



Exploration & Production

GENERAL SPECIFICATION

PIPELINES - RISERS

GS PLR 403

Installation of onshore pipelines

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1. Scope

The present standard specification for installation defines the general conditions for laying onshore steel pipelines for transporting fluids such as liquid or pressure liquefied hydrocarbons, gases, chemical products, water and solids in suspension.

In the present General Specification, the following definitions shall apply:

Project Requirements	means the requirements set for a specific project, such as detailed throughout the job specifications, the scope of works and in the general, the associated contractual documents.
WORKS	means the whole of the site surveys, the site preparation, the assembly and installation of the pipeline and of its ancillary equipment, and the site restoration works.
Local Authority	means any Local Authorities, which are involved in the design and installation processes.
COMPANY	means the COMPANY on behalf of which the pipeline system is to be installed in the frame of the Project.
COMPANY's Representative	means the representative of the COMPANY on the work sites, as stipulated in the Project Requirements.
CONTRACTOR	means the main CONTRACTOR and its SUBCONTRACTORS in charge of the WORKS covered by the Project Requirements and the present General Specification.
SUPPLIER	means the supplier of the line pipes, ready made for the WORKS.
OWNER	means the owner of a land through which the Right of Way of the pipeline shall have pass, or the owner of a land that shall be occupied for the works, on a temporary basis.

It is outlined that:

- This General Specification is mainly dedicated for onshore pipeline systems not to be installed in the French territories
- When this General Specification is to be used in conjunction with the relevant French Regulations, the latter have precedence on this General Specification
- For hilly areas, this General Specification shall be used with care when addressing points such as testing and precommissioning activities and CONTRACTOR'S experience in these domains can be used wherever this General Specification is silent
- This General Specification does not cover temporary swamp areas of known or expected significant water depths, permanent swamp areas, and permafrost areas.

The stipulations of the present specification are applicable, unless otherwise amended by Project Requirements.

The scope and methods of the detailed engineering works are covered by the **GS PLR 104**.

The standard drawings SD PLR 401 to SD PLR 424 are presented in section 17 of the present General Specification; several drawings are addressing the French regulations which may have changed since then. CONTRACTOR shall check these references, as applicable for the WORKS.

Alternate methods may be proposed in the frame of the WORKS; meanwhile, in such cases these alternates shall reflect as a minimum the requirements set out in the present General Specification.

2. Reference documents

The reference documents listed below form an integral part of this General Specification. Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and supplements, is the latest revision published at the EFFECTIVE DATE of the CONTRACT.

Standards

Reference	Title
Not applicable	

Professional Documents

Reference	Title
Not applicable	

Regulations

Reference	Title
Not applicable	

Codes

Reference	Title
Not applicable	

Other documents

Reference	Title
Not applicable	

Total General Specifications

Reference	Title
GS PLR 000	General Specification Catalogue
GS PLR 104	Design of onshore pipelines
GS PLR 404	Installation of steel pipeline by horizontal directional drilling
GS PLR 501	Hydrostatic testing of pipelines
GS EXP 101	Precommissioning & Commissioning Guidelines

Reference	Title
GS EXP 103	Precommissioning & Commissioning Technical Preparation
GS EXP 105	Precommissioning Execution

3. Safety, health and environmental requirements

3.1 General

During the preparation and the execution of the WORKS, due consideration shall be permanently brought on the Health, Safety and Environmental Project Requirements.

Several General Specifications dedicated to COMPANY HS&E requirements are addressing HS&E requirements of relevance for the installation of onshore pipelines; they have been listed in the **GS PLR 000** and shall be read in conjunction with the present General Specification.

3.2 Ground occupation

The permanently and temporarily occupied sites shall be prepared and maintained in the strict observance of the requirements set out in this Section.

Risks on the existing facilities, plants, properties, public and private roads and paths, railways, rivers and secondary courses shall be duly avoided or mitigated.

Permanent and temporary markings shall be erected so as to keep inhabitants, drivers, pedestrians, etc. fully aware of the risks and damageable consequences during the WORKS and on the permanent sites dedicated to the pipeline system.

3.3 Personnel and means

The personnel intended for the execution of the WORKS shall be permanently kept informed of the inherent risks of the activities herein represented and of the environmental prescriptions in general, and trained accordingly.

The means intended for the execution of the WORKS shall be permanently kept and used in such a condition that they fit for safety and environmental purposes.

3.4 Environment

Over the entire duration of the WORKS, special care shall be brought to environmental conditions bearing on:

- The temporary occupation of the public and private areas
- The induced disturbance to the human activities
- The cut vegetation and plantations
- The re-usable excavated top soils and other non re-usable soils
- The temporary and permanent disposal zones for the soils, debris, unused construction materials, consumables, scraps, chemical agents and waters containing chemical agents
- The disturbed secondary courses and the drained waters.

The permanently and temporarily occupied grounds shall be restored in such a way that the environmental disturbances and risks are permanently suppressed or at least mitigated and only fully approved measures and procedures shall be used (see Section 4).

3.5 Use of explosives

For the preparation of these works and during their execution, the HS&E requirements set in Section 3 shall be strictly fulfilled.

A detailed work permit procedure shall be elaborated in the course of the construction engineering phase and the works involving the use of explosives shall be fully documented in this view.

Work permit for use of explosives shall address **one and only one work** with explosives, and shall therefore correspond to a **unique location and a unique period of time**.

4. Organisation of the WORKS

4.1 General

The WORKS comprise:

- Any Construction Engineering details, as needed to supplement the detailed engineering studies, for the completeness of the WORKS,
- The route detail surveys
- The site preparation works
- The care of and the site delivery of the line pipes, fittings, ancillary equipment and consumables
- The laying works on the standard route sections
- The execution of the singular and special points
- The precommissioning works
- The site restoration works and finally
- The exhibition of the completion file for the above said works.

4.2 Knowledge of the worksite conditions

The detail studies and installation procedures, and the selection of the installation means, machinery and ancillary equipment shall take into account the specific environmental conditions which are prevailing in the temporary and permanent areas intended for the WORKS; as such but not limited to:

- Health, safety and environmental requirements
- Meteorological conditions during the works and during the service life of the pipeline system
- Water tables during the works and during the service life of the pipeline system
- Seismic condition
- Existing private and public properties and facilities

- Other local regulations.

4.3 Management activities

Management activities of the WORKS shall conform to the Project Requirements. As a minimum they shall cover:

- Progress scheduling and reporting procedures,
- Health, safety and environmental management and track records,
- Logistic support for the work-sites, and shows the functional and links between the work-sites and the centralising office,
- Work permit applications, especially for hot works, works on or nearby existing facilities, works with explosives, works on communication ways, private and public zones, etc.; it is outlined here that these applications involve COMPANY's representative authorisations and may involve such from the Local Authorities,
- Advising the Local Authorities and obtaining the authorisations necessitated for temporarily diverting or interrupting the traffic on the public roads,
- Advising the landowners of the lands to be temporarily occupied during the WORKS,
- Providing means and resources to the COMPANY such as offices, local and international communications, computer with network means, sanitary facilities, individual transportation means,
- Etc.

4.4 Construction Engineering details

The Construction Engineering details shall provide all the necessary detailed instructions, procedures and drawings at an "Approved for Construction" level.

In addition, the Construction Engineering details shall also aim at resolving issues and/or developing alternatives as soon as contingency conditions are locally met in the course of the WORKS.

They may involve as a minimum:

- Stability of trenches
- Over stabilisation of pipeline section by means of concrete weighting
- Contingency repair works, following major soil disturbances
- Contingency works as a consequence of unexpected underground live or abandoned lines, cables, wrecks, etc.
- Use of elastic bends at very large bending radius

4.5 Connection to an existing installation

Connection to an existing installation requires a precise programme and timetable for the connecting works shall be prepared, with due consideration on the necessary permits for the admission of staff, machinery and vehicles to the installation.

If the connection operations involve any works that are deemed to constitute a fire hazard, such as welding, gas cut, grinding, heating of materials, etc., instructions for fire permit application

and works shall be strictly followed even when accorded all these permits, the works shall only be initiated in the presence of the COMPANY Representative.

The COMPANY Representative has the right to order the immediate interruption of work if he is of the opinion that there exists a danger or if the prescriptions set out above are not followed to the letter.

4.6 Links with local authorities and OWNERS

Mandatory applications shall be permanently requested in duly time, then made accessible during the WORKS and finally incorporated in the Completion File.

They bear on the authorisation to be obtained from the concerned parties and in general, they shall be required for:

- The pre-works statement of condition
- The occupation of the temporary and permanent areas for the WORKS
- The excavation, reinforcement, restoration works to be executed in these areas
- The special applications for works of high risk, such as hot works, works in the vicinity of existing facilities, etc.
- The crossings of the existing underground facilities and ways and the involved temporarily interrupted or diverted traffic
- The transportation of special equipment on roads and waterways
- The full discharge of the CONTRACTOR from the Local Authorities, in the case of damages caused in the public domain under the normal condition of the WORKS
- The post-works statement of condition.

4.7 Pre-works statement of condition

The reports and official notes specified in this paragraph are subject to section 4.5 requirements.

Before any work is undertaken, the parties shall carry out a thorough inventory of the site within the strip of land delimited by marker posts, which also forms the boundary of the zone put at the disposal of the WORKS.

This shall take the form of a set of reports and an official inventory which shall be submitted to for the full extent of the zone put at the disposal of the WORKS and for all additional rights of way deemed necessary, notably for particular points.

The official inventory of the site shall reflect the observations made by the public and private OWNERS and the planned date for the occupation of the land.

All the surfaces of access roads, including all public or private roads or communication lines used for the movements and transportation intended for the WORKS shall be documented through reports stating the condition of these roadways.

Buried structures (tables, pipes, drains, aqueducts, etc.) pointed out by the public and private parties should form the observations on the statements of condition.

Underground work reports shall be also drawn as necessary as and when observations become possible.

4.8 Post-works statement of condition

The reports and official notes specified in this paragraph are subject to section 4.5 requirements.

Upon completion of the site restoration works, a post-work statement of condition certificates shall be drawn up.

The latter shall be jointly signed after due hearing of the parties by the COMPANY Representative, the Landowners and/or farmers, and the CONTRACTOR Representative.

4.9 Completion file

The following information shall be supplied in the conditions set out in the Project Requirements:

- The detail engineering dossier with the whole sets of documents at the "Approved for Construction" level which shall be at scale and accuracy level identical to that of the "Approved for Construction" dossier, as a minimum
- The as built dossier with whole sets of documents at the "Approved" level
- The inventories, the application dossier, the reports on damages and repairs made, etc.

The maps shall indicate the location of the principal installations and the line equipment with positions marked in kilometres.

For the strip of land, which figures on the laying drawing, each map shall show:

- The plane geometry elements
- The exact route of the piping axis after laying
- Indicators of the position of line equipment and structures, singular or special points, pipe and weighting characteristics
- The lengths which are the result of horizontal chaining following the pipe axis
- The angles
- The bending radii
- The limit of permanent easements (reduced strip zone)
- And the references to particular drawings in relation to certain parts of the structure.

The cross-sections shall provide in particular:

- The reference drawing level
- The horizontal lengths and lengths measured by chaining according to the upper generating line of the pipe
- The height of the earth and the upper generating line of the pipe
- The position of buried obstacles
- And the pipe protection devices.

For the special points and singular points, a plan drawing and a cross-section shall be drawn up at a suitable scale, especially indicating the particular measures taken for:

- The crossing of the point in question

- The depth of the piping
- The dimensions, nature, and location of the protection devices, casings, etc.
- The location and the nature of the weighting blocks and anchors
- And the nature of the backfill.

For miscellaneous structures and equipment, the as built files shall include a plan drawing, a cross-section and all the sectional drawings necessary for the full descriptions of the structures.

The pipe book shall be drawn up onto a computer-readable format as per the Project Requirements and shall reflect:

- The characteristics of the pipe: thickness, grade, SUPPLIER, number, length, casting number
- The cumulative length
- The welding number
- The bent pipes
- The plan drawing and cross-section
- The date the welding was executed
- The identification locators for the welds
- The x-rayed welds
- And the geographical location of certain welds in relation to natural or artificial permanent surface location points.

5. Pipeline route detailed assessment

5.1 General requirements

The standard width of the right-of-way is of 30 m, unless otherwise stipulated in the Project Requirements.

The various types of Right of Ways as per COMPANY requirements shall conform to SD PLR 401, 402, 403 and 404 in Appendix 1, as applicable.

As a consequence of any future pipelines to be installed in this right-of-way, the offset between the pipeline and R.O.W. centre lines shall be as large as feasible, and shortcuts shall be avoided where significant heading changes of the route occur.

Several areas for future in-service purposes (i.e. temporary storage of contingency repair means and materials) shall be prepared and worked out in such a way that they will remain accessible during the intended service life of the pipeline.

In specific cases, and as instructed by the Project, certain sections of the pipeline shall be as horizontal as feasible which shall require additional detail studies.

Sections of the pipeline route showing important variations of elevation profile shall be treated as special points, thus requiring special constructional dispositions and means.

Very large elastic bend curvature radii may be used, based on detailed assessment that shall be performed by CONTRACTOR with accurate reference to the site conditions.

No connection shall take place after backfilling in the vicinity of a curvature made of elastically bent elements.

5.2 Singular and special points

They consist of the points on the route that require very specific laying methods. Those points shall have been clearly reported as such in the detailed route maps.

This is the case notably for the crossing of natural or artificial obstacles such as table or below ground piping crossings, the crossing of communication lines and minor water courses.

5.3 Crossing of a major railway

The execution project shall comprise:

- A drawing giving the location of the structure as a whole and indicating the kilometre marker of the lines crossed,
- A longitudinal cross-section of the piping giving:
 - The right of way of the railway
 - The depth of covering of the upper generating line of the pipe or its casing in relation to the lowest point of the railway sleepers and any other points of the crossing
 - The slope of the casing
 - The location of the connection sleeves, if applicable
 - The length and the nature of the pipes in place
 - The bending radii of the pipes
 - The location of the breathers and cap access ports, if applicable.

5.4 Crossing of a major water course

A drawing shall be prepared giving in addition to the location of the pipe and its possible annexes (valve chambers):

- The extent of the surfaces necessary for setting up the site on each bank
- The probable limits of the earth works, according to the method used
- The locations of the profile sections, with, in certain cases, a diagram of the access routes to valve chambers.

A longitudinal section of the pipe shall be prepared giving, with reference to a clearly defined reference level (general level of the country):

- The level of the natural bed, of the current or planned theoretical navigation channel, of the location of the stabilised bed (particularly for water courses in mountain regions and intermittent water courses), of the location of the high-water bed, of the low-water bed and of the distance which the latter moves
- The level of the bottom of the trench
- The levels of the position of the pipe with respect to the real bed, theoretical channel, to the stabilised bed
- The low-water mark and the level of the highest water known, also indicating:

- The location of the connection sleeves, where they exist,
- The length and nature of the pipes in place,
- The bending radii of the pipes,
- The location of the weightings necessary,
- The attachment and suspension devices,
- The reconstitution, attachment, safety and tightness procedures for the bed, the embankments and the dikes.

6. Materials and equipment

6.1 General

Care and custody of any of the materials to be permanently or temporary incorporated in the pipeline system is comprised in the frame of the WORKS covered by the present General Specification and as supplemented by the Project Requirements.

Any appraisal of materials found in unacceptable condition shall be subject to Project's expertise and approval before application.

In the case of bare pipes being supplied, where the coating is to be carried out by a third party on a special site, the management and quality control of the coating works shall remain on the side of the main CONTRACTOR of the WORKS.

In addition to the minimum requirements set in the next par. 6.6 to 6.10, any ancillary materials to be provided in the frame of the WORKS shall to the Project Requirements.

The Project Requirements set out the list of accessories to be installed in the frame of the WORKS.

Layout, locations, levelling and assembly operations shall be performed in compliance with the Project Requirements, then in compliance with the instructions of the supplier of the ancillary equipment.

6.2 Supplies of materials

In general, purchase of coated or non coated line pipes is under Project's responsibility, unless otherwise stipulated in the Project Requirements.

Other materials such as -but not limited to- casings, with their tight end closure fittings, breathers and breather cap access ports, connecting sleeves for pipes of different thickness, any accessories and special parts, shall be provided in the frame of the WORKS.

6.3 Handling

The WORKS shall include:

- The supplies of machinery and personnel needed for unloading equipment at the point of delivery and on-site handling
- The load handling to be carried out by qualified personnel, using suitable machinery, with the required flexibility, power and range for the job in hand, in order above all to avoid the deterioration of weld bevels, the permanent deformation of pipes, the deterioration of the coating of pipes that are delivered pre-coated

- All necessary precautions to be taken during handling of the coated pipe to avoid deterioration. In particular, supports are to be padded and the width of hoisting straps shall be suited to the diameter and weight of the equipment handled
- The supplies of the straps, which shall be designed to be detached without the risk of tearing the coating, and without impact damage to the pipe. The use of chains or tables is strictly forbidden.

6.4 Transportation and storage

The WORKS shall include the transportation of the material between the place of taking possession of the goods and materials and the storage areas. The latter must have a perfectly flat surface.

Transportation equipment shall be fitted out so as to prevent all risk of damage.

Manoeuvres liable to damage material are forbidden.

Vehicles used for transporting coated pipes shall be equipped with devices to prevent coatings being exposed to shocks or friction. Padding shall be provided on the supports, side panels and stowage slings.

The pipes are stored by SUPPLIER and according to their characteristics (diameter, grade, thickness) and, where applicable, by the nature of the coating.

The maximum height of the stockpiles is normally stated in the Project Requirements, depending in particular on the climatic conditions and taking into account safety considerations. Bevels must continue to be protected.

The storage of material other than pipes shall conform to the SUPPLIERS' instructions; the pipe storage area is to be equipped to ensure that the pipes are protected from the sun.

6.5 Inventories

The WORKS includes monthly and final cumulative inventory reports of material taken into possession by the CONTRACTOR with and without reservations.

These reports shall show the quantities taken into possession for bare and coated pipes according to SUPPLIER, diameter, grade and thickness.

At the end of the works, and before the provisional reception notice is drawn up, a definitive inventory of the material taken into possession by the CONTRACTOR shall be implemented.

The pipe balance shall be used by the CONTRACTOR for allocating the costs of the laid and unused pipes, according to the Project Requirements.

Unused materials and pipes, which have not been provided by the CONTRACTOR, shall be returned to the COMPANY as per the Project Requirements.

The line pipe inventories shall reflect:

- The quantities used according to the weld book, after deductions have been made for lengths corresponding to equipment laid in line
- The quantity used for the qualification of welds and the approval of the welding procedure
- The weld samples
- The whole pipes remaining available and their place of storage

- The reusable off cuts (at least 5.00 m in length) and their place of storage.

CONTRACTOR shall at the end of the works, and before drawing up the provisional notice of reception, provide a pipe balance that shall show per diameter, grade and thickness:

- The lengths taken into possession without reservation
- The lengths that can be justified according to the inventory
- The difference between the lengths taken into possession and the lengths that can be justified
- The permissible tolerances (in length) for non-reusable off cuts (0.20% of the length laid)
- The balance, that is difference between c and d.

The inventories of materials other than pipes shall reflect the quantity and nature of the materials, their SUPPLIER names, their as-built identification and geographical location, and for surplus material, the storage location(s).

6.6 Flanges, valves and fittings

Scrupulous attention shall be paid to the direction in which equipment is installed (valves, check valves, etc.); all equipment and accessories shall be vertically and horizontally aligned; the greatest care shall be taken to avoid any strain or misalignment.

For flange joints, bolts shall be tightened using a torque wrench to ensure that the torque does not cause, whether in the metal of the joint components, or in that of the assembled parts (flanges notably), a stress greater than the permissible limit; the forces to be applied for the tightening of the parts to be assembled shall be fully assessed in the frame of the WORKS.

6.7 Casings

The WORKS shall include the design, supplies and installation of the casings required for the installation of pipes at the crossings of particular points.

The interior diameter of the casing shall be at least 0.10 m greater than the exterior diameter of the coated pipe for pipes up to 16" OD, 0.15 m greater from 18" to 24" OD and 0.20 m greater for pipes of 24" OD and above.

The nominal thickness of the pipe forming the casing (steel, concrete, etc.) and the characteristics of the casing are normally set in the Project Requirements.

The casings used for railway, road and path, canal, etc. Crossings are to be sealed at their ends using a watertight and insulating ring seal.

Breathers shall be tapped onto the casings used for railway, road and path, canal, etc.

Crossings shall, depending on the situation, consist of steel tubing or of heavy duty reinforced plastic tubing.

Unless otherwise indicated in the Project Requirements, these pipes shall be 50 mm in diameter and 5 mm thick.

The threaded sealing plugs on the breather shall be made of bronze, and designed in such a way that they can only be unscrewed using a special wrench. They must enable compressed air to be injected.

Breather pipes made of steel must be protected by a coating of quality equal to that of the line pipes.

6.8 Cap access ports for breathers

When the ends of breathers emerge into manholes, the latter are constituted either by a cap access port, of commercial design, or on the basis of a particular model set in the Project Requirements.

Cap access ports shall be installed as near as possible to the boundary of the public domain or at easily accessible locations where their presence disturbs the local inhabitants as little as possible.

The cap access port shall have a caver provided with a locking system.

The caver shall be flush with the ground.

The “approved for construction” documents shall give details of the type and location of the position finding device, and its distance, position and orientation with respect to the axis of the pipe.

6.9 Pipe insulation in a casing or undercut

In a casing the piping is laid on antifouling insulating clamps, which ensure it, is correctly centred, and allow the pipe to be slid into the casing without damaging the pipe coating; the use of untreated wood runners is forbidden.

The amount of clamps shall be such that the pipe does not enter into contact with the casing or the undercut.

6.10 Connecting sleeves for pipes of different thickness

Some connecting sleeves for pipes of different thickness and different grades and qualities of steel may be necessary.

If they have to be manufactured, they shall meet the Project Requirements.

If they have to be machined, a section of the pipe with the best mechanical characteristics shall be used.

6.11 Accessories and special parts

COMPANY shall approve the dimensions and conditions for the manufacture of accessories and special parts not provided by the COMPANY.

7. Ground occupation and site preparation works

7.1 Staking out

The staking out procedure of the pipeline route shall be established or refined in conformity with the Project Requirements and during this, the Project shall be kept informed of any anomaly or drawing error that he notices, any unforeseen difficulty encountered.

7.2 Marker posts

See section 17 – SD PLR 417 to SD PLR 419.

Temporary mark out on the ground works occupation zones for the WORKS shall be performed on the basis of the staking out procedure.

Topographical marking shall be carried out in the presence of the COMPANY's representative.

Except otherwise required by the Project, this is realised using reference points of suitable cross-section and 1.50 m high, with the top 0.20 m painted blue, placed at intervals of about 50 m.

Marker posts located on the trench side and visible from the work track shall indicate every 250 m, the distance covered by the track in kilometres.

Additional signs shall clearly indicate the changes in the category of pipes as set out in the “approved for construction” drawings.

All buried works crossed by the future pipeline that figure on the “approved for construction” drawings shall be identified by two visible signs placed on either side of the track.

7.3 Access to the site

Aside from access by public roadways, any additional access means to be created in the frame of the WORKS to allow the circulation of works and transportation machinery shall be documented and subject to the agreement of the concerned parties and prepared in time to ensure the normal running of the site and the progress of the different operations in the time allocated in the schedule.

7.4 Execution of the work track

As necessary for the WORKS, the following activities shall be performed within the strip of land put at the disposal of the WORKS:

- Preparation works to allow the supply and the approach of the pipes, the passage of work machinery, the different operations necessary for the proper execution of the works, the circulation of any vehicles intended for the WORKS
- Installation of culverts, backfilling of ditches or certain poor parts of the non worked ground
- Management of surface waters by appropriate drainage works
- Execution of necessary breaches in fencing, hedges, slopes, etc. either as temporary barriers to be opened only on CONTRACTOR's authority to allow the passage of teams and vehicles, or as sectioning off the works zone by temporary fencing parallel to the route
- Temporary removal or permanent relocation of the posts supporting electricity or telephone lines, under the agreement of the authorities and during the allocated time
- Erection of clearly visible sign placed on the work track, each crossing of an electric table, so that machinery drivers are aware of the danger of contact of the machinery jibs with overhead lines.

In the case of working on a longitudinal section of the public road network, the execution of works must never take up more than half of the carriage way except in the case of special provisions demanded by the authorities that manage the roadway.

The section of the road where the width has been reduced must, in principle, not exceed 50 m and must be kept as clean as possible.

7.5 Tree felling

The WORKS shall include the removal of underbrush, tree trunks, surface of trunks and large roots within the strip of land intended for the WORKS.

These removal works shall be performed according to the following minimum requirements together with the Project Requirements which shall have clearly stated the various categories of trees concerned and the stacking and the disposal procedures thereof and assuming that the felled trees remain the property of their OWNERS.

Tree felling shall be carried out in such a way that neighbouring trees, plantations, crops and constructions are not damaged.

Felling of trees liable to provide works wood shall be carried out so as to avoid splitting the trunk.

Trees stripped of their branches shall either be stacked alongside the track, or transported to locations set by the Project, in which is listed the length to which the trunks should, if necessary, be cut before transportation.

7.6 Separation of the top soil

In any cases during the execution of the WORKS, the top soils shall be excavated and separated from the other ones, then located to temporary disposal areas and finally replaced on the areas they were removed from.

Unless otherwise stipulated in the Project Requirements, separation steps of the topsoil shall be performed wherever work carried out on the track makes cuttings necessary and the depth is limited to a maximum of 0.3 m.

Whatever the side of the track the topsoil is disposed, it shall not stretch beyond the boundaries of the work zone.

Moreover, the cordon must be arranged so that it does not interfere with the methods of cultivation used by the neighbours.

7.7 Upkeep of the track

It is outlined here that the track shall be worked out in such a manner that it shall remain accessible by vehicle or at least by foot during the intended service life of the pipeline.

7.8 Excavating and laying out trenches

Unless otherwise stipulated in the Project Requirements, there is no requirement for the pipe laying and the progress of earthworks to be in step.

All necessary action shall be developed to minimise the time duration for which the trenches are left open.

Any information such as unpredicted nature or instability of the ground, infiltration or seepage of water, changes in the nature of water, etc., which is likely to jeopardise the stability of materials or structures, shall be subject to specific documentation to be provided to the COMPANY Representative prior to resume the WORKS.

7.9 Trench features

The depth and width of the trench shall conform to the Project Requirements. All constraints caused by the method of carrying out earthworks, of bringing in loose earth, of the laying bed and the backfill and the use of materials shall be part of the WORKS.

The trench bottom and walls shall be prepared so as not to constrain or damage piping as it is laid.

If the trench bottom is rocky, the earth shall be excavated and a protective bed shall be created using a sand layer of 0.30 m. Failing this, a mechanical protection device may be realised.

The trench bottom and walls shall be carefully prepared; as a rule, a slope that avoids any packing under the lower generating line of the pipe shall be insisted upon.

In certain cases where the levelling of the trench bottom proves particularly difficult, pipeline supporting measures shall be taken.

In areas with steep slopes, the trench bottom shall be prepared so that the lower generating line of the piping can never come into contact with the rocky ground, for example, particularly owing to water run-off. Means for evacuating this run-off water are to be provided where necessary.

The trench facings shall be carefully cleaned and prepared, unless the nature of the land or the means necessitates alternate measures to be prepared and applied.

The WORKS shall include any temporary wall stabilisation means such as sheeting.

For assemblies which have to be executed at the trench bottom, supplementary excavations of sufficient size shall be made to enable the correct execution and verification of the couplings shall be performed and their safety shall be ensured by sheeting and/or drainage where necessary.

7.10 Excavated material

Excavated material is to be deposited within the expropriated ground made available for the WORKS.

A bank at least 0.25 m wide shall be left free between the foot of the excavated material and the nearest trench wall.

Where the excavations are carried out in the middle of a field, the topsoil is to be removed and deposited separately so that the continuity of arable soil may be re-established when work is completed.

Locations of the deposits are normally instructed by the Project.

On public land, the excavated material shall be removed and disposed in agreed places, then backfill shall be supplied and worked as necessary.

Material excavated from the trench and which cannot be used for backfill of the pipe shall be carried off immediately.

7.11 Crossing of subsidence or landslide zones

Zones crossed by the pipe, which are at risk from subsidence and landslides (clay banking, mines, quarries, etc.), shall be fully documented prior to any further works in these zones.

7.12 Water drainage

The WORKS shall include any protection of the worksites against waters of all kinds, whatever their origin and water run-off both on the surface and underground shall be permanently maintained during the WORKS.

Drain effect produced by the backfilled trench may cause damage to piping or for local residents, and therefore, appropriate remedial actions shall be engineered the frame of the WORKS.

For sections of significant slope, draining systems shall be designed so as to avoid important/permanent water accumulation in the expected low points.

7.13 Underground drainage

In regions drained or destined to be drained, piping shall be preferably laid according to the provisions of the typical drawing associated with SD PLR 411 (section 17).

Immediately after the pipe has been laid, the drains shall be re-established, taking all steps to ensure that they function at least as well as with the initial system.

Before the trench is backfilled, the restoration of the drain network shall be inspected by the landowner.

In the case of deficiency on the part of the WORKS, a third party expertise may be requested by the Project.

Precautions shall also be taken so that after backfill the trench cannot play the role of a drain.

A report shall be drawn up and sent to the COMPANY, releasing the latter from all responsibility toward each of the landowners.

8. Pre-assembly works

8.1 Laying out

The quantities received shall be checked out in the light of the laying out drawing and any anomaly, omission or error shall be immediately noticed to the COMPANY Representative.

Pipes shall be handled using only lifting apparatus and straps or hooks approved by the COMPANY Representative.

When the pipes are brought alongside the route, the following is forbidden:

- Any handling liable to damage the pipes or the coating (falls from the lorry to the floor, sliding along the ground, shocks, etc.)
- Keeping the pipes for a prolonged period in conditions where they might deteriorate (flood zone, corrosive land, etc.)
- Where pipes coated in the factory or on a stationary base are to be cladded, it is compulsory to place padding between the pipe and wedge fastening to protect the coating.

If a fault is noticed (indentation of the coating, damaged bevel, etc.), the COMPANY Representative shall be kept informed so as to decide whether the material is to be scrapped, or to be used after repairs have been made.

8.2 Stringing of the pipes

Before laying out, an inspection of the route shall be carried out to make sure that the indications on the ground are sufficient and that the points where category of pipe changes (thickness, coating, ballast, etc.) are clearly marked out on the ground.

8.3 Pre-alignment

Before being bent and welded, pipes are to be pre-aligned, that is laid out carefully end to end next to where they are to be placed in the trench, and placed on wedges.

8.4 Bending

Bending is to be carried out after the trench has been dug, except in special cases, where approval of the COMPANY Representative shall be sought.

Curves in the route are obtained by successive bending carried out in the following manner:

- Miter bends and permanent elastic bending are prohibited
- On the worksites, bending shall be carried out cold in compliance with the applicable code
- No heating is allowed on-site
- The value of the bending radius shall not be lower than the minimum acceptable value set by the Project. This value shall never be less than 20 times the external diameter of the pipe to be bent
- The bends shall follow the form of the trench in the horizontal and vertical
- A pipe welded lengthways shall be bent in such a way that this weld is not subjected to elongation or significant stresses
- Each spiral welded pipe shall only be bent after inserting an expanding sleeve into the pipe, at the place of the part to be welded, for any diameter above 16"
- After bending, pipes shall show neither rippling nor buckling
- Out-of-roundness inspections shall be carried out by inserting a gauge or by any other method that has been submitted for the approval of the COMPANY Representative
- Any bend showing bending faults shall be scrapped and replaced.

In certain cases, and with the agreement of the COMPANY Representative, certain profile curves of very large radius using elastic bending can be made, the minimum radius being set out as per the Project Requirements.

At each end of a bend made on the worksites one straight section of diameter of at least 0.50 m shall be kept so that, except for dispensations requested by the Project, no circular weld shall be less than 0.50 m from the bent part.

Where the laying of the pipe imposes a curve radius lower than the minimum value specified by the Project for cold bending on the worksites, prefabricated.

Bends using heat induction in the factory shall be used according to a procedure approved by the COMPANY Representative.

The bending of coated pipes is dealt with in provisions contained in the general coating specifications.

8.5 Cleaning and verification of pipes and bevels

The inside of pipes is to be cleaned before any assembly takes place.

In the course of all subsequent operations, care shall be taken to avoid the accidental introduction of foreign bodies and, in particular, water and earth.

All sections or assembled parts shall without fail be sealed every time work is stopped, using plugs approved by the COMPANY Representative.

Immediately after carrying out the alignment, each end shall be carefully cleaned using a wire brush.

If these surfaces show traces of rust, machining scales, grooves, burrs, etc.; an abrasive wheel with a brush disk shall be used.

This cleaning shall where necessary be carried out on inside and outside walls up to 0.10 m from the end.

When the bevel is cleaned using an abrasive wheel, the root face should be reconstituted.

9. Assembly and installation

9.1 Welding

The conditions in which operations concerning the welding of pipes and the inspection of these operations take place are set out in the standard specifications for installation dealing with welding.

9.2 Pneumatic tests

Project Requirements make it clear whether the pipe is to be tested using pneumatic tests before coating the welds on the work-site and backfilling the trench.

Where tests of the tightness of transverse welds is required, these shall be carried out from the edge of the trench, by pipeline sections.

The ends of each section shall be blanked off using bottoms that have been specially equipped for tests carried out using compressed air at a pressure that complies with applicable regulations.

In the course of this test, welds carried out on the work-site shall be coated with a frothy liquid and hammered with a hammer with a bronze, brass or plastic surface to discover possible leaks or beading.

Welds that are recognised as defective in the course of tests shall be repaired or cut off or redone, depending on the decision made by the COMPANY Representative.

9.3 External coating of the piping

The execution and inspection of operations relating to the preparation, implementation and protection of pipe coatings shall conform to the Project Requirements.

9.4 Above ground pipeline sections

For zones where piping is to be laid above ground, execution drawings for the supports and/or conduits together with a calculation sheet, as well as the procedure for laying the pipe shall be submitted to COMPANY Representative approval.

Project Requirements shall in theory indicate the principal type of support to be used. If this is not the case, its characteristics and the distance between each support shall be determined in the frame of the WORKS.

When the Project Requirements are silent about spacing or whenever these distances cannot be followed, new or alternate ones shall be worked out.

For all earthworks and civil engineering work connected with the pipe support, the WORKS shall comprise any testing as necessary for assessing the ground resistance.



Supports may be fitted with sliding devices with lateral guidance, or may be fixed according to Project Requirements.

Where fixed supporting devices are used, the pipe shall be locked to the support using collars, or by anchoring flanges, or by welding.

The pipe and metal supporting elements shall be protected externally by a system of anti-corrosion paint, and according to Project Requirements.

9.5 Pipeline in a trench

Lowering the piping into the trench is only authorised after acceptance of the welds by the COMPANY Representative, of coating checked using a dielectric test, of the condition and the depth of the trench.

The COMPANY Representative may oppose the lowering into the trench when there is a risk that conditions will damage the pipe coating or lead to unacceptable stresses.

The equipment and procedures used shall be chosen in such a way that no harmful force is exerted on the pipe or its coating in the course of operations connected with its lowering into the trench.

The trench shall be in such a condition that the coating cannot suffer damage; the trench bottom in particular shall be free from hard elements and shall not be uneven.

If water or mud is present, drying out and cleaning of the trench before lowering in shall be performed, insofar as this is possible.

If it is not possible to remove the water, any intended provisions to make for the pipe to rest correctly on the trench bottom shall be prepared and submitted to COMPANY Representative approval.

9.6 Laying operations

Laying may either be direct or deferred.

The pipe is placed in the trench, after inspection using an electronic scan and, where necessary repairs have been made to the coating, using broad linen, leather or nylon straps, in such a way as to avoid damaging the coating.

The use of pipe dollies may be permitted with the agreement of the COMPANY.

The intended apparatus (nature, number, and spacing) shall not induce excessive force on the piping or its coating.

All provisions shall be made so that the pipe placed in the trench is not under stress at any point, and that it does not skid off.

Particular attention that the full length of the pipe rests on the bottom of the trench shall be paid.

Upon agreement of the COMPANY Representative, and in the frame of the WORKS, the pipe can be wrapped in places to protect its coating during pipe handling.

9.7 Additional stability

Additional ballast shall be used when it is necessary to make the piping descend to the prescribed level, or to keep it in place when the backfill is insufficient to prevent the rise due to hydrostatic buoyancy in marshland or at the crossing of water courses.

When this method is not sufficient or not applicable for practical reasons, continuous or discrete concrete weighting shall be used, as per SD PLR 415 and 416, and the weight of the empty pipe shall be 110% that of the hydrostatic buoyancy.

Additional stability can also be obtained with fastening bolt and stem systems as per SD PLR 408.

For trenched sections of pipeline on steep slopes, additional stabilisation works shall be implemented as specified in SD PLR 424.

9.8 Connection at the bottom of a trench

Connections shall be carried out in such a way that after welding the piping is not subjected to any stress due to pulling, bending or shearing.

To this end, connections shall be carried out after backfilling when the piping is at a temperature close to that of the ground.

Where connection is made using one weld only, the backfill shall be stopped at a distance sufficient to allow the elements to be joined to be positioned properly.

The connections shall be made without the use of mechanical or thermal means intended to apply pressure to the elements.

No connection shall take place after backfilling in the vicinity of bent elements of the piping or a part of the piping that has been flexion-laid when flexion-laying is permissible.

9.9 Backfilling of the trench

Backfilling the trench is only authorised after inspection and on the authorisation of the COMPANY Representative. Provisions shall be made so that the pipe is then covered as rapidly as possible.

When the backfill from the trench does not contain any element likely to damage the pipe coating, backfilling shall be carried out according to accepted practices.

The upper level of the backfill shall be that of the natural terrain taking into account the subsidence of the earth.

When backfill comes from a part of a trench located in rocky ground or containing elements likely to cause harm to the coating, the pipe shall be covered by a 0.30 m layer of sand material and completed by a layer of material containing a small proportion of clay, sand or light soil.

Whatever the distance of the disposal facility, surplus backfill or poor quality backfill impossible to reuse shall be taken to municipal tips or levelled on-site with the approval of the OWNER, the landowner or the farmer.

The trench shall be backfilled in such a way that a strip of earth remains to compensate for the effect of subsidence.

In areas where sand is the only material available for creating this strip, a backfill fixing device capable notably of withstanding erosion due to the action of the wind shall be set up.

If the pipe is laid beneath raised earth, it shall be covered in all parts by a minimum backfill thickness of 0.50 m after packing, unless otherwise instructed by the Project.

Wherever compacting is necessary, it shall be carried out in layers of maximum thickness 0.40 m (see next paragraph for special requirements).

When the pipe is located on a slope or incline, all provisions shall be made to avoid the erosion of backfill (stone bolsters, fascines, retaining arches, concrete structures, dams for fixing backfill, etc.).

A marking net of non perishable material, preferably of red colour, shall be laid 0.30 m above the pipeline.

Immediately upon completion of these works, the site restoration requirements set out in Section 16 shall be strictly followed.

For **hot pipelines**, a stepped backfilling shall be performed and each layer shall be sufficiently compacted and the checked compaction level shall have the minimum guaranteed level before working out the next one.

10. Additional requirements for parallel laying

10.1 General requirements

When piping is laid parallel to an existing buried work, this must be carried out in such a way that the distance between the closest lateral generating lines shall be of 6 m as far as feasible and the minimum acceptable value shall be the higher of 0.40 m or one diameter of the largest line.

In certain particular cases, Project Requirements may set a greater distance to take account of the characteristics of the product to be transported and special operating conditions.

10.2 Superimposed laying to an existing buried line

In certain particular cases, Project Requirements may address a new pipeline to be installed above an existing one or two new pipelines to be installed in the same trench.

In such cases, a minimum gap of at least 0.60 m shall be ensured and in addition there shall be no interference between the cathodic protection systems of either lines and a marking net shall be installed in the vertical mid-span of the lines.

10.3 Positioning alongside railway lines

Refer to SD PLR 423 in section 17.

The “approved for construction” drawings give details of the points where the piping is laid alongside a way belonging to the public domain (railway, road, path, etc.).

Work shall be carried out in compliance with the documents approved by the Local Authority concerned and the COMPANY.

Precautions shall be taken at the time of implementation, with regard to personnel and machinery, and particularly for everything relating to marker posting and signalling.

The trenches shall be secured using the appropriate means, to avoid any disturbance of existing structures in the vicinity.

If the piping is to be laid in a trench, the latter shall be dug in such a way that its wall is at least 2.0 m from the closest rail, 1.5 m from buildings or foundations of construction works, and 2.0 m from the crest of the slope if the line is in a cutting or from the foot of the slope if the line is in an embankment.

The trench shall be boarded in non-clayey ground if the depth is more than half the distance from the nearest rail, and whatever the depth in clayey soil.

When the trench passes less than 3.50 m from the pylons of an electrified line, the latter shall be supported throughout the duration of the work; when it passes less than 1.0 m from the foundation blocks of the pylons, it shall be dug as far as the block and the excavation thus made shall be filled with coarse concrete.

A warning device shall be placed between the upper generating line of the pipe and the surface of the earth.

Where a duct is needed, duct and pipeline system shall conform to 6.7 requirements.

10.4 Positioning alongside roads and paths

The piping shall in principle be laid in an open trench off the roadway and on the shoulder; a warning device shall be placed above the piping to indicate its presence.

The excavated earth shall be placed in a position where it causes the least possible disturbance to traffic.

In addition to shoring the trenches, all security measures indicating that work is taking place shall be taken, in accordance with the demands of the Local Authority concerned.

11. Additional requirements for crossings

11.1 General

Where buried works exist within the right of way of the communication channels, the WORKS shall respect the constraints of spacing and protection imposed both by the typical drawings relating to the crossing of these works and by those concerning the structure crossed.

For all crossings, the pipe or casing shall rest on a bed of sand 0.20 m thick, and the upper part of the pipe or the casing shall be protected by a layer of sand or loose earth 0.20 m thick to cover the pipe or casing.

For connection between the pipe laid in the casing and the sections located on either side, all necessary provisions shall be made so as to avoid the pipe being subjected to abnormal stresses within the casing, due in particular to the settling of backfill material and material from excavation required for drilling and evacuation.

These prescriptions shall be understood in the light of the statements and principles set out in Section 4.

11.2 Crossing of existing lines

Refer to SD PLR 412, SD PLR 413, and SD PLR 414 in section 17.

Where existing pipelines and cables shall be crossed, the new pipeline shall pass under the existing line, and a minimum vertical gap of 0.3 m shall be aimed.

The crossing point of the piping to be laid with the buried work in place shall be located and at each of these points, an excavation shall be made by hand to expose the structure encountered.

The dimensions of the structure crossed shall be taken.

A polythene or asbestos cement insulating plate shall be placed between the two structures,

If the structure is to be crossed over, the exposed part shall be backfilled, having put in place the warning device given in the typical drawing,

If an underpass crossing is to be made, the trench to be created for the passage of the piping shall be dug by hand, taking all precautions to ensure that the structure crossed is preserved intact.

11.3 Crossing of public roads and major railways

Lines belonging to the public domain such as railways, motorways, A-roads, roads classified for major circulation, all other channels, on the express request of the Local Authority and with the agreement of the COMPANY, shall be crossed in a casing by horizontal drilling, jacking or trenching, the detailed requirements being developed in the following sections 11.4 and 11.5.

11.4 Crossing in a casing by horizontal drilling or jacking

Refer to SD PLR 410 in section 17. In addition, crossing by horizontal drilling shall also conform to **GS PLR 404**.

During drilling or jacking operations, all the necessary measures shall be taken so as to guide the casing carefully in the horizontal and vertical axes, and so as to avoid creating empty spaces around the casing which might cause land subsidence.

Any damages caused by such subsidence shall be repaired.

When the pipe laid in a casing is connected to sections on either side, all measures shall be taken to avoid the pipe being subjected to abnormal stress within the casing, particularly owing to the settling of backfill material, and from the drilling and reception pits.

Steel casings shall not be coated externally but shall be protected internally by a layer of primer. In addition, the pipe and casing system shall conform to the prescriptions of par. 6.6, and 6.8.

11.5 Crossing of roads by trenching

Refer to SD PLR 408 in section 17.

The trenching method shall be in one go, if traffic can be diverted, or by half-widths if traffic cannot be diverted and temporary signalling, lighting and precautions shall be installed with regard to communication lines.

If the crossings are to be inside a casing, the type of casing shall be specified and the pipe shall be insulated and the ends of the pipe blanked off in accordance with the prescriptions supplied earlier for casings for crossings by drilling/jacking.

Where a steel casing is used it shall conform to 6.7 requirements.

If no casing is envisioned, a warning device generally consisting of the trench being filled with lean concrete, a reinforced concrete slab and plastic or plastified fencing shall indicate the pipeline position.

The “approved for construction” drawings list, for each crossing, the applicable typical drawings referred to by the Project.

11.6 Crossing of privately owned paths

Privately owned paths shall, in principle, be crossed without a casing. The “approved for construction” drawings shall give the applicable typical drawing according to the type of warning device to be put in place.

11.7 Crossing of a major water course

The trench bottom shall be carefully raised and adjusted to levels such that the minimum covering laid out in the project is ensured; verification of the trench bottom shall be carried out by sounding and profile section readings to be carried out under the control of the COMPANY, who may ask for specific verification by a diver.

The pipe shall be protected in such a way as to avoid damage to the coating in the course of handling and laying.

During these operations, the pipe shall not be subjected to any bending or twisting strain, which might cause abnormal stresses in the metal, the maximum allowable stress being worked out in the frame of the WORKS.

If the crossing has block valves on either side, their installation, the fencing, and the access track shall comply with the Project Requirements and the "approved for construction" drawings.

The backfilling of the trench bottom and the site restoration works shall be carried out in accordance with the requirements set in Section 4.

11.8 Crossing of rivers or secondary water courses

Ditches, water courses, rivers and canals shall be preferably crossed in compliance with SD PLR 415; however, depending on the length of the crossing, the horizontal drilling method may be required and in such an event, the works shall be carried out in compliance with **GS PLR 404**.

If necessary, and to ensure it rests properly in its excavation, the piping shall be weighted using weighting collars or any other method approved by the COMPANY.

Wherever there is a risk of washout of the excavation where the piping rests, and particularly when crossing water courses where there is a risk of flooding, and the bed of which is not stabilised, the piping shall be laid at a sufficient depth to ensure its stability and preservation, and all necessary protection structures, such as bed pitching, grouting, a line of stone bolsters, sheet pile cells, etc. shall be provided.

11.9 Crossing of streams and pits

Crossing of streams and pits shall be performed by trenching and backfilling according to SD PLR 405, as far as feasible.

12. Ancillary works

12.1 Concrete and concrete works

These minimum requirements shall be fulfilled, unless otherwise specified by COMPANY.

Lean concrete shall be mixed with 250 kilograms of cement per cubic meter of concrete used.

Reinforced concrete shall be mixed with - at least - 350 kilograms of cement per cubic meter of concrete used; it shall be thoroughly vibrated.

Mortar for tight coatings shall be mixed with 500 kilograms of cement per cubic meter of mortar used and the coating thickness shall not be exceed 2.5 cm.

Masonry shall be rough-plastered with cement mortar mixed with 350 kilograms of cement per cubic meter of sand.

12.2 Hardware work

Hardware work (doors, ladders, platforms, fencing, etc.) Shall be executed in standard commercial materials according to the profiles and characteristics indicated on the drawings.

The characteristics of cast iron articles (cap access ports, manholes, etc.) are given in the "approved for construction" drawings.

The locks on various structures are of the safety type and such that all the structures on the same pipeline may be opened using the same key. In the case of other structures to be erected on the same pipeline but outside the frame of the WORKS, the lock shall conform to the Project Requirements.

12.3 Painting work

All metal parts shall be protected by a system of anti-corrosion paint, the characteristics and implementation of which, defined by the SUPPLIER according to climatic conditions and the corrosive characteristics of the surrounding atmosphere, shall be submitted for the acceptance of the COMPANY.

12.4 Cathodic protection

The "approved for construction" documents shall give details of the type and location of the junction or potential takeoff to be installed, together with the different possible connections to the installations where the tables terminate.

Attachment of the tables to the bare pipe must in no way alter the characteristics of the metal.

When the pipe crosses steel piping or an electric or telephone table, the Project Requirements may require the supply of potential takeoff both on the pipe and on the piping or table.

12.5 Intermediate stations

Refer to SD PLR 421 and SD PLR 422.

Locations of intermediate valves, venting points, branches, etc. shall be prepared so as they will remain accessible during the intended service life of the pipeline.

These locations shall be permanently marked and permanently enclosed by wire mesh fences, with an access door having sufficient dimensions to allow for circulation of the type of vehicles stipulated by the Project Requirements, and an escape door shall be installed if required so by the Project.

13. Hydrotesting - Precommissioning

Cleaning, gauging, filling and hydrotesting shall be engineered as specified in:

- **GS PLR 501** for hydrostatic testing of pipelines.

In addition, the following COMPANY References shall also be used:

- **GS EXP 101** Precommissioning & Commissioning Guidelines
- **GS EXP 103** Precommissioning & Commissioning Technical Preparation
- **GS EXP 105** Precommissioning Execution

Conflicts and inconsistencies between the GS.PLR and GS.EXP series found by CONTRACTOR at the beginning of the WORKS shall be **thoroughly** reported to COMPANY.

The precommissioning engineering works shall not commence until formal resolution of these issues by COMPANY.

Parts containing branch connections, or produced using tubular parts not tested at the test pressure of the pipes in-factory, shall undergo, before assembly, a hydraulic test at the pressure level required by the Project and in the presence of the COMPANY Representative.

14. Commissioning

The Commissioning of the pipe may only be undertaken when the hydraulic tests have been judged satisfactory, section connections carried out and inspections completed.

The activities to be performed in the frame of the WORKS during pipeline Commissioning period shall conform to the Project Requirements.

On this occasion, staff and equipment necessary for the filling of the pipe and production tests shall be made available to the COMPANY.

15. Permanent marking

Permanent markings shall be erected at the “approved for construction” locations and according to Project Requirements for the special and singular points and the access through private properties.

The ground shall be carefully compacted after their installation to ensure that they are firmly anchored. In the case of non-stabilised ground, a concrete base shall be designed and erected so that they can be anchored properly.

These devices shall be installed immediately after the site has been restored, and at the latest before the certificate of restoration of the site is drawn up.

The identification of the pipe shall be preferably carried out according to SD PLR 418, SD PLR 419 and SD PLR 420.

16. Site restoration

16.1 General requirements

The site restoration activities in the frame of the WORKS shall be performed with due consideration on the general requirements stated in Section 3 and according to the following details:

- All debris, equipment and left-over materials, or rejected parts, shall be rejected from the work zones
- After the earth has settled, it shall be ensured that the ground will return to the form it had before work began
- The separated off topsoil shall be replaced
- In cultivated land and meadows, stones lying on the surface due to the upheaval of the earth caused by the work, and which might interfere with the working of the land, shall be removed
- Where necessary, the soil compressed by the movement of machinery in work zones, shall be loosen using equipment adapted to the nature of the land

- Access paths and surfaces damaged by vehicles shall be restored to their original condition
- Fences, embankments, ditches, etc. shall be restored to a condition at least equivalent to their initial condition
- All the structures affected by the work shall be restored in such a way that in all circumstances and despite the loosening of the earth in particular, they remain stable
- The expansion of the earth shall not interfere with the natural drainage of water, particularly at the side of roadways. If necessary, drainage grooves shall be created
- In regions with crops grown on terraces, the supporting walls shall be restored and the crop layout shall be reconstituted by suitable distribution of the arable soil
- In zones which are wooded and steeply sloping, drainage and shoring up against erosion and gulying in the right of way shall be provided
- In irrigated regions, where care shall have been taken in the course of work not to disturb the water distribution system, the irrigation system shall be restored to the required pre-work statement of condition
- In steep areas, ditches or banks across the track shall be restored in order to divert surface water from the trench
- The “approved for construction” location of all special parts and that of the piping axis shall be marked as per section 15
- Damages of whatever nature caused in surfaces occupied outside the limits of the work track put at the disposal of the WORKS shall be repaired in the frame of the WORKS.

16.2 Restoration of the singular points - General condition

Backfilling of the trench on either side of the singular points shall be carried out in such a way that the pipe rests on a perfectly raised trench bottom; the empty spaces below the pipe shall be carefully filled in, if necessary using sand, to avoid subsidence at a later stage.

Pipes shall not be covered without the approval of the COMPANY, in the absence of which the COMPANY may order the reopening of the trenches to carry out any inspection at his convenience.

The restoration of the site shall be carried out with the utmost care, in such a way that solidity and safety be at least equivalent to before the outset of work and in any cases, according to the pre-work statement of condition.

16.3 Restoration of Railway lines

Backfill and restoration of the site, in the right of way of a railway line, shall be carried out according to the directives given by the COMPANY with the approval of the representative of the operating body of the railway concerned.

16.4 Restoration of Roads and tracks

The roadway, pavements, borders, shoulders, ditches, gutters, banks, etc. shall be re-established and the deposits of materials kept in reserve shall be re-used to this end or, failing this, a type and quality at least equivalent to those set aside shall be used, and the excess earth excavated shall also be transported to rubbish tips.



16.5 Restoration of Rivers and secondary water courses

The trench shall be backfilled using excavated material, starting with the finest, on the condition that they do not contain any hard elements; where this is not possible, the necessary materials shall be provided.

Backfilling and setting up of protection devices shall be carried out in such a way that, after execution, they cause no disturbance to the water flow.

Reinforcement of the embankments shall be performed so as to obtain a permanent protection during the intended service life of the pipeline.

Techniques involving further maintenance and repair, such as sheet pile walls, are prohibited, unless otherwise instructed by the Project.

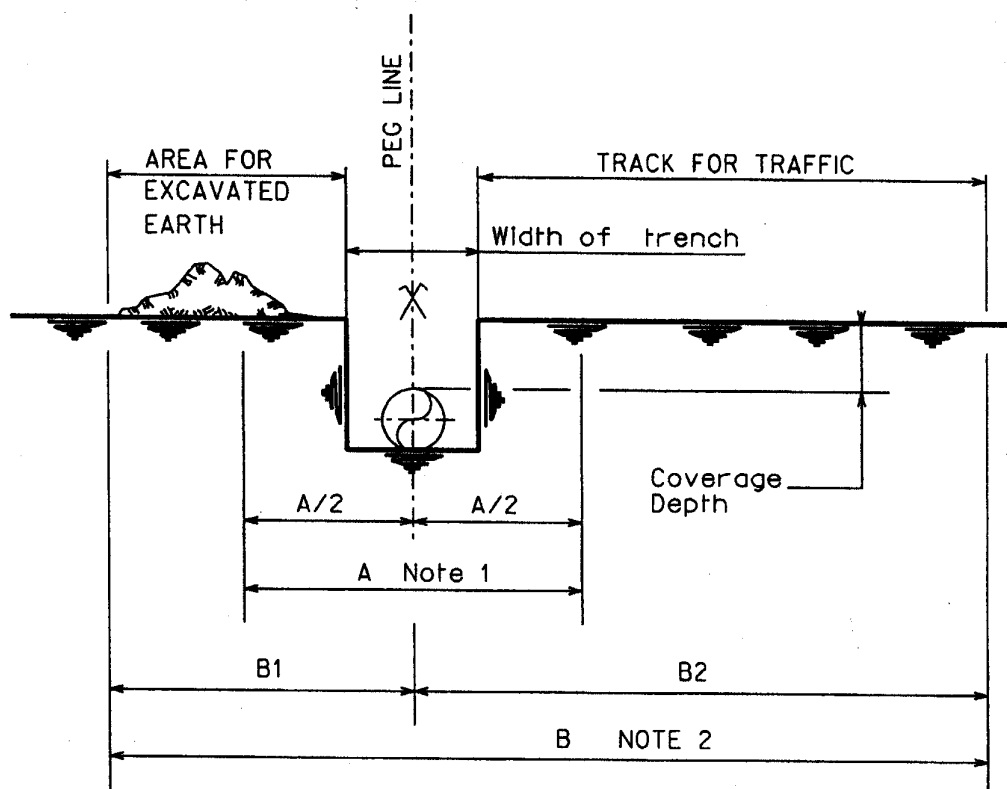
16.6 Other restoration works

Backfill shall be executed taking all precautions to ensure that works may not follow the subsiding of the backfill, using carefully tamped, and if necessary dampened, 0.20 m layers. Previously existing protection already shall be replaced on the works.

17. Standard drawings for installation

SD PLR 401	R.O.W. for continuous burying of pipeline
SD PLR 402	R.O.W. for laying pipeline in embankment ground with good load bearing capacity
SD PLR 403	R.O.W. for laying pipeline in embankment ground with poor load bearing capacity
SD PLR 404	Theoretical cross-section of trench for buried pipeline - Stable ground
SD PLR 405	Crossing of streams and pits by trenching without special protection
SD PLR 406	Crossing of railway lines with pipeline in casing with installation by trenching
SD PLR 407	Crossing of railway lines with pipeline in casing with installation by drilling/jacking
SD PLR 408	Crossing of roads by trenching across the R.O.W.
SD PLR 409	Crossing of roads with pipeline in casing with installation by trenching
SD PLR 410	Crossing of roads with pipeline in casing with installation by drilling/jacking
SD PLR 411	Crossing of drain pipes
SD PLR 412	Crossing of buried high pressure combustible gas lines
SD PLR 413	Overpass crossing of buried pipelines and cables
SD PLR 414	Underpass crossing of buried pipelines and cables
SD PLR 415	Crossing of rivers and canals with concrete coated buried pipeline
SD PLR 416	U-type reinforced concrete weighting
SD PLR 417	Cramping of pipeline by fastening bolts
SD PLR 418	Concrete base milestone with indicator plate
SD PLR 419	Benchmark for aerial position marking
SD PLR 420	Benchmark for semi-desert and desert zones
SD PLR 421	Fencing around pipeline valve with access perpendicular to pipeline
SD PLR 422	Fencing around pipeline valve with access parallel to pipeline
SD PLR 423	Positioning of pipelines alongside roads and railways
SD PLR 424	Stabilisation of pipelines on steep slopes

Standard Drawings	SD PLR 401
R.O.W. for continuous burying of pipeline	Rev.: 01
	Date: 10/03

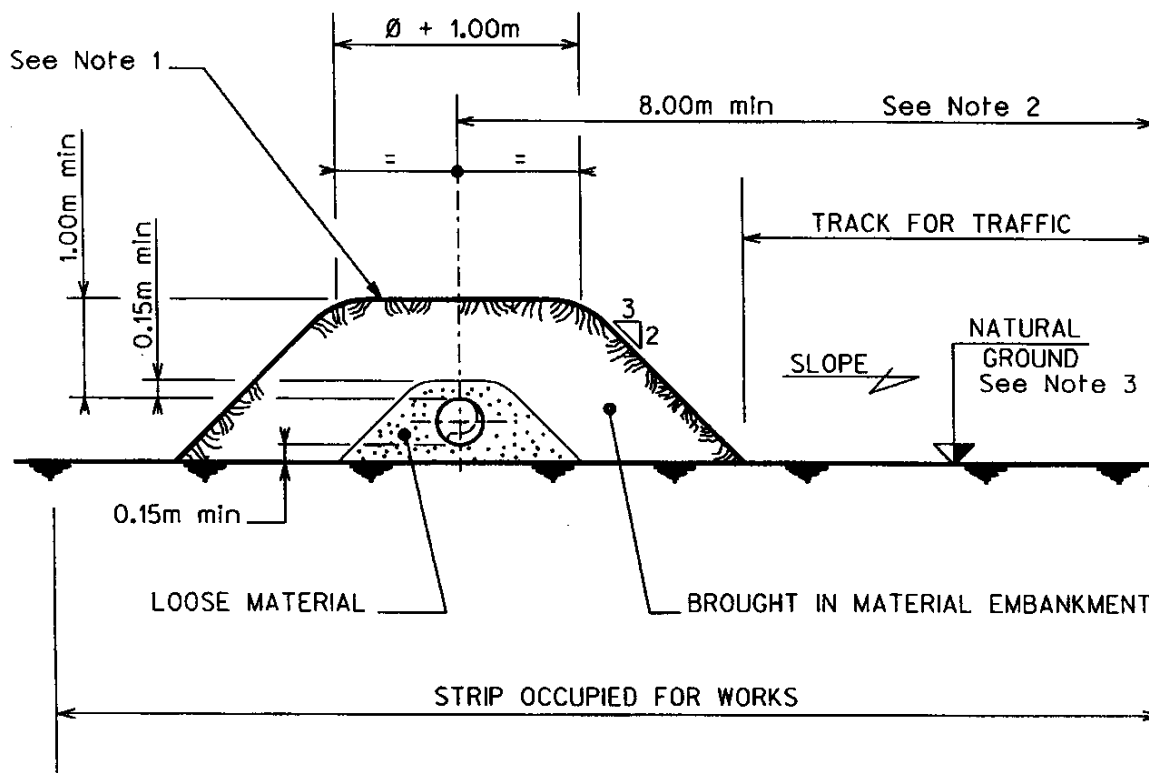


NOTES :

- 1 A = Area permanently occupied
- In wooded area $A/2 = B1$
- 2 B = The area occupied for works , known as the right of way ,
is the strip of land made available to the contractor .
- 3 - The value of A and B ($B1 + B2$) is to be defined by the OWNER
according to the type of work and its dimensional characteristics .
- 4 - When laying pipes , the pipeline is on the left .

Standard Drawings	SD PLR 402
R.O.W. for laying pipeline in embankment ground – Good load bearing capacity	Rev.: 01
	Date: 10/03

Exploration & Production

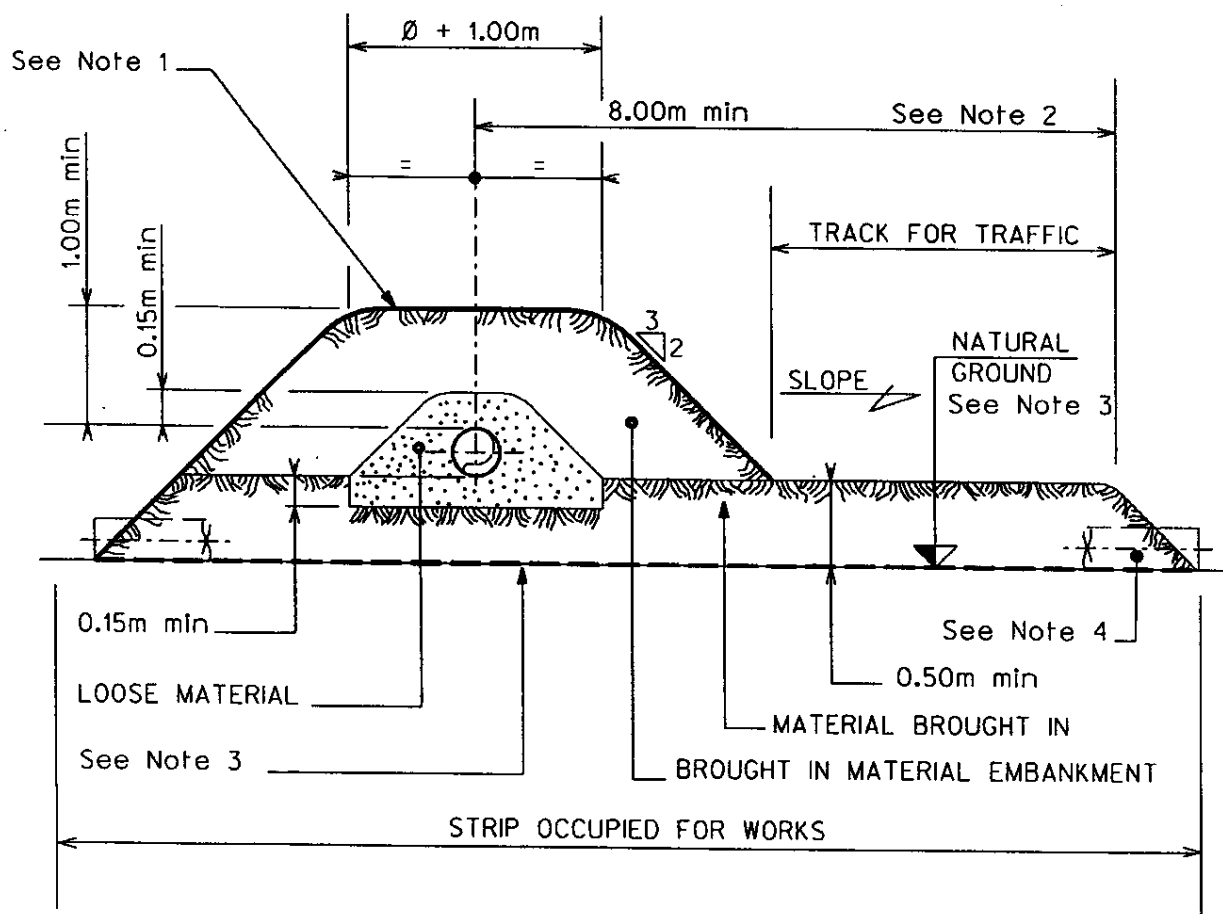


NOTES :

- 1 _ Embankment material should be stabilised using rocks , by compacting , or by other appropriate means .
- 2 _ This value may be increased by the OWNER to ensure that there is sufficient track width for two way traffic .
- 3 _ Ensure that natural water drainage is restored .
- 4 _ Dimensions are in metres .
- 5 _ When laying pipes , the pipeline is on the left .

Standard Drawings	SD PLR 403
R.O.W. for laying pipeline in embankment ground poor load bearing capacity	Rev.: 01
	Date: 10/03

Exploration & Production

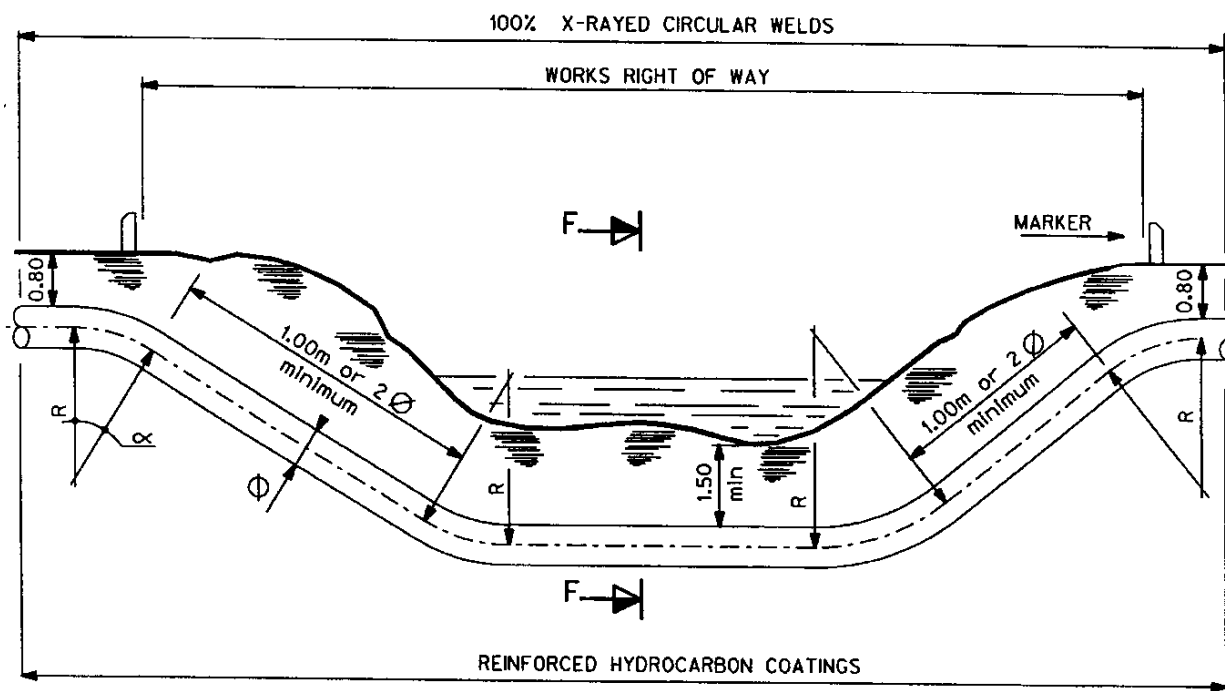


NOTES :

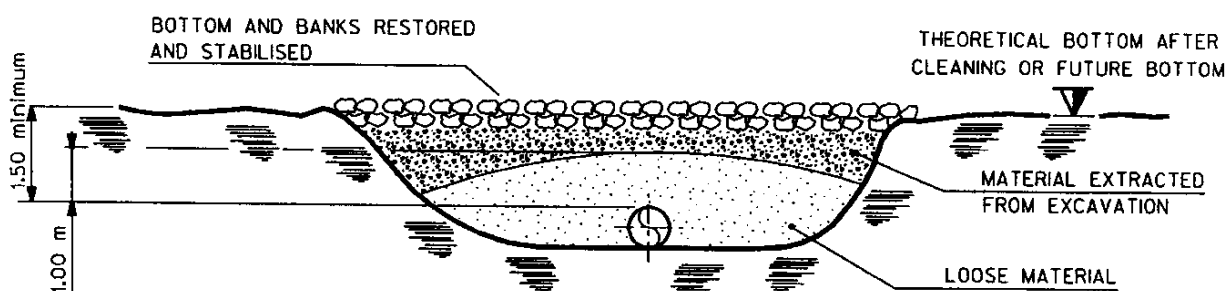
- 1 _ Embankment material should be stabilised using rocks , by compacting , or by other appropriate means .
- 2 _ This value may be increased by the OWNER to ensure that there is sufficient track width for two way traffic .
- 3 _ If necessary geotechnical fabric can be placed between the natural ground and the material brought in .
- 4 _ If necessary , lay drainage pipes to re-establish natural drainage .
- 5 _ Dimensions are in metres .
- 6 _ When laying pipes , the pipeline is on the left .

Standard Drawings	SD PLR 405
Crossing of streams and pits by trenching without special protection	Rev.: 01
	Date: 10/03

Exploration & Production



CROSS SECTION F-F

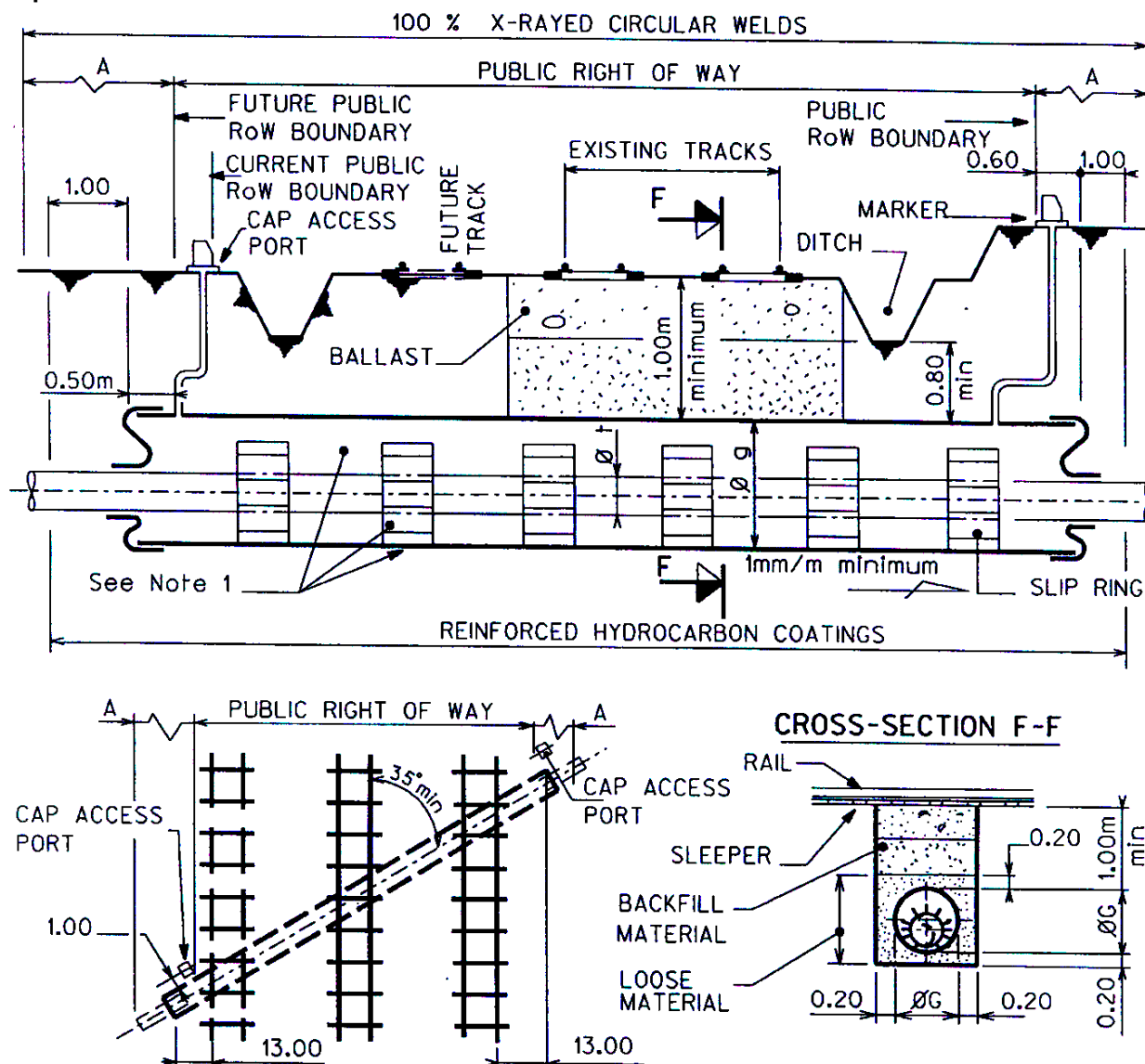


NOTES :

- 1 : If the excavated earth contains items likely to damage the coating , physical protection must be provided around the pipe .
- 2 : The cold bend radius of pipe is $\geq 20 \varnothing$
- 3 : The size of angle α depends on pipe characteristics ($\varnothing$, length)
- 4 : All dimensions are in metres

Standard Drawings	SD PLR 406
Crossing of railway lines with pipeline in casing – Installation by trenching	Rev.: 01
	Date: 10/03

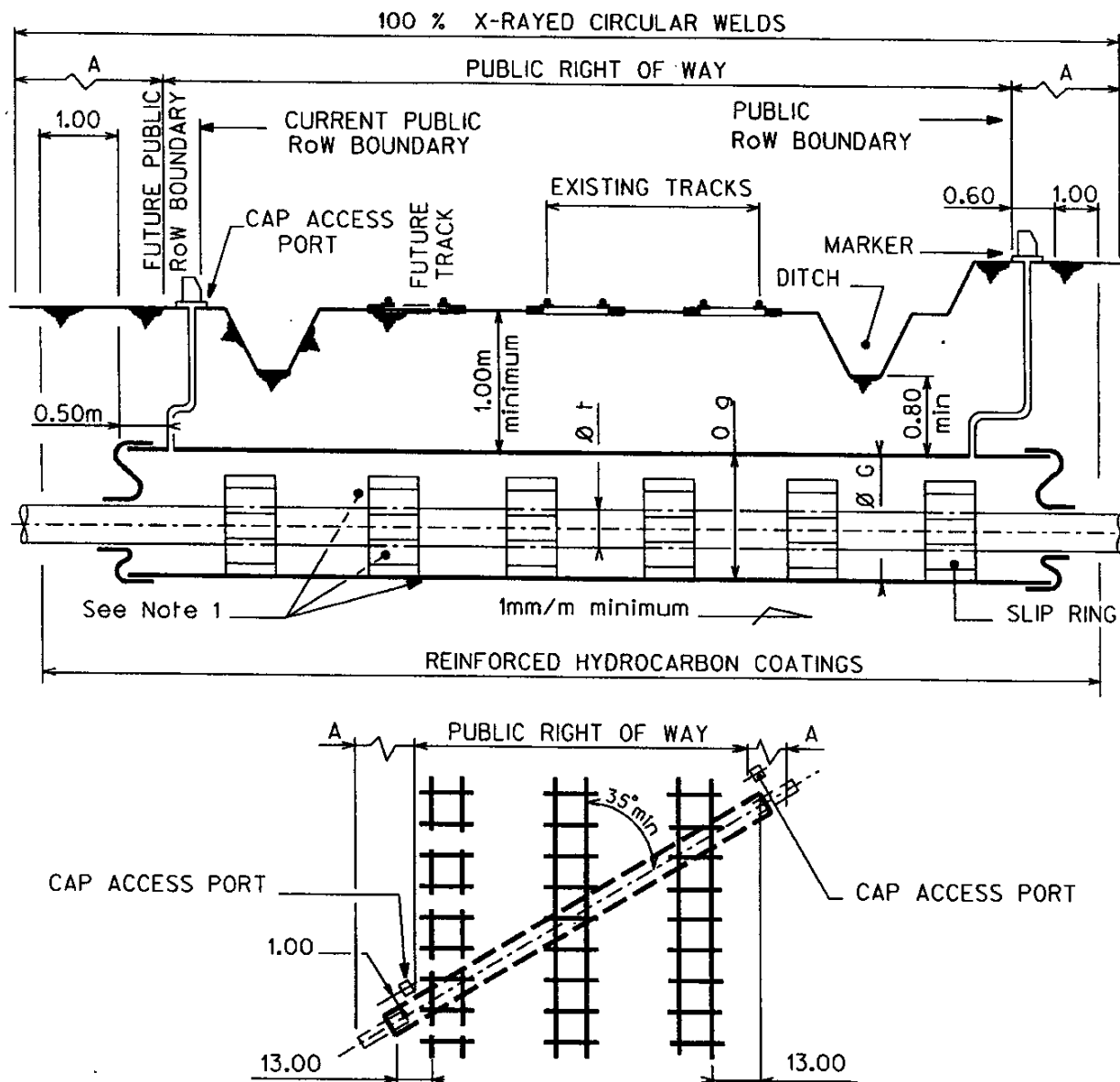
Exploration & Production



NOTES :

- A = Pipeline in the strip of land classified by French regulations as :
 - CATEGORY I for liquid hydrocarbons or LPG .
 - CATEGORY B or C for flammable gases .
- 1 : ØG : Outer casing diameter . Øg : Internal casing diameter .
 Øt : Outer diameter of coated pipe . $\text{Øg} - \text{Øt} \geq 0.10\text{m}$.
 - Spacing between slip rings depends on type of ring and pipe characteristics .
 - Ends of casing sealed off by flexible watertight seal .
- 2 : All work on railway tracks (installation of stiffeners , removal of track and associated works) is to be carried out by or in the presence of representatives of the company operating the tracks being crossed .
- 3 : All backfill material must be methodically compacted . (M.P.O : 95 %)
- 4 : All dimensions are in metres .

Standard Drawings	SD PLR 407
Crossing of railway lines with pipeline in casing with installation by drilling/jacking	Rev.: 01
	Date: 10/03



NOTES :

A = Pipeline in the strip of land classified by French regulations as :

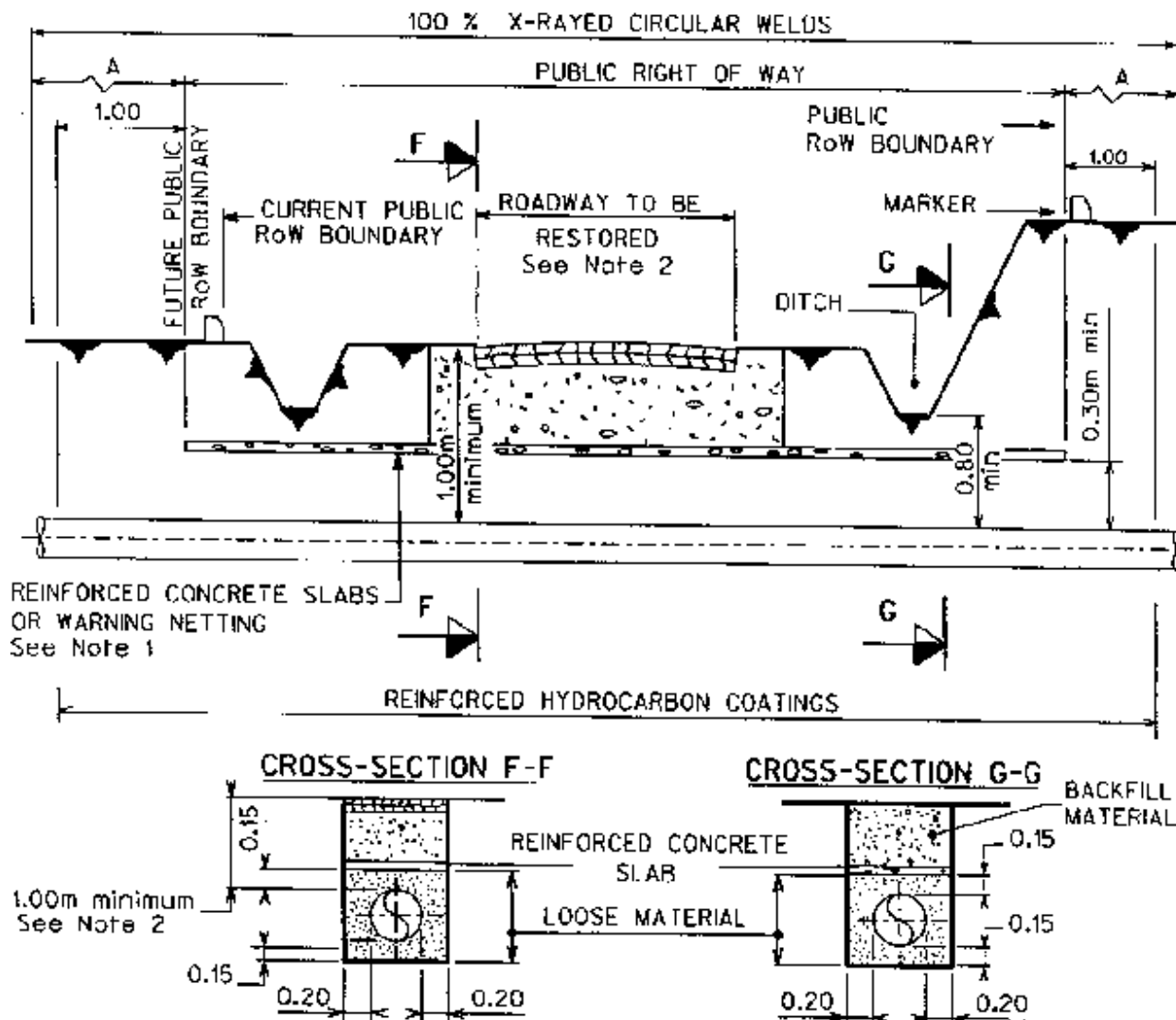
- CATEGORY I for liquid hydrocarbons or LPG .
- CATEGORY B or C for flammable gases .

1 : ϕG : Outer casing diameter . ϕg : Internal casing diameter .
 ϕt : Outer diameter of coated pipe . $\phi g - \phi t \geq 0.10m$.

- Spacing between slip rings depends on type of ring and pipe characteristics .
- Ends of the casing sealed off by flexible watertight seal .

2 : All dimensions are in metres .

Standard Drawings	SD PLR 408
Crossing of roads by trenching across to R.O.W.	Rev.: 01
	Date: 10/03



NOTES :

A = Pipeline in the strip of land classified by French regulations as :

- CATEGORY I for liquid hydrocarbons or LPG .
- CATEGORY B or C for flammable gases .

1 : The reinforced concrete slabs can be prefabricated or poured on site for each element . - Width = $\varnothing + 0.40\text{m}$ and Thickness = 0.15m

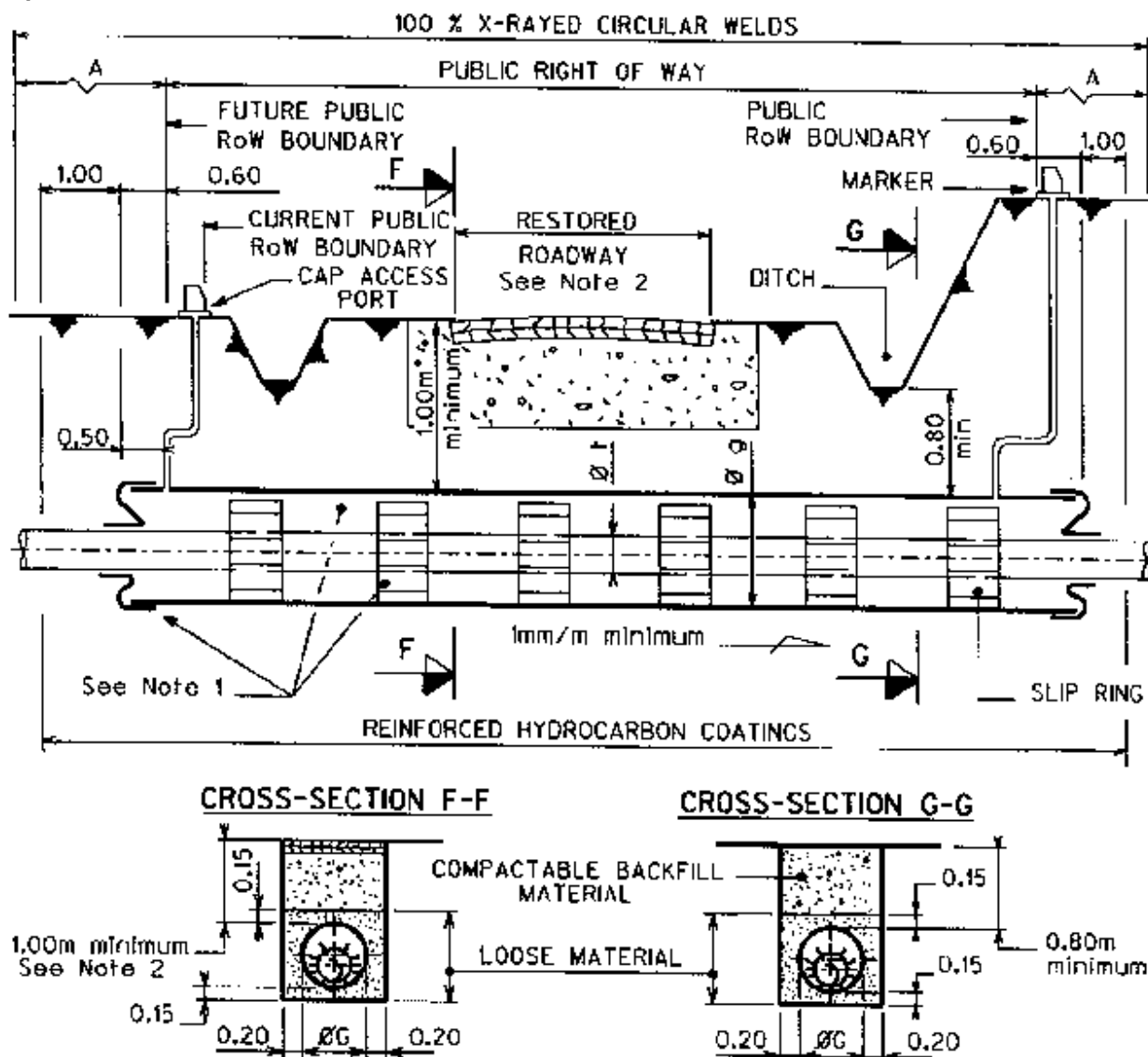
The warning device shall be :

- plastic coated steel mesh , or
- plastic netting , or
- a plastic strip indicating pipeline operator's address and phone number

2 : Repair of the roadway and possibly of the bed supporting the roadway is to be carried out with the agreement of the authority in charge of the road .

3 : All back-fill material must be methodically compacted (M.P.O 95 %)

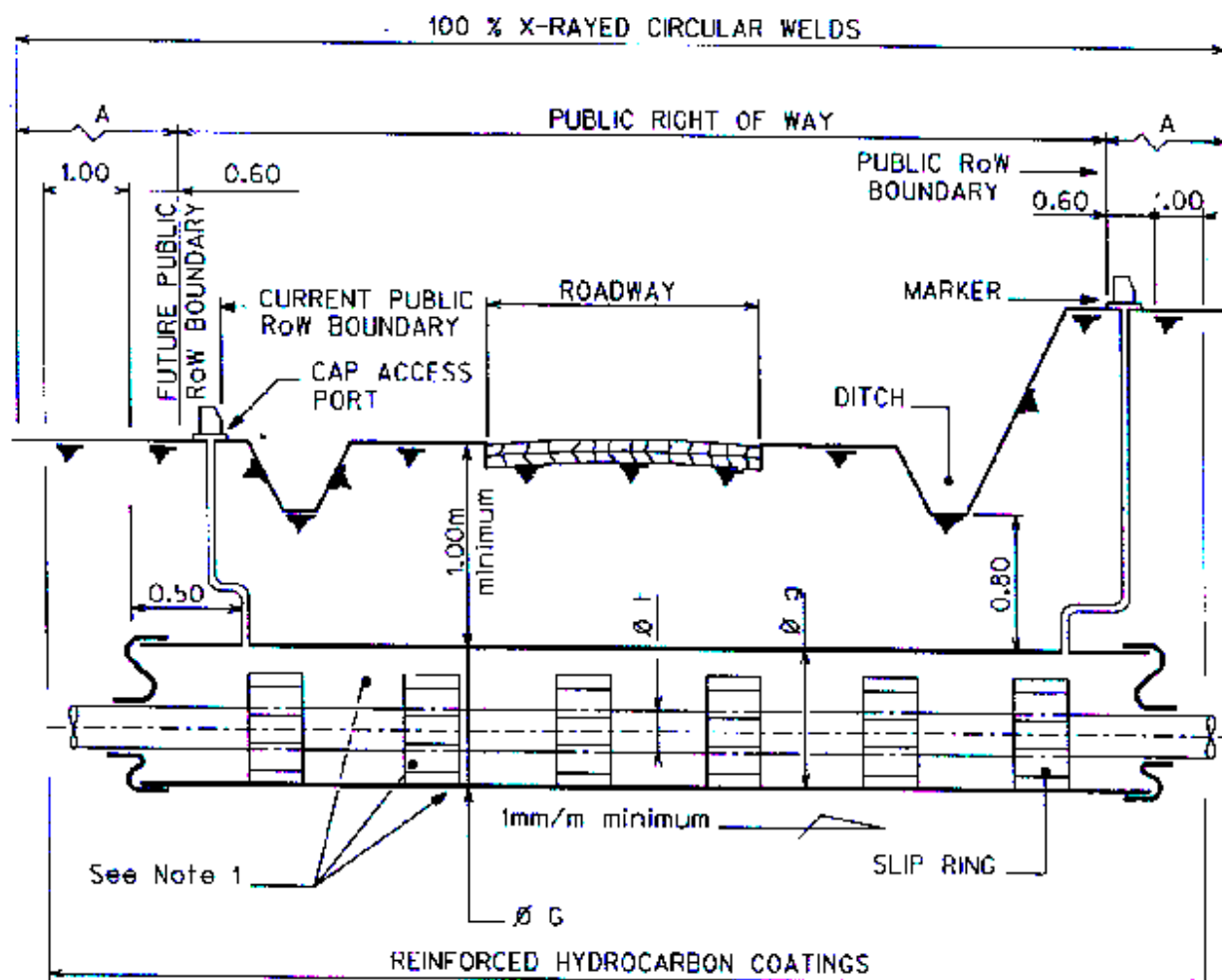
4 : All dimensions are in metres .



NOTES :

- A = Pipeline in the strip of land classified by French regulations as:
 - CATEGORY I for liquid hydrocarbons or LPG .
 - CATEGORY B or C for flammable gases .
- 1 : ØG : Outer diameter of casing . ØI : Internal diameter of casing .
 ØI : Outer diameter of coated pipe . $\text{ØI} - \text{ØG} \geq 0.10\text{m}$.
 - Spacing between slip rings depends on type of ring and pipe characteristics .
 - Ends of casing sealed off by flexible watertight seal .
- 2 : Repair of the roadway and possibly of the bed supporting the roadway is to be carried out with the agreement of the authority in charge of the road .
- 3 : All backfill material must be methodically compacted (M.P.O 95 %)
- 4 : All dimensions are in metres .

Standard Drawings	SD PLR 410
Crossing of roads with pipeline in casing with installation by drilling or jacking	Rev.: 01
	Date: 10/03



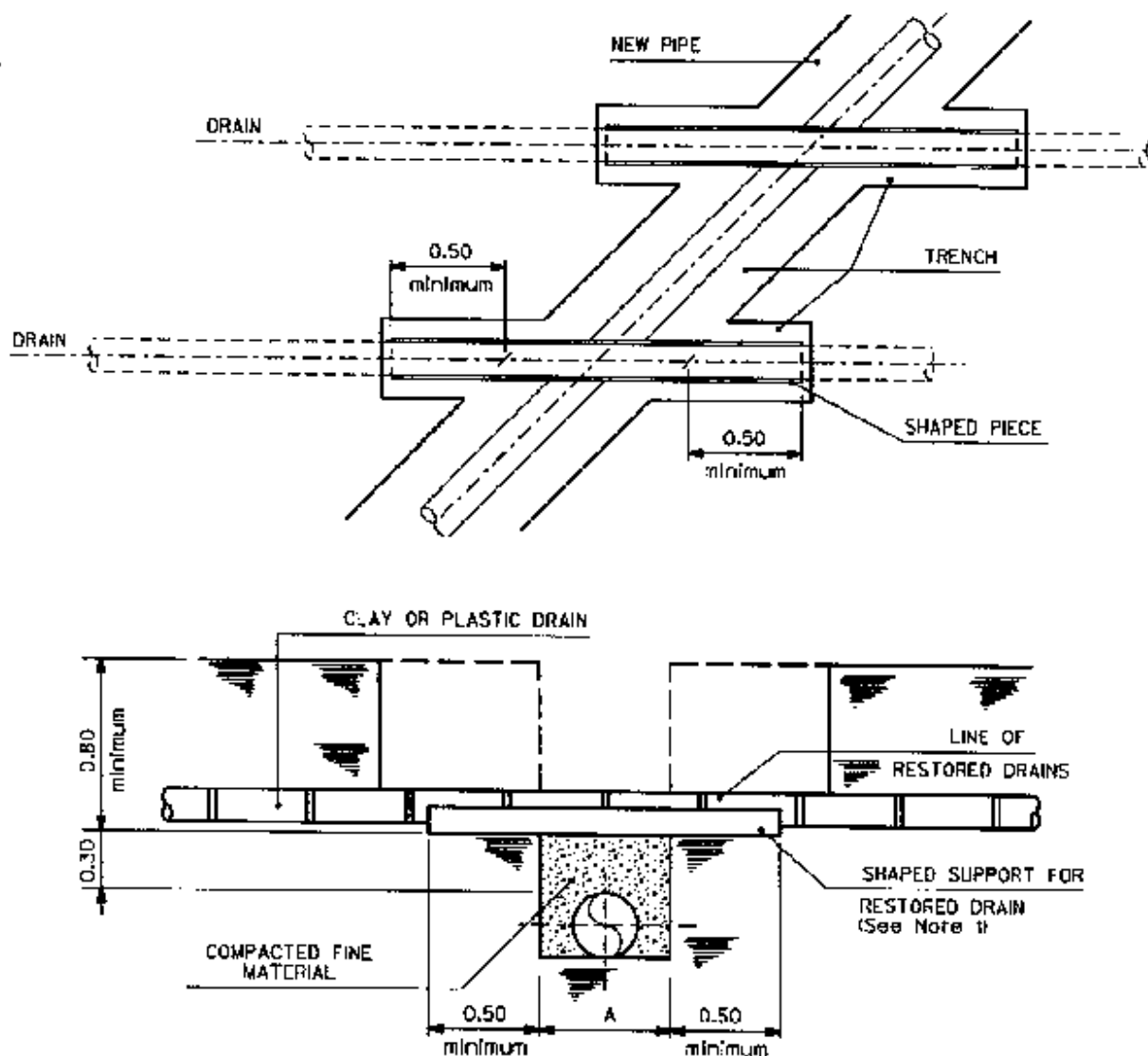
NOTES :

- A = Pipeline in the strip of land classified by French regulations
as : - CATEGORY I for liquid hydrocarbons or LPG ,
- CATEGORY B or C for flammable gases .

- 1 : $\emptyset G$: Outer diameter of casing . $\emptyset g$: Internal diameter of casing .
 $\emptyset t$: Outer diameter of coated pipe . $\emptyset g - \emptyset t \geq 0.10m$.
- Spacing between slip rings depends on type of ring and pipe characteristics .
- Ends of casing sealed off by flexible watertight seal .

- 2 : All dimensions are in metres .

Standard Drawings	SD PLR 411
Crossing of drain pipes	Rev.: 01
	Date: 10/03



NOTES :

A = Actual width of trench

- 1 : If shaped pieces are of metal they must be protected against corrosion
- 2 : The technical methods of connecting the drains must be submitted for the OWNER's approval .
- 3 : All dimensions are in metres .



Standard Drawings

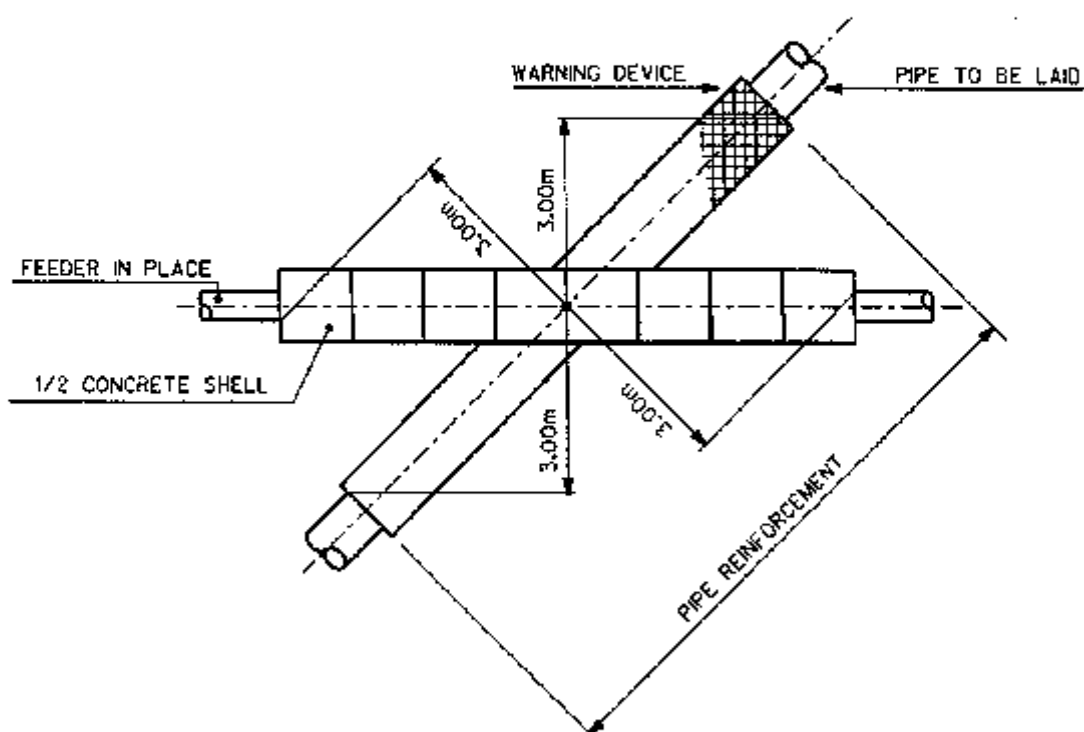
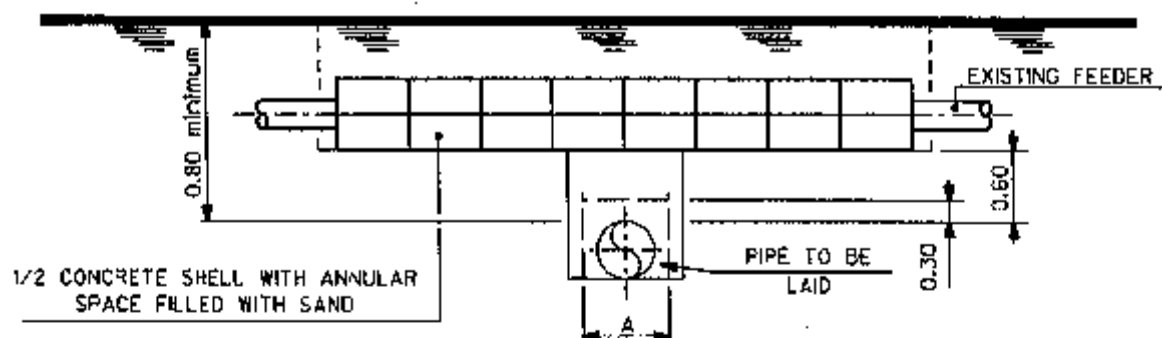
SD PLR 412

Crossing of buried high pressure combustible gas lines

Rev.: 01

Date: 10/03

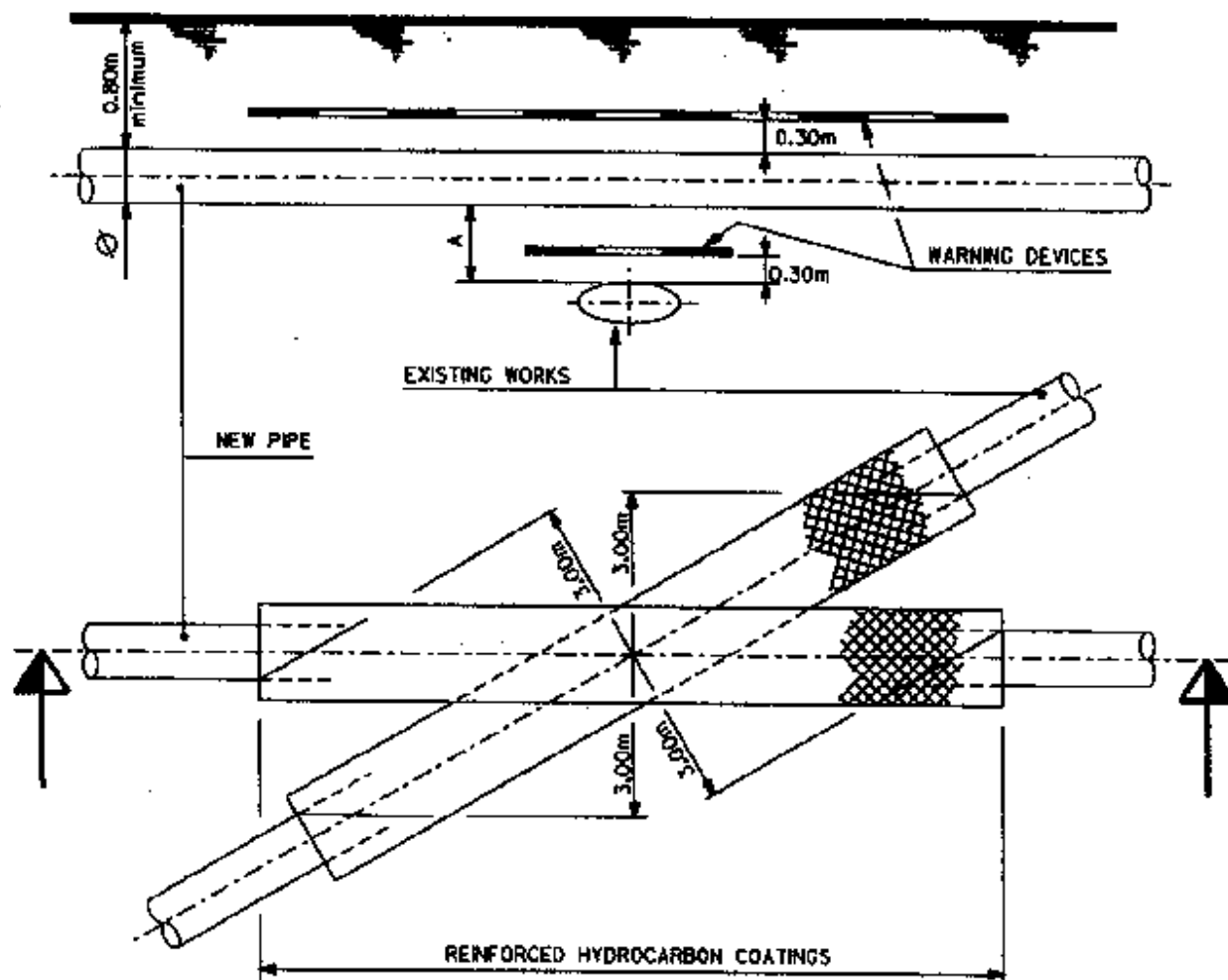
Exploration & Production



NOTES :

- 1 : The warning device shall be :
 - plastic coated steel mesh , or
 - plastic netting , or
 - a plastic strip indicating pipeline operator's address and phone number
 - $\phi \geq 0.20m$ wide
- 2 : When crossing with casing , the casing will serve as the warning device .
- 3 : All dimensions are in metres .

Standard Drawings	SD PLR 413
Overpass crossing of buried pipelines and cables	Rev.: 01
	Date: 10/03

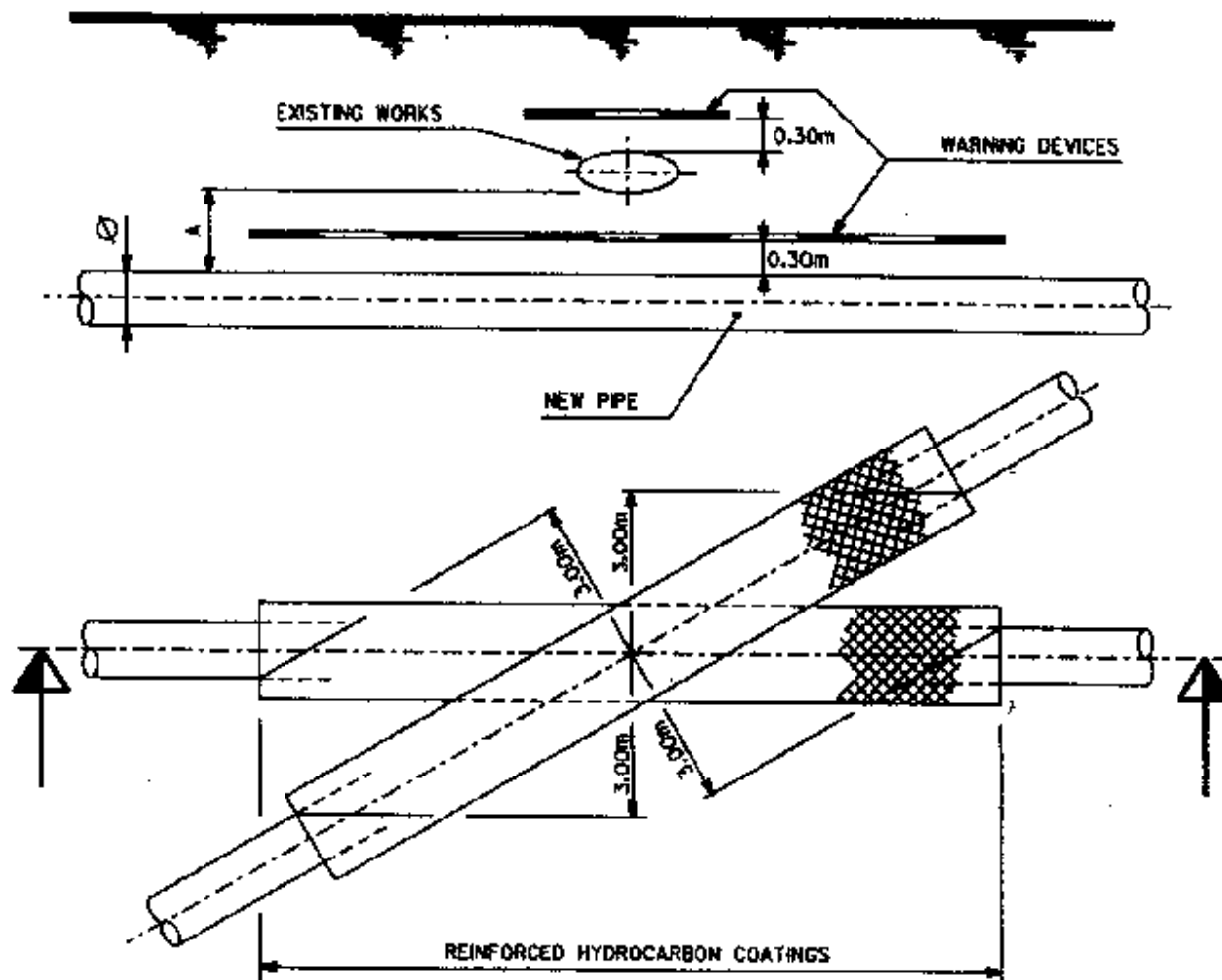


TYPE OF WORKS CROSSED	A
TELECOMMUNICATIONS CABLE	
NON METALLIC PIPE (NON-FLAMMABLE GAS OR LIQUID)	0.40
METALLIC PIPE (NON-FLAMMABLE GAS OR LIQUID)	
ELECTRIC FEEDER CABLE	0.50
FLAMMABLE GAS DISTRIBUTION PIPE	
HYDROCARBON PIPE	0.60

NOTES :

- The warning device shall be :
 - plastic coated steel mesh , or
 - plastic netting , or
 - a plastic strip indicating pipeline operator's address and phone number
 - $\varnothing \geq 0.20m$ wide
- When crossing with casing , the casing will serve as the warning device .
- All dimensions are in metres .

Standard Drawings	SD PLR 414
Underpass crossing of buried pipelines and cable	Rev.: 01
	Date: 10/03



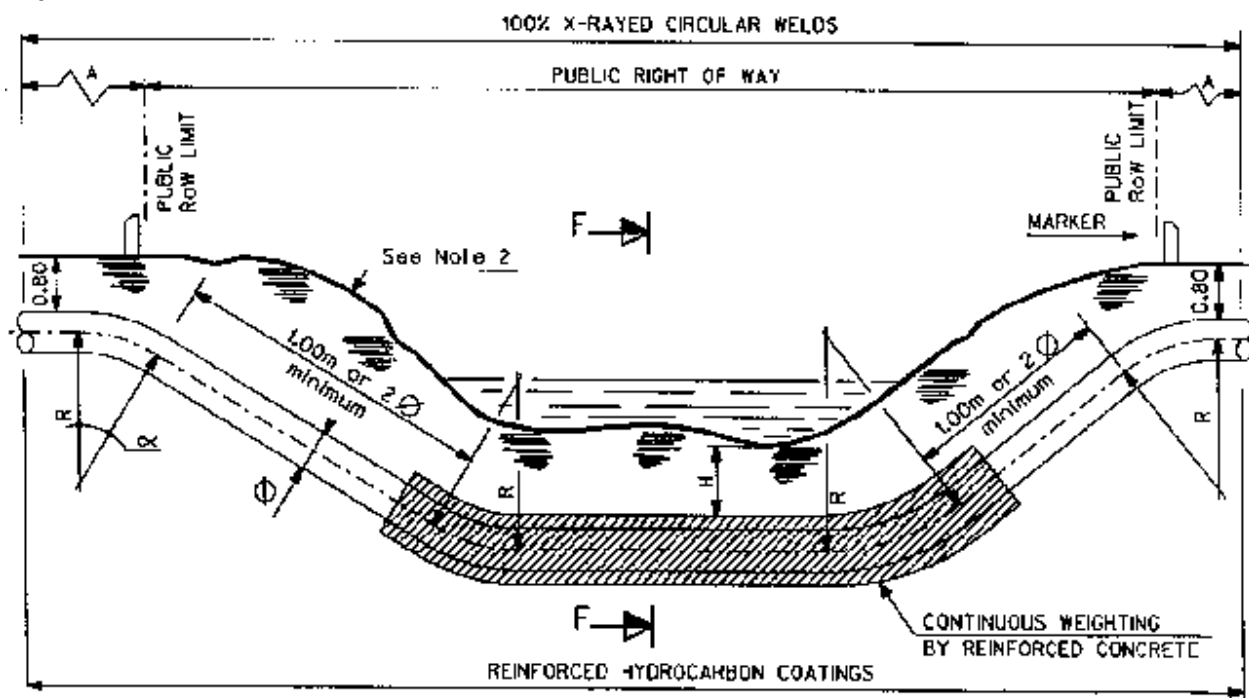
TYPE OF WORKS CROSSED	A
TELECOMMUNICATIONS CABLE	0.40
NON METALLIC PIPE (NON FLAMMABLE GAS OR LIQUID)	
METALLIC PIPE (NON FLAMMABLE GAS OR LIQUID)	
ELECTRIC POWER CABLE	0.50
FLAMMABLE GAS DISTRIBUTION PIPE	
HYDROCARBON PIPE	0.60

NOTES :

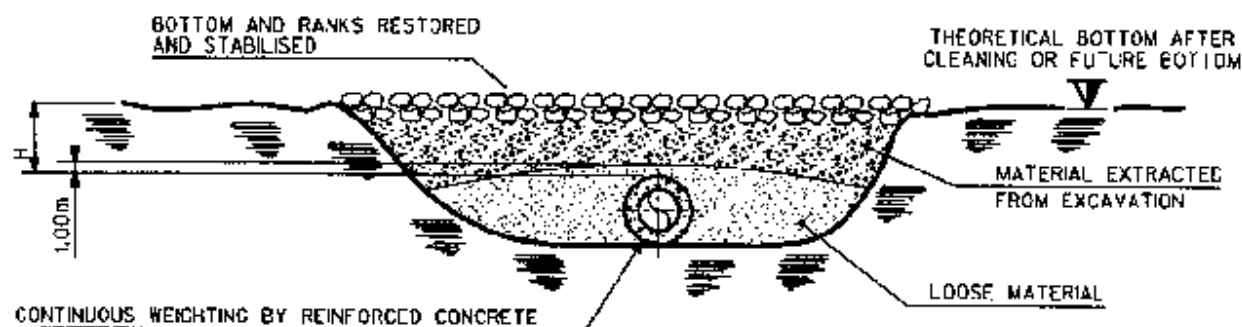
- The warning device shall be :
 - plastic coated steel mesh , or
 - plastic netting , or
 - a plastic strip indicating pipeline operator's address and phone number
- When crossing with casing , the casing will serve as the warning device .
- All dimensions are in metres .

Standard Drawings	SD PLR 415
Crossing of rivers and canals with concrete coated buried pipeline	Rev.: 01
	Date: 10/03

Exploration & Production



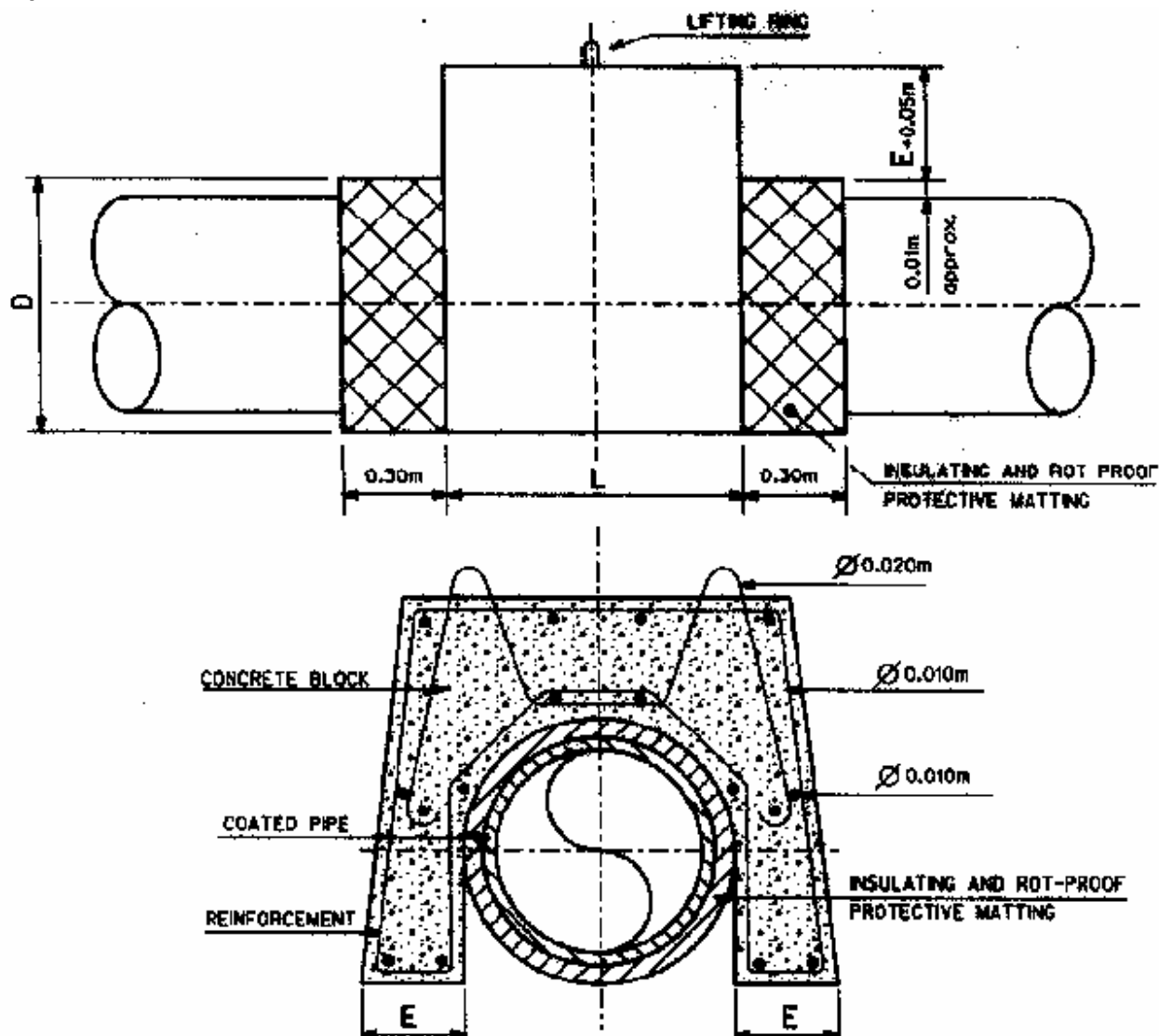
CROSS-SECTION F-F



NOTES :

- A = Pipeline in the strip of land classified by French regulations as :
 - CATEGORY 1 for liquid hydrocarbons or LPG .
 - as : -CATEGORY B or C for flammable gases .
- For PRIVATE rivers or canals , this strip of land , as the right of way on the waterway , is classified as :
 - CATEGORY 1 for liquid hydrocarbons or LPG .
 - CATEGORY A (or B or C) for flammable gases .
- 1 : The technical methods of restoring the banks and stabilising the backfill are to be agreed with the authority in charge of the waterway .
- 2 : The coverage height H must be submitted for approval by the authority in charge of the waterway. However $H \geq 1.50m$.
- 3 : The cold bend radius of pipe is $\geq 20 \varnothing$.
- 4 : The size of angle α depends on pipe characteristics ($\varnothing$, length)
- 5 : All dimensions are in metres .

Standard Drawings	SD PLR 416
U-type reinforced concrete weighting	Rev.: 01
	Date: 10/03



NOTES :

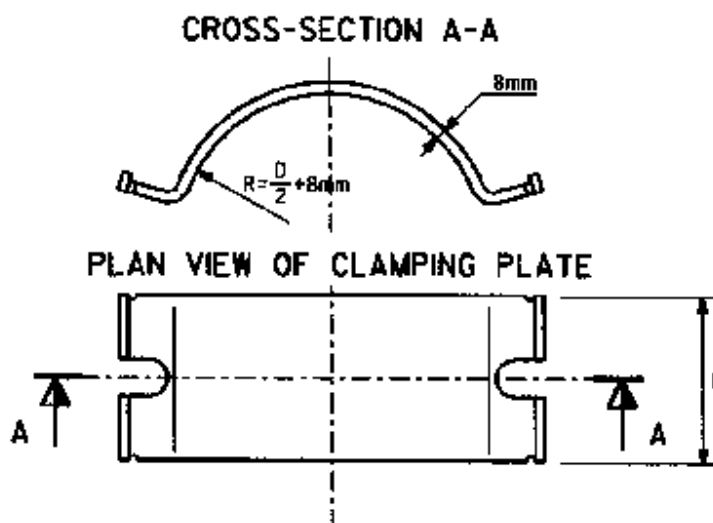
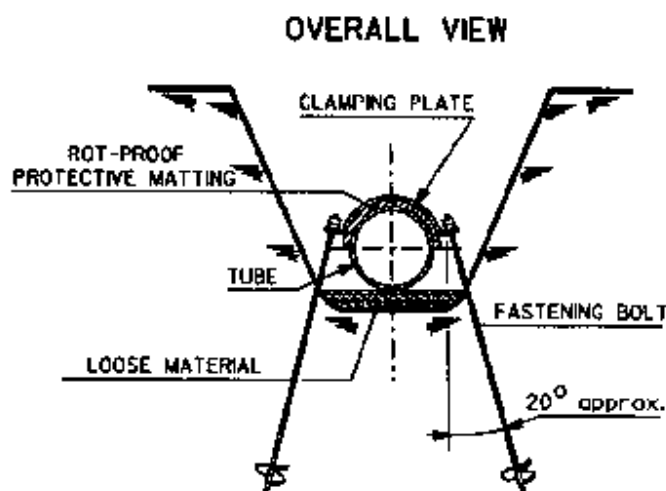
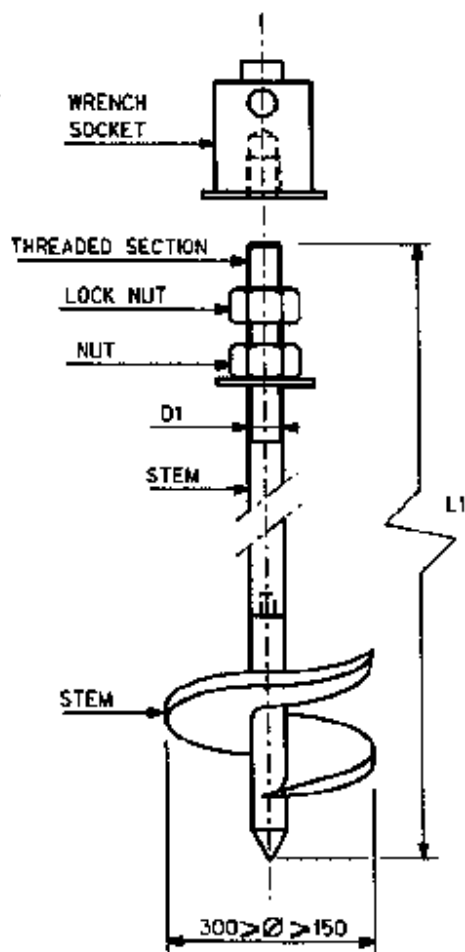
$$L \approx 1.5D \text{ and } 0.50\text{m} \leq L \leq 1.50\text{m}$$

$$E = \frac{D}{3} \text{ and } 0.15\text{m} \leq E \leq 0.40\text{m}$$

The reinforcement mentioned is for information only . It must be made according to the final dimensions of the U-section .

All dimensions are in metres .

Standard Drawings	SD PLR 417
Cramping of pipelines by fastening bolts	Rev.: 01
	Date: 10/03

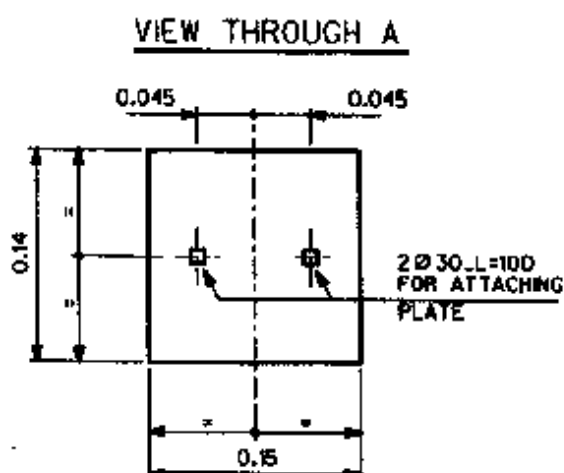
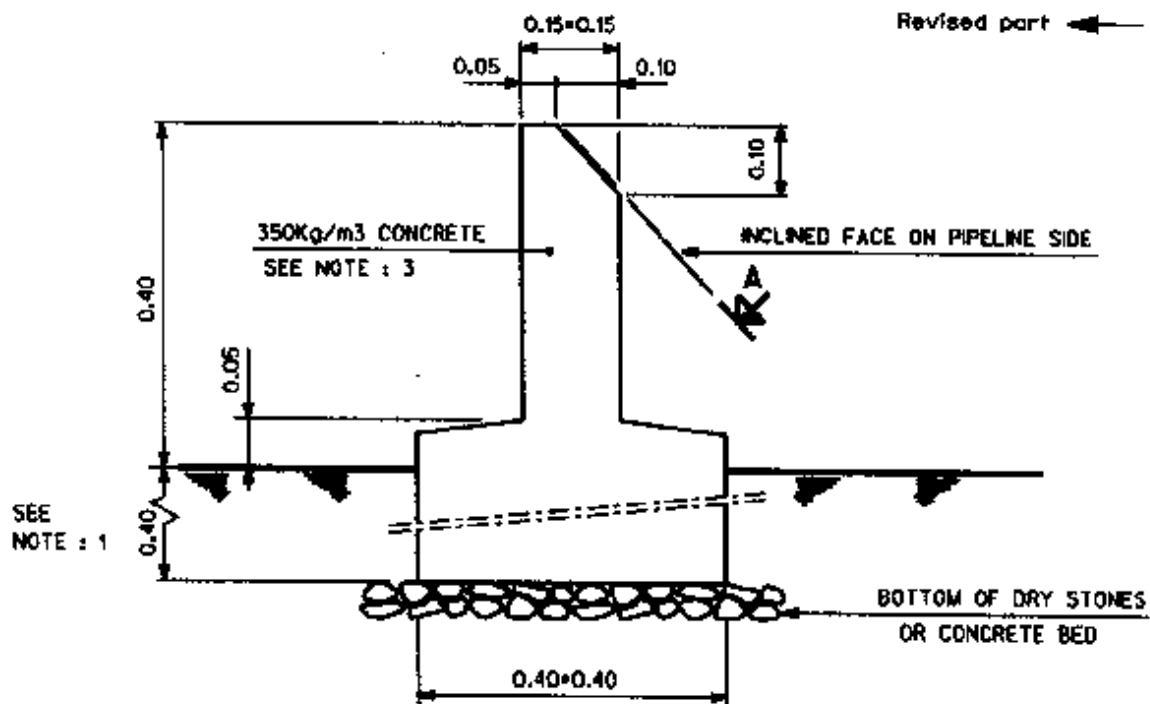


- D** : Outer diameter of coated pipe
D1 : Diameter of fastening bolt stem = $0.01D + 20\text{mm}$.
L : Width of clamping plate = $D/3$
Ø : Outer diameter of bolt depends on diameter of pipe and type of soil
L1 : Length of stem depends on diameter of pipe and type of soil
 $(1.50\text{m} < L1 < 2.50\text{m})$

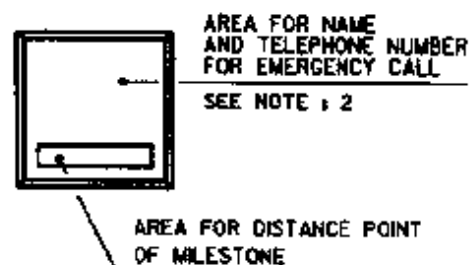
NOTES :

The CONTRACTOR must submit the type and dimensions of the fastening bolt for the OWNER's approval.

Standard Drawings	SD PLR 418
Concrete base milestone with indicator plate	Rev.: 01
	Date: 10/03



INDICATOR PLATE

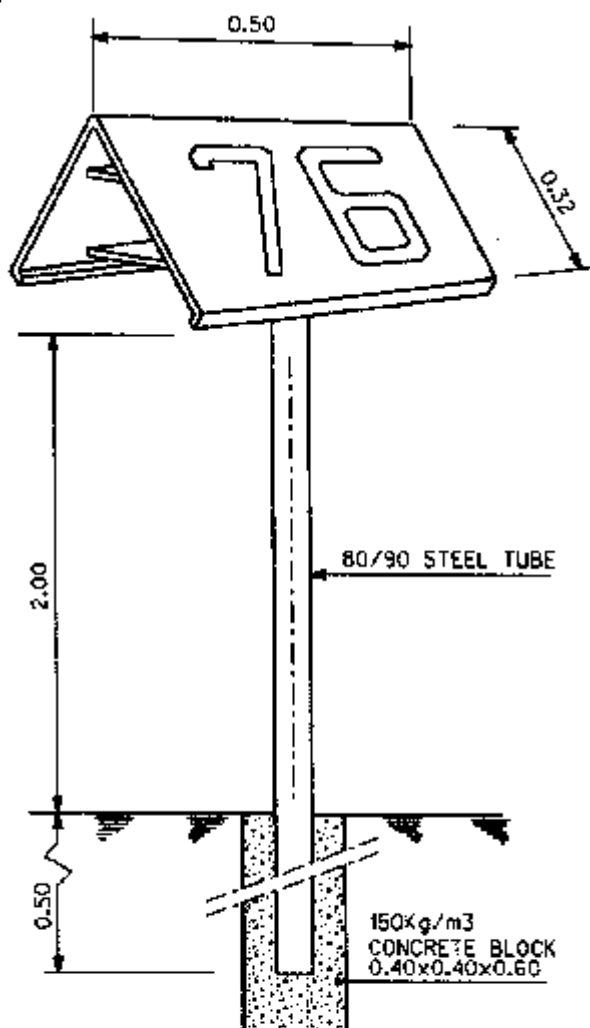


NOTES :

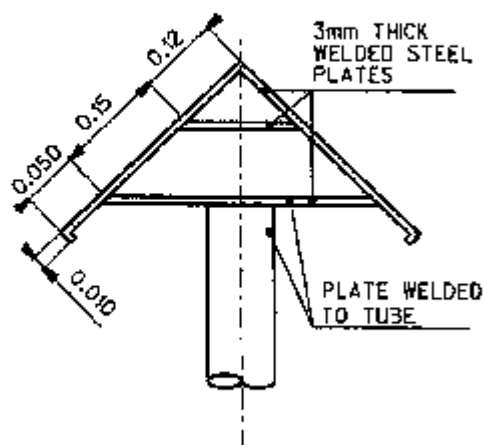
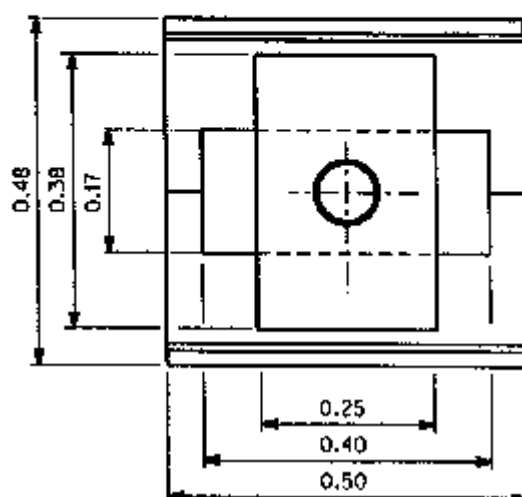
- The height of 0.40 may be increased to take account of the terrain .
- Unless otherwise specified , the indicator plate must be supplied by the OWNER .
- The reinforcement must be submitted for the OWNER's approval .
- All dimensions are in metres .

Standard Drawings	SD PLR 419
Benchmark for aerial position marking	Rev.: 01
	Date: 10/03

Exploration & Production



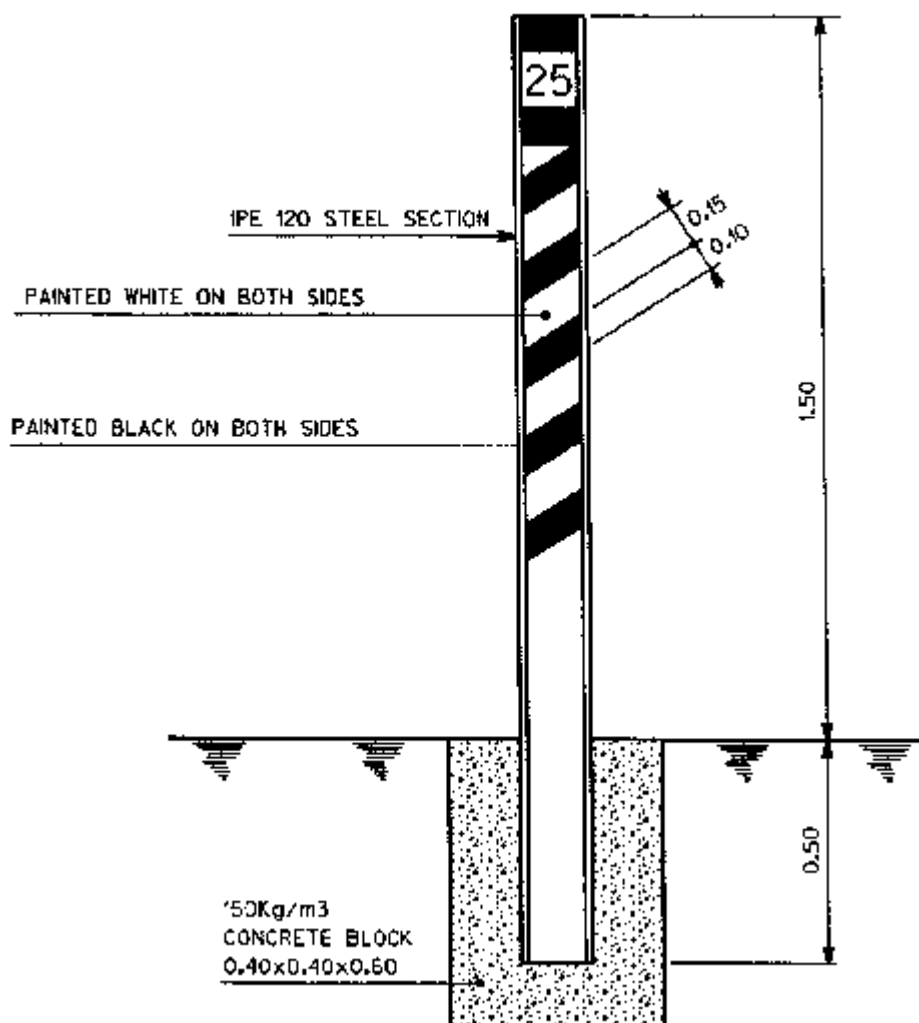
BOTTOM VIEW



NOTES :

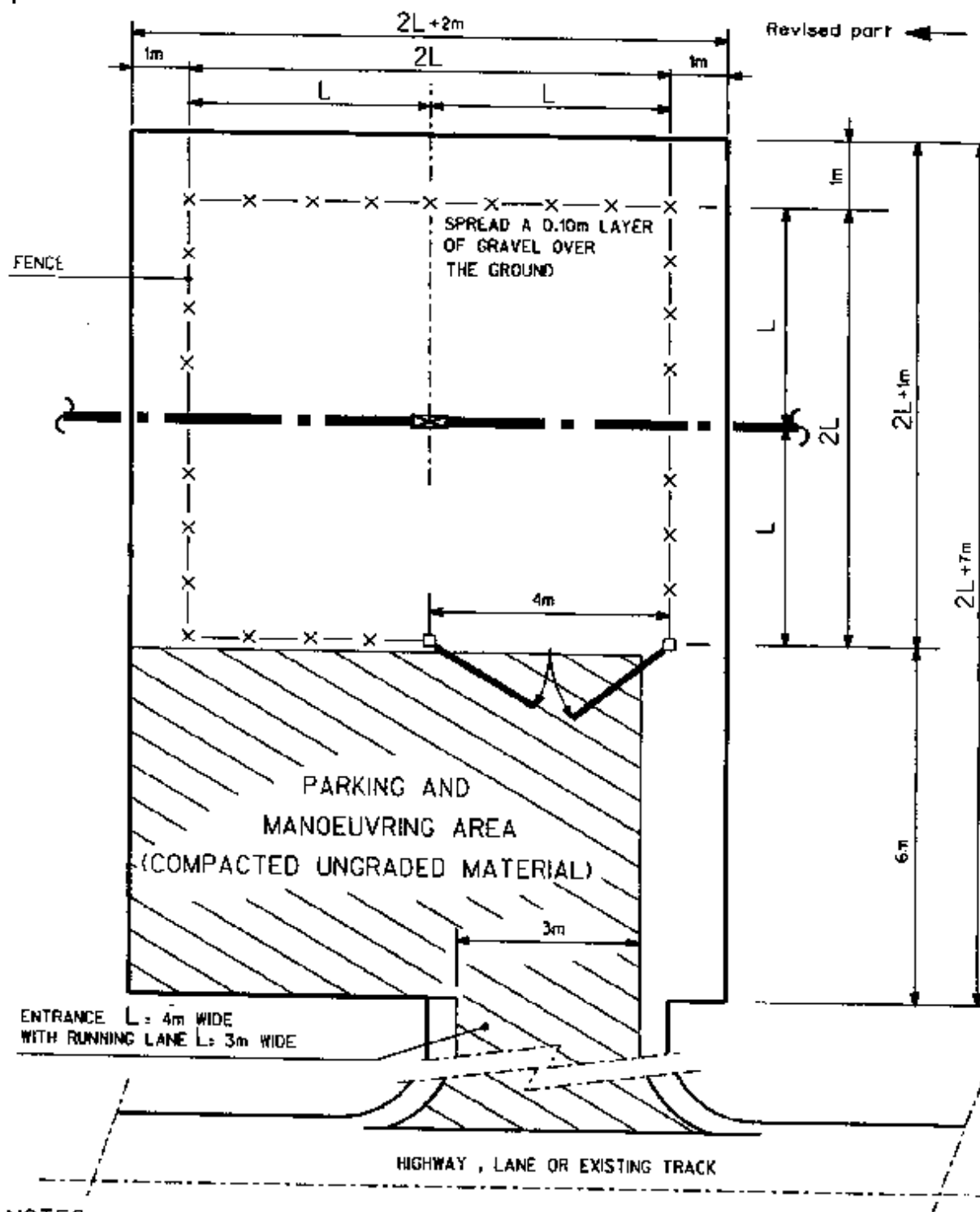
- The benchmark must be installed at the limit of the area permanently occupied

Standard Drawings	SD PLR 420
Benchmark for semi-desert and desert zones	Rev.: 01
	Date: 10/03



Standard Drawings	SD PLR 421
Fencing around pipeline valve with access perpendicular of pipeline	Rev.: 01
	Date: 10/03

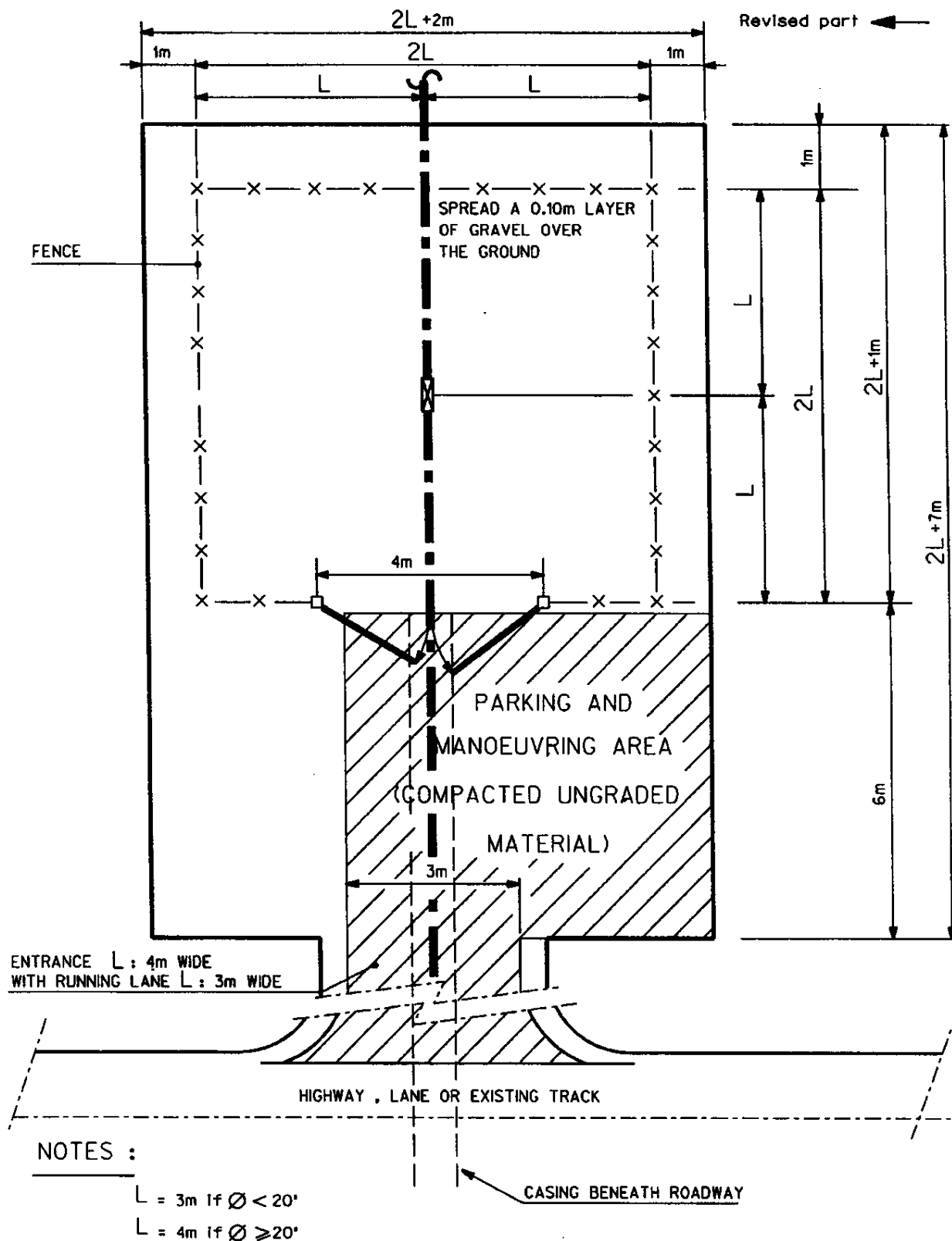
Exploration & Production



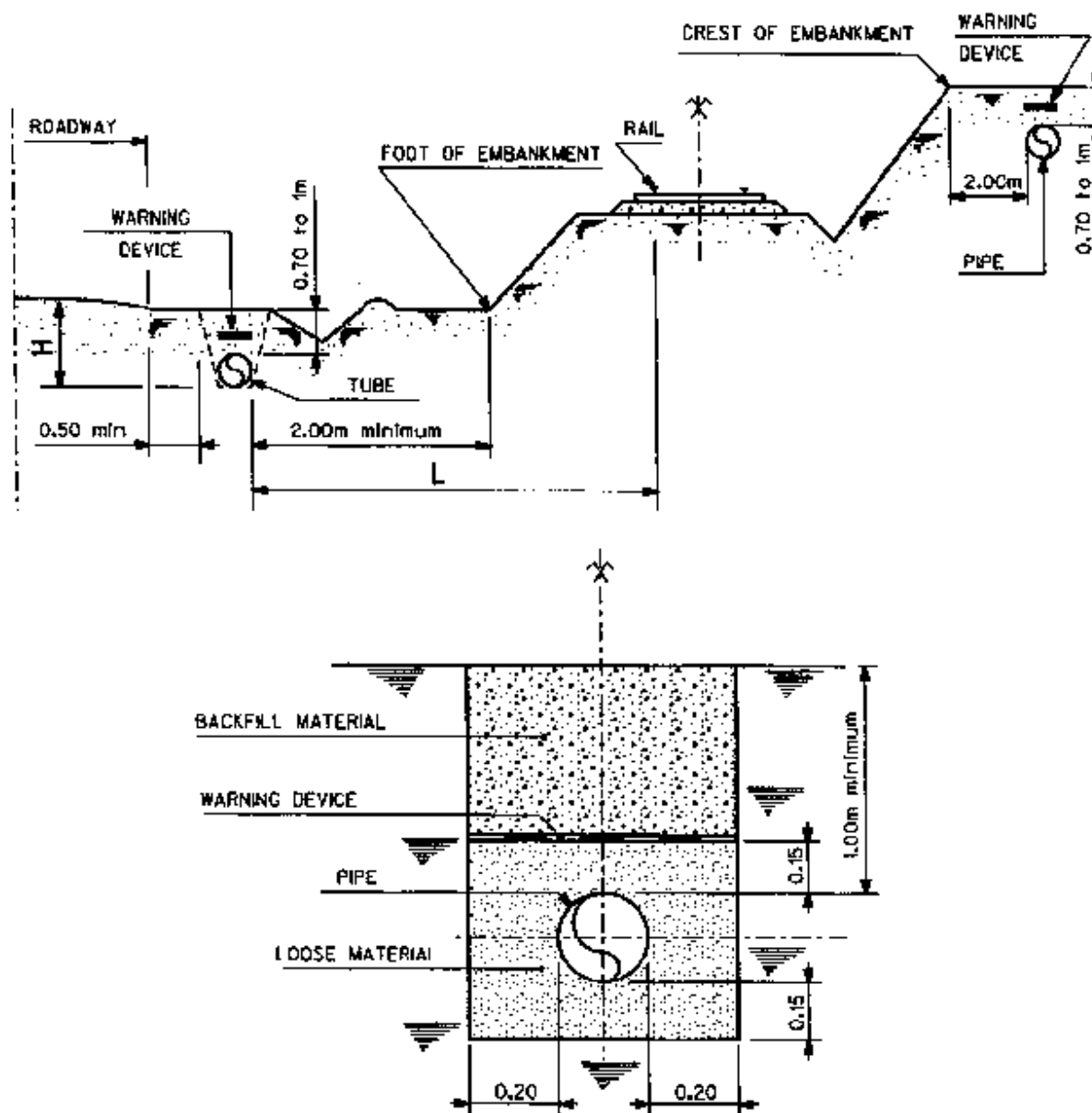
NOTES :

- $L = 3m$ If $\varnothing < 20^\circ$
- $L = 4m$ If $\varnothing \geq 20^\circ$

Standard Drawings	SD PLR 422
Fencing around pipeline valve with access parallel to pipeline	Rev.: 01
	Date: 10/03



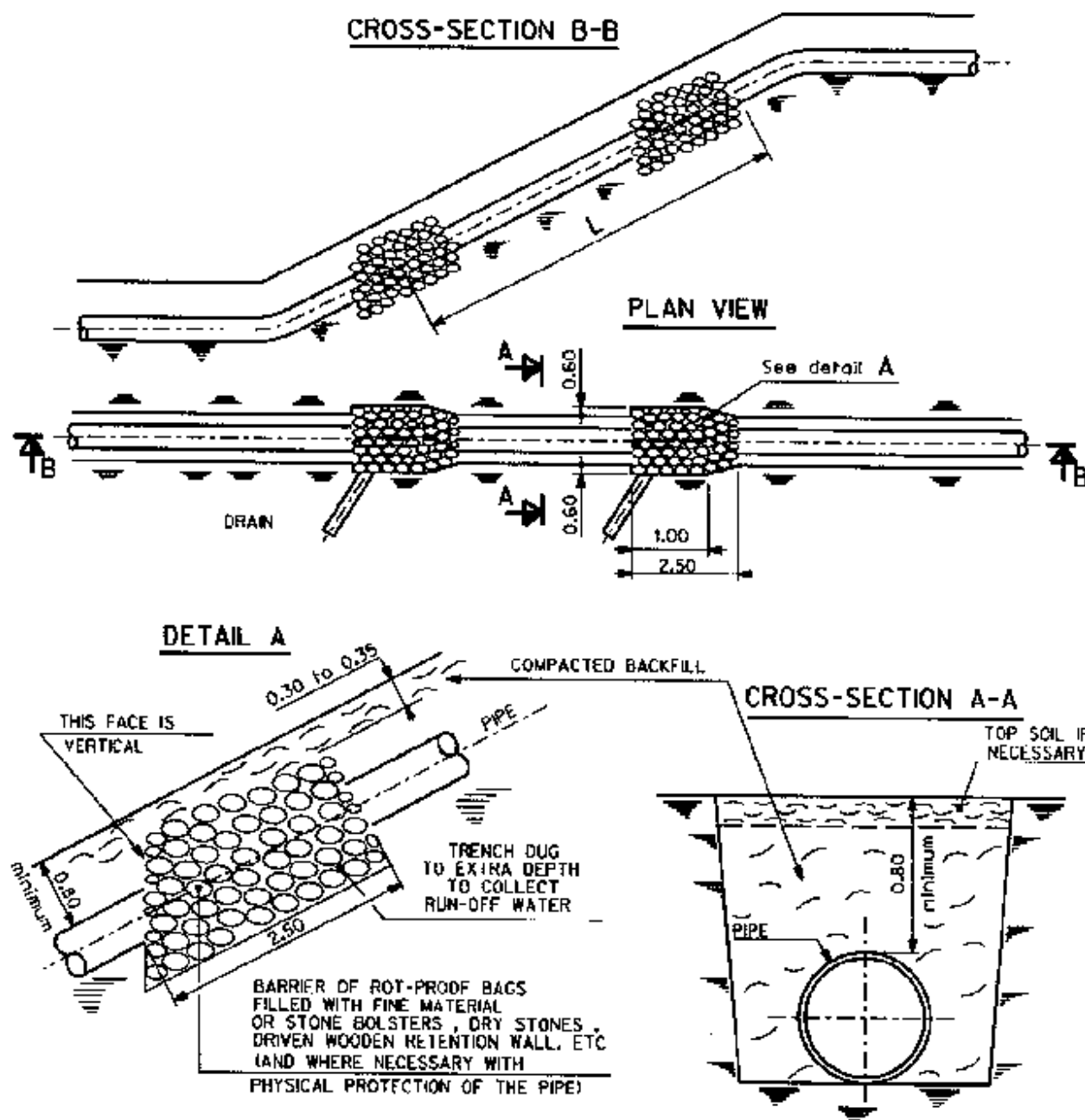
Standard Drawings	SD PLR 423
Positioning of pipelines alongside roads and railways	Rev.: 01
	Date: 10/03



NOTES :

- 1 : Pipe laying alongside more than 50m of road or rail is not allowed
- 2 : In all terrains , the pipeline trench must be shuttered if $H > L/2$
- 3 : In clay soils , the trench must be shuttered irrespective of height and length
- 4 : All backfill material must be methodically compacted
- 5 : All dimensions are in metres

Standard Drawings	SD PLR 423
Positioning of pipelines alongside roads and railways	Rev.: 01
	Date: 10/03



NOTES :

- L = 15m for 20% < gradient < 35%
- = 10m for 35% < gradient < 50%
- = 5m for 50% < gradient < 60%
- All dimensions are in metres .