unsuitable as construction fill, it shall be disposed of at a disposal site approved by the Owner's Representative.

If site conditions permit (minimal impact on vegetation and trees, erosion and water quality), excavated material can be placed in berms not less than 5 metres from the new channel. The berms shall be graded and trimmed to sightly proportions in preparation for future hydroseeding or sodding.

Particular care shall be taken in excavating the channel so as to incorporate features that will render the channel habitable by fish. The channel alignment shall be irregular like a natural stream channel. The alignment shall have varying cross sections, an uneven profile and frequent meanders so as to create a riffle and pool environment in the completed stream relocation.

Measurement for payment shall be by the number of cubic metres of excavated material as shown between the position of the ground lines as cross sectioned after grubbing operations have been completed, and the completed and accepted excavation lines. Material excavated outside of the required limits will not be included in measurement for payment. The volume of the excavation to be computed by the average end area method of computation or as wedges or pyramids, as the case may be, when terminating at grade points.

During excavation operations whenever the character of material changes from Other Material to Solid Rock the Contractor shall strip the area within the limits of all overlying material and notify the Owner's Representative, in order that proper measurements for cross sections may be made. No allowance will be made for material excavated before such measurements or cross sections have been made.

For boulders present in Other Material; the three maximum rectilinear dimensions of boulders, actually excavated, will be measured and the volume of each so determined. Volumes of the boulders which are equal to, or greater than, 0.5 cubic metres will be included for payment as rock.

Payment shall be at the contract price per cubic metre for either Excavation of Channel for Permanent Relocation of Streams, Solid Rock, hauled 1 kilometre or under; or Permanent Relocation of Streams, Other Material, hauled 1 kilometre or under, as the case may be. Such payment shall be compensation in full for all labour, materials and use of equipment to: excavate the material from within the required horizontal alignment, cross sections and profile, then load and transport the material up to the 1 kilometre freehaul limit and place and compact the material in a fill, or in the case of waste material place and trim the material in berms.

Where the Owner's Representative requires that excavated materials be hauled in excess of the 1 kilometre freehaul limit before being placed, additional payment for overhaul will be made in accordance with Section 215.

Should the contract not include quantities for "Excavation of Channel for Permanent Relocation of Streams, Solid Rock", then payment for that quantity shall be at the contract price for "Excavations for Foundations, Solid Rock".

Likewise, should the contract not include quantities for "Excavation of Channel for Permanent Relocation of Streams, Other Material", then payment for that quantity shall be at the contract price for "Excavation for Foundations, Other Material".

#### **402.06 HYDRAULIC RIP RAP**

Should the channel bed or sides require Hydraulic Rip Rap treatment, then this work shall be carried out and paid for in accordance with Section 917.

#### **402.07 RIP-RAP FOR CHANNEL**

Should the channel bed or sides require rip rap treatment, then this work shall be carried out and paid for in accordance with Section 610.

#### **402.08 SMALL SHOT ROCK FOR CHANNEL BED**

Should small shot rock be required to line the channel bed, then the small shot rock shall be placed on the excavated channel bed in a layer no thicker than one piece of shot rock thick. Care shall be taken not to place any appreciable depth of shot rock, so as to help avoid the stream becoming a "French Drain" during periods of low flow.

The small shot rock shall be well shattered with no pieces larger than 100 millimetres, and be placed to the satisfaction of the Owner's Representative.

Measurement for payment shall be on the basis of the number of cubic metres, rounded to one decimal place, of the small shot rock placed within the limits required by the Owner's Representative. The volume shall be calculated from the computed surface area multiplied by a nominal thickness of 0.1 metres.

Payment at the contract price for small shot rock for channel bed, shall be compensation in full for all labour, materials and use of equipment to supply and place the small shot rock, as specified.

#### **402.09 GABIONS FOR CHANNEL**

Should gabions be required for the channel, then the gabion work shall be carried out and paid for in accordance with Section 601.

#### **402.10 WASHED GRAVEL FOR CHANNEL BED**

Should washed gravel be required in the channel bed, the washed gravel shall consist of aggregate all of which passes the 20 millimetre sieve, but none passes the 1.25 millimetre sieve. The gravel shall be washed.

The washed gravel shall be placed after the Hydraulic Rip Rap, Rip Rap, Stream Rock or Small Shot Rock has been placed in the channel bed. The Contractor shall place the washed gravel in the spaces between the rocks. Care shall be taken not to completely cover the rock. Should the underlying rock be completely obscured by the washed gravel, then the excess washed gravel shall be removed so as to expose the tops of the rocks.

Measurement for payment shall be on the basis of the area of washed gravel treated channel bed, measured in square metres rounded to the nearest whole number.

Payment at the contract price for washed gravel for channel bed shall be compensation in full for all labour, materials and use of equipment to supply and place the washed gravel described.

#### **402.11        STREAM ROCKS**

Stream rocks are sometimes used in streams to assist fish passage by providing places of slower current behind the rocks, so that fish can rest while migrating upstream.

Should stream rocks be required, they shall be placed individually, or in clusters, as directed by the Owner's Representative. The stream rocks shall be placed prior to the placement of small shot rock and washed gravel.

Stream rocks shall vary from 300 millimetres in diameter to a larger boulder.

Measurement for payment shall be by the number of individual stream rocks placed as required.

Payment at the contract price for Stream Rocks shall be compensation in full for all labour, materials and use of equipment to supply the stream rocks and place them as required.

#### **402.12        PROVISION OF TREES AND SHRUBS**

The planting of trees and shrubs may sometimes be required in order to provide cover for fish.

Trees and shrubs shall be of the species and sizes specified.

Transplanting shall not take place during the growing season (June-September). However, should the trees or shrubs be growing in flower pots, then these may be transplanted at any time if care is taken not to disturb the roots when removing the pot.

The most satisfactory transplanting results are often obtained using native trees or shrubs of height less than 1.2 metres.

The trees and shrubs shall be planted at the locations designated by the Owner's Representative.

Trees and shrubs of height 1.2 metres or less, shall be planted in at least 0.5 cubic metres of topsoil. The Contractor shall excavate a hole of the required size to take the topsoil. The excavated material shall be disposed of. The hole shall be half filled with lightly tamped topsoil. A hand full of bone meal shall be sprinkled over the topsoil near the roots. The tree or shrub shall be planted and the topsoil lightly tamped.

The planted tree or shrub shall be maintained by the Contractor including frequent watering that is to the satisfaction of the Owner's Representative. The Contractor shall provide a one year warranty for all plantings.

Measurement for payment shall be by the number of individual trees of the specified species and size planted.

Payment at the contract price for a tree or shrub of the specified size shall be compensation in full for all labour, materials and use of equipment to: excavate the required hole for the tree or shrub roots, dispose of the excavated material, supply and place topsoil, supply and place bone meal, and supply and plant the required tree or shrub.

#### **402.12 SODDING CHANNEL SIDES**

Should all or part of the channel sides and adjacent sides require sodding, then this work shall be carried out and paid for in accordance with Section 633.

#### **402.13 HYDROSEEDING NEAR CHANNEL**

Should hydroseeding be required at or near the stream relocation, then the work shall be carried out and paid for in accordance with the provisions of Section 632 and Section 635. Should soil for hydroseeding be required also, then it shall be provided and paid for in accordance with Section 634.