

DEP SPECIFICATION

SITE PREPARATION AND EARTHWORKS INCLUDING TANK FOUNDATIONS AND TANK FARMS

DEP 34.11.00.11-Gen.

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DESIGN AND ENGINEERING PRACTICE



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1. INTRODUCTION

1.1 SCOPE

This DEP specifies requirements and gives recommendations for the design, planning, material selection and construction for site preparation (3) and earthworks (4) of onshore facilities. The DEP also covers the same elements for the civil works of tank farms and tank foundations.

The information contained in this DEP is supplementary to the following civil engineering DEPs:

Earthquake design for onshore facilities - Seismic hazard assessment	DEP 34.00.01.10-Gen.
Structural design and engineering of onshore structures	DEP 34.00.01.30-Gen.
Onshore and nearshore site investigations	DEP 34.11.00.10-Gen.
Geotechnical and foundation engineering - Onshore	DEP 34.11.00.12-Gen.
Roads, paving, surfacing, cable trenches, slope protection and fencing	DEP 34.13.20.31-Gen.
Drainage and primary treatment facilities	DEP 34.14.20.31-Gen.

This is a revision of the DEP of the same number dated February 2015; see (1.5) regarding the changes.

1.2 DISTRIBUTION, INTENDED USE AND REGULATORY CONSIDERATIONS

Unless otherwise authorised by Shell GSI, the distribution of this DEP is confined to Shell companies and, where necessary, to Contractors and Manufacturers/Suppliers nominated by them. Any authorised access to DEPs does not for that reason constitute an authorization to any documents, data or information to which the DEPs may refer.

This DEP is intended for use in facilities related to oil and gas production, gas handling, oil refining, chemical processing, gasification, distribution and supply/marketing. This DEP may also be applied in other similar facilities.

When DEPs are applied, a Management of Change (MOC) process shall be implemented; this is of particular importance when existing facilities are to be modified.

If national and/or local regulations exist in which some of the requirements could be more stringent than in this DEP, the Contractor shall determine by careful scrutiny which of the requirements are the more stringent and which combination of requirements will be acceptable with regards to the safety, environmental, economic and legal aspects. In all cases the Contractor shall inform the Principal of any deviation from the requirements of this DEP which is considered to be necessary in order to comply with national and/or local regulations. The Principal may then negotiate with the Authorities concerned, the objective being to obtain agreement to follow this DEP as closely as possible.

1.3 DEFINITIONS

1.3.1 General definitions

The **Contractor** is the party that carries out all or part of the design, engineering, procurement, construction, commissioning or management of a project or operation of a facility. The Principal may undertake all or part of the duties of the Contractor.

The **Manufacturer/Supplier** is the party that manufactures or supplies equipment and services to perform the duties specified by the Contractor.

The **Principal** is the party that initiates the project and ultimately pays for it. The Principal may also include an agent or consultant authorised to act for, and on behalf of, the Principal.

The word **shall** indicates a requirement.

The word **should** indicates a recommendation.

The word **may** indicates a permitted option.

1.3.2 Specific definitions

Term	Definition
Bund	Walled area enclosing some equipment (e.g., tanks)
Bund wall	Wall forming the outside of a bund
Environmental engineering	Engineering to protect the environment of those who may be affected by the activities
Freeboard	An additional height provided by the bund wall to allow for the following affects that may or may not occur: a) storm surge; b) foam containment; c) collection of rainwater; d) standing water in bunded area; sloshing resulting from sudden collapse of a storage tank.
ITP	Inspection and Test Plan
Tank Farm	A group of tanks contained in a bund
Very toxic (substances)	Substances that are very hazardous for the environment or human health, as specified in DEP 01.00.01.30-Gen. (which also identifies "toxic" substances by reference to chemical substances databases).

1.3.3 Definitions of materials

For the definitions of materials, see ISO 6707-1, BS 6100-2 and BS 6100-3.

1.4 CROSS-REFERENCES

Where cross-references to other parts of this DEP are made, the referenced section or clause number is shown in brackets (). Other documents referenced by this DEP are listed in (7).

1.5 SUMMARY OF MAIN CHANGES

This DEP is a minor revision of the DEP of the same number dated February 2015. The following are the main, non-editorial changes.

Section/Clause	Change
All	Restructured and clarified requirements, enforced use of shall/should/may for normative statements.

1.6 COMMENTS ON THIS DEP

Comments on this DEP may be submitted to the Administrator using one of the following options:

Shell DEPs Online (Users with access to Shell DEPs Online)	Enter the Shell DEPs Online system at https://www.shelldeps.com Select a DEP and then go to the details screen for that DEP. Click on the "Give feedback" link, fill in the online form and submit.
DEP Feedback System (Users with access to Shell Wide Web)	Enter comments directly in the DEP Feedback System which is accessible from the Technical Standards Portal http://swwww.shell.com/standards . Select "Submit DEP Feedback", fill in the online form and submit.
DEP Standard Form (other users)	Use DEP Standard Form 00.00.05.80-Gen. to record feedback and email the form to the Administrator at standards@shell.com .

Feedback that has been registered in the DEP Feedback System by using one of the above options will be reviewed by the DEP Custodian for potential improvements to the DEP.

1.7 DUAL UNITS

This DEP contains both the International System (SI) units, as well as the corresponding US Customary (USC) units, which are given following the SI units in brackets. When agreed by the Principal, the indicated USC values/units may be used.

1.8 NON NORMATIVE TEXT (COMMENTARY)

Text shown in italic style in this DEP indicates text that is non-normative and is provided as explanation or background information only.

Non-normative text is normally indented slightly to the right of the relevant DEP clause.

2. GENERAL

2.1 EXISTING SITE CONDITIONS, SERVICES AND FACILITIES

1. A pre-construction plan shall be submitted to the Principal to address all required site investigations and construction works.
2. The pre-construction plan shall include all permits, notifications to authorities having jurisdiction, any re-routing of existing utilities, and the schedule to provide these approvals/notifications prior to beginning site investigations, site preparation works and/or earthworks.
3. All site work construction shall follow the project approved pre-construction plan.
4. Relevant utility companies and/or local authorities shall be contacted to establish whether they have services in the subject locations.
5. The Contractor shall confirm that services in the locality have been made safe, and any services or other facilities adjacent to the proposed work are described.
6. The pre-construction plan shall specify any safety aspects and measures that are to be maintained during the work, including ensuring that all aboveground and underground services are maintained during the works through physical support if necessary.
7. Before any excavation, all underground utilities, and structures that would potentially be affected by the disturbance shall be located on the drawings.
8. All safety aspects and precautionary measures that are to be maintained during the work shall be noted on the drawings and specifications.
9. If additional utilities or obstructions are located prior to excavation the Principal shall be notified before proceeding with the work.
10. Where old underground obstructions are located in the field that might form obstructions preventing the installation of new assets, and these obstructions were not previously located on the drawings, a survey shall be conducted to record the location, dimensions (and inclination where relevant) of existing obstruction.
This is to ensure that new foundations avoid the existing buried structures.
11. If unknown underground cavities or streams are detected during the construction scope, the Principal shall be notified.
12. The identified void or stream shall be suitably investigated (3.3) and a mitigation plan proposed to the Principal.
13. If services or facilities are accidentally cut or damaged, these shall be repaired.
14. Repair methods or temporary works for accidentally cut or damaged services or facilities shall be submitted to the Principal for review and comment prior to commencing work.
15. On completion of performing work and making the utilities safe, they shall be marked on as-built drawings showing locations of routing and terminations of temporary and permanent utilities.
16. As built drawings shall be submitted to the Principal immediately after the completion of the work.
17. The stability of all supports or excavations shall be proven by calculations based on realistic assumptions and/or available data.

2.2 CONSTRUCTION SURVEY CONTROL AND SITE LEVELS

2.2.1 Site levels

1. During the process of establishing finished grade levels, the following shall be taken into account:
 - a. working areas shall be prepared in such a way that surface water will drain from it under gravity via the plant drainage systems, in accordance with DEP 34.14.20.31-Gen.
 - b. site layout/plot plan and related safety aspects, including safety distances, shall be adhered to.

2.2.2 Construction survey control

1. Prior to all site work a topographic survey shall be performed unless existing topographic information is deemed adequate by the Principal.
2. The drawings and specifications shall indicate the location and control elevation of all Temporary Bench Marks (TBMs) or site monuments that are to be used as reference for the site work of the contractor's scope of work.
3. A minimum of four TBMs should be available to act as the main survey control system for the site throughout the planned construction works.
4. TBMs or site monuments shall be designed to be stable given the ground and climatic conditions at the site and their expected service life.
5. The location of permanent site bench marks shall be planned taking into account future construction activities, location of temporary facilities and materials storage.
6. Site bench marks shall be located to maximise clear site between them. All lines and grade stakes as required for the work shall be extended from controlled benchmarks and base lines which are traceable to the site monuments or TBMs indicated on the drawings.
7. Where permanent site monuments are required, the drawings shall indicate the number, location and design of permanent monuments based on known national survey datum reference points.
8. The Survey Control Plan shall be submitted to the Principal for review and comment.
9. The Survey Control Plan shall include the maintenance interval for all monuments and TBMs used by the project scope.
10. The maintenance plan shall include the production of a verification survey report that has an acceptable closing error.
11. A verification survey report shall be submitted which includes the comparison of the current to those from each previous surveys to confirm the TBMs are stable.
12. If it is suspected that any of TBMs or site monuments are not stable, or that the TBM is damaged or destroyed, a proposal for immediate replacement/ remediation shall be submitted to the Principal.

2.2.3 Surveyor Quality Control

1. All survey work shall be performed by qualified surveyors and under the direct supervision of a locally licensed or certified surveyor.
2. The surveyor shall meet the following tolerances when making both vertical and horizontal measurements:
 - a. ± 30 mm (0.10 ft) for ground elevations;
 - b. ± 75 mm (3 in) for surface contours;
 - c. ± 6 mm (1/4 in) for measurements on concreted;
 - d. ± 3 mm (1/8 in) for tie-in work and survey of existing facilities.

2.2.4 Dimensional tolerances

1. The closing error on all verification surveys and settlement monitoring surveys shall be less than ± 3 mm in elevation.
2. The elevation of any point and the line of any edge, or centre of excavations and the final grading shall conform to that shown on the drawings within the tolerances stated in Table 2.1.

Table 2.1 Dimensional Tolerances in Earthworks

Description	Tolerance from true level in mm	Tolerance from true line in mm
Site Clearance	+60 -60	+75 -75
Excavations	+30 - 30	+ 30 - 30
Basic Grading	+25 - 25	+ 75 - 75
Embankment	+ 75 - 0	+ 75 - 75
Road Subgrade	+ 25 - 25	+ 50 - 50
Road Subbase	+ 13 - 13	+ 50 - 50

3. Irrespective of these tolerance from True Level specified in Table 2.1, there shall be no low spots or areas where water may pond on finished surfaces.
4. For Road Sub-grade, true level tolerance shall be based on measurements over the finished surface, tested with a 3 meter straightedge applied parallel with and at right angles to the centre line.
5. For road sub-base, the surface of the completed sub-base shall not deviate more than 13 mm from the specified cross section at any point and 13 mm in 30 m from the specified longitudinal grade at any location.

2.3 DESIGN INCLUDING SEISMIC ASPECTS

1. Refer to DEP 34.00.01.30-Gen. for requirements related to seismic zones and other design aspects.

2.3.1 Engineering and planning for site preparation and earthworks

1. During the detailed design phase, an Earthworks Construction Plan shall be prepared that describes the following:
 - a. plan for performing the earthworks;
 - b. drawings indicating the sequence of work;
 - c. drawings indicating the location of stockpiles, haul roads, disposal areas and control of ground and surface water;
 - d. system for segregation of soil types, identification and ticketing system for earthmoving activities;
 - e. operations to minimise erosion from surface water and controlling the quality of discharged water;
 - f. approach to perform preparations for foundation work, including the methodology of opening up work fronts and maintaining them in a safe accessible state;
 - g. a review of the main hazards and provide processes by which these hazards can be mitigated and controlled. This shall include hazards associated with excavations, protection of the site and minimizing the environmental impact.
2. The Earthworks Construction Plan shall be issued to construction site and used in planning activities and in developing Method Statements and other construction documentation.

2.4 CONSTRUCTION SAFETY

1. The Contractor shall develop a detailed work procedure for the demolition of existing facilities where applicable, including measures to protect personnel and the adjacent facilities and buildings designated to remain after all construction works.
2. The Contractor shall take appropriate measures to protect personnel from risks associated with airborne contaminants such as asbestos fibres and metal dusts during all demolition works.
3. All necessary temporary works such as safety barriers, fences, safety nets, coverings and screens shall be provided to protect personnel and adjacent property from injury or damage caused by demolition operations.
4. All necessary dead or raking shores to support existing work shall be provided during demolition and associated operations.
5. Any voids, buried tanks or old basement structures shall be temporarily supported or backfilled.

Where possible, temporary support or backfilling is best undertaken during demolition and site clearance.

6. Necessary precautions shall be taken to protect adjacent work and structures and to prevent detrimental effects to adjacent foundations.
7. Shoring adjacent to existing underground installations during construction shall be designed and detailed on the drawings based on the project geotechnical report(s).
8. Excavation under foundations shall not be permitted.

9. To avoid excess surcharge at the top of excavations, no materials, or heavy equipment shall be located near the edge of the excavation.
10. The required distance to the edge of the excavation shall be subject to approval by the Principal.
11. The exclusion area required from the edge of excavation shall be marked by pegs.

3. SITE PREPARATION

3.1 DEMOLITION AND SITE CLEARANCE

1. All materials arising from demolition and site clearance work, except materials specified for re-use or as otherwise specified by the Principal, shall be removed from the site as appropriate as the work progresses and disposed of in an agreed and responsible manner.
2. Materials removed from the facility to an external repository shall be disposed of in accordance with all applicable local and national laws and regulations.
3. The site shall be maintained in a safe and tidy condition at all times, and materials identified for removal from the facility should not be permitted to accumulate.

3.1.1 Demolition

1. The presence of existing foundations shall be evaluated to ensure that they do not impact on the installation or performance of new foundations. Demolition procedures drawings and specifications shall be submitted to the Principal for review and comment prior to any demolition in the field.
2. Where existing strip, pad or raft foundations are present, these shall be broken out and the resulting void filled with compacted structural fill. Alternatively the existing foundation may be incorporated into a new foundation structure provided the impact of the existing structure is allowed for in the design of the new foundation.
Existing derelict piles need to be assessed for their effect on any new foundation as they may form "hard spots".
3. Where existing piles might affect new foundations, the area shall be excavated to a level below the new foundation elevation and the existing piles broken down to the base of the excavation.
4. Ground levels shall be made up to finished levels using compacted structural fill on which the new foundation can be constructed.
5. Where old piles and caissons may form obstructions that prevent the installation of new piles, a survey shall be conducted to record the location, dimensions (and inclination where relevant) of existing piles to ensure new foundations avoid the existing buried structures.
6. Care shall be taken to ensure the site clearance and demolition work does not adversely affect or diminish the capacity of the foundation of the existing adjacent buildings/structures.
7. Any reaction on adjacent structures shall be monitored and a mitigation measures taken to ensure no damage is done to adjacent structures.

3.1.2 Site clearance

1. Site clearance shall include the taking down or grubbing up and satisfactory removal/disposal, of surface obstructions and unsuitable materials.
2. Topsoil, when not designated on the drawing, shall extend to the bottom of the root zone.

In areas designated for site clearance, typically there will be areas for preservation, or vegetated areas outside the construction area.

3. Construction operations shall carefully protect from abuse marring, or damage, those trees, shrubs and other landscape features outside the construction area and those areas specifically designated for preservation on the drawings and specifications.
4. The site shall be inspected after clearing and grubbing operations to confirm clearance activities have been completed according to the drawings and specifications, or to identify areas where additional materials require removal.
5. Before backfilling of depressions and holes, inspection of the surface condition shall be executed and recorded.
6. Backfilling operations shall be performed in accordance with Section (4.14).
7. Materials required for re-use shall be stored in a safe location and protected from damage or deterioration as agreed with the Principal.
8. Segregation and quantification of hazardous and non-hazardous waste material and certified disposal of hazardous material shall be carried out in accordance with applicable legislation.

3.2 STRIPPING OF TOPSOIL

Topsoil means natural, friable, fertile, fine, loamy soil containing no less than 1.5 percent organic materials, and generally representative of agriculturally productive soil in the vicinity of the site.

1. Topsoil for reuse shall be free from subsoil and objectionable material that would hinder plant growth or maintenance, and not contain more than 5% by volume of stones, lumps, or other objects larger than 50 mm (2 in) in any dimension.
2. All areas to be excavated, filled or constructed upon shall be stripped entirely of topsoil to a suitable depth below ground level, as indicated by the site investigation and agreed with the Principal.
3. Topsoil to be used for construction shall be segregated and stockpiled in accordance with the requirements of the specification.
4. The excess topsoil from the site shall be removed to an external repository in accordance with all applicable local and national laws and regulations.
5. Topsoil intended for re-use, as agreed with the Principal, shall be stock-piled and/or spread at approved locations in limited heights as appropriate to the region to avoid detrimental effects to its chemical and biological composition.
6. The remaining topsoil which is not intended for re-use shall be disposed of at locations agreed by the Principal, in accordance with national and local laws and regulations.

3.3 REROUTING OF EXISTING DITCHES AND WATER COURSES

1. Existing drainage ditches and water courses shall be temporarily or permanently rerouted, as specified on the drawings and specifications. Reference is made to (3.5).
2. Refer to DEP 34.13.20.31-Gen. and DEP 34.14.20.31-Gen for requirements pertaining to rerouting plans.

3.4 TREATMENT OF UNDERGROUND CAVITIES

1. If naturally occurring cavities or man-made cavities are detected under or adjacent to the construction area, they shall be suitably investigated and treated in consultation with the Principal.
2. A thorough investigation and assessment of likely size, distribution (laterally and vertically) and nature (infill type and its stability) of cavities shall be carried out by Contractor along with the development of effective, robust and economical mitigation measures, where needed.

3.5 PROVISION OF TEMPORARY SITE DRAINAGE

1. Adequate temporary drainage systems shall be provided to accommodate ground water and surface water runoff.
2. All temporary drainage and dewatering systems shall be complete and functional prior to commencement of earthwork operations, including all excavating and filling for inlets, outlets, diversion ditches and dikes required for construction drainage.
3. The installation, operation, maintenance and removal of dewatering systems shall be conducted without disturbing other parts of the work area.
4. Any damages to the excavation or surrounding areas resulting from failure of the dewatering system shall be rectified.
5. Groundwater inflows into excavations and high pore pressures in surrounding ground shall be controlled to avoid deterioration of exposed surfaces and erosion.
6. The selected dewatering method shall not have any adverse effect on adjacent existing structures.
7. Necessary dikes or interceptor trenches shall be provided at the top of excavation slopes to prevent surface water from entering excavations.
8. Free water in excavations shall be removed such that works can be conducted in the dry.
9. Surface drainage and water from dewatering systems shall be fed into the surface drainage system such that the site remains workable when it is raining.
10. Fill material shall be placed in such a manner and in such sequences that ponding of free water shall be prevented.
11. A contingency plan shall be developed that addresses the failure of any critical components of the dewatering system.

3.6 PERMANENT DEWATERING AND DRAINAGE WORKS

1. Refer to DEP 34.13.20.31-Gen. and DEP 34.14.20.31-Gen for requirements pertaining to permanent surface water runoff drainage systems.

3.7 DITCHING AND INSTALLATION OF OPEN DRAINAGE CHANNELS

1. Ditches and trenches shall be installed and maintained at the required locations and within the allowable tolerances for line and level.
2. For channels and ditches, after each section of the route has been excavated, it shall be lined commencing from the highest point, working towards the lowest to minimise the risk of ingress of silts and other unsuitable materials during rain storms.
3. Ditches and channels shall be installed with a continuous slope to prevent ponding of water in sections when there is no flow.
4. The minimum slopes on ditches and channels shall be 1 (vertical) to 1000 (horizontal) or as indicated on the drawings.
5. Excavation for ditches and channels shall conform to the specified locations, elevations and slopes as indicated on the drawings, allowing for installation works.
6. For the installation of precast concrete sections, sufficient space shall be provided to install bedding layers and necessary gravel drainage blankets as shown on the drawings.
7. No works shall be carried out when water is present in the excavation, or when the trench conditions are unsuitable for such work.
8. Bedding materials shall be fully compacted prior to installation of precast concrete sections, or casting of concrete panels to provide a uniform support.
9. Bedding material shall not be jetted in place, nor hydraulically placed.
10. Methods for installation of precast concrete sections shall be adopted that do not damage the concrete.
11. Each segment shall be inspected for defects and cracks before being carefully lowered into the excavation.
12. Any defective, damaged, or unsound segment or any segment that has had its grade disturbed after laying shall be taken up and replaced.
13. Defective segments shall not be incorporated into the works. Special attention shall be given to joints to ensure wash in of silt and fine sand does not occur.
14. Where placement of materials to the sides of concrete channels is required, the layer thickness of the materials shall be limited to 150 mm (6 in).
15. The plant and equipment used for compaction of materials to the sides of concrete channels shall not over stress, or move the concrete channel.
16. Fill material shall be placed on both sides such that there will not be an uneven height difference of more than 300 mm (1 ft) on each side of the concrete channel.
17. Open ends of ditches and channels shall be protected to prevent soil, or other materials from entering during construction.
18. The ditches and channels shall be free from dirt, excess water and foreign materials during the laying progresses.
19. The ditches and channels shall be left clean at the completion of the installation and protected from inflow of deleterious materials until Hand Over.
20. Ditches lined with rip rap and geotextile shall have sections of geotextile overlapping by at least 150 mm (6 in).
21. For ditches lined with geotextile, the overlap shall have the upstream section placed on the downstream section.
22. The rip rap shall comply with the requirements of the specifications and shall be placed in a tightly interlocking fashion to form the thicknesses shown on the drawings.

23. No geotextile shall be visible on completion of the installation.
24. The rip rap ditches shall be kept clean of rubbish, silt and other deleterious materials until Hand Over.

3.8 INSTALLATION OF PIPES AND LAND DRAINS

1. Pipes shall be of the size and length shown on the drawings. The prescribed sizes of pipes are nominal inside diameters.
2. The pipelines, fittings, bends, manhole risers and other appurtenances shall be laid and maintained at the required locations and within the allowable tolerances for line and level.
3. For pipelines, installation shall commence at the lowest point for each segment of the route.
4. Pipes shall be installed with a continuous slope to prevent ponding of water in sections of pipe when there is no flow.
5. The minimum slopes on pipes shall be 1 (vertical) to 1000 (horizontal) or as indicated on the drawings.
6. Excavation for underground pipes shall conform to the specified locations, elevations and slopes as indicated on the drawings, allowing for installation works.
7. The trench depth and width shall be sufficient to allow inspection of the pipe, pipe joints and proper compaction of bedding material at bottom sections and sides of the pipes.
8. For pipes of diameter up to and including 250 mm (10 in), the base of the trench shall be at least 300 mm (1 ft) below the bottom of pipe and provide at least 300 mm (1 ft) on each side of the pipe.
9. For pipes of diameter larger than 250 mm (10 in), the base of the trench shall extend at least 300 mm (1 ft) below the bottom of pipe and provide at least 500 mm (20 in) on each side of the pipe.
10. For concrete pipes, excavation for bells and hubs shall be enlarged such that the full load is carried by the pipe barrel and a minimum bedding depth of 300 mm (1 ft) beneath the pipe is maintained.
11. Prior to installation of the pipe segments, bedding material may be placed or alternatively, supports such as sand bags may be installed. The pipe segments laid on these supports with bedding material being placed after installation.
12. If sand bags are installed for support, these shall be removed after backfill completion and prior to pipe system testing.
13. No pipe shall be laid in water or when trench conditions are unsuitable for such work.
14. The bedding material shall be fully compacted under the pipeline to provide a uniform support which may require tamping sand in from both sides of the pipe to ensure uneven lateral loads do not develop which might result in subsequent movements on sections of the drainage system.
15. Bedding material shall not be jetted in place, nor hydraulically placed.
16. Methods for installation of piping and placement of bedding material shall be adopted that does not damage the pipes and protective coatings and complies with manufacturer's recommendations for installation.
17. Each pipe segment shall be inspected for defects and cracks before being carefully lowered into the trench.
18. Any defective, damaged, or unsound pipe or any pipe that has had its grade disturbed after laying shall be taken up and replaced.

19. Defective pipe segments shall not be incorporated into the works.
20. Attention shall be given to joints to ensure excessive stresses cannot build up, or allow wash in of material during operation due to poor connection of joints.
21. Concrete pipes shall be laid with the bell (female) end facing upstream.
22. The joint faces shall remain clean and undamaged at all times.
23. The pipe and drain joints shall be left exposed until the piping has passed all necessary testing and in the case of concrete pipes, for at least twenty-four hours after joints have been made.
24. The layer thickness of bedding material shall be limited to 150 mm.
25. Equipment shall be used to compact bedding material and subsequent fill materials that will not over stress, or damage the installed piping.
26. Bedding material shall be placed symmetrically around and above pipes and structures such as culverts to prevent eccentric loading.
27. The pipeline shall be left clean at the completion of the installation and protected from inflow of deleterious materials until Hand Over to Principal.

3.9 PROVISION OF TEMPORARY ACCESS

1. Suitable temporary roads shall be laid to provide all-weather access for all construction activities.
The temporary roads are to preferably coincide with the planned permanent routes.
2. Temporary access shall be designed to suit climatic, traffic and subsoil conditions.
3. Traffic routing schemes and signalling shall be established.
4. Disturbance of permanent surface and subsurface drainage shall not be permitted.

3.10 TEMPORARY PARKING, LAY-DOWN AND STOCKPILE AREAS

3.10.1 Temporary parking and lay-down areas

1. Refer DEP 34.13.20.31-Gen for requirements pertaining to design and construction of permanent lay-down areas normally located inside battery or module limits.
2. All temporary lay-down and parking areas required for construction activities shall be suitably levelled and provided with suitable access, temporary paving and surface drainage as necessary and submitted to the Principal for acceptance.
3. The temporary lay-down and parking areas shall be located within the designated Contractor's area.
4. The temporary lay-down areas shall be drained so that stored materials remain dry at all times, and surface as well as subsurface drainage may be required.
5. Proper access to these areas for lifting equipment and construction vehicles shall be maintained.
6. The bearing capacity of the areas shall be determined such that lifting operations can be planned and carried out safely.

3.10.2 Stockpiled storage areas

To minimise the import and export of material to and from a site, materials identified in the site investigation are to be considered for re-use.

1. Materials required for re-use from other site preparation activities shall be stored in a safe location that is protected from damage or other deterioration as agreed with the Principal.
2. The method of stockpiling of materials shall ensure that the stockpile is kept in a stable condition for work operations and equipment operators.
3. The Method Statement for stockpiling of materials shall include the following:
 - a. take into consideration all requirements for protection from the weather and from contamination through mixing;
 - b. be arranged so as not to obstruct drainage or other construction operations in the vicinity of the works;
 - c. be placed, graded and shaped with appropriate drainage and maintain the required moisture content and workability. The maximum slope ratio is 2 (horizontal) to 1(vertical);
 - d. address the changes in weather conditions and surface protection at the end of each day's work;
 - e. address each material to be temporarily stockpiled. (Including topsoil, concrete, asphalt pavement, pressure vessels, piping, electrical utilities).
4. Stockpiled topsoil or other grubbed material shall not be stockpiled on a prepared subgrade or in excess of 3 m (10 ft) in height.
5. Segregation and quantification of hazardous and non-hazardous waste material and certified disposal of hazardous material shall be carried out in accordance with applicable legislation.
6. When specified to be stockpiled topsoil shall be free from subsoil and objectionable material that would hinder plant growth or maintenance and not contain more than 5% by volume of stones, lumps, or other objects larger than 50 mm (2 in) in any dimension.