

DUSUP GUIDELINES FOR ROAD & RAIL INFRASTRUCTURE PARALLEL TO PIPELINES

Approval

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1 INTRODUCTION

Dubai Supply Authority (DUSUP) provides energy supply (Natural Gas) to Emirate of Dubai to meet the needs of electricity generation and water desalination through its pipeline network, Through the production of natural gas (which is processed into gas and condensate products), the purchase of pipeline gas and LNG (and its regasification), gas storage and the operation of the pipeline network, DUSUP plays a key role in the growth and development of Dubai.

DUSUP has assigned Dubai Petroleum Establishment (DPE) the responsibility for operating DUSUP assets and authorised DPE to manage all emergency events occurring on its own operated facilities, pipelines and assets within pipeline corridors in liaison with other governmental entities.

DPE-DUSUP designs operates and maintains DUSUP's onshore pipelines and related facilities to International Standards in order to ensure an uninterrupted flow of gas and other hydrocarbons across Dubai.

There are approximately 700 kilometres of onshore hydrocarbon pipelines operating in Dubai. The gas pipelines operate at high-pressures up to 960-psig and transport highly explosive and flammable natural gas. A number of jet fuel and fuel oil pipelines share the corridors with the gas and condensate pipelines.

2 ABOUT NOC

NOC stands for No Objection Certificate. The NOC System is in place in Dubai to review and pre-approve any work in NOC Zone in order to confirm compliance of the Property Developer/Owner, Consultants & Contractor with DUSUP standard and requirements. DUSUP NOC is issued through Dubai Governments e-NOC system administered by RTA.

3 PURPOSE

The purpose of this guideline is to assist the DUSUP/DPE NOC staff for NOC review and field staff for monitoring safe execution of road and railway infrastructure works affecting DUSUP/DPE pipelines and pipelines assets.

This guideline document is based on DUSUP/DPE previous experience of providing quality service of energy supply (Natural Gas) to Emirate of Dubai through the pipeline network.

This Guideline document will be published in DUSUP website for NOC Applicants (Consultants & Contractors) easy reference.

4 REFERENCES

DUSUP NOC Standard Conditions - DP-OPSON-0056

DUSUP Guidelines for Trial Pit: DP-OPSON-0148

DPE Hot Work Procedure - DPE-HSE-00044

AREMA - Chapter 5 - Pipelines

Gas Transmission and Distribution Piping Systems – ASME B31.8

Pipeline Transportation Systems for Liquid Hydrocarbons and Other Liquids - ASME B31.4

API RP 1102 Steel Pipelines Crossing Railroads and Highways

5 ABBREVIATIONS & DEFINATIONS

5.1 Abbreviations:

Abbreviation	Description
ALARP	As Low As Reasonably Practicable
AREMA	American Railway Engineering and Maintenance - of - Way Association
DPE	Dubai Petroleum Establishment
e-NOC	Electronic NOC
GCS	Gas Control Station
HSE	Health, Safety and Environment
MS	Method Statement
MSRA	Method Statement and Risk Assessment
NOC	No Objection Certificate
PHA	Preliminary Hazard Analysis
PPE	Personal Protective Equipment
PPV	Peak Particle Velocity
PTW	Permit to Work
RA	Risk Assessment
RCC	Reinforced Cement Concrete
ROW	Road Right of Way
RTA	Roads and Transport Authority
TRA	Task Based Risk Analysis

5.2 Definitions:

Term	Definition
Accident	The unexpected and undesirable occurrence directly associated with DUSUP operations and DUSUP asset/facility, which results or may result in human casualties or damage to property.
At Grade Crossing	For the purpose of pipeline protection, the carriageway crossing at same level of adjacent ground or not more than 5'-0" (1.5meter) above adjacent ground/pipeline corridor to be considered as "At Grade Crossing".
Berm	A soil bund built over the pipeline as a protection cover.
Bridge	A bridge is a structure built to span a physical obstacle without blocking the way underneath in order to provide passage over the obstacle.

Construction	The erection of any new buildings or structures, or the variations to the Infrastructure facilities or existing asset.
Consultant	A natural or legal person who is offering advice/consultation on engineering, technical, or any other matter related to design and construction.
Contractor	An organization designated by the Owner or the Operator for the purpose of carrying out the works related to Construction, or execution of any work that requires obtaining of No Objection Certificates from the DUSUP.
Control Measure	Provisions to reduce identified risks.
Cathodic Protection	Cathodic Protection (CP) is a technique used to control the corrosion of a metal surface by making it the cathode of an electrochemical cell. A simple method of protection connects the metal to be protected to a more easily corroded “sacrificial metal” to act as the anode.
DPE	Dubai Petroleum Establishment responsible for the Operation of DUSUP Asset.
DUSUP Corridor	DUSUP Corridor is the land allocated by Dubai Municipality or other statutory government authority to DUSUP for the construction, operation and maintenance of gas and fuel pipelines in the emirates of Dubai.
Elevated Road	A road raised 1.5 meter or more above grade.
e-NOC	The electronic NOC application that can be submitted via the online system: https://noc.rta.ae/RTAeNOC/Webpages/common/login/login.aspx
Embankment	A mound of earth built to carry a road or railway over an area of low ground.
Excavation	Excavation is a man-made cut, cavity, trench or depression formed by earth removal.
Hazard	A Hazard is any source of potential damage, harm or adverse effects on people, property environment or organization.
No Objection Certificate (NOC)	A document approved by the DUSUP through e-NOC, for the technical design of proposed development or authorizing a contractor to carry out a Construction/Restricted Activity within the NOC Zones.
PERMIT TO WORK (PTW)	A written or digital approval granted by DPE that authorises a person or persons to carry out specific work within a specified time frame within the proximity of DUSUP asset/plot boundary limit.
Recoverable Distance	Distance from the road edge where driver can regain control of errant vehicle and stop.
Risk	A situation involving exposure to danger
Risk Assessment	A report prepared by the Applicant/Customer seeking DUSUP NOCs, identifying potential risks and mitigation measures involved in carrying

	out any Construction or Restricted Activity within the DUSUP NOC Zones.
Road Interchange	Road interchange is a junction of two or more major roads by a system of separate levels that permit traffic to pass from one to another without the crossing of traffic stream.
Safety	The absence of any risk of harm or damage to the people, DUSUP asset/Infrastructure that is deemed unacceptable as per the DUSUP/DPE Safety Regulation or Standard Operating Procedure.
Viaduct	Viaduct is a specific type of bridge that consists of a series of arches, piers or columns supporting a long elevated road or railway.

6 ROAD AND RAIL INFRASTRUCTURE PARALLEL TO EXISTING PIPELINES

New road and rail infrastructure may be constructed parallel to the existing DUSUP/DPE pipelines or DUSUP corridor in various locations of DUBAI. The design and construction of such road or railway within the DUSUP NOC zone require review and approval through NOC process.

DUSUP receive and process NOC through the Dubai Government e-NOC (electronic NOC) system administered by RTA. The link for e-NOC application is:

<https://noc.rta.ae/RTAeNOC/Webpages/common/login/login.aspx>

DUSUP NOC is issued for hydrocarbon pipelines that are owned and operated by DUSUP/ DPE, ENOC, EMDAD and Dolphin Energy.

Subsequent sections stipulates the minimum requirements to be followed in order to obtain NOC.

6.1 NOC Type & Submission Requirements:

For the Road & Railway parallel to DUSUP corridor within NOC zone, following DUSUP NOC's are applicable:

- Information NOC
- Concept Design NOC/Route NOC/Preliminary Design NOC
- Final Design NOC
- Trial Pit NOC on other utilities within NOC Zone (if applicable).
- Construction NOC
- NOC Close-out

6.1.1 Information NOC

Existing, planned pipeline and related facility information along with the corresponding DUSUP Guidelines and Standard DUSUP NOC Conditions are shared with the applicants (consultant or contractor) for the design and construction of planned developments through e-NOC.

6.1.2 Information NOC - Submission Requirements

- a) AutoCAD drawing on DLTM coordinates datum showing the proposed Project Limit Plan for issuing Pipeline Information.

- b) Pdf file of drawing showing proposed Project Limit Plan for issuing Pipeline Information.
- c) For issuing Pipeline information, it is mandatory for the applicant to submit a confidentiality undertaking letter as per the DUSUP approved letter template. The Confidentiality Undertaking Letter template can be downloaded from DUSUP website using link: <https://www.dusup.ae/noc>
- d) Undertaking letter must be submitted with company stamp and signed by the authorized company representative.

Note: Information NOC will be issued with DUSUP Standard NOC Conditions, AutoCAD file of existing pipeline information, corridor limits, corridor fence and gate locations, desert crossings and other facilities such as valve station and pigging facilities and applicable guidelines.

6.1.3 Concept Design NOC/Route NOC/Preliminary Design NOC

Concept Design NOC/Route NOC/Preliminary Design NOC are initial design proposal seeking input and approval in order to proceed with the Final Design.

6.1.4 Final Design NOC

Final Design NOC is submitted after incorporating Preliminary Design NOC conditions. A check list for Preliminary Design NOC conditions compliance must be included in the submission of Final Design NOC.

Impact of railway design parallel to DUSUP corridor may require third party review by the DUSUP/DPE approved specialist consultant. Such design review typically exceeds standard review duration. The applicant shall make suitable allowance for the extended review period by specialist consultant in their schedule.

6.1.5 Design NOC - Submission Requirements

- a) Key Plan showing project location.
- b) General Layout Plan incorporating existing and proposed work, DUSUP corridor limit, pipelines/ facilities as provided in Information NOC.
- c) AutoCAD file of General Layout Plan drawing prepared on DLTM coordinates datum.
- d) Typical Cross Section drawings showing proposed work incorporating pipeline and corridor information provided through the Information NOC, minimum horizontal separation from the pipeline corridor limit /existing pipeline and any element of work having direct or indirect effect on DUSUP pipelines or facilities.
- e) Applicable design considerations mentioned in this document shall be considered for the design and drawing.

6.2 General Design Requirements

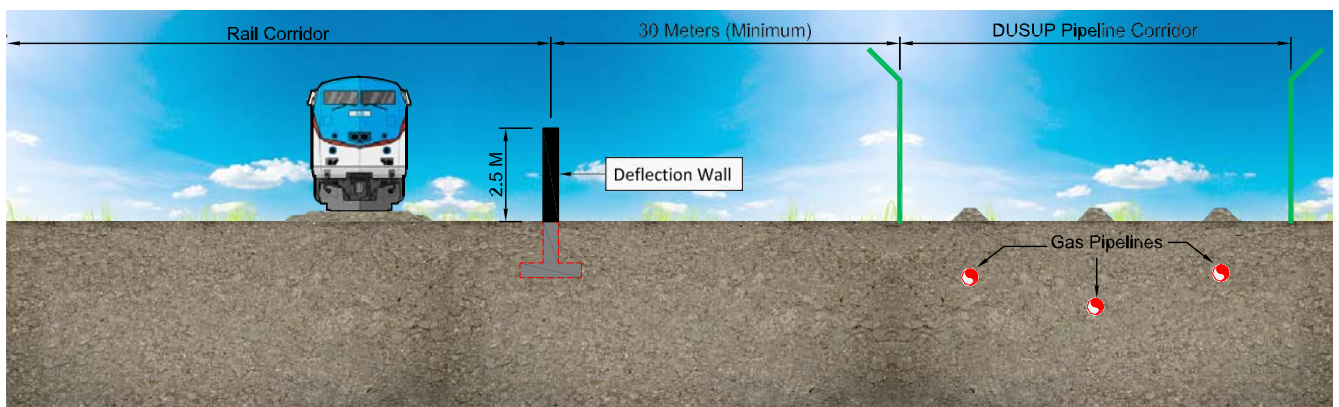
- a) Safety in design should be paramount, with due consideration of safe methods for the construction of the works and the ability to apply adequate controls for these activities. The design documents must take into account the requirements outlined within this document along with any other controls that may be required by DUSUP
- b) The consultant must verify site conditions that could affect the safety and practicability of construction or operation in the presence of existing or planned DUSUP facilities (particularly above ground pipelines or valve station in the proximity of construction).
- c) The distance from the road edge to DUSUP corridor must be more than maximum recoverable distance of errant vehicle as per the road design or 10 meter from the edge of road shoulder, whichever is greater, so that drivers are able to regain control of their vehicles without damaging DUSUP asset.
- d) Any reduction in above mentioned separation distance from the road edge to the pipeline corridor shall be risk assessed and all necessary agreed control measures are implemented to reduce the risk level to ALARP. E.g. make the DUSUP corridor safe by shielding with a suitable continuous safety barrier.
- e) If the pipeline is located within the ROW or within the recoverable distance of errant vehicle or 10 meters from the edge of road shoulder, whichever is greater must be protected with DUSUP approved slab protection as per "DUSUP Typical Road Crossing Arrangement" drawing reference: 900-08-03-01 (Attachment 1) and crash barrier protection as stated in item 6.4.2.5 of this document.
- f) The likelihood of vehicle rollover with a high severity outcome increases significantly where the embankment height exceeds 1.5 m and embankment slopes are critical (steeper than 1 on 3). Therefore road with embankment height of 1.5m and above are considered as elevated road.
- g) Existing DUSUP Pipelines has been verified for the minimum depth of soil cover in accordance with API RP 1102, ASME B31.4/B31.8 and minimum burial depth required from the ground level to the crown of the pipeline is 1.20 meter. Refer to DUSUP drawing: 900-08-03-01 (Attachment1).
- h) The pipeline parallel to elevated road on embankment shall be checked for the extent of vehicle rollover impact and unless proved otherwise the pipeline within the parallel distance must be protected with DUSUP approved slab protection as per "DUSUP Typical Road Crossing Arrangement" drawing reference: 900-08-03-01 (Attachment1). The extent of protection shall be as follows:

Side slope of 1:3 or flatter	: 10 meters from the toe of embankment.
Side slope steeper than 1:3	: 20 meters from the toe of embankment.
Roundabout/Curved road & Bridge	: 20 meters.
- i) Any road infrastructure installation along the DUSUP corridor or gas/fuel pipeline shall be adequately designed such that when excavating the gas/fuel pipeline or

other related asset, that there is no risk of the installed structure toppling / collapsing or otherwise effecting the gas/fuel pipeline or the personnel working on that gas/fuel pipeline.

- j) Storm water drainage design for the parallel road/rail infrastructure must ensure that DUSUP corridor and pipeline berm or other pipeline infrastructures are protected from the erosion damage or accumulation of rain water resulting from the proposed road /railway. If storm water drainage design is based on the principal of gravity, it is important that grade elevations and slope are considered accordingly before these system is created.
- k) Locating any storm water drainage soak away parallel and proximity to the pipeline corridor shall be avoided. The design of soak away must consider the protection of existing DUSUP assets from the subsidence or flooding in the event of overflow or blockage (considering existing ground water level/tidal effects). However no soak way may be permitted within 10 meters of pipeline or pipeline corridor.
- l) Sources of electric current from road and railway infrastructure (such as earth rods, substations, transformers or impressed current systems of non-DUSUP assets) must not interfere with the corrosion protection and induced voltage mitigation equipment of existing DUSUP assets. Specific approval from DUSUP is required for such installation design.
- m) Parking facility parallel to corridor must be risk assessed to ensure that existing DUSUP corridor fence or pipeline assets are protected and control measures are implemented to reduce the risk level to ALARP. However a purpose designed concrete crash barrier and gas pipeline warning sign shall be installed as a minimum protection.
- n) The consultant must carry out the PHA specific to the proposed railway route parallel to the existing pipelines and facilities and implement necessary mitigation measures in order to demonstrate that the risk to DUSUP asset have been mitigated to As Low As Reasonably Possible(ALARP).
- o) The design of railway route at the parallel section must include a robustly constructed derail containment system in order that the horizontal deviation of a derailed train can be contained against derailment to the full width of DUSUP corridor/existing facility. Specific detail of derail containment design must be included in the submission.
- p) Railway design must ensure that the propagation of vibration measured (PPV) at the pipeline must be less than 40 mm/s.
- q) Approved vibration isolation matt / material may be provided under the railway track to reduce the vibration propagations to the existing pipeline.
- r) The railway consultant must demonstrate that no stray current effect from railway to DUSUP pipelines exists and provide all necessary corresponding design information and assessment for DUSUP or DUSUP specialist consultant's review. Any interference must be mitigated by the client (railway owner) at their cost.

- s) If applicable, monitoring shall be carried out before railway operation, during commissioning and after commercial start as per the DUSUP approved procedure. The railway Consultant must consider installation of coupons, reference electrodes and test boxes as per DUSUP requirements/specifications in the vicinity of the railway crossings for monitoring stray currents at no cost to DUSUP.
- t) Minimum 30 meters parallel distance shall be maintained from the DUSUP pipeline corridor to railway corridor and existing pipelines / corridor parallel to proposed railway shall be protected with approved protection such as railway deflection wall as shown in sketch below:



6.3 Trial Pit

While DUSUP NOC is applicable for any Trial Pit work within the DUSUP NOC zone, most of the standard conditions mentioned in DUSUP Guidelines for Trial Pit may not be applicable for the trial pit on other utilities (not belonging to DUSUP/DPE). However some specific conditions to protect the DUSUP assets such as corridor fence or patrolling access may be applicable.

6.4 Construction NOC

Any activities occurring near gas infrastructure require due consideration of the risks and controls to ensure they can be conducted safely. At closer proximity the risk and extent of controls will increase accordingly

Activities that likely to result in high vibration levels have increased ranges of influence where they may impact the safety of the gas/fuel pipelines.

Following are the minimum requirements for Construction NOC submission and Construction of Road and Railway works parallel to pipelines/corridor.

6.4.1 Construction NOC - Submission Requirements

Construction NOC submission must include but not limited to following:

- a) Key Plan Showing Project Location.

- b) General Layout Plan on DLTM Coordinates datum, incorporating existing and proposed temporary and permanent work, DUSUP corridor limits, existing fence & gates.
- c) Bridge /Interchange structure General Arrangement drawing, if applicable.
- d) Detail Cross Section drawings showing :
 - The elevation of existing ground, proposed finished ground, DUSUP corridor limit, all temporary and permanent construction within DUSUP NOC Zone.
 - Horizontal separation from the DUSUP corridor/existing pipeline to the proposed work.
 - Embankment slope and separation from the toe of embankment to the pipeline corridor/pipeline.
 - Detail drawing for vehicle rollover protection design for elevated road.
 - Detail drawing for storm water drainage system to ensure protection of DUSUP corridor from the erosion from rain water discharge from the proposed road/railway.
 - Detail drawing for railway deflection wall, if applicable.
 - Hazard Analysis for railway crossing covering all construction activities, vibration, derailment mitigation, and applicable stray current mitigation.
 - A letter from Client confirming stray current monitoring and reporting during the commissioning and during railway operation will be coordinated with DUSUP/DPE operation.
- e) Include applicable notes from the DUSUP Standard NOC Conditions in the drawing.
- f) Completed check list for Design NOC condition compliance.
- g) MSRA reviewed and approved by the consultant.

6.4.2 General Construction Requirements

- a) The contractor must verify site conditions that could affect the safety and practicability of construction in the presence of existing or planned DUSUP facilities (particularly above ground pipelines or valve station in the proximity of construction).
- b) Any activities occurring near gas pipeline infrastructure require due consideration of the risks and controls to ensure they can be conducted safely. At closer proximity the risk and extent of controls will increase accordingly.
- c) The activities within 10 meters of DUSUP pipeline or corridor limit must be risk assessed with particular attention to the safety of DUSUP pipeline and DUSUP/DPE assets. Method statement shall be job specific and location specific. Risk assessment shall be reviewed and approved by the consultant or client representative before submission to DUSUP.

- d) The vibration level on the pipeline(s) shall be measured for the worst case scenarios. After measurement, if any mitigation is required then the contractor must carry out approved mitigation measures. The vibration level (PPV) at the pipeline must be less than 40 mm/s.
- e) Use of vibratory construction equipment's are typically not permitted within 10 meters of pipeline. However compaction with roller compactor on non-vibratory mode may be permitted if the pipeline is protected as per the DUSUP approved protection design and minimum 300mm soil cover is available over the protection slabs.
- f) Use of specifically identified road roller in vibration mode for the compaction of road embankment may be permitted provided if the contractor demonstrate that the vibration level on the pipeline from specified road roller remains within the prescribed limit of 40 mm/s PPV and submission is reviewed and approved by DUSUP.
- g) Existing DUSUP pipeline must be protected with approved design as mentioned in above item 6.2 - General Design Requirements.
- h) Pipeline protection must be complete to the approval of DUSUP before commencement of subsequent construction works within the NOC witnessing zone.

6.4.3 Specific Construction Requirements

The construction of road and railway infrastructure parallel to gas and fuel pipeline must consider following situation specific additional requirements, but not limited to:

6.4.3.1 At Grade Road /Railway Parallel to Pipeline Corridor

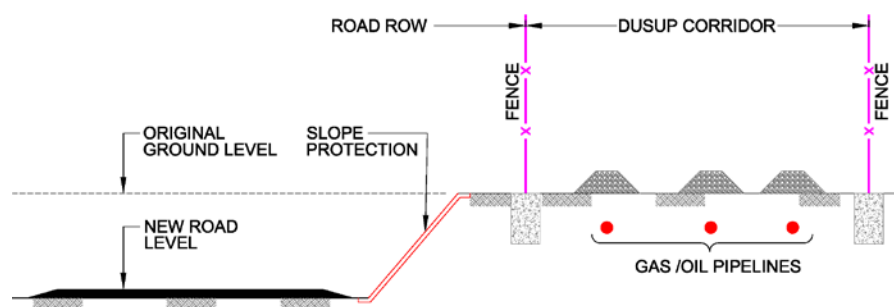
- a) If the road infrastructure to be constructed is within 5-meters of an existing pipeline or where access to the pipeline may be restricted or excavation for the pipeline maintenance work deem to be unsafe, the existing pipeline must be exposed with a minimum one (1) meter working space all-around for coating inspection. An assessment for the need for any coating repairs to be carried out by the DUSUP/DPE approved coating contractor, engaged by the road contractor and shall be undertaken to the approval of DUSUP. All cost of coating repair shall be borne by the road contractor.

Note: DUSUP Senior Pipeline Engineer typically performs assessment of the coating condition and repairs should they be necessary during trial pit excavations and prior to proceeding with the protection construction.

- b) A joint inspection of existing DUSUP fence must be carried out between DUSUP and contractor's representatives prior to the commencement of the works and the condition of the DUSUP fence agreed and recorded. Upon completion of the works, a further joint inspection of the fence shall be carried out to determine if there has been any damage to the pipeline corridor fence as a result of construction activities.
- c) Any damage to the existing pipeline corridor fence as a result of the work must be repaired or replaced utilizing the same material specification by a DUSUP approved fencing contractor and approved by the DUSUP representative. All costs will be borne by the contractor.

6.4.3.2 Road/Railway at Lower Elevation (Cut/Excavation)

- a) The construction of road or railway infrastructure at lower elevation and parallel to DUSUP corridor may require excavation or cut along and adjacent to the corridor. Historically most of the DUSUP corridors pass through the undulating desert with dunes and ditches. Pipelines are laid at approximately 1.5 meters below existing ground. Corridor security fence at the edge of corridor was installed to align with the existing natural terrain. Therefore profile of existing corridor fence, existing pipeline along the fence and protection of DUSUP assets shall be taken into account while designing the interface section of road/railway corridor and DUSUP corridor so that any undermining/ toppling of corridor fence foundation and ground settlement at pipeline can be avoided.
- b) Slope of cut parallel to DUSUP corridor limit shall be protected with durable slope protection such as stone pitching or other approved design (see figure below).

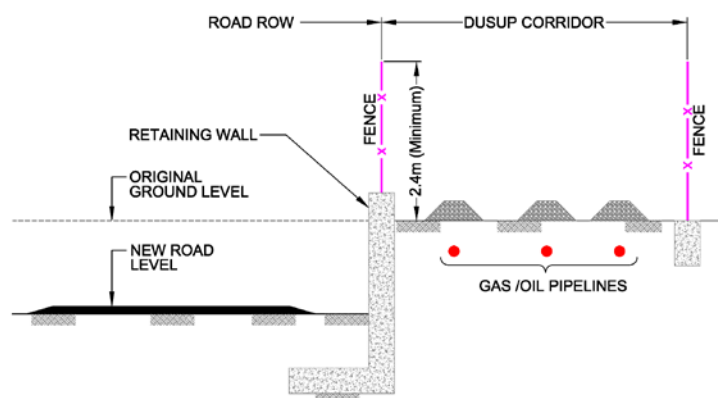


Notes:

1. GATE LOCATION TO BE CONFIRMED AS PER SITE CONDITION

ROAD PARALLEL TO DUSUP CORRIDOR

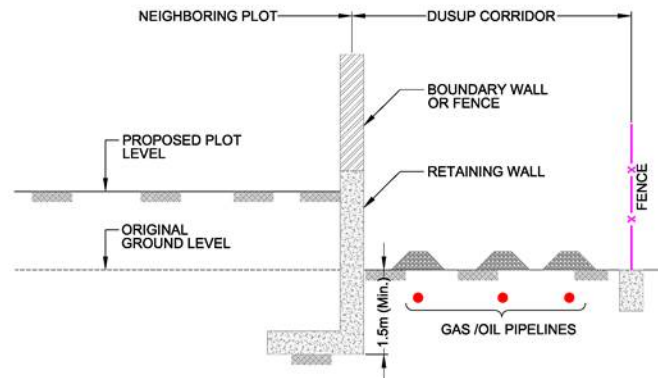
- c) Where vertical cut is required at the DUSUP corridor limit, DUSUP approved retaining wall to be constructed at the corridor limit. DUSUP corridor must be protected from any settlement before, during and after construction of retaining wall. The existing corridor fence may be replaced with an approved security fence on the top of retaining wall (see figure below).



RETAINING WALL AT DUSUP CORRIDOR

Note: MSE (Mechanically Stabilized Earth) wall as retaining wall for protecting the DUSUP corridor is not acceptable as the presence of soil reinforcement of MSE wall may freeze considerable corridor space.

- d) When a plot adjacent to DUSUP corridor to be developed at the raised elevation, the design of plot boundary wall at the corridor limit shall be duly consider that the DUSUP corridor will be fully populated with the hydrocarbon pipelines in future and pipeline construction and operation may require approximately 3.0 to 3.5 meter deep excavation along the corridor limit. However the boundary wall foundation at the corridor limit for all cases shall be minimum 1.5 meter deep from the existing DUSUP corridor elevation



RETAINING WALL AT DUSUP CORRIDOR

6.4.3.3 Hot Work

- Naked flame activities conducted within 10 meters of DUSUP/DPE onshore pipelines required separate hot work permit from DPE (Refer to DPE Hot Work Procedure : DPE-HSE-00044).
- All permit designated personals shall be trained in relevant DPE trainings.

6.4.3.4 Planting & Vegetation

Pipeline are treated with a protective coating and carry a small amount of direct current to assist in resisting corrosion. Tree roots are drawn to loose soil around the pipeline and the consistent temperature generated by the moving gas. The roots can damage the coating when coming into contact with the steel pipeline. Further, as roots carry water and nutrients to the tree, they act as conductors of electricity, absorbing the electrical current that is in place to mitigate corrosion.

While damage and increased fire risk are issues from trees for above ground assets, damage to pipeline coating are issues for below ground assets.

Therefore planting of trees is not permitted within the pipeline corridor.

- In general, planting of small plants/shrubs or grass within road ROW/Corridor interface area, but outside the "No Go Zone" of pipeline may be permitted after DUSUP review, provided the roots of the plant are not capable of causing damage to the pipeline and approved root arrestor or other mitigation measure that would mitigate any damage to the pipelines is provided. However, free passage shall be maintained along the pipeline route.

- b) Inside the 5-metre “No Go Zone” loosely laid gravel layer may be accommodated instead of grass after further consultation with DUSUP.
- c) Trees parallel and outside the corridor fence may be planted, however the separation distances should be planned and the expected height of the fully grown plant should be taken into account so that the security of corridor is not compromised. Further, the plant shall be placed such that it shall not fall onto any corridor fence or above ground asset, nor the roots shall interfere with the pipeline or below ground assets. Tree shall have approved root arrestors. However, it should be noted that any tall trees are not be permitted within 10 meters of pipeline.
- d) Any approval granted to plant within DUSUP pipeline corridor or corridor interface area within ROW is subject to DUSUP retaining the rights to remove at any time in the future all vegetation which DUSUP consider may restrict access or endanger the pipeline with no cost to DUSUP. If plant is to be reinstated after removal from DUSUP, the cost of reinstatement or other improvement works must be borne by the owner of such plant.

6.4.3.5 Crash Barrier Protection

- a) While designing of roadside crash barriers the PHA by the road consultant shall ensure that the hazards are identified considering crash history, traffic volumes, speed, clear zone, road geometry, roadside topography, surface condition, and the expected severity outcome of crashes into the roadside hazard/pipeline and demonstrate that the risk to DUSUP asset have been mitigated to As Low As Reasonably Possible (ALARP).
- b) Special Crash barriers shall be provided at critical facilities such as Block Valve Stations, Pigging Stations and at the Dubal Corner Manifold plot. The existing facility shall be protected with specially designed concrete crash barrier as shown on DUSUP drawing reference: 900-08-024 (See Attachment-2).
- c) For the road bridge and viaducts parallel to DUSUP corridor/facility, purpose designed crash barrier to test level 6 (TL6) with a minimum height of 1.5 meter shall be provided in accordance with the Bridge Design Standard AS 5100.
- d) The railway bridge/viaduct or ramp parallel to DUSUP corridor/facility, shall be provided with a purpose designed crash barrier with minimum height of 2050mm (TL-6 barrier). The design and extent of the crash barrier must be as per the international standard or as per the best industry practice.

7 DUSUP NOC CLOSEOUT

For DUSUP NOC Close-Out Requirements refer to:
DUSUP NOC Standard Conditions - DP-OPSON-0056

8 DUSUP GUIDELINES

Various Guidelines for DUSUP/DPE Onshore pipelines are being developed for internal and external use. Reference is made to following of those Guidelines:

- DUSUP Guidelines for Trial Pit
- DUSUP Guidelines for Road & Rail Infrastructure Crossing
- DUSUP Guidelines for Road & Rail Infrastructure Parallel to Pipeline

- DUSUP Guidelines for Utilities Crossing Existing Pipeline
- DUSUP Guideline for Structures Close to DUSUP Corridor
- DUSUP Guidelines for Dewatering Works
- DUSUP Guidelines for NOC Management and Work Supervision
- DUSUP Guidelines for Hydrocarbon Pipeline Patrolling
- DUSUP Guidelines for Hydrocarbon Pipeline Integrity Management
- DUSUP Guidelines for Hydrocarbon Pipeline Emergency Management
- DUSUP Guidelines for Land Use Planning

Attachment 1:

PLAN VIEW
SCALE=NIS

TYPICAL ROAD CROSSING OVER EXISTING PIPELINE
SCALE=NIS

SECTION X-X
SCALE=1:20

SECTION Y-Y
SCALE=1:20

PRECAST RC SLAB
SCALE=1:20

Pipeline Particulars Table

Rev.	Date	Revision Description	Drawn	Checked	Approved
D	25.06.06	36" & 48" Pipeline Data Added	BV	RES	ACS
C	10.09.05	Approved For Construction	BV	RES	ACS
B	30.08.05	Approved For Construction	BV	RES	ACS
A	15.07.05	Approved For Construction	RM	SKR	GW

GENERAL NOTES:

- Pipeline road crossing designed in accordance with latest revision of API RP 1102, ASME B31.4/ B31.8.
- Pavement width is considered vehicular loading width whether paved, crushed stone or sand.
- Whenever possible roadways shall cross the pipeline at right angles.
- Where a roadway is to cross a pipeline, the pipeline must be surveyed for coating defects to assess the need for any repairs. If repairs are required, the pipeline must be excavated & sand blasted clean after inspection. Any repairs to the pipeline are to be primed and recoated according to DUSUP specification. This work is to be done by or under supervision of DUSUP personnel at the expense of those persons carrying out the work.
- Compaction of backfills shall be as follows:
 - ≤ 400mm all around : By hand tamping equipment in lifts not greater than 100mm.
 - 400mm - 1000mm : By manually operated vibratory Plates in lifts not greater than 100mm.
 - > 1000mm : By conventional earth moving equipment, other than vibratory rollers.
- Vibratory rollers to a maximum dead weight of 15 to cannot be used within a distance of 3m offset. Vibratory rollers of a greater weight are subject to approval.
- Safety barrier length to be minimum 20m approaching, 8m leaving. Offset distance from pavement shall be defined with local authority at site. Necessary approval shall be obtained from Govt. or other relevant authorities for safety barrier design and construction, where required.

SLAB PROTECTION NOTES:

- Slab protection required as per approved NOC.
- Slab detail typical only. Bars are high yield steel grade 460 (Type 2).
- Dimensional specification
 - H: To be maximised, minimum 950.
 - Z: Road pavement + 10m either side.
- Maximum gap between slabs shall be 20mm.
- Slabs shall be maximum weight of 2.0 tonne.
- Concrete particulars as follows:
 - a. Grade 30.
 - b. Minimum cement content 660 lbs/cyd
 - c. Maximum water cement ratio 0.40
 - d. No admixtures shall be used.
 - e. Cement for all concrete construction shall be Type-V Sulphate resisting cement.
 - f. Concrete shall be mechanically vibrated.
 - g. Slab shall be tanked with bituthene 1200HC or equivalent membrane installed as per manufacturers' recommendations.
 - h. Slab shall be cured in accordance with normal UAE practice.
- If slab is located at ground surface level, then dependent upon crossing location, 4m material of 2m width to be added to slab perimeter to prevent local scouring, may be specified.

Dubai Supply Authority

CAD File Name: 900-08-003-001-RD
Site: A3
Scale: As Stated

TYPICAL ROAD CROSSING ARRANGEMENT FOR 10", 16", 20", 24", 36" & 48"

Area Code: 9 0 0 0 8 0 0 3 0 0 1 0 0 1
Doc Code: 9 0 0 0 8 0 0 3 0 0 1 0 0 1
Sheet of: 0 0 1 0 0 1
Sheet No.: 0 0 1
Rev. No.: D

Attachment 2:

