PASSENGER RAIL AGENCY OF SOUTH AFRICA

SPECIFICATION

FOR

TRENCHING
AND
OUTDOOR CABLE INSTALLATION

Document acceptance

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1 INTRODUCTION

1.1 PURPOSE OF THE DOCUMENT

1.1.1 This specification covers the trenching for and installation of outdoor signalling cable. It does not include the jointing or termination of cables.

1.2 REFERENCES

1.2.1 This specification shall be read in conjunction with the following documents:

a) TFR specification: CSE516 (Latest version)

2 METHOD STATEMENT

2.1 PLANNING

2.1.1 A civil plan depicting general underground services needs to be acquired to identify existing services such as Telecommunication, water mains, Electrical distribution, culverts etc before the cable route is planned and trenching commences.

2.1.2 A proposed main cable route survey plan shall be submitted by the contractor and approval obtained from PRASA before any cables are laid.

2.1.3 Approval for any deviation from the approved route must be obtained in writing from the PRASA.

2.2 TRENCHING

2.2.1 The trench shall be 950mm x 400mm wide unless any concessions are requested or required.

2.2.2 In general, the main cable trench shall be 4m from the fence line where possible. Where deviations are required, PRASA must be consulted and give approval for the deviation.

2.2.3 All main and tail cable trenches must be in a straight line, and as parallel to the railway line as possible, and all deviation changes from this norm must be at a 900 angle, while still complying with the cable's minimum radius of curvature.

2.2.4 Safe walkways will be available alongside trench for people traffic, primarily those working on the site.

2.2.5 Where due to the terrain, trenching is not possible, the use of GI (Galvansied pipes) cast in 300mm concrete at 30MPa is permissible.

2.2.6 Where the trench is being evacuated in uneven ground, reasonably long sections of consistent grading shall be dug up rather than following every undulation of the ground.

2.2.7 Trenching is not permitted up and down the side of slopes or cuttings. In such cases GI pipes boxed at both ends in concrete in such a way that the bank is not disturbed. In these instances, the method adopted must be discussed and approved by PRASA.

2.2.8 The contractor's attention is drawn to the conditions pertaining to blasting as set out in clauses 24 and 25 of the E5 (November 1998) General Conditions of Contract.

2.2.9 Where trenches are excavated in rock, the contractor has to dispose of the evacuated material as directed by PRASA and backfill with appropriate soft soil.

2.2.10 All cable trenches must be marked on the cable plan with differential GPS co-ordinates every 200m or at a change of direction.

2.2.11 No visible cable markers must be used.

2.2.12 Special care must be taken to avoid contamination of the ballast with soil.

2.2.13 All requirements shall be met, using the appropriate methods to excavate the trenches, regardless of the type of soil i.e rock, marshland or sand. Special permission to deviate will be obtained from PRASA prior to deviation.

2.2.14 All open trenches to be marked with barrier tape. When the trench must be kept open for more than 2 weeks, the following safety precautions will be put in place:

a) The trench will be barricaded with safety warning tape.

b) Warning illuminates or any other clearly visible boundary indicators at night or when visibility is poor

c) Warning signs must be positioned next to an open excavation at regular intervals.

2.3 MACHINE TRENCHING

2.3.1 The TLB operator will be a competent person who has done PRASA Induction and is PRASA C-Green certified

2.3.2 No moving parts of the TLB or part of its load, shall come within a radius of 3m of the OHTE /Track

2.3.3 A spotter will be allocated to each TLB machine in order to verify the dimensions (depth and width) of the trench for the operator.

2.4 CABLE LAYING

2.4.1 Before the commencement of any cable laying, the trench must be inspected by PRASA.

2.4.2 Care to be taken when rolling the cable off the drums to avoid kinks and all drums to be meggered and readings recorded per cable drum number before cable is laid.

2.4.3 Special care must be taken in handling of cables and under no circumstances must the cables be dragged, stepped on or the PVC sheath be damaged.

2.4.4 Where cables are not concreted, no direct laying, without imported soft soil surround, will be permitted.

2.4.5 Cables shall not be laid in ash; unless it is surrounded by at least 300mm sand or any other approved material and the trench depth is increased to 1200mm.

2.4.6 The cables to be concreted are required to be raised by at least 60mm from the trench floor. The method of raising the cables from the floor can be done in the following ways due to the supply available (See **Figure 2.4.1** and **Figure 2.4.2** below):

a) PVC or similar pipe with an outside diameter of not less than 60mm and no more than 70mm

b) Set of smaller pipes which when tied together make a height of at least 60mm and no more than 70mm.

c) Polystyrene blocks (as used in civil slab and form work) these must have the two short sides 60mm -70mm with the length 350mm to 400mm in dimension.

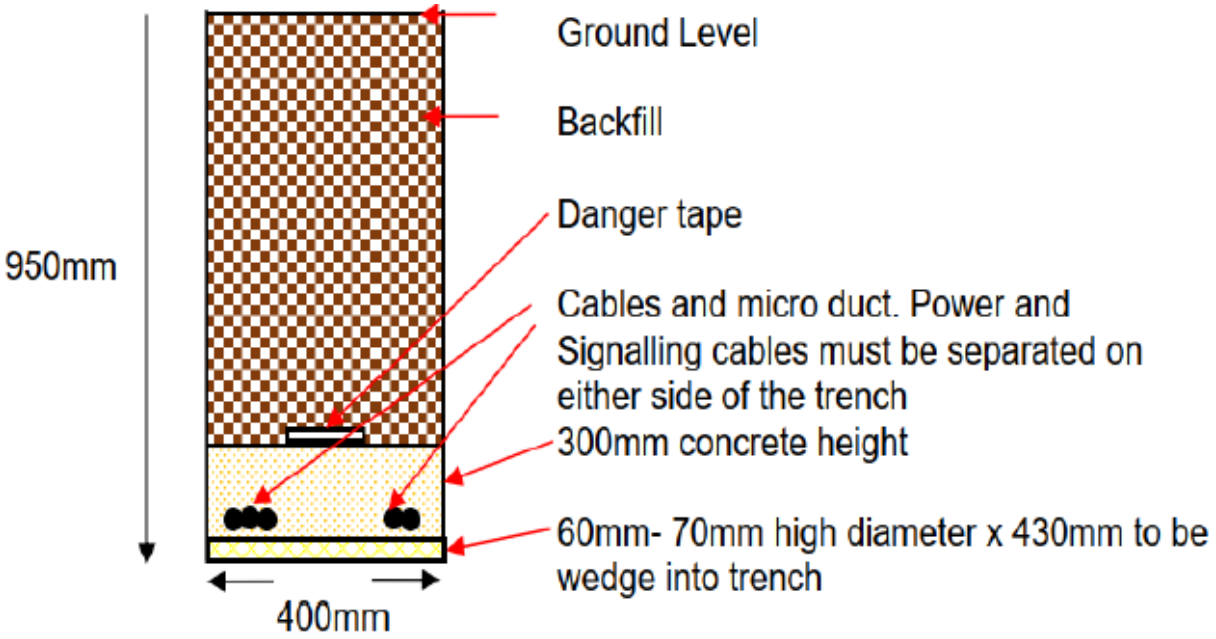

Figure 2.4.1: Section view of trench

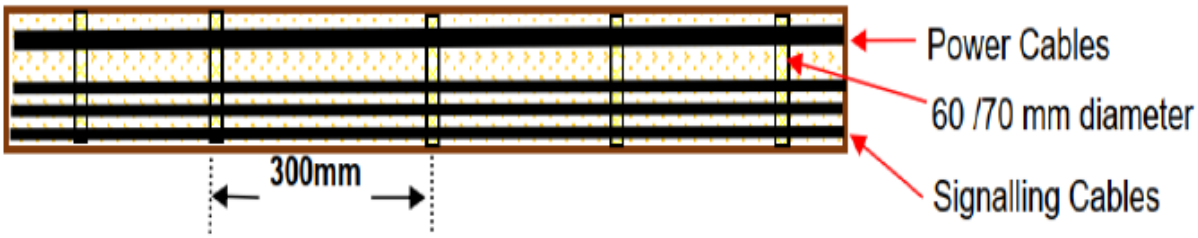

Figure 2.4.2: Top view of trench

2.4.7 At each relay room, apparatus case or pot head, cable slack of at least 3m shall be provided.

2.4.8 If the apparatus case has not yet been provided, the cable ends must be properly sealed and then coiled and buried.

2.4.9 Each cable must be identified by a PVC, aluminium or lead strap which is tied around the cable at each end and which is inscribed with the cable size and number.

2.4.10 Where cables are to be jointed, 3m of overlap (1,5m on each end) must be provided.

2.4.11 No cables to be left unattended in the ground. All cable laid, must be covered on the same day and security must be provided if this is not achievable.

2.5 CABLE JOINTING, JOINT PITS AND MAN-HOLES

2.5.1 Cable jointing shall be done in time to allow closing the joint pit while back-filling.

2.5.2 Joint pits must be excavated from the main trench away from the track and must be a semi-circle radius of 1,5m.

2.5.3 If used, manholes must be constructed of brickwork or cast concrete and water-proofed.

2.5.4 Each man-hole shall be provided with a concrete floor, steel rungs, sump, and vandal-proof cover.

2.5.5 Man-holes shall not be smaller than 1m by 1m.

2.5.6 Prasa may opt not to install cable-joints, man-holes and joint pits.

2.5.7 The minimum cable length between joints shall be 500m. Any deviation from this will be approved by PRASA.

2.6 CONCRETING AND BACKFILLING

2.6.1 All cables shall be concreted. Approval for any deviation from this standard must be obtained in writing from the PRASA.

2.6.2 All cables shall be meggered after laying and before concreting and closing of the trenches.

2.6.3 No cable trench shall be cemented / closed until fully inspected by PRASA.

2.6.4 The concrete must be cast at a height of 300mm and at a strength of 30mPa before backfilling.

2.6.5 A SABS approved high voltage indication tape must be supplied and installed directly above the concrete.

2.6.6 The excavated material for the trenches may only be used for backfilling if it has an acceptably low amount of rock and stones in it, and therefore large stones shall not be used for backfilling. (Maximum size is 5mm). This material must be sifted with a 5mm gap diamond mesh sieve and supplemented by additional soft soil where required.

2.6.7 Compaction shall be carried out by an industrial mechanical rammer / compaction hammer or other approved power tool to the minimum dry density in layers of 300mm hereinafter specified.

2.6.8 Where necessary water shall be added to obtain the specified compacted density.

2.6.9 Each layer shall be completed before the next layer is commenced.

2.6.10 The Contractor shall be responsible for ensuring that no damage is caused to the cables or pipes from the filling and compaction and shall take such steps as are necessary to prevent any such damage.

2.6.11 The minimum dry densities of backfilling after compaction are specified as:

a) Within the earthworks to provide the formation, both in bank and in cut, and on the formation and floor of cuttings: 1 760 kilograms per cubic metre.

b) In all other cases: 1 600 kilograms per cubic metre. Need to specify intervals where readings are required.

2.6.12 A Dynamic Cone Penetrometer must be used to measure the densities.

2.6.13 Compaction to match adjacent soil conditions must be maintained throughout.

2.7 CROSSINGS

2.7.1 Where the main trench crosses bridges, platforms and culverts, the cables shall be laid in 150mm GI Pipes boxed in 450mm x 450mm 30Mpa concrete.

2.7.2 These trenched must be marked with differential GPS co-ordinates on plans.

2.7.3 Where the piping is attached to a structure which is an electrical structure such as steel, such piping must be isolated from this structure by means of wooden cleats. Allowance must be made for the expansion or contraction of pipes on bridges.

2.7.4 Cables passing through tunnels shall be installed in GI Pipes or approved GI ducting when then suitable cable ducts let into the wall in the walls of the tunnels are not or provided.

2.8 TRACK CROSSINGS

2.8.1 All track crossings shall be made constructed using of 100mm pvc pipe or nextube pipe tubing approved for cable laying with a wall thickness of 6mm.

2.8.2 The length of the pipe must be sufficient for the pipe to protrude 1,5m beyond the edge of the ballast.

2.8.3 Digging under the track, including shoring as determined by PRASA, is the contractor's responsibility.

2.8.4 This work will be supervised by PRASA.

2.8.5 The perway formation must be reinstated according to the Perway standards after trenching.

2.8.6 Strengthening the track where necessary and tamping the ballast after refilling will be done by PRASA or a PRASA approved Contractor as per the contract.

2.8.7 For main trench track crossings, only 150mm GI pipe with a wall thickness of 5mm shall be allowed.

2.9 ROAD CROSSINGS

2.9.1 Sufficient GI Pipes must be provided at road crossings to cater for the cables to be installed. The cross-sectional area of cables per pipe shall not exceed 60% of the cross-sectional area of the inside of the pipes.

2.9.2 For cables crossing under the roads:

a) Authority to dig must be obtained from the appropriate authorities by the Contractor. The contractor is responsible to liaise with the associated role players or municipalities on whose property the crossings are to be constructed, for permission and occupations to conduct these works. The relevant wayleaves need to be obtained.

b) The trench must be at a depth of 1000mm.

c) Minimum pipe size is 100mm GI.

d) At least one spare pipe must be provided.

e) Cables crossing public roads shall be piped throughout, where the cable laid is not on Prasa property.

f) The roadway formation and surface must be reinstated according to the relevant standards after trenching.

2.9.3 Temporary roads for construction purposes shall not be piped but slabbed.

2.9.4 All pipes shall be surrounded by 50mm sand or approved soil.

2.9.5 All crossings shall be marked on the cable plan with differential GPS co-ordinates and NO visible cable markers shall be provided.