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# **CHANGES SINCE LAST VERSION**

Amendments		
Amendments since last issue	Par/page	Date
Change from 325Q to 325R due to major changes		2002-07-01

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## INSTALLATION SPECIFICATION FOR CIVIL ENGINEERING WORKS OF UNDERGROUND TELEPHONE PLANT

## 1. SCOPE OF SPECIFICATION

a. This specification describes how excavations and back filling of trenches, the construction of manholes, the installation of jointing pits, jointing pillars, street distribution cabinets, underground pipes and the reinstatement of surfaces are to be done.

## 2. ACRONYMS AND DEFINITIONS

## 2.1 Acronyms

- b. HDPE High Density Polly Ethylene
- c. UV Ultra Violet
- d. SABS South African Bureau of Standards
- e. PVC Poly Vinyl Chloride

## 2.2 Definitions

Telkom SA - "The company" or "Telkom" means Telkom SA Ltd, reg.No1991/005476/01, a company duly incorporated in terms of the company laws of the Republic of South Africa.

## 3. SUPPLEMENTARY SPECIFICATIONS, SCHEDULES AND DRAWINGS

a. The specifications and documents stipulated hereunder shall be read in conjunction with and be considered to form part of this specification. Unless otherwise stated the latest issue of and amended to the specified specification and documents shall be applicable.

## 3.1.1 TELKOM SA Standard Commercial terms and conditions (Outside Plant Services) at: http://www.tns.telkom.co.za/bookshelf/downloads/documents/FO-BN0002.pdf

## 3.1.2 Telkom Business Code Of Ethics

## 3.1.3 Rules of Allocation

3.1.4 Street cabinets for exchange and cable concentrators Earthing http://www.tns.telkom.co.za/bookshelf/downloads/documents/ST-0003.pdf

## 3.1.5 Telkom Standard (Technical) : Outdoor Plant -Earthing, Bonding, Surge and lightning

protection ST-0010. http://www.tns.telkom.co.za/bookshelf/downloads/documents/St-0010.pdf

- 3.1.6 Explosives Act. (Act 22 of 1956)
- 3.1.7 Safety at Roadwork's in Urban and Rural areas.
  - a. The Department of Transport publishes these two manuals under Roadworks 13.
- 3.1.8 Occupational Health and Safety Act Act 85 of 1993
- 3.1.9 Conservation of Agricultural Resources Act Act 45 of 1983
- 3.1.10 Environment Conservation Act 73 of 1989
- 3.1.11 National Forests Act Act 84 of 1998
- 3.1.12 National Environmental Management Act Act 107 of 1998

#### 3.1.13 SABS Specification 0121 of 1977

a. This specification refers to CATHODIC PROTECTION OF BURIED AND SUBMERGED STRUCTURES.

#### 3.1.14 SABS ENV 413-1:1994;

a. Masonry cement Part 1: Specification

#### 3.1.15 SABS EN 413-2:1994;

a. Masonry cement Part 2: Test methods

#### 3.1.16 SABS EN 196-1:1994;

a. Methods of testing cement Part 1: Determination of strength

#### 3.1.17 SABS Specification 558 of 1973

a. Cast iron surface boxes, manhole, inspection covers and frames

## 3.1.18 SABS Specification ISO1461 of 1999

a. Hot-dip (galvanized) zinc coatings (other than on continuously zinc coated sheet and wire)

#### 3.1.19 SABS Specification 878 of 1993

a. Ready-Mixed concrete

## 3.1.20 SABS Specification 1200 D of 1988 (as amended 1990)

a. Standard specification for Civil Engineering Construction: Earthworks

# 3.2 The Schedules and drawings listed hereunder are appended to this document and form part of this specification.

Schedule 1:	List of material to be supplied by Telkom.
Schedule 2:	Test for suitability of material for use as bedding or padding.
Schedule 3:	Laying of pipes in waterlogged conditions.
	Schedule 1: Schedule 2: Schedule 3:

3.2.4 Schedule 4: Pipe jacking

## 3.2.5 Schedule of drawings

DESCRIPTION
2.3m STANDARD MANHOLE
2.75m STANDARD MANHOLE
3.52m STANDARD MANHOLE
3.52m "L" TYPE MANHOLE
2.75m "L" TYPE MANHOLE
2.75m "T" TYPE MANHOLE
3.52m "T" TYPE MANHOLE
STANDARD MANHOLE EQUIPMENT
1,0m X 0.8m JOINTING PIT AND COPING
MANHOLE NECK LAYOUT
MANHOLE PIPE ENTRIES
UNDERGROUND PIPE JUNCTION BOX
METALLIC SINGLE-SIDED SDC
MANDRILL
STANDARD PIPE POSITIONS AND TRENCH SIZES
HANGER POSITIONS FOR 2.75m STANDARD MANHOLE
HANGER POSITIONS FOR 2.75m "T" TYPE MANHOLE
ALUEX PILLAR
STEEL PILLAR

3.2.6 Wire mesh stone baskets where applicable according to local authorities' by-laws.

3.2.7 Working drawings detailing the nature, extent and location of works.

3.2.8 Wayleave drawings and conditions from authorities.

3.2.9 Tender meeting minutes (original - before awarding of the proposal.)

3.2.10 All details, dimensions and instructions shown on any drawings, diagrams and specifications quoted herein shall be taken as forming part of this specification.

3.2.11 The Service Provider shall carefully examine all plans, drawings and specifications issued and if any inaccuracy, discrepancy or inconsistency is detected, the Service Provider shall immediately bring it to the notice of the Area Manager and obtain a decision in the matter, in writing.

## 4. WORKING TO WAYLEAVES AND SERVICE PLANS AND PRIVATE PROPERTY.

- a. Telkom SA shall arrange for the procurement of the necessary wayleaves / services plans from the various Municipalities, councils, roads, provincial, government and semi-government authorities and private property owners concerned.
- b. The Area Manager shall furnish the Service Provider with originals of all such wayleave / services plans drawings against his signature and shall draw his attention, in writing, to any special conditions stipulated therein by local authorities terms and conditions.
- c. The Service Provider shall ensure that all plant is correctly located and aligned in relation to road / street centre lines and or boundaries and building lines as the case may be as specified in the relevant wayleave / services plans and related documents. Furthermore the Service Provider shall ensure that all construction work meets the standards of and is executed in accordance with the stated requirements, terms and conditions of the relevant authorities and property owners.
- d. The recorded position of sewers, drains, petroleum and gas and water pipes, electricity cables and conduits, telephone cables and conduits or such services or their accessories / appurtenances as exist within the limits of the contract will be shown on the wayleave or service plan. The accuracy of such information is however not guaranteed and the Service Provider shall not make any discrepancy therein as a basis for a claim against Telkom SA.
- e. The Service Provider shall be solely responsible for contacting and liasing with the relevant authority in order to establish more accurately the position of service over, under or in the vicinity, of which work must be executed before such work is commenced.
- f. Where work is to be undertaken on private property the Service Provider shall give the property occupier at least twenty four (24) hours prior notice of his intention to commence work.
- g. In addition to satisfy the wayleave conditions, the Service Provider shall ensure that the property occupier's reasonable requirements are given effect to.
- h. Excavations on the private property should not be left open outside of normal working hours. Where this is unavoidable the Service Provider shall take adequate precautions to safeguard such excavations during such periods.

- i. All surfaces disturbed in the execution of the Works, shall be restored by the Service Provider on completion of backfilling and compaction. Surfaces shall be reinstated to original state or better. The Service Provider is to ensure to the owner's / local authority's satisfaction of reinstatement.
- j. The Service Provider shall undertake tree and bush cutting and shrub clearing as may be necessary for the execution of the Works. Prior to undertaking such work the Service Provider shall obtain approval in writing from the relevant authority and/or property owner. The Service Provider shall also dispose of the cuttings and cleared material.
- k. The Service Provider will be solely responsible and accountable to remedy any damages and or claims, due to his activities, from any party or authority.

## 5. CAMP ESTABLISHMENT / SERVICE PROVIDER HOLDING AREA

- a. This section covers the provision of the construction site camp / safe holding area, where material will be stored and includes office accommodation for the Service Provider and the Area Managers' representatives as requested in the proposal document.
- b. The Service Provider shall provide on the site of the works or at some other convenient point as per Area Manager's approval as close as possible to the site of the works a Construction Site Camp for:
- i. All Specific Rates Contracts;
- ii. All Lump Sum Contracts over the value of R250 000.00
- c. For Flat Rate Contracts and all Lump Sum Contracts below the value of R250 000.00, the Contractor must provide a safe holding area to store all material obtained from Telkom.

## 5.1 Site camp minimum requirements

- a. Suitably fenced 1.8m high.
- b. Must have lockable gates 1.8m high.
- c. An office with a floor area of 12m<sup>2</sup> and in compliance with OHASA, Act 85 of 93 and local authority requirements (Fixed or Mobile office).
- d. Sanitary facilities in compliance with OHASA and local authority requirements.
- e. Suitable communication facilities (telephone or base station radio system)(Account for the Contractor).
- f. Size of camp must be sufficient to accommodate all material and equipment needed for the project.

## 5.2 Safe holding area

- a. Suitably fenced 1.8m high.
- b. Must have lockable gates 1.8m high.

## 5.3 General requirements

- a. A Service Provider representative that has a fair command of the English language, both written and spoken, must be present at the camp / holding area at all times to take receipt of all notices, materials, etc.
- b. The entire site camp / holding area and its surroundings must be of such a nature that it enhances Telkom's image.
- c. Minor material, HDPE pipe and optical fibre cables must be stored in an enclosed storing area. Ultra-violet non-protected material must be kept in shaded places areas at all times.
- d. The service Provider shall use materials supplied to him in the most economical manner. Materials lost or damaged through neglect on the part of the Service Provider or his employee's, shall be made good by the Service Provider, or the value thereof will be deducted from any payments due to him.
- e. The Service Provider shall collect and transport all material supplied by Telkom from the address of the point of supply to the work site and on completion of the work deliver all surplus materials back to the same address at his own cost.
- f. The cost for the establishment of the Site Camp / Safe Holding area is inclusive in the approved Flat and Specific Rates, and shall be inclusive in the proposal value for Lump Sum proposals and no claims in this respect shall be entertained.
- g. Service Provider to confirm the acquisition of a safe holding area / camp establishment in writing. If the Service Provider does not confirm acquisition / establishment within 5 working days the Contract Representative must report the matter to the Senior Contract Representative. Senior Contract Representative to act in accordance with Standard Commercial Terms and Conditions.
- h. The Contract Representative must inspect the camp and must arrange an announcement meeting within 1 day of confirmation of the acquisition of a safe holding area / camp establishment.
- i. The Service Provider shall not commence with any work without the written authorisation of the Area Manager prior to the acquisition of a safe holding area / camp establishment. Only emergency work or pilot holes and / or surveying may start prior to the acquisition of a safe holding area / camp establishment.
- j. No material shall be delivered to the Service Provider prior to the safe holding area / camp approval except for emergency materials.
- k. The Service Provider shall maintain a written material inventory at all times.
- I. The Service Provider shall ensure that all delivery notes be forwarded to the Contractor Representative within one working day

## 6. SAFETY PRECAUTIONS AND CONSIDERATIONS.

## 6.1 Safety of Personnel.

a. The Service Provider shall be solely responsible for the safety and welfare of his employees and shall comply fully with the provision of the Occupational Health and Safety Act, Act 85 of 1993.

## 6.2 Road Safety Precautions

- a. The Service Provider shall be solely responsible for the application, maintenance of enforcement's of proper road safety precautions when working within road reserves. To this end he shall comply with the requirements of the local authority concerned.
- b. The Service Provider shall also, where applicable, observe the guidelines as set out in the site manuals entitled "Safety at Roadwork's in Urban Areas" and Safety at Road Works in Rural Areas" issued by the Department of Transport under "Roadworks 13".

## 6.3 Safety Foundations, Buildings and Structures.

- a. The Service Provider shall ensure that excavations do not endanger the foundations of adjacent buildings and shall take all the necessary precautions in the terms of the Mines and Work Act 1956 (Act 27 of 1956) to prevent subsidence of soil which could result in damage to foundations. The Service Provider shall bear the responsibility for any claims arising from such damage.
- b. Where excavations will unavoidably endanger the safety and/or stability of fences or other structures the Service Provider shall remove and replace such fences or structures to the satisfaction of the owners.

## 6.4 Safety of Services

- a. The Service Provider shall ensure that the safety and/or stability of above ground services will be unavoidably endangered by excavations such services will be adequately and suitably support and/or stayed during such operations.
- b. The Service Provider shall ensure that any underground services exposed during excavation operations are adequately supported to avoid their subsidence and suitably protected against damage.
- c. In the case of both above ground and underground services the Service Provider shall liase with the relevant owners or authorities to obtain their approval of the safeguards being applied.

## 6.5 Barricading and Lighting

- a. In terms of regulation Occupational Health and Safety Act 85 of 1993, General Safety Regulation 13 (H) (I) & (ii), every excavation that is accessible to the public, or that is adjacent to a public road or thoroughfare, or by which the safety of persons may be endangered, shall be:
- i. Adequately protected by a steel barrier, netting or fence of height at least 1.0m and as close to the excavation as practicable, and
- ii. Provide red warning lights and / or any other clearly visible boundary indicators at night and when visibility conditions are poor.
- b. The Service Provider shall provide these measures and employ watchmen to ensure that barricades and lights are effective at all times.
- c. An example of a method of robust barricading is shown in the picture below:-



## Example of a robust barricading

- i. The distance between Y poles is 5 metres.
- ii. The spacing of wires is from the bottom 400 mm and between wires is 400 mm.
- iii. Three wires to be used at a total height of 1.2 m
- iv. Minimum depth of Y pole is 300 mm
- v. Take cognisance of the danger tape knotting.

## 6.6 Safe Guarding of Excavations

# 6.6.1 Service Provider to refer to Occupational Health and Safety Act 85 of 1993, General Safety Regulation 13: -

- a. "Cause convenient and safe means of access to be provided to every excavation in which persons are required to work and which is more than 1,5m deep: provided that, in the case of an excavation which is more than 50m in length, a safe means of access shall be provided at intervals of not more than 50m.
- b. Cause every excavation which is more than 1,5m deep, including all bracing and shoring, to be inspected by a person who is competent to pronounce on the safety thereof, at least once before every shift and before the commencement of work after rain, to ensure the safety of persons; and
- c. Cause every excavation which is accessible to the public or which is adjacent to public roads or thoroughfares, or whereby the safety of persons may be endangered, to be :-
- i. Adequately protected by a barrier, netting or fence at least one metre high and as close to the excavation as is practicable; and
- ii. Provided with red warning lights or any other clearly visible boundary indicators at night or when visibility conditions are poor." Refer to Roadworks 13 for doing excavation on the roadway.

## 6.7 Accommodation of Traffic and Access to Properties.

- a. Where the work affects the operation or safety of public traffic.
- b. In addition to complying with the relevant requirements as applicable, the Service Provider shall:
- i. Construct or put in order such by-pass/es as may be required to deviate traffic from portions of the road that are to be affected by the construction,
- ii. The Service Provider shall provide and allow reasonable access to persons occupying properties that fall within or adjoining the area over which he is working. If, for any reason, such access has to be closed for certain periods during the construction period, the persons affected shall be given reasonable notice in writing of each construction period.

## 6.8 Explosives

- a. Should blasting be necessary, the Service Provider shall take every precaution to protect the works and persons, animals, other services and every property in the vicinity of the Site. The Service Provider will be held responsible for any injury or damage caused by any blasting operations and shall make good such damage at his own expense.
- b. The Transport, storage and the use of explosives shall comply with the provision of the Explosives Act 1956 (act 26 of 1956), or chapter of the regulations published in terms of the Mines and Works Act. 1956 (act 27 of 1956), as applicable. A copy of each blasting permit issued to workmen, and of each permit issued to the Service Provider to cover the purchase, storage and transport of explosives shall be handed to the Area Manager. The Service Provider shall grant the Area Manager access to all records maintained for the Inspector of Explosives or the Government Mining Engineer, as the case may be.
- c. When blasting to specified profiles, the Service Provider shall so arrange that the holes and charges resulting from exposed surfaces are as sound as the nature of the material permits. The Service Provider shall make good at his own expense any additional excavation necessitated by the shattering of rock in excess of an over break.
- d. Blasting in the vicinity of petroleum pipelines (within 500m) must be done as per terms and conditions as stipulated in "Petronet Standard Crossing Conditions and Requirements For Underground Services (Cables, Pipes, etc.)".

## 6.9 Silencing of Plant.

- a. The Service Provider's attention is drawn to the applicable regulations framed under the Occupational Health and Safety Act, Act 85 of 1993.
- b. When working in built -up areas, the Service Provider shall provide and use suitable and effective silencing devices for pneumatic tools and other plant that would otherwise cause a noise level exceeding 85-dB (A) during excavation and other work. Alternatively, he shall, by means of barriers, effectively isolate the source of any such noise in order to comply with the said regulations.

## 6.10 Pollution

a. The Service Provider shall take all reasonable measures to minimise any dust nuisance, pollution of streams and inconvenience to or interference with the public (or others) as a result of the

excavation of the works.

b. Environmental Management act, Act 107 of 1998 and all other environmental legislation.

## 7. GENERAL EXCAVATION WORKS

## 7.1 Excavation Equipment

a. The Service Provider may use any trenching equipment that is suitable to excavate to the specified width and depth, but must accept full responsibility for any unnecessary excavation.

## 7.2 Control of Water

a. The Service Provider shall use appropriate techniques or provide plant such as pumps, well points and sheeting or close timbering for keeping the trenches sufficiently free from water to enable him to lay pipes true to line and level and to bed them soundly, all as specified in this specification.

## 7.3 Compaction Equipment

a. The Service Provider shall use mechanical compaction equipment and he shall select equipment and operate it in such a manner that the pipeline, duct, or cable is not stressed or damaged. Machine compaction shall not be used directly above the pipe.

## 7.4 Storm water Seepage Precaution

a. The Service Provider shall properly and adequately protect the works from flooding and damage by Storm water, flow from springs, and seepage.

## 7.5 Special Water Hazards

a. The Area Manager may schedule particular items for dealing with a special water hazard at a designated part of the Works and as required in terms of the specification.

## 7.6 Damage to Road Surfaces

a. Where, during the execution of the work, any road or paved surface adjacent to a trench has been damaged in any way whatsoever, the Service Provider shall, at his own expense and as soon as is practicable, repair and restore such surface to a condition at least equivalent to that previously existing, and to the satisfaction of the Area Manager / Local Authorities.

## 7.7 Dust Nuisance

a. Where dust from the works, haul roads, or road deviation becomes a nuisance to the public or damages adjacent properties, the Service Provider must apply sufficient water or take other measures to lay the dust.

## 7.8 Excavated Material not to be a hazard or interference.

a. All excavated material shall be so deposited as not to interfere with or endanger the Works (for example, by causing the sides of the excavation to collapse), other property, or traffic. The Area Manager may order the Service Provider to remove any material that he considers liable to endanger or interfere with the Works, private property, traffic, or pedestrians, and to place such material at some other approved location. If the necessity for such removal is, in the opinion of the Area Manager, a result of some fault on the part of the Service Provider, the cost of removal shall be borne by the Service Provider, but otherwise it will be borne by Telkom SA.

## 7.9 Detection, Location and Exposure.

- a. The drawing shows the position of the existing service based on the best information available. The Service Provider shall verify the position of all services including manholes, valve boxes, and the like, and all other obstacles and existing works on the Site.
- b. Where any underground services are shown on the drawings, the Service Provider shall have the equipment available on the site for as long as is necessary to detect and locate such services. If so ordered, he must excavate by hand to expose such services in areas and in a manner and at a time agreed with the Area Manager.

## 7.10 Protection and Alteration.

a. The Service Provider shall advise the Area Manager in advance of the actual date on which he proposes to excavate near any cable. He shall not, unless with written approval of the Area Manager, excavate with mechanical equipment closer than 1 m to the estimated position of any cable and shall, if necessary, expose the cable by means of hand excavation carried out under proper supervision. When so instructed, the Service Provider shall backfill such cable trenches with approved material to the compaction density ordered.

## 7.11 Location of Services

a. Provided that clear copies of service drawings have been issued to the Service Provider, manholes, valve boxes, and the like will be regarded as known services, and he shall report any manholes, valve boxes, and the like that are missing to the Area Manager before commencing construction in any particular area.

## 7.12 Negligence

a. Where a service is damaged because of the Service Provider's negligence, he shall bear the cost of the repairs, for making good such damage.

## 7.13 Separation of Trenches and Manholes from Power Cables.

- a. Where a pipeline will cross an existing underground power cable the pipeline shall be laid at a minimum radial distance of 300mm from the power cable. If the power cable is not enclosed in a steel pipe, concrete slabs (see 7.13.c) shall be provided by the Service Provider immediately above the power cable to extend, not less than one metre on either side of the crossing.
- b. Where the pipeline will be parallel to an existing power cable as great a separation as possible

between the power cable and the pipeline shall be maintained. Where the radial separation is less than 300mm the pipeline shall be separated from the power cable by concrete slabs (see 7.13.c) placed vertically.

- c. The concrete slabs shall be provided by the Service Provider at Telkom SA's expense and shall be 400mm X 400mm and thickness of not less than 50mm. It must be suitably re-inforced with 100mm square welded mesh of 4mm thickness.
- d. Materials used for the manufacture of the slabs shall be as specified in clause 20.5. The concrete of the slabs must reach strength of 20mpa after 28 days.
- e. The concrete slabs shall be neatly finished to the satisfaction of the Area Manager.
- f. Underground plant such as gas, water or sewerage mains, electricity supply cables and storms water drains, which obstruct the construction of pipelines and manholes, shall be brought to the notice of the Area Manager. Where there is no other alternative these will be moved at Telkom SA's expense (or as the Area Manager may otherwise decide) in conjunction with the respective authority.
- g. Where the relocation of a service at a manhole is not possible, the location of the service must be clearly indicated on the completion plan and marked in the inside of the manhole by engraving the location and type of service into the wall and painting the engraving red.
- h. Any warning or protective material encountered in the course of excavation shall be carefully opened up to avoid damage and where necessary, removed.
- i. Trigonometrically and other survey beacons or pegs may not be removed or altered. If unavoidable, pegs to be replaced at service provider's cost. Where this becomes necessary the Area Manager must be advised in order that suitable action may be taken.
- j. Tree roots exposed in the course of trenching shall be protected and shall not be cut unless this is unavoidable.

## 7.14 Bedding and padding material

- a. The Service Provider shall lodge a sample of granular material with the Area Manager for his approval before bedding and pipe laying is started. He shall ensure that stockpiles of granular material do not become contaminated during the construction period. Selected granular material shall be of a granular, non-cohesive nature that is singularly graded between 0,6mm and 19mm, is free-draining, and has a compactibility factor not exceeding 0,4 or such other value that is laid down in the project specification.
- b. Schedule 2 bedding and padding material may only be used with the written consent or site instruction of the Area Manager.

## 7.15 Quality

- a. The Service Provider, when using materials that are required to comply with a standard specification shall, if so ordered, furnish the Area Manager with certificates showing that the materials do comply. Where so specified, materials shall bear the official mark of the appropriate standard.
- b. Samples ordered or specified shall be delivered to the Area Manager's office.

- c. Unless otherwise specified, all proprietary materials shall be used and placed in strict accordance with the published instructions of the relevant manufacturer.
- d. All work carried out shall be in accordance to the Specification 325R.

## 7.16 Structures and Natural Materials on Site

a. Earth, stone, gravel and sand, and all other materials excavated or structures existing on the Site, shall not become the property of the Service Provider.

## 7.17 Dealing with Water on Works

a. The Service Provider shall properly deal with and dispose of water to ensure that the works are kept sufficiently dry for their operation and maintain sufficient quantity such pumping equipment, well points, pipes and other equipment as may be necessary, and he shall also provide any sumps, furrows and other temporary works as may be necessary to minimise damage, inconvenience or interference.

## 7.18 Ground and Access to Works

a. The Service Provider shall occupy only such ground as is necessary to carry out the work. He shall provide and maintain such access to the various sections of the Works, as he requires for the proper execution of the work. All fences an other structures that have been damaged or interfered with by the Service Provider shall be restored to a condition at least equivalent to their original condition.

## 7.19 Blasting of Rock

- a. Excavation in rock may be assisted by the use of explosives to shatter the rock, provided that the Service Provider shall observe and comply with the provisions of the Explosive Act (Act 26 of 1956) as amended.
- b. Written approval must be obtained from the Chief Inspector of Explosives, and be presented to the Area Manager by the Service Provider, before blasting will be allowed.
- c. Blasting in the vicinity of petroleum pipelines (within 500m) refer par 6.8 (d).

## 7.20 Classification for Excavation Purposes

- a. <u>Normal ground</u> shall include all materials which can be excavated by means of pick and shovel, trenching machine or excavator without the use of independent compressor and pneumatic rock breaking equipment or independent hydraulically operated rock breaking equipment.
- b. <u>Hard rock excavation</u> shall be excavation in all materials that cannot be efficiently removed, with a trenching machine or excavator, without blasting, wedging, splitting or the use of independent compressor and pneumatic or electrical rock breaking equipment or hydraulically operated rock breaking equipment, prior to removal. Service provider to supply proof of rock excavation.
- c. All excavations, separation of pipelines, backfilling, blasting, etc in the vicinity of petroleum pipelines must be done as per terms and conditions as stipulated in "Petronet Standard Crossing

Conditions and Requirements For Underground Services (Cables, Pipes, etc.)".

## 7.21 Method of Classifying

a. The Service Provider may use any method he chooses to excavate any class of material but his chosen method of excavation shall not determine the classification of the excavation. The Area Manager will decide on the classification of the materials to be excavated and his decision shall be final and binding.

## 8. EXCAVATION OF TRENCHES

- a. Trenches for pipelines shall generally be excavated by hand / mechanical means in a straight line between manholes / jointing pits in accordance with the way-leave plan, except where obstructions or other conditions require bends.
- b. Grass should be cut in square blocks and put aside and be kept wet for reinstatement after completion of excavation, backfilling and compaction of trench.
- c. When the trench has been marked out, pilot holes should be dug at intervals along the run, (30 50meters apart) particularly at points where the new trench crosses existing services, according to way leave plans. The pilot holes should be at least 150mm deeper and wider than the proposed excavation so as to reveal the presence of any plant belonging to other administrations.
- d. If a pilot hole discloses an immovable obstruction, the position of the cable / pipe run should be shifted as to by-pass the obstruction. New pilot holes should be dug to the new cable / pipe run position.
- e. All excavation work must be performed under the supervision of a responsible person who must be competent to exercise such supervision.
- f. The surface material (asphalt, concrete, paving slabs, gravel, grass, etc.) and the subsoil must be kept apart by placing them on opposite sides of the trench and where they are least likely to interfere with traffic, pedestrians and street drainage systems.
- g. Tree trunks must not be cut, Tunnelling must be done underneath the trunks.
- h. Only tar / concrete cutters must be used when breaking tar or concrete when crossing driveways and road-crossings.
- i. The trench should be in such a position that cables / pipes may be laid at least 300mm from power cables.
- j. When there is any other services in the way of the pipe line, the ducts must be tunnelled underneath the other services
- k. Storm-water gutters and drains must not be obstructed.
- I. Trench widths normally required for 110mm pipes are
  - i. 1 pipe 375mm
  - ii. 2 pipes 450mm
  - iii. 3 pipes 625mm

- iv. 4 pipes 800mm
- m. Trench depth for,
  - i. 1 to 4 pipes 1,3meters
  - ii. 5 and more pipes 1,5meters
- n. Where it is not possible to get the required depth, (less than 600mm coverage) the pipes must be boxed in concrete.
- o. Most authorities require a minimum coverage of 1 meter above the pipes. Always ensure that the specified coverage is adhered to.

## 9. TRENCHING

- a. Trenching for pipelines shall generally be excavated in a straight line between manholes in accordance with the wayleave plan except where obstruction or other conditions required as permitted by the Area Manager.
- b. <u>The width and depth</u> of trenches shall be in accordance with the Bill of Quantities associated with the Contract. The onus shall be on the Service Provider to satisfy the Area Manager of the necessity where a trench, wider or deeper than that called for the Bill of Quantities associated with the Service Provider. Trench widths normally required for 1, 2, 3 and 4 (110mm) pipes respectively are 450mm, 625mm and 800mm.
- c. The configuration of a new route must be as follows: The first layer of pipes must be at the same level e.g. 4 pipes at same level, not 2 at one level and another 2 on top.
- d. On existing routes, the existing banks of pipes must be filled first and then in layers of 4 pipes.

## 9.1 Depth and Widths

- a. The minimum cover from the crown of the top pipes and ground level shall be 1 metre or as specified per site instruction or bill of quantities. Deviations of up to 5% in specified widths and depths will be acceptable.
- b. If the minimum coverage cannot be obtained, concrete protection should be provided directly above the padding above the top layer pipes, 50mm thick and of 20 Mpa strength. The Area Manager will make the final decision where concrete protection is necessary.

## 9.2 Site Clearance

- a. The Service Provider shall clear an area of sufficient width along the route of the pipeline to ensure that the selected operations are not hampered.
- b. Where trenches are in the servitude's or wayleaves specified width, the Service Provider shall ensure that clearing and damage to plant growth is restricted to the servitude or wayleave area.
- c. Trenches shall be so excavated that half of the base width is either side of the designated centre line of the pipe.

## 9.3 Excavation

a. Pipe trenches shall be excavated in lengths approved by the Area Manager. The sides of each trench from the bottom up shall be as near vertical as possible for a height equal to at least the full diameter of the pipe plus the specified depth of selected fill blanket over the pipe.

## 9.4 Trench Bottom

a. Material that the Area Manager considers being unsuitable for the bottom of the trench shall be excavated to the depths and disposed of in the manner directed. The resulting space shall be refilled, as ordered, with approved material and compacted as directed.

## 9.5 Levelling and trimming of trenches for pipes exceeding 75 mm internal diameter

- a. Before commencing pipe-laying operations in an excavated trench the Service Provider shall suitably prepare the trench floor to provide firm support for the pipes over their full length. To this end he shall ensure that the trench floor is :
- i. Free from all loose and or unsuitable material, including soil saturated with water,
- ii. Evenly levelled and
- iii. At the proper depth for the pipeline,
- iv. Undercut when required in terms of Sub-clause 9.6.a and raised again to the proper level with compacted bedding material in accordance with Sub-clause 9.6.b

## 9.6 Trenching in abnormal conditions (Clay & Rock) - Undercut

a. The Service Provider shall undercut trench floors **below** the required final level by the amount and under the conditions indicated hereunder and refill this space with **compacted** bedding material. (See drawing below)



110 mm Pipes Laid in Abnormal Soil



Bedding & Padding

110 mm Pipes Laid in

Backfill

Conditions	Depth of undercut
i) Where the excavation is in rock or hard ground in which an even bed	
cannot be provided.	75mm
ii) Where the trench floor consists of clay or other material which, in the	
opinion of the Area Manager is unsuitable for supporting the pipeline.	150mm

- b. Bedding material shall conform to the same requirements as laid down for padding under Clause 10.1 and shall cover the full width of the trench in a uniform layer of the required thickness. The bedding shall be compacted over it's whole area by means of a compactor.
- i. (93% mod aashto for sidewalks and 98% mod aashto for roads)
- c. Where PVC / HDPE pipe installations are <u>provided in clay ground</u>, or in <u>any unstable conditions</u>, the Service Provider shall trim the trench walls to provide a horizontal clearance of 150mm between the pipe/s and the trench wall. Further more, padding shall be extended to at least 150mm above pipe work, and the trench shall be undercut as set out in 9.6.a
- d. The Service Provider shall exercise due care in trimming and/or undercutting trench floors to ensure that only the necessary amount of ground is removed. Should the Service Provider remove, either by neglect or bad workmanship more ground than is necessary, he shall at his own cost fill such excess excavation with compacted bedding material which conforms with the requirements of Clause 8 and is installed in accordance with Sub-clause 9.6.b

## 9.7 Trenching adjacent to other services

- a. No pipes shall be laid directly above and parallel to any service **other than** TELKOM Services.
- b. When trenching adjacent to any existing services, the Area Manager will designate the position of the trench after the Service Provider has located the existing plant.

## 10. DEFINITIONS OF BEDDING, PADDING AND BACKFILLING

- a. This clause specifies the characteristics, testing and installation of bedding, padding and backfilling material. The following definitions apply:
- i. **Bedding** The material constituting the even floor of an excavated trench onto which a pipe or a bank of pipes is laid.
- ii. **Padding** The material installed around and/or between pipes up to a level of at least 75 mm or 150 mm above the pipe or bank of pipes. (As specified in 10.1.a) (The area taken up by the pipes will not be considered for payment purposes)
- iii. **Backfilling** The material installed above the padding material layer to complete the refilling of an excavated trench.
- b. Bedding, padding and backfill material shall be installed with moisture content as near to optimum as possible to ensure that optimum compaction is achieved. The Area Manager may, if he considers it necessary, direct the Service Provider to carry out tests, which the Area Manager shall specify, to determine the optimum and actual moisture content of any material being used. Should the results of such tests require it, the Area Manager may direct the Service Provider to add water to the material which is too dry at the Service Provider's expense or to dispose of material, which is too moist, or import suitable material.
- c. Under no circumstances shall material, which is saturated with water, be used for bedding, padding and backfill.
- d. The Service Provider shall pay particular attention to the proper compaction of bedding, padding and backfilling material.
- e. A high standard of compaction effort will be incited upon in all cases where fine materials are approved as bedding and padding.
- f. The Compaction of padding shall be in accordance with Sub-Clause 9.6.b
- g. The compaction of padding immediately adjacent and between pipes shall only be executed manually using a suitable tamping tool (see Sub-clause 10.k). Manual compaction should continue until the pipes are covered by a layer of padding 75 mm thick or 150mm and 300mm backfill, at which point the use of a vibratory plate compactor must be reverted to.
- h. The use of the "skis" method of compaction, in the proximity of pipes, may only be adopted with the Area Manager's approval.
- i. The compaction of backfill shall be by means of a compactor and shall be compacted to a density higher than that or at least similar to that of the virgin soil parallel to the trench. These comparative tests shall not be taken more than 0,5 metre from the compacted trench. The above shall be applicable to all roadway crossing and normal trenching.
- j. Manual compaction methods shall only be employed in accordance with Sub-clause 10.g or as

authorised by the Area Manager in writing.

- k. <u>Tamping tools</u> for the manual compaction of padding material immediately adjacent to and between pipes in accordance with Sub-clause 10.g shall be supplied by the Service Provider. A suitable tamping tool consists of a tamping foot made up of a 37 mm diameter steel rod 300 mm long securely attached to a vertical handle made up of 20 mm steel rod 1.35 meters long.
- I. During the compaction of padding and backfill material the Service Provider shall exercise due care to ensure that pipes and pipe joints are not disturbed or damaged in any way.
- m. The volumes of bedding and padding shall be calculated according to "Bedding and Padding Calculations" Annexure Y-

#### EXAMPLE OF BEDDING AND PADDING FORMULA

BEDDING AND PADDING CALCULATIONS										
PROPOSAL NO SERVICE PROVIDER					_					
PROJECT NO.										
NUMBER OF PIPES	1	2	3	3	4	4	6	6	8	12
PIPE CONFIGURATION	o	00	000	0 00	0000	0 0 0 0	00 0000	000	0000	0000 0000 0000
TRENCH WIDTH	0.450m	0.450m	0.625m	0.450M	0.800m	0.450m	0.800m	0.625m	0.800m	0.800m
TRENCH DEPTH	AS REQ									
BEDDING & PADDING PER LINEAR METER	0.107 m³/m	0.098 m³/m	0.134 m³/m	0.172 m³/m	0.171 m³/m	0.162 m³/m	0.299 m³/m	0.221 m³/m	0.282 m³/m	0.39 m³/m
BEDDING AND PADDING FORMULA										
Formule : Length of trench x amount of pipes x 0,0095 (volume of pipes)										
Example : Assume the length of the trench is 200m, two pipes was laid, the padding is 260mm and the width is 450mm						e width is				
200 x .450 x .260 - 200 x 2 x 0.0095										
= <u>19.6</u>										

## **10.1** Padding around pipes exceeding 75mm internal diameter.

- a. Padding material for pipes exceeding 75 mm internal diameter shall conform to the following characteristics. The material shall:
- i. Granular, evenly graded, between 0,6mm and 19mm.
- ii. Be of a free draining, non cohesive nature,
- iii. Free from vegetation, organic material, lumps and stones of diameter exceeding 19 mm,

- iv. Exhibit a compactibility factor not exceeding 0.4 or such other value that is laid down in the project specification.
- v. And has plasticity index not exceeding 12.
- b. The characteristics listed under (i) (iii) and (iv) shall be determined by the tests specified in Schedule 2
- c. Provided the characteristics as specified under (i) (v) are met, sieved excavated material may be used as bedding and padding, or otherwise from a source at the Service Providers discretion, subject to the Area Manager 's approval.
- d. The following table reflects the relative schedule applicable, with respect to bedding and padding, under various soil conditions.

GROUND CONDITIONS	TRENCH WIDTH	SCHEDULE APPLICABLE	CEMENT STABILIZATION
Dry & normal Stable ground conditions	Normal	2 with written consent of Area Manager or 3	No
Clay or Unstable Ground Conditions	Widen 150 mm on either side of outermost pipe	3	Yes if so Directed
Marshy, wet and waterlogged conditions	Normal	3	Yes if so directed
Road / rail Crossing	Normal	Consulted wayleave or authority concerned	Yes if so Directed

- e. The Service Provider shall provide the equipment (i.e. Sieves and Buckets, including a triple beam balance scale, model 760) necessary for the execution of the tests specified in Schedule 2 and shall make this equipment available to the Area Manager, upon request, through-out the contract.
- f. The Service Provider shall carry out regular tests in accordance with Schedule 2 on the bedding and padding material installed, shall retain a record of the results thereof cross-referenced to installation locations and shall make such records available to the Area Manager upon request. The Area Manager shall decide the frequency at which the tests are to be carried out.
- g. Padding around and between pipes and the compaction thereof (see Sub-clause 10.g) shall be carried out as pipe laying proceeds. Padding shall be placed in layers not exceeding 80 mm, in thickness and shall extend to a level of at least 75-mm above pipe work.
- h. In the case of <u>multiple layer HDPE / PVC pipe installations</u> the padding procedure described in Subclause 8.g. shall be followed: A compacted layer of padding material shall be provided between layers of pipes such that a separation between layers of 75 mm is maintained.
- i. Padding material must be stabilised, when directed by the Area Manager by the addition of two (2) 50kg pockets of the cement per cubic metre. Cement stabilised padding material shall be mixed damp, placed immediate after mixing and compacted within four (4) hours after placing.
- j. All road crossings must be stabilised.

## 10.2 Backfilling

a. After padding over the pipes has been compacted, backfilling of the remaining trench should proceed. Backfill material shall be installed in layers not exceeding 300 mm; each layer thoroughly compacted before the next layer is added. Backfill material must be stabilised with cement as in

10.1.i if so directed by the Area Manager.

- b. All road crossings backfill as per Local Authority terms and conditions if not specified must be stabilised.
- c. Material excavated from trenches may be used as main fill in all areas, provided only that it is readily compactible and contains little or no organic material. It must not include stone of average dimension greater than 150mm in diameter and that it can be placed without significant voids and so compacted as to avoid significant settlement. Material containing large clay lumps that do not break up under the action of the compaction equipment being used, will be regarded as unsuitable for use in backfilling. As a guide, backfill material for sidewalks and road crossings should exhibit compactibility factors not exceeding 0.30 and 0.2 respectively.
- d. Through water courses pipes must be encased in concrete suitably reinforced to extend 5.0 metres on both sides of the watercourse. The Service Provider shall provide a design for each course to the Area Manager for approval, using 8-mm mild steel rods as reinforcing. This requirement is described in detail in clause 21 of this document
- e. The Service Provider shall be responsible should subsequent subsidence in the backfilling of a trench occur and shall bear the cost where additional reinstatement costs are incurred as a result of subsidence or breakage's within 12 months from the date of completing the work.
- f. The Service Provider shall dispose of all surplus spoil or boulders due to any construction work that cannot in the opinion of the Area Manager, be spread evenly over the trench site. The cost for this is already included in rates or tendered price.

## 11. EARTHING SYSTEMS

## 11.1 Earthing systems shall be provided according to Telkom standard.

11.1.1 Telkom Standard : Outdoor Plant -Earthing, Bonding, Surge and Lightning protection ST-0010

## **11.2 Exothermic welding**

11.2.1 Exothermic welding of earthing systems to be carried out by an accredited person/s and a certificate of compliance to be supplied to Telkom SA on completion of the contract.

## 12. RE-INSTATEMENT OF SURFACES (EXCLUDING PRIVATE PROPERTY)

- a. Any permanent re-instatement of any surface, unless otherwise specified, shall be at Telkom SA's expense.
- b. Wherever the work requires excavation of tarred or made-up sections of roads, streets or sidewalks, the Service Provider as directed by the Authorities concerned shall carry out interim reinstatement of the surface. All material shall be replaced in 150-mm layers in the reverse order to which they were excavated and each layer thoroughly compacted.
- c. If the local Authority is unable to undertake the permanent re-instatement work the Service Provider shall undertake to work to the specification of the Authority concerned.
- d. All tarred surfaces must be cut 100mm wider than the trench width on either side by means of a

mechanical asphalt cutter, before any excavation commences with mechanical trenching machines.

- e. Where final re-instatement of a surface is to be undertaken by the Local Authority concerned, Telkom SA will place the necessary order unless otherwise specified.
- f. Where the pipes are laid in the slopes of the road cuttings or in the fill of embankments, the Service Provider to the satisfaction of the responsible Road Authority shall restore the surface and slopes.
- g. Re-instatement of unpaved areas must be carried out by the Service Provider to restore the surface to equivalent of the natural state. Particular attention shall be paid to minimising erosion. Measures applied by the Service Provider to prevent erosion of disturbed ground shall bear the approval of the Department of the Agriculture and Water Supplies.

## 13. RESPONSIBILITY FOR TRENCH MAINTENANCE.

a. Full responsibility for the maintenance of the trench in the period between the initial backfilling and final reinstatement is that of the Service Provider.

## 14. PIPE LAYING

## 14.1 Pipes 75 to 100mm internal diameter.

- a. Deviations of up to 5%, in specified widths and depths will be acceptable.
- b. Generally the pipes shall be placed in the trench, a length at a time and shall be jointed on the floor of the trench. With the plastic coupling it is not necessary to allow for clearance under the joints.
- c. Pipelines should generally be laid in a straight line between manholes and for jointing pits. However pipeline sections may, if necessary, deviate from a straight line provide that:
- i. Individual pipe lengths not shorter than 3 metres may be offset by not more than 35 mm per metre of pipe length,
- ii. All pipes are offset in the same direction to avoid creating S-bends within a pipeline section, unless the Area Manager directs otherwise, and
- iii. The maximum overall deviation of the pipeline between manholes and/or jointing pits shall not exceed 15 degrees
- d. As the pipes are laid and jointed, they shall be kept free from internal obstructions and dirt. Care should be taken to ensure that no dirt collects between the pipe and the coupling to ensure a watertight seal. On completion of pipe laying and backfilling the pipes shall be proved by pulling through a cylindrical cleaning brush followed by a wooden or Teflon mandrill ± 400 mm long and 5 mm less in diameter than the bore of the pipe.
- e. Multiple pipe installations shall be laid in layers of up to 4 pipes per layer with a horizontal pipe-topipe clearance of 50 mm and vertical layer-to-layer clearance of 75 mm. Pipe spacers to be supplied and installed at 3m intervals by Service Provider. The trench width shall suit the particular installation size in accordance with the Bill of Quantities.

## 14.2 Pipes smaller than 75-mm internal diameter.

- a. Pipes smaller than 75-mm internal diameter may be either high-density poly ethylene or PVC as determined by Telkom SA. The laying procedure of the pipes will be as described in 14.1 or they can be directly buried, as determined by the Area Manager.
- b. Pipes shall be proved by pulling through a cylindrical cleaning brush followed by a mandrill of diameter dependent on the internal pipe diameter as follows:
- i. ±50 mm diameter pipes
  - 1. Wood or Teflon mandrill having spherical ends and off length 150 mm and 5mm less in diameter than the bore of the pipe.
- ii. ± 32 mm diameter pipes
  - 1. Wood or Teflon mandrill 50 mm long having spherical ends and 3mm less in diameter than the bore of the pipe.

## 14.3 Crossing of other Services

- a. Where a pipeline will cross an existing service such as an electricity supply cable, a water supply pipe or a sewerage pipe, the telecommunication pipeline shall, if possible, be laid not less than 300 mm above the other service.
- b. Where the depth of the existing plant is insufficient for this to be done, the Telecommunication pipe shall be laid to pass not less than 300 mm below the other service. (Rand Water Board and Petronet always to be passed below or as indicated on wayleave)

#### 14.3.1 Crossing of services by auguring or jacking

- a. Where auguring is required, the Service Provider shall use a Rigid PVC pipe, supplied by Telkom SA unless otherwise specified. The size of the pipe will have an internal diameter of not less than 110 mm or as otherwise directed by the Area Manager on site. Only successful boring operations are acceptable and will be paid for by Telkom SA. Unsuccessful attempts are for the Service Provider's account (see sub clause 25.g).
- b. The Service Provider shall supply a concrete pipe for jacking. The pipe shall have a load factor of "100D" complying with SABS specification 677 of 1986 The nominal internal diameter of the pipe shall be 900 mm. Work to comply with the conditions as laid down in schedule 4.

## 14.4 Marshy Ground Conditions

a. The installation of HDPE or PVC pipes in marshy conditions is described in Schedule 3 of this document.

## 14.5 Crossing under railway tracks.

a. Pipes under railway tracks shall be installed in accordance with SABS Specification 0121 of 1977 and the wayleave for the particular crossing. Where the railway authority requires the work to be carried out under its supervision the Area Manager must be advised not less than one month before this is to be done to enable the necessary arrangements to be made. Railway supervision

costs shall be borne by Telkom SA.

## 14.6 Bridge Crossings

- a. Telkom SA shall furnish approved drawings by the respective road and rail authorities, illustrating approaches and methods to be used to attach pipes to bridge structures, to the Contractor.
- b. All fittings shall be supplied by the Service Provider and shall be galvanised in accordance with the requirements of SABS Specification ISO 1461 of 1999 The fittings shall be treated with a 10% solution of hydrochloric acid, washed down with clear water dried completely and finally painted as follows:
- i. 1<sup>st</sup> Coat: Epidermix 352 Black
- ii. 2<sup>nd</sup> Coat: Epidermix 352 Aluminium
- iii. NOTE: Hot dipped galvanised fittings do not require painting.
- c. The Service Provider in accordance with the requirements of local authorities shall supply galvanised metal pipes for bridge crossings. SPECIFY WALL THICKNESS AND CLASS OF PIPE 3.9 4.5 mm
- d. The Service Provider shall provide approved expansion joints and pipe butt joints where required on structures.

## 14.7 Cable Bend Radius in Pipe Junction Boxes

a. Provision for subsequent cable installation requires that the bend radius of a centre line between pipe ends be as large as possible and not less than 110 mm where a cable will be fed into a 50 mm or 110 mm pipe. Where parallel pipes end in a junction box associated with a pillar the centre line bend radius between the open ends shall not be less than 110 mm.

## 14.8 Pipe proving

a. On completion of pipe laying it shall be proved between manholes, by pulling through a cylindrical cleaning brush twice followed by a polished hardwood or Teflon mandrill as specified in clause 14.1.d & 14.2.b.

## 14.9 Plugging of Pipe Ends.

a. All open pipe ends must be plugged using standard pipe plugs to prevent the ingress of dirt.

## 14.10 Marker Tape.

a. A marker tape shall be placed 300mm above the top layer of pipes, or as directed by the Area Manager. The tape shall be continuous and must be knotted to joint lengths. The tape, which may be polythene or PVC sheet is 150mm wide and 0,12mm thick and will be supplied in rolls nominally 500 metre long.

## 15. JOINTING OF PVC / HDPE PIPES.

- a. Plastic couplings and '0' rings are used to joint the pipes assisted by a lubricant supplied with the pipes. The pipe end and the inner surface of the coupling shall be clean before the spigot is pushed into the coupling.
- b. The end of the first pipe to be placed in a trench shall be firmly against a solid object to ensure that pressure applied to subsequent pipe lengths will drive pipe ends firmly into couplings. Pipe lengths are supplied with a coupling with a 'O' ring in the 3<sup>rd</sup> corrugation valley from the end of the pipe prefitted on each length. To joint two pipes, fit a 'O' ring in the 3<sup>rd</sup> corrugation valley of the open end of the pipe. The seal should not be twisted and should be properly and evenly seated in the corrugation valley. Apply lubricant on the inside bore of the coupling and push the pipe firmly into the pre-fitted coupling on the other length until it stops against the end stop in the coupling. Repeat this process with all the lengths in the pipe run.
- c. The Service Provider shall do any necessary cutting of pipes according to the requirements of the work. Pipes shall be cut to length using a sharp fine-toothed saw or knife.

## **16. PIPELINE BRANCHING POINTS**

a. Where single pipe runs converge where manholes or other facilities are not provided the Service Provider shall lay the pipes so that the pipe centre lines are at the same level and so that the ends of the branching pipes butt against the backbone pipe, unless otherwise indicated on the drawings.

## **16.1 Underground Pipe Junction Boxes**

- a. Pipe junction boxes shall be constructed on site, where specified, utilising two concrete slabs e.g. paving slabs, not less than 800 mm x 800 mm x 50 mm and standard size bricks and mortar. Bricks must be of baked clay quality. The bricks must be build in a single wall configuration, be of 20 mpa strength and a minimum of five layers. The slabs must be suitably reinforced with 100 mm square welded mesh of 4 mm thickness. See Drawings PJB4R. The number of pipes converging at that point and their direction will determine the configuration and positioning if pipe ends relative to one another at any particular site. The pipe junction boxes shall not be covered with backfill before inspection.
- b. If a frame and cover are to be placed on the pipe junction box, in certain applications like townhouse developments, the size of the coping must be 300mm bigger on all sides than the diameter of the frame and overlap 300mm as on a jointing pit. Refer to drawing JP 4A.

## **17. STREET DISTRIBUTION CABINETS**

## 17.1 Positioning of SDC

- a. The cabinet should not obstruct the view of vehicle drivers.
- b. The cabinet must not obstruct any footpaths or pedestrian walk ways.
- c. The cabinet should be reasonably safe from damage by vehicles and other working operations.
- d. Cabinets should preferably be installed in dry weather conditions.
- e. The doors must be easily accessible to working parties and for working conditions.

- f. The single-sided SDC should be mounted as near as possible against a wall or fence. (if possible +- 200mm)
- g. The excavation for the SDC plinth must be 1200mm x 450mm x 375mm. (L x W X D)

## 17.2 Earthing of SDC

- a. An earth must be provided by means of a ring design at every protected SDC. Only in circumstances where space does not allow the ring design will another design, approved in writing by Telkom, be allowed. The resistance to earth must be as per design with reference resistance less than 30 Ohms where the SDC is associated with a digital concentrator and 50 Ohms at other SDC's. Refer to Street Cabinets for Exchange and Cable concentrators Earthing ST-0003 at: <a href="http://www.tns.telkom.co.za/bookshelf/downloads/documents/ST-0003.pdf">http://www.tns.telkom.co.za/bookshelf/downloads/documents/ST-0003.pdf</a> and Telkom Standard (Technical) : Outdoor Plant -Earthing, Bonding, Surge and lightning protection ST-0010. <a href="http://www.tns.telkom.co.za/bookshelf/downloads/documents/St-0010.pdf">http://www.tns.telkom.co.za/bookshelf/downloads/documents/St-0003.pdf</a>
- b. All connections must be exothermic welded and the earthing system must be a minimum depth of 700mm with the rod at a minimum of 600m. (refer to clause 11.2.1)
- c. The connection wire between the earth system and the SDC must be 2 x 35mm<sup>2</sup> green/yellow insulated copper wires with lugs and housed in a 50mm pipe to the SDC plinth. Make use of a 50mm long radius bend to extend the 50mm pipe and route it together with the 110mm long radius bends at the SDC plinth.
- d. There is a hole provided in the baseplate of the SDC for the earth wires.
- e. The earth wires must be connected to the SDC frame to the 8mm earth stud that is provided in the SDC cabinet.
- f. For detailed earthing system see: Street cabinets for exchange and cable concentrators Earthing STD 0003. <u>http://www.tns.telkom.co.za/bookshelf/downloads/documents/ST-0003.pdf</u> and Telkom Standard (Technical) : Outdoor Plant -Earthing, Bonding, Surge and lightning protection ST-0010. <u>http://www.tns.telkom.co.za/bookshelf/downloads/documents/St-0010.pdf</u>
- g. All SDC's to be earthed when installed as per specification and standards.

## 17.3 Excavation and erection

#### 17.3.1 Pipe entry in manhole

- a. Install four pipes between the SDC and the manhole at a minimum depth of 600mm in the configuration as shown in drawings SDC 5B and MPE 7. Use long radius bends at the SDC plinth. A 50mm pipe must be installed for the SDC earth.
- b. The pipes must be laid to the nearest manhole wall from the SDC. The minimum distance between the pipe entry nearest to a corner in the manhole must be 75mm. There must be a minimum of 300mm between the pipe entries and the manhole roof. These measurements should be measured in the inside of the manhole.
- c. When installing a new SDC at an existing manhole, pipe entries must be drilled into the manhole wall with a 110mm concrete drill.
- d. Once the pipes are in place, the wall must be repaired and sealed with mortar or 2 x O' rings and

silicone sealer.

- e. After reparation of the wall, the pipes should be cut flush against the wall with a sharp knife or product of supplier's tool.
- f. Follow the same procedure and materials for bedding, padding and backfilling as described in points 8 and 9 of this document.
- g. Place the plinth of the SDC over the long radius bends to make sure the spacing are correct before finalising the backfilling of the pipes.
- h. The trench must be compacted with a compactor as in specified in points 8 of this document.

#### 17.3.2 Erection of SDC

- a. The excavation for the SDC plinth must be 1200mm long x 450mm wide x 375mm deep.
- b. Remove the steel plinth with the base plate from the cabinet by loosening the nuts inside the cabinet floor.
- c. Place the plinth over the long radius bends to make sure the spacing is correct. Backfill the excavation with sieved material and compact it by hand.
- d. Remove the plinth and compact the backfilled material to provide a firm bed for the plinth at a depth of 375mm.
- e. Place the plinth over the long radius bends and level it with a spirit level and support the plinth firmly.
- f. Cut the pipes 25mm above the level of the base plate with a sharp knife. Place the rubber seal that is provided on top of the base plate over the pipes before you bolt the cabinet back on the plinth.
- g. Pour concrete mixed to a mix of 20 Mpa strength (reached after 28 days) into the excavation around the steel plinth and tamp or vibrate it properly. Fill the excavation up to ground level with concrete.
- h. Allow the concrete to set for 24 hours before the cabinet can be bolted onto the plinth.
- i. Compact the whole area around the plinth with a mechanical compactor to prepare a firm surface for the coping as described in (j). Take care not to damage the concrete around the plinth.
- j. Cast concrete coping of 150mm thick, 1000mm at the door side (front), 300mm at the sides and 200mm at the back of the plinth mixed to the same mix as in (g).
- k. Allow for 24 hours to set before you remove the templates of the coping.
- I. Clean the working area after completion.
- m. Refer to drawings SDC 5A for details of the SDC installation.

## 18. STEEL PILLARS

## 18.1 Aluex stainless steel pillars (ANO requirement only)

- a. Aluex pillars are used in limited applications as SDC for distribution purposes. It must be installed as shown on drawing AP 1.
- b. If the pillars are used in lightning areas and protection is used on the IDC blocks, an earth must be provided as in the case of a SDC. The earth wire must be installed through the 110mm pipe and connected on the earth stud as shown on AP 1.
- c. All exposed metal conductors must be bonded as per Telkom Standard (Technical) : Outdoor Plant -Earthing, Bonding, Surge and lightning protection ST-0010 <u>http://www.tns.telkom.co.za/bookshelf/downloads/documents/St-0010.pdf</u>

## 18.2 Steel pillars

a. Galvanised steel pillars are used to replace damaged asbestos pillars and details of the steel pillar and installation thereof are shown on drawing PJ 3.

## **19. PIPE ENTRIES TO BUILDINGS AND MANHOLES.**

- a. Holes required to be made in the walls of existing buildings or manholes to provide new pipe entry shall be neatly made by drilling and without cracking or otherwise damaging the surrounding structure.
- b. The point of entry of underground pipes into buildings, manholes or jointing pits must be effectively closed and sealed with cement to prevent ingress of water between pipe and the wall of the structure.
- c. No entry holes may be made into private structures without the written consent of the owner.

## 20. MANHOLE CONSTRUCTION

#### 20.1 General

- a. A deviation of up to 5%, in specified measurements or dimensions will be acceptable.
- b. Footway and/or roadway manholes shall be constructed in accordance with the particulars indicated in the drawings listed in section 3.2.5 of this document. Details of the standard manhole equipment used by Telkom SA are shown in Drawing SME 6. Steel forms or sturdy sheet steel-faced timber shall be used for the construction throughout, unless other forms are specifically ordered or permitted by the Area Manager.

#### 20.2 Positioning of other services at manholes

a. Underground plant such as gas, water or sewerage mains, electricity supply cables and storms water drains, which obstruct the construction of manholes, shall be brought to the notice of the Area Manager. Where there is no other alternative these will be moved at Telkom SA's expense or as

the Area Manager may otherwise decide.

- b. Where the relocation of a service at a manhole is not possible, the location of the service must be clearly indicated on the completion plan and marked in the inside of the manhole by engraving the location and type of service into the wall and painting the engraving red.
- c. If the service must pass through the manhole, it must be protected by a split steel pipe and clearly marked. The type of service must be indicated by means of permanent paint on the protection pipe.

## 20.3 Ready Mixed Concrete

a. Maximum use shall be made of ready, mixed concrete, with strength of **20 Mpa** after 28 days, supplied by a reputable firm and delivered in agitator trucks. Whichever method of mixing is used, the total delivered period shall not exceed 3 hours. (See SABS 878). The Local Mixing Machine method can be adopted, with the Area Manager's approval, if ready mixed concrete is not available or the terrain is inaccessible for agitator trucks.

## 20.4 Special Manholes

a. Special pre-designed re-inforced manholes may be required in certain situations. The Service Provider shall be responsible to comply with the loading requirements of SABS specification 558 (table 2) or to withstand the maximum loads permitted by the Authorities concern.

## 20.5 Materials

#### 20.5.1 Cement

a. All cement used shall be ordinary Portland cement obtained from an approved South African manufacturer. It shall be strictly in accordance with the requirements of SABS Specification 471 immediately prior to its use and at all times subject to the approval of the Area Manager.

#### 20.5.2 Fine Aggregate for Concrete

- a. Sand shall be clean, hard and free from clay, lumps, loam, organic matter or other deleterious substances.
- b. Sand, stockpiled on the site of the works, shall be protected from contamination by being placed on steel sheets or other approved type of hard standing.

#### 20.5.3 Coarse Aggregated for Concrete

- a. Coarse aggregate for concrete, shall consist of clean hard stone, broken to a cubical or spherical shape and well graded to the satisfaction of the Area Manager, between the sizes 20 mm and 13 mm. It must be free from injurious amounts of soft, friable, thin, elongated or laminated pieces, clay, and organic or other deleterious substances.
- b. Coarse aggregate stockpiles on the site of the works shall be protected from contamination by being placed on steel sheets or other type of approved hard surfaces.

#### 20.5.4 Water

- a. Only clean water e.g. from a municipal water supply shall be used for mixing and curing concrete on the work.
- b. The Service Provider shall make his own arrangements to obtain water.

#### 20.5.5 I-Beams

d. The I-beams shall be of the following specific requirements W=70 mm x H=140mm x T6mm with Chromite treated solution.

#### 20.5.6 Angle Iron

a. The Angle Iron shall be of the following specific requirements 50mm x 50mm x 5mm with Chromite treated solution.

#### 20.5.7 Corrugated Iron

a. The Corrugated Iron shall be of the following specific gauge requirements 0,55mm - 0.6mm grade A full hard SABS approved.

## 20.6 Concrete Mixture

## 20.6.1 The concrete used shall be of the following proportions by volume :

Footway	<u>Roadway</u>	Parts:
1	1	Cement
3	2	Fine aggregate
5	4	Coarse aggregate

In particular circumstances, local authorities might require a stronger make-up of concrete. Mixture strength/s can be obtained from reputable suppliers. Depending materials used, the 1:2:4 mix should e.g. provide a strength of 35 MPA. For reference:-SABS 1200 G (1982) Section G : Concrete (Structural), and SABS 1200 GA (1982) Section GA : Concrete (small works).

#### 20.6.2 Mixing of Concrete (Rotary Batch Mixing)

- a. Mixing of concrete shall be effected in an approved machine of the rotary batch mixing type.
- b. The whole of the materials to be used in any one batch of concrete is to be separately and accurately gauged to the satisfaction of the Area Manager.
- c. The materials shall be fed into the mixing drum and this shall be turned a sufficient number of times to mix the materials dry before any water is added.
- d. Water shall be added so that the amount of water used may be controlled according to the conditions at the time of working. In general, a slump of not more than 75 mm in standard slump

testing accordance with SABS Specification 878 will be allowed. Mixing shall be continued until a thoroughly homogeneous and uniform concrete is produced.

e. The drum of the machine shall be completely emptied after each batch and shall be cleaned and washed.

#### 20.6.3 Tests Equipment for Slump Test.

a. The Service Provider shall provide the necessary equipment for the standard slump test and shall make this available to the Area Manager throughout the contract. (SABS Method SM 862-1 refers).

## 20.7 Placing of Concrete

- a. The concrete shall be placed in position under the supervision of competent tradesman as soon as possible after mixing and not more than 30 minutes shall be allowed to elapse between the time of first wetting and placing in position, nor shall any re-mixing be allowed.
- b. Before any concrete is placed, the Service Provider shall examine all forms or shuttering for firmness and correctness of position and all dirt and other foreign matter shall be removed.

#### 20.7.1 Hand Mixing

- a. Hand mixing is permitted in exceptional cases, but only with the written permission of the Area Manager and shall be performed only on watertight platforms. In measuring the mixture quantities the same size containers should be used for the mixture items.
- b. Cube test per batch to be provided when called for by the Area Manager 20MPA / 28 days. Results of the Cube test to be forwarded to the Area Manager. Costs for the test will be for the Service Provider's account.

## 20.7.2 Bricks

- a. Under special circumstances where bricks are used to construct manholes the following shall apply:
  - i. Area Manager's written permission;
  - ii. Baked quality clay bricks (preferably of the solid type to accommodate cable hanger bolts

fixing);

- iii. Re-enforcement, pending size of manhole;
- iv. Outside wall waterproofing.

## 21. SUPPLY AND PLACEMENT OF REINFORCED CONCRETE

## 21.1 Materials

#### 21.1.1 Concrete

a. The concrete mixture used shall be such that strength of 20 Mpa shall be obtained 28 days after being placed. The Area Manager may call for samples.

#### 21.1.2 Reinforcing

a. The reinforcing used shall be mild steel rod with a nominal diameter of 8 mm. The Area Manager shall approve the design of all reinforcing.

## 21.2 Dimensions of Casting

a. Where pipes are cased with concrete, a minimum separation of 50 mm between pipes and 75mm between layers of pipes shall be maintained. The thickness of the concrete bedding below the bottom layer of pipes shall be a minimum of 75 mm and the thickness of the cover over the top layer of pipes shall be minimum of 75 mm. The minimum concrete thickness on the sides of the pipe layer must be 75mm. The volume of the concrete casing shall be computed from the above measurements and no allowance shall be made for bulking of material.

## 21.3 Pipe Support

- a. During pipe laying and before the placing of the concrete casing, the pipes shall be suitably supported. Care shall be taken during the placing of concrete to prevent movement or flotation of the pipeline.
- b. In the case of pipes with flexible joints, concrete shall not be allowed to enter the joints during construction of the bedding and a positive vertical expansion joint in the bedding shall be formed at each joint.
- c. Where ordered or where required in terms of the project specification or drawings, pipes shall be encased in concrete of the specified grade. The lower part of the encasement shall be constructed first in the manner specified in 21.2. Once the pipeline has been tested and approved, the pipes shall be covered with concrete to the specified depth and expansion joints shall be constructed in the upper part to co-inside with those in the lower part. No earth filling over the concrete shall be placed until the concrete has attained strength of at least 15 Mpa.

## 21.4 Cable Support Hangers

- b. Cable hangers shall be fitted on each sidewall of a manhole as specified on the appropriate manhole drawing or as the Area Manager may direct. In special non-standard manholes, at a height such that the bottom of the hanger is 150mm lower than the horizontal line of the lowest pipeline.
- c. Drawing numbers HSM 1 and HTM 1 shows the principle of determining the correct positions of the cable hangers.

## 22. DEMOLITION OF EXISTING MANHOLES.

a. Demolition of existing concrete or masonry necessary to enable inadequate manholes to be reconstructed shall be undertaken in such a way that cables or joints are not damaged. Cable joints shall not be moved or allowed to sag. Where joints must be moved, the Area Manager shall be advised at least eight working hours in advance so that Supervision and subsequent pressure testing of such joints may be arranged where necessary. Existing Manhole covers and frames as well as roof supporting rails shall be recovered for possible re-use.

b. Split pipes in conjunction with ropes must be used to support existing cables and joints.

## 23. MANHOLE FRAMES AND COVERS

a. Frames and covers supplied by Telkom SA shall be used by the Service Provider to cover manholes constructed. Details of the frames and covers are shown in drawing SME6 for manholes.

## 24. MANHOLE MARKERS

- a. Manhole markers shall be placed at each manhole in a position designated by the Area Manager. These markers shall be provided by the Service Provider, but at Telkom SA's expense.
- b. The markers shall have a length of not less than 1 800 mm and a diameter of not less than 100 mm (or a square cross section of not less than 90 mm thickness).
- c. The material used to construct the manhole markers shall be in accordance with sub-clause 21.1.1 and 21.1.2
- d. The manhole marker shall be reinforced with 4 (four) mild steel rods of nominal diameter of 8 mm and length not less than 1 700 mm placed diagonally apart with a spacing of 38 mm.
- e. The manhole markers shall be planted 600 mm deep, opposite the manhole, preferably against the fence, and be well compacted.
- f. In special circumstances Telkom SA might specify electronic marking (for manhole tracing when manholes are covered) which will be specified in the project specifications.

## **25. DIRECTIONAL BORING**

- a. Directional boring will be the preferred method to cross roads, highways, railway lines, rivers and all other services that proves dangerous or costly to cross using conventional methods like trenching or ploughing.
- b. Rigs capable of drilling up to 300 metres in one drill are available and various sizes of ducts can be installed with this equipment depending on soil conditions.
- c. If 110 mm ducts must be pulled in through the drilled hole, a 110 mm class 10 HDPE pipe must be used.
- d. The diameter of the drilling hole should exceed that of the pipe by 30% in curved drillings and may be smaller (20%) in straight drilling applications.
- e. The covering in areas without water should not be less than three times the final diameter of the drilling hole and a minimum of 1,5 metre.
- f. At river crossings the distance between the bottom of the water and the drilling hole should be ten times the diameter of the pipe and not less than 3 metres.
- g. The payment of drilling done up to a point where an unforeseen obstacle was found which caused abandonment of further drilling must be specified in the proposal documents. (See 14.3.1a)
- h. Abandoned drilling holes must be refilled by the Service Provider with materials of homogenous composition and must harden after a certain time.
- i. Soil removal during the drilling process is the responsibility of the Service Provider.
- j. If the accuracy of the drilling is not specified in the tender documents, the area in which the drilling may wander should not exceed 40cm diameter around the predetermined axis. This is applicable for small to medium size drilling holes not exceeding 20cm and with the lowest point less than 5m below the surface.
- k. The most commonly used drilling fluid is bentonite-based and the main purpose of the drilling fluid are the sealing and the hydraulic support of the opened drilling channel, the transportation of the soil and the hydro mechanical loosening of soil by means of jet-bits.
- I. The location and depth of services must be pre-determined before drilling can commence, as the bending radius of the drilling rods is limited. Sudden deviations are not possible to bypass obstacles.

## 26. PLOUGHING IN OF CABLES

#### 26.1 Route preparation

- a. Road crossings and railway crossings must be done in advance, by either directional boring or the conventional method of trench and laying of pipes. Dirt roads in rural areas can be crossed by ploughing in the cable in the plough in process.
- b. Stay wires and struts on overhead routes that will obstruct the passage of the machines, must be removed and temporary supports must be installed to support the overhead routes.
- c. Pre-ripping must be done with a suitable machine, D8, D9 or four-wheel drive tractor depending on soil conditions, at a depth greater than the required depth for cable placement. The minimum laying depth should be between 1m and 1.2m or as stipulated in the wayleave. This is to allow a sufficient bed of fine materials at cable laying depth.
- d. The final rip must be in the same direction as the direction of ploughing in of the cable.
- e. The only exception to pre-ripping will be in sandy soil conditions, where there are known to be no rock up to cable laying depth.
- f. Creek and river crossings must be pre-trenched with an excavator to allow for the placement of the cable in a split pipe and covered with a concrete slab for protection against water erosion.

#### 26.2 Ploughing in method

- a. Excavate at least 5 metres of normal trench at the starting point of the plough in with an excavator to allow the plough to start laying the cable at the correct depth. (1m to 1.2m or as stipulated in the wayleave)
- b. Position the plough-in machine over the opened trench, with the plough in the open trench.

- c. Load the cable drum on the cable carrying attachment on the front of the machine and feed the cable through the rollers and the chute into the trench.
- d. Under no circumstances must the inner duct be laid simultaneously with the cable in any plough in method, because the duct will have bends and cannot be used, as any method be it hauling or blow-in of cable will be impossible.
- e. Load the marker tape and feed it through the chute to be laid at a position 300mm above the cable.
- f. The sequence out of the chute must be first the cable and then the marker tape on top.
- g. Ensure that sufficient slack is pulled of the cable drum for splicing purposes.
- h. The machine must start slowly to allow workers to hold the cable and marker tape by hand in the trench to prevent it from being pulled along with the machine.
- i. The plough in process should be a continuos process and stoppages should be minimised.
- j. The feeding through the chute must be monitored continuously by a worker to ensure that the marker tape does not break or that the feeding system runs out of marker tape. On some machines the marker tape is mounted at the back and the operator can not monitor it. It is advisable to have an alarm button at the back of the machine to warn the operator if needed.
- k. Stoppages in the plough in process should only be for loading of cable or marker tape and when the terrain demands it.
- I. At the end of the cable length or where a splice must be introduced, the trench must be excavated manually and sufficient slack must be left for the splice. 15 meters on optic fibre cables and 3 meters on either side on copper cables.
- m. The next length of cable must be loaded and fed through the plough chute and the same process followed as in (a) to (h).
- n. Plough in can be stopped for the night in the middle of a drum length, providing that the machine does not pose an obstacle to traffic and farming operations. A guarded camp must be established at the machine to protect the machine and cable for the night.
- o. Jointing pits or small manholes must be build after the plough in of the cable at the splicing locations. Pre-fabricated pits can also be utilised if it is cost effective.
- p. At the end of the plough in section where the cable link up with existing infrastructure, the last 5 meters must also be excavated beforehand and the cable can be ploughed in to as near as possible to the jointing pit or manhole and installed by hand.
- q. All optical fibre cables must be tested before and after the plough in process to ensure that there is no damage to the cable.

#### 26.3 Cleaning up

- a. After the plough in process is completed, the trench must be levelled by one of the following methods:
- i. Back blading with the plough in machine.
- ii. Re-instating the disturbed surface by driving the tracks of the plough in machine directly over the

disturbed area.

- iii. Using a TLB to level the disturbed areas.
- b. Compaction needs to be done as the plough in machine disturbs between 200 and 300 mm of soil. If the top layer of the soil is not compacted it will cause sacking of the trench or erosion will take place.
- c. All fences stays and struts must be repaired after completion of the levelling of the trench.

# 27. DIRECT BURIAL

#### 27.1 Applications

- a. Direct burial of copper or optical fibre can be done in the following instances:
- i. In rural areas where plough in can not be done due to terrain or machinery constraints.
- ii. In urban areas where the initial cables are directly buried under a layer of ducts which will be for future expansion of the network.
- iii. In urban areas, the lengths that can be directly buried will be limited by services crossing the proposed route and road crossings. No trenches are allowed to be left open during the night unless they are properly protected and guarded and arrangements have been made with the local authorities.

#### 27.2 Method

- a. In both applications should the trench be excavated as in normal pipe laying situations (1.2m deep or as stipulated in the wayleave).
- b. If only a cable must be buried in the trench, a trench not wider than 375mm should be excavated. This is to save on compaction material but still allow for a worker to stand in the excavated trench.
- c. The most suitable bedding and padding material in both applications will be river sand or sieved material not greater than 3mm.
- d. A layer of 150mm-bedding material must be placed on the bed of the trench before the cable can be laid.
- e. Lay the cable and cover it with 150mm-padding material, which must be tamped over and around the cable by hand. River sand should contain a moisture content of 9-11% to be able to compact within the accepted specification.
- f. If pipes must be laid simultaneous with the directly buried cable, firstly the cable must be laid on a bedding of 150mm and covered with a padding of 150mm, then lay pipes with a padding of 75mm and finally backfill the trench. (**NOTE Do not lay pipes directly on top of the cable**)



#### DRAWING SHOWING A DIRE CT BURIED CABLE AND TWO PIPES IN A TRENCH

- g. Lay the pipes as described in point 11 of this document and use the same compaction material as is used with the directly laid cable or as specified in section 8 on approval of the Area Manager.
- h. Mechanical compaction should not be done on top of the cable unless it is covered with a minimum of 300mm of backfill over and above the 150mm-compaction material.
- i. Manholes and jointing pits must be build as planned to accommodate joints and future development in normal way.

# 28. MATERIAL TO BE SUPPLIED BY TELKOM

a. The material to be supplied by Telkom SA for the work as set out in this specification is listed in Schedule 1. All material received must be signed for by the Contract representative and the company stamp must attest each delivery.

# 29. ACCESS TO BUILDINGS

a. No member of the Service Provider's personnel shall be allowed to enter Telkom SA's premises unless he is identified by the Service Provider and is in possession of a South African passport or valid identity card.

# **30. EXECUTION OF WORK**

a. The Service Provider shall make himself thoroughly conversant with the terms and conditions as set out in the contract and his proposal shall provide for carrying out the work in its entirety as called for by Telkom SA.

# 31. ACCEPTANCE OF PIPE INSTALLATION

a. Telkom SA will take over the completed portions of pipe installation for the installation of the cable when necessary or on completion of the contract, whichever is the earlier. The Service Provider shall be responsible for the complete installation until it is taken over and shall prove that the pipe lines are in order throughout by repeating the mandrill test specified in Clauses 14.1.d and 14.2.b in the presence of the accepting officer.

# 32. CLEARANCE OF SITE ON COMPLETION

a. On the completion of the Works, the Service Provider shall at his own expense, clear away and remove from the site all plant, equipment, surplus materials and temporary works of any kind. He shall restore any area, roads, fences, etc. that may have been interfered with by him or his workmen, and shall leave the whole of the site and the Works clean and in a workmanlike condition, to the satisfaction of the Area Manager.

# **33. CERTIFICATE AND PAYMENT**

- a. Payment will be made for accepted completed work only: between two completed manholes inclusive of: manhole marker; pipe surface and surrounding area to acknowledged satisfaction of the land owner or relevant authority; repair to damaged fences, earth contours, etc. satisfactory proving of the pipe by the mandrill test; and final acceptance by the Area Manager.
- b. The Service Provider shall provide completion plans to the Area Manager, of each section completed. These plans and measurements will be checked by the basis of payment calculations.

# 34. SCHEDULE 1

# 34.1 List of material to be supplied by Telkom SA

Item	Description of item	Drawing	TELKOM Specification
1	Manhole frame and cover, security type, roadway type, round	SME 6	_
2	Cable Hangers and Brackets	HSM 1 & HTM 1	_
3	Self locating bolts for brackets		_
4	Pipe bends for SDC's	_	_
5	All pipes, couplings & pipe plugs110mm	_	_
6	All pipes 40mm and 32mm HDPE	_	_
7	Marking tape (yellow "danger")		
8	Street distribution cabinets (All types) (Including securing bolts)	_	_
9	Pre-Cast Pits (where applicable)	_	_
10	Steel Pillars (Pillar joints)	_	_

# <u>NOTE: The Service Provider shall supply all other material necessary for execution and completion of the work.</u>

# 35. SCHEDULE 2

a. This material may only be used with the written consent or a site instruction of the Area Manager.

# 35.1 TEST FOR SUITABILITY OF MATERIAL FOR USE AS BEDDING OR PADDING

#### 35.1.1 GRADING : Obtain a representative sample of the material as follows :

- a. Heap about 40 kg of the dry material on a clean surface, mix it thoroughly, divide it into two parts of approximately equal size, and discard one part. Repeat the mixing, division, and discarding procedure until a sample of mass about 2.5-kg is obtained. Weigh this sample.
- b. Pass the representative sample through three sieves of nominal aperture size respectively 19 mm, 13.2mm and 0.6 mm. If:
- i. Any particular are retained on the 19 mm sieve, or
- ii. More than 5% by mass of the sample is retained on the 13.2 mm sieve, or
- iii. Less than 40% by mass of the sample is retained on the 0.6-mm sieve, regard the material as unsuitable for use in bedding.

## 35.2 COMPACTIBILITY TEST

#### 35.2.1 Apparatus

- a. Cylinder: An open-ended cylinder of length approximately 200 mm and nominal internaldiameter 150 mm.
- b. Rammer : A metal rammer of mass approximately 1 kg and having a striking face of diameter approximately 38 mm.
- c. Rule: A steel rule graduated in millimetres.

## 35.3 Procedure

#### 35.3.1 Obtain a representative sample of the material as follows :

- a. Heap about 160 kg of the material on a clean surface, mix it thoroughly, divide it into two parts of approximately equal size, and discard one part. Repeat the mixing division and discarding procedure until a sample of mass about 10kg is obtained. Ensure that the moisture content of the sample is approximately the same as that of the main body of bedding material at the time that it will be used in the trench.
- b. Place the cylinder on a firm flat surface and gently pour the sample into it, taking care not to compact the material in any way. Strike off the top surface of the material level with the top of the cylinder, and remove all surplus material from the flat surface. Lift the cylinder up clear of its contents and place it on fresh areas of flat surface.
- c. Return about one-quarter of the sample to the cylinder and tamp vigorously until no further compaction can be obtained. Repeat this procedure on each of the other quarters, adding each, in turn, to the material in the cylinder and tamping the final surface as level as possible.
- d. Measure the distance (**x**) in mm from the level of the compacted sample to the top of the cylinder and record. This distance divided by the length of the cylinder is the compactibility factor of the bedding material. i.e. x mm / 200 mm.

# 35.4 Evaluation of Results

uitable for bedding
Iso suitable for bedding but may only be the Engineers approval, as it requires re and more compaction effort.
nsuitable

# 36. SCHEDULE 3

# 36.1 LAYING OF PIPES IN SOIL CONDITIONS

#### 36.1.1 SCOPE

a. These specifications shall cover the laying of HDPE / PVC conduit for TELKOM cables in all ground conditions. These specifications shall not cover trenches under roads and railways. Where pipes are to be laid under road or rail, the specifications of the road or rail authority must be considered in conjunction with the requirements for backfilling of the pipe.

#### 36.1.2 DEHYDRATION

a. Where pipes are laid under the road and rail, the Service Provider must dehydrate the trench and maintain the trench in a dry condition. In other cases, the Service Provider must make a reasonable effort to dehydrate the trench.

#### 36.1.3 MATERIAL

a. The material to be used for bedding and padding shall be single sized, even graded crushed stone with nominal size ranging from 6 mm to 19 mm. The material must have a compactibility factor of less than 0.10.

#### 36.1.4 COMPACTION

a. The compaction of bedding and padding shall be carried out in the normal method.

# 37. SCHEDULE 4

#### **37.1 PIPE JACKING**

#### 37.1.1 SCOPE

a. This specification covers the insertion, by jacking, of pipelines of diameter not exceeding 3 m under roads, railways, and the like without disturbing the surface or interfering with the normal flow of traffic.

#### 37.1.2 DEFINITIONS

37.1.2.1 For the purpose of this specification the following definitions shall apply ;

#### a. Intermediate Jacking Station

i. A transverse joint in a jacking structure at which jacking is performed.

#### b. Jacking

i. The action of pushing a pipeline into position.

#### c. Jacking Frame

i. A frame on which the jacks are mounted and through which the jacking forces are transmitted.

#### d. Jacking Structure

i. An assembly comprising the jacking frame, the permanent pipes being jacked, and the shield.

#### e. Lead Pipe.

i. A pipe that has a rebated end over which the trailing end of the shield is fitted and that is intended to be the first pipe to be used in the jacking process.

#### f. Reception Pit.

i. An excavated shaft that is located at the end of a jacked section of a pipeline and from which the shield is recovered.

#### g. Shield

i. A device that is located at the leading end of the jacking structure and is intended to provide protection for workmen at the leading end, and to prevent collapse of the face of the tunnel excavation.

#### h. Thrust Pit.

i. An excavated shaft at the commencement point of a jacked section of a pipeline, in which the jacking structure and other equipment are installed and from which the jacking operations are carried out.

#### i. Thrust Plate

i. A steel plate that is placed against the end of the concrete pipe against which the jack operates and that is intended to ensure that the jacking forces are spread over the end face of the pipe.

## 37.2 MATERIALS

#### 37.2.1 Pipes:

- a. Pipes for jacking shall be reinforced concrete pipes of the SC type and D-load designation 100D that comply with the relevant requirements of SABS 677, and shall be sealed. The actual diameters of the pipes supplied shall be not less than the nominal diameters given on the drawings or stated in the schedule.
- b. In additional to withstanding the specified two (or three edge-bearing test load, the pipes shall be capable of withstanding, without damage, the maximum longitudinal force to be transmitted by the Service Provider's jacks during jacking.

#### 37.2.2 INTERMEDIATE JACKING STATIONS

- a. Under certain circumstances it may be necessary to provide an intermediate jacking station within a single jacked length between the thrust and reception pits.
- b. Such a station shall consist of a pair of modified jacking pipes. The Service Provider shall provide cylindrical mild steel sleeves of wall thickness at least 8 mm and of such length that they overlap the pipes for a distance of a least 150 mm on either side of the joint.

#### 37.3 PLANT

#### 37.3.1 General

a. The Service Provider shall provide and use suitable equipment for handling pipes and placing them in position for jacking, for jacking the pipes, for the lubrication of the outer surface of the pipeline, and for excavation within the pipe.

#### 37.3.2 Jacks

a. Each set of jacks shall be fitted with a suitably calibrated pressure gauge in good working order and such that the actual jacking forces can be read any time during the jacking operation. To transfer the load from the jacks to the pipes, suitable thrust plates shall be provided for placing against the ends of the pipes.

#### 37.3.3 Shield

a. A suitable shield for fitting to the front of the lead pipe shall be provided by the Contractor to protect workmen and prevent collapse of the face or roof of the excavation ahead of the jacked structure. Shield shall be directionally adjustable.

#### 37.3.4 Lighting

a. The Contractor shall provide adequate lighting for execution of the Works.

#### **37.4 CONSTRUCTION**

#### 37.4.1 General

- a. Authority to jack pipeline under facilities controlled by third parties.
- i. Except where otherwise required in terms of the project specification, the Area Manager will obtain prior permission from any third party who controls the land or any structure on the land (or both) under the surface of which the pipeline is to be observed before and during jacking operations.

#### 37.4.2 Competence

a. Jacking and excavation shall be supervised and undertaken only by persons fully conversant with

this work.

#### 37.4.3 Design Calculation by the Service Provider

- a. The Service Provider shall, when so ordered, furnish details design calculations, specifications, and working drawings to show his methods of installation and methods of providing temporary support for the road, rail track, or other service or structure and any modifications to structures required before pipe jacking commences.
- b. The design shall be carried out by a Civil Engineer with adequate experience in this field. The Area Manager responsible for their preparations shall sign calculations, specifications, and drawings. The Service Provider shall not commence any work shown of the said drawings or specified in the said specifications until the Area Manager has signified in writing that the Service Provider may proceed.

#### 37.4.4 Service Provider's sole Responsibility.

a. Any permission to proceed given in terms of 37.4.3.b or otherwise, shall not indicate acceptance by Telkom SA or the Area Manager of any responsibility for safety or adequacy of jacking structures and methods of working and, in terms of sub-clause 2.5 of SABS 1200 A or SABS 1200 AA, as applicable, shall not limit the obligations and liabilities of the Contractor in regard to such safety or adequacy.

#### 37.4.5 Safety Control Requirements

#### 37.4.5.1 Jacking not to Impair Safety

a. The pipeline shall be jacked through under the road, railway, or other service or structure, as applicable, without disrupting traffic and without disturbing the alignment or levels of the road surface, the tracks, or other service or structure, as applicable, to an extend that may impair the safety of traffic or of the service or structure.

#### 37.4.5.2 Examination of Structures at Risk

a. Before commencing work in the vicinity of any structure, the Service Provider shall make a detailed examination of the Structure record its condition, and submit a copy of such record of the Area Manager.

#### 37.4.6 Recording of Movements

- a. **General.** The Service Provider shall take measurements before and after the construction period and shall record any change in line or level (or both) of any road, rail track or other service or structure being traversed. A copy of such record shall be made available to the Area Manager.
- b. **Working under roadways**. Before commencing work under a roadway, the Service Provider shall measure levels on the road surface directly over the jacking line and for a distance of at least 5m on each side of the jacking line. These levels shall be measured at 500-mm intervals along each line of the road paint markings. In cases where the road has no painted shoulder markings, the shoulder levels shall be measured 300 mm from the edges of the surfacing.
- c. Where the road has paved side drains, levels shall also be measured in the invert of the drains. In order to facilitate control of the measuring of levels, the exact position of each spot height shall be discreetly marked on the road surface before the levels are measured.

- d. After completion of the works, the Service Provider shall re-measure the levels in the same manner as before, and shall submit to the Area Manager the records of levels taken before and after jacking. The submission of such records shall be a prerequisite for any consideration by the Area Manager of the acceptability or otherwise of the Works or the issue of any certificate of completion.
- e. If, within a period of one year after completion of the Works, the road shows any sign of settlement in the vicinity of the jacked pipe, the road authority may re-measure levels on the Site.
- f. The Service Provider shall be held responsible for the rectification, to the satisfaction of the road authority, of any deformation that occurs in the road surface in the vicinity of the jacked pipe during the period of one year.

#### 37.4.7 Temporary Supports

a. Except when such support is provided by others, the Service Provider shall provide such temporary support as is necessary to carry road and rail traffic, and in the case of railway tracks, to prevent horizontal or vertical misalignment.

#### 37.4.8 Restriction on Blasting

a. No blasting shall be carried out without the prior written permission of the Area Manager, and without the necessary approval of clearance being obtained from the relevant authorities.

#### 37.4.9 Sleeve pipes

a. Pipes intended as sleeve pipes shall be laid with the inside walls smooth and free from projections and sharp edges.

#### 37.4.10 Excavation

a. General Subject to the provision of 32.4.8, the requirements of SABS 1200 D or SABS 1200 DA, as applicable, shall apply.

#### 37.4.11 Thrust Pit

- a. The Service Provider shall be responsible for excavation of the thrust and reception pits at each end of the section of the pipeline or sleeve that is to be jacked. These pits shall be dimensions at least equal to the minimum dimensions needed for the Service Provider's equipment and for safe and efficient working. The approximate dimensions of the pits that the Service Provider intends to excavate shall be agreed upon with the Area Manager before work commences. The excavated material shall be stockpiled for later backfilling.
- a. Timbers or other approved means shall adequately support the sides of the pits. Where a pit adjoins a railway or a heavenly entire operation to prevent any movement caused by vibration arising from rail or road traffic. [(The Service Provider's attention is drawn to the requirements of the Factories, Machinery and Building Work Act, Act 22 of 1941). (See Sub-clause 7.1 of SABS 1200 D or SABS 1200 DA, as applicable.)]
- b. The Service Provider shall ensure that, all times, each pit is provided with barriers and is a safe place within which to work.

## 37.4.12 Jacking of Pipeline

#### 37.4.12.1 General

a. The excavation shall be such that over break is kept to a minimum. No material shall be removed in advance if the leading edge is in unstable or loose material. If the material at the face starts to slip or run (see 37.4.12.2.c), excavation shall be stopped immediately and the Service Provider shall take such action as is necessary to stabilise the material before excavation is resumed.

#### 37.4.12.2 Prevention of subsidence during jacking

- a. To ensure that over break is kept to a minimum, the Service Provider shall ensure that the first concrete pipe used is so rebated that there is no substantial difference between the outside diameters of the shield and the pipeline.
- b. The Service Provider shall ensure that excavations within the pipe are under continuous expert supervision such that conditions at the front of the shield are always safe.
- c. The Service Provider shall take every reasonable precaution to ensure that no cavities exist beyond the circumference of the lead pipe.
- d. If necessary, the Service Provider shall make provision for suitable de-watering of the material in the vicinity of the leading edge of the pipe.
- e. Should any cavity occur around the outside of a pipe during the jacking process, such cavity shall be filled immediately by the injection of suitable approved process grout holes drilled in the pipe walls.
- f. Any subsidence occurring above the jacked pipe and arising from any cause related to jacking operations shall be made good to the satisfaction of the Area Manager at the Service Provider's expense.

#### 37.4.12.3 Standard procedure

a. At the conclusion of each day's work the pipeline being jacked shall be jacked up to the face and boarded up where necessary.

#### 37.4.12.4 Drainage

a. The Service Provider shall ensure that the head of each excavation is drained at all times.

#### 37.4.12.5 Jetting

a. Under no circumstances will jetting be permitted.

#### 37.5 Jacking Procedures

#### 37.5.1 Procedures.

- a. Each pipe shall be advanced by means of one or more hydraulic jacks of adequate capacity that bear(s) against a suitable thrust plate so that the thrust of the jack(s) is distributed adequately over the end face of the pipe.
- b. The rear end of each jack shall bear against a suitably designed structure such that the force is transferred to the surrounding material and evenly distributed over an area sufficient to ensure that the bearing capacity of the soil is not exceeded and that no structure in the vicinity of the thrust pit is disturbed.

#### 37.5.2 Lubrication of Structure During Jacking

a. The Service Provider may, with the written permission of the Area Manager, inject a suitable lubricant through performed holes in the structure or at the cutting edge of the shield.

#### 37.5.3 Thrust and Reception Pits.

a. Thrust and reception pits will in general be permitted only at positions where manholes or junctions are required, as indicated on drawings. Thrust pits shall be of sufficient size to allow jacking operations to be conducted with maximum efficiency.

#### 37.5.4 Backfilling and disposal of excavated material

a. When jacking has been completed and the jacking frame and shield dismantled the thrust and reception pits shall be backfilled to the extent necessary and in the manner indicated on the drawings or laid down in the project specification. Surplus excavated materials shall be disposed of as specified in the project specification.

#### 37.5.5 Grouting and Plugging

a. When the jacked pipeline is in its final positioning a stabilised sand / cement grout shall be injected to fill all voids between the jacked pipeline and the surrounding material. The grout consisting of one part cement and four parts sand and shall have a slump of 120 mm. All holes in the pipeline shall be sealed with an approved epoxy sealant.

#### 37.5.6 As-built Drawings

a. If an alternative design by the Service Provider has been accepted or if the structure shown on the tender drawing has been modified to suit the jacking method, the Service Provider shall, on completion of the work and before the final payment is made, supply to the Area Manager transparencies showing details of the completed structure. Each such transparency shall be certified by the Service Provider to be an accurate reflection of the details of the work as constructed.

#### 37.6 TOLERANCES

#### 37.6.1 General.

- a. Subject to any requirements of the project specification imposed because of the gradient(s) of the pipeline or the purpose for which it is required, the pipes shall be jacked into position within the tolerances given in 32.6.2
- b. Should the difference between the actual and the specified position on the alignment of the finished pipeline exceed the value of the said tolerance to an extent that additional costs are incurred in locating, installing, supporting, or maintaining any service that has been designed to be laid through the finished pipeline, the Service Provider shall bear such additional costs provided that the details of the work to be done to relocate, install, or support the said service, and the order for the work to be done (by the Service Provider or by others) have been given by the Area Manager within 30 working days after the completion of the jacking operation.

#### 37.6.2 Permissible deviations

a. The position of any point of the finished pipeline shall be within 100mm horizontally and 50 mm vertically of the designed position. Adjustment to line or level, or both, shall be gradual and pipe manufacturer's state maximum permissible draw or angular deflection shall not be exceeded at any point. Misalignment between pipe units shall not exceed 10 mm.

#### 37.6.3 Checking Alignment

a. The Service Provider shall check line and level at least once during the installation of each pipe length, and shall take such corrective action as is necessary. A copy of the results of all checks and a statement of any corrective measures taken shall be available for inspection on the Site, and a copy shall be given to the Area Manager as soon as the Jacking has been completed.

#### 37.7 TESTING

a. Except as required for the purposes of testing the pipes to be jacked (see 37.2.1) and to assess compliance with the relevant requirements of SABS 677, and except for any hydraulic tests specified elsewhere in the contract, no test are required on the complete pipeline.

## **38. DRAWINGS TO FOLLOW**

# End

REQUIREMENTS	FOOTWAY F/W	ROADWAY R/W
WIDTH	1.52m	1.67m
TENGTH	2.60m	2.75m
DEPTH	3.00m	3.00m
WALLS, ROOF, FLOOR	0.15m	0.225m
SURFACE AREA	3.95m ²	4.60m <sup>2</sup>
EXCAVATION	11.85m ³	13.80m 3
CONCRETE	4.03m <sup>3</sup>	6.07m <sup>3</sup>
CORRUGATED IRON SHEETS	3	3
"I" BEAMS	2x1.50m	2x1.50m
ANGLE IRON	2x1.05m	2x1.05m



#### NOTES:

- 1. Concrete mixfor TELKOM applications
- a. FOOTWAY:-5:3:1 (Diameter of stone = 19mm)
- b. ROADWAY:- 4: 2: 1 (Diameter of Stone = 19mm)
- 2. Concrete for Service Provider applications should have a cured strength of 20 MPA for manholes.
- 3. SHUTTERING:- Height = 1.91m
- 'I' BEAMS should not project beyond manhole walls but shall have a footing of at least 125mm on each wall.
- 5. Size of frame and cover: See Drawings SME 6.
- 'I' BEAMS to be used for Chromite treated manholes-140mm (high) x70mm (wide) x6mm (thk).
- 7. A floor sump of 220mm (dia) x 120mm (depth) to be placed directly under manhole cover.
- After casing the roof, the frame must be positioned in the roof/neckto allow for ultimate slight level alterations without disturbing the roof structure.
- 9. A slope of 25mm towards the sump should be provided.
- 10.Where a neckisrequired, it must be with concrete or
- built up with a double layer of bricks. 11.Additional frame and cover should be provided when required.
- 12.ANCE IRON to be fitted at the edge of corrugated iron sheeting. Angle iron to use:-50x50x5mm (qtyx2)
- for manholes.
- 13. Measurements quoted on drawing: DRAWING NOT TO SCALE

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NOTES:

- 1. Concrete mixfor TELKOM applications
- a. FOOTWAY:-5:3:1 (Diameter of stone = 19mm)
- b. ROADWAY:- 4: 2: 1 (Diameter of Stone = 19mm)
- 2. Concrete for Service Provider applications should have a cured strength of 20 MPA for manholes.

3. SHUTTERING:- Height = 1.91m

- 4. 'I' BEAMS should not project beyond manhole wallsbut
- shall have a footing of at least 125mm on each wall.
- 5. Size of frame and cover: See Drawings SME 6.
- 6. T' BEAMS to be used for Chromite treated manholes-140mm (high) x 70mm (wide) x 6mm (thk).
- 7. A floor sump of 220mm (dia) x 120mm (depth) to be placed directly under manhole cover.
- 8. After casting the roof, the frame must be positioned in the roof/neckto allow for ultimate slight level
- in the root/neckto allow for ultimate sight level alterations without disturbing the roof structure.
- 9. A slope of 25mm towards the sump should be provided.
- 10.Where a neckisrequired, it must be with concrete or

built up with a double laver of bricks.

- 11.Additional frame and cover should be provided when required.
- 12.ANGLE IRON to be fitted at the edge of corrugated iron sheeting. Angle iron to use:- 50x50x5mm (atyx2)
- for manholes.

13. Measurements quoted on drawing: DRAWING NOT TO SCALE

REQUIREMENTS	FOOTWAY F/W	ROADWAY R/W
WIDTH	1.67m	1.82m
LE NG IH	3.05m	3.20m
DEPTH	2.40m	2.60m
WALLS, ROOF, FLOOR	0.15m	0.225m
SURFACE AREA	5.09m <sup>2</sup>	5.80m <sup>2</sup>
E X CA VA IION	15.2/m 3	1/.40m °
CONCRETE	4.80m 3	7.50m 3
CORRUGATED TRON SHEETS	4	4
"1" BEAMS	4x1./0m	4x1./0m
ANGLE IRON	2x1.05m	2x1.05m



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NOTES:

1. Concrete mixfor TELKOM applications a. FOOTWAY:-5:3:1 (Diameter of stone = 19mm) b. ROADWAY:- 4: 2: 1 (Diameter of Stone = 19mm) 2. Concrete for Service Provider applications should have a cured strength of 20 MPA for manholes. 3. SHUTTERING: - Height = 1.91m 4. 'I' BEAMS should not project beyond manhole walls but shall have a footing of at least 125mm on each wall. 5. Size of frame and cover:- See Drawings-SME 6. 6. 'I' BEAMS to be used for Chromite treated manholes-140mm (high) x70mm (wide) x6mm (thk). 7. A floor sump of 220mm (dia) x 120mm (depth) to be placed directly under manhole cover. 8. After casting the roof, the frame must be positioned in the roof/neckto allow for ultimate slight level alterations without disturbing the roof structure. 9. A slope of 25mm towards the sump should be provided. 10.Where a neckisrequired, it must be with concrete or built up with a double layer of bricks. 11.Additional frame and cover should be provided when required. 12.ANGLE IRON to be fitted at the edge of corrugated iron sheeting. Angle iron to use:- 50x50x5mm (qtyx2) for manholes. 13. Measurements quoted on drawing: DRAWING NOTTO SCALE

REQUIREMENTS	FOOTWAY F/W	ROADWAY R/W
WIDTH	1.67m	1.82m
LE NG TH	3.82m	3.97m
DEPTH	3.00m	3.00m
WALLS, ROOF, FLOOR	0.15m	0.225m
SURFACE AREA	6.40m ²	7.30m <sup>2</sup>
EXCAVATION	19.20m <sup>3</sup>	21.90m °
CONCRETE	5.54m <sup>3</sup>	8.43m <sup>3</sup>
CORRUGATED IRON SHEETS	5	5
"I" BEAMS	4x1.70m	4x1.70m
ANGLE IRON	2x1.05m	2x1.05m



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0. 10701	mi, t. z. i (u u licita u l	aute – tatitity
2. Concret	e for Service Provider applic	ations should have
a curea	istrength of 20 MPA for mor	hd es.
3. SHUTT	ERN Q− Height = 1.91m .	
4, '1' BEA	MIS should not project beyond	l marhal e w al l s but
shdil h	ove a facting of at Least 125	imm on each widli.
5. Size of	frame and cover: - See Drav	vings – SME 6.
6. 11' EEA	MiSito be used for Omomite	treated manholes: -
140mm	(high) x 70mm (wide) x 6r	mm (thk).
7. A floor	sump of 220mm (di a) x 120	)mm (depth) to be placed
directl	y under marholle cover.	
8. After o	asting the roof, the frame r	must be positioned
inthe	roof∕neck to dlow for ulti	mate slight level
diterat	ions without disturbing the	roof structure.
9. A slope	e of 25mm tow ords the sump	o shoul d be provi ded.
10. Where	a neck is required, it must	be with concrete or
built u	p with a double layer of bri	cks.
11. Additi c	nd frame and cover should b	e provided when required.
12. AN GLE	IRON to be fitted at the ea	be of corruppted iron
sheetir	q. Angle iron to use: - 50x50	)x5mm (qty x2)
for mo	inhol es.	
13. Miecosu	rements quoted on drawing	DRAWING NOT TO SOALE

REQ U I REM EN TS	FO O TWAY F/ W	RO ADW AY RZ W
WIDTH	STE SKEICH	SEE SPETCH
LEN GIH	4.21m	4.36m
CEPIH	2.40m	2.60m
WALLS, FO O F, FLO O R	0.15m	0. 225m
SU RFACE AREA	7.73m ²	8.80m ²
EXCAVATI O N	23.19m 3	26.40m <sup>3</sup>
CON CRETE	7.50m <sup>3</sup>	11.70m 3
CO RRU GATED I RON SH EETS	7	7
"T" EEAM S	4x 1.70m + 2x2.60m	4x 1, 70m + 2x2, 60m
AN GLE I RO N	4x 1.05m	4x 1.05m



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0.225 to 0.250 ROADWAY MANHOLE WALL (RW)

# STANDARD MANHOLE EQUIPMENT SME 6

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# MANHOLE PIPE ENTRIES MPE 7

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MANDRILL A110/R

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# 110mm PIPES LAID IN ABNORMAL SOIL (CLAY)











NUMBER OF PIPES	TRENCH WIDTH
1	450
2	625
3	625
4	625

NOTE: TRENCH DEPTHS AND WIDTHS CAN VARY AND WILL BE SPECIFIED ON THE BILL OF ESTIMATED QUANTITIES

STANDARD PIPE POSITIONS AND TRENCH SIZES TAB 2

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TNS - Business Resource Services Methods and Procedures - For Telkom use only -Proprietary and Confidential Company Information Implementation date: 2002-07-01 Page 66 of 73 MULTILAYER 110mm PVC PIPES LAID IN NORMAL SOIL



NOTE: TRENCH DEPTHS AND WDTHS CAN VARY AND WLL BE SPECFED ON THE BLL OF ESTMATED QUANTIES

STANDARD PIPE POSITIONS AND TRENCH SIZES ML3

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# SINGLE LAYER 110mm PVC PIPES LAID IN NORMAL / ABNORMAL SOIL.

450





MULT LAYER 17 AND MORE OF 110 PVC

PIPES LAID IN ABNORMAL(CLAY) SOIL



MULTI LAYER OF 110 PVC PIPES LAID IN ABNORMAL(CLAY) SOIL









\*ABNORMALSOIL=150mm (EXCLUDING UNDERCUT) \*NORMALSOIL=75mm (EXCLUDING UNDERCUT)

# STANDARD PIPE POSITIONS AND TRENCH SIZES TNGP

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900mm HANGERS, 150mm UNDER BOTTOM PIPE, NOT NEARER THAN 100mm FROM ROOF.

# HANGERS FOR 2,75 STANDARD MANHOLE HSM – 1

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