



# DUSUP GUIDELINES FOR UTILITIES CROSSING HYDROCARBON PIPELINES

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# 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.

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.

#### 3 PURPOSE

The purpose of this guideline is to assist the DUSUP/DPE NOC staff for NOC review, DUSUP/DPE field staff for monitoring safe execution of utilities crossing existing DUSUP/DPE pipelines and a guide for NOC applicants (Consultants & Contractors) on the requirements for NOC application acceptance.

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

This Guideline document will be published in DUSUP website.

#### 4 REFERENCES

DUSUP NOC Standard Conditions - DP-OPSON-0056

DUSUP Guidelines for Trial Pit: DP-OPSON-0148

DPE Hot Work Procedure - DPE-HSE-00044

# **5 ABBREVATIONS & DEFINATIONS**

## 5.1 Abbreviations:

Abbreviation	Description
ALARP	As Low As Reasonably Practicable
BHA	Bore Hole Assembly
СР	Cathodic Protection
DPE	Dubai Petroleum Establishment
EMARAT	Emirates General Petroleum Corporation
EMDAD	EMARAT, Air BP and Shell Joint Venture
ENOC	Emirates National Oil Company
e-NOC	Electronic NOC
GCS	Gas Control Station
HDD	Horizontal Directional Drilling
HSE	Health, Safety and Environment
HV Cable	High Voltage Cable
LEL	Lower Explosion Limit
LV Cable	Low Voltage Cable
MDD	Maximum Dry Density
MS	Method Statement
MSRA	Method Statement and Risk Assessment
MT	Micro Tunnelling
NDC/NDCM	Non-Disruptive Crossing / Non-Disruptive Crossing Method
NDRC	Non-Disruptive Road Crossing
NOC	No Objection Certificate
OHL	Over Head Line
PJ	Pipe Jacking
PPE	Personal Protective Equipment
PPV	Peak Particle Velocity
PTW	Permit to Work
RA/TRA	Risk Assessment/ Task Based Risk Analysis
RCC	Reinforced Cement Concrete
ROW	Road Right of Way (of RTA)

RTA	Roads and Transport Authority
ТВ	Thrust Boring

#### 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.		
ALARP	In risk assessment when the risk is assessed and controlled the residual risk shall be reduced to ALARP(as low as reasonably practicable)		
BenchingBenching is a type of safe excavation method in which sides of are formed in steps in order to prevent them from collapsing. Br is also called as Step cutting.			
Berm	A soil bund built over the pipeline as a protection cover.		
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.		
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/consul engineering, technical, or any other matter related to de 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.		
Corridor Intersection	Common area covering crossing of two corridors at the intersection of DUSUP corridor and RTA ROW.		
Cave-in Cave-in means the movement of soil or rock into an excavation loss of soil from under a trench shield or support system, large to trap, bury/injure and immobilize a person.			
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.			
e-NOC	The electronic NOC application that can be submitted via the online system: https://noc.rta.ae/RTAeNOC/Webpages/common/login/login.aspx			
Excavation	Excavation is a man-made cut, cavity, trench or depression formed by earth removal.			
Gyro Steering	Gyro steering relays accurate navigation information from the drill head to the operator in real-time without the effect of external influences. Gyro steering works through a tool which is mounted behind the jetting assembly.			
Hazard	A Hazard is any source of potential damage, harm or adverse effects on people, property environment or organization.			
Horizontal Directional Drilling(HDD)	HDD is a minimal impact trenchless method of installing underground utilities in a relatively shallow arc or radius along the prescribed path using a surface launched drilling rig.			
Manual Excavation	Manual Excavation is also called as Hand Excavation, which is carried out by use of hand shovel.			
Manual Excavation Limit	Excavation within 5 meter of pipeline must be carried out by Manual Excavation.			
Micro Tunnelling(MT)	Micro tunnelling is a pit launched trenchless installation technique and uses laser-guided steerable remote control for live monitoring for real- time correction capability.			
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.			
NOC Zone	DUSUP NOC Zones are :			
	60 meter either side from the center of pipelines or DUSUP Corridor limit, whichever is greater.			
	10 meter either side of the pipelines line for the pipe lines located within DEWA or EGA (DUBAL) Plot limits.			
	<ul> <li>5 meter either side from the center of 8"Shell pipeline (Abandoned, Positively Isolated).</li> </ul>			
	<ul> <li>300 meter for High Voltage Over Head Lines parallel to hydrocarbon pipelines/pipeline corridor.</li> </ul>			
	500 meter for Subsea Pipelines.			
	<ul> <li>500 meter for Land Use Planning adjacent to DUSUP Pipeline/Pipeline Corridor.</li> </ul>			
Non-HDD	Trenchless crossing method other than horizontal directional method, i.e. Micro Tunnelling, Thrust boring, Pipe Jacking methods.			

Observation Pit An Observation pit or Daylight Inspection pit is excavated to and confirm the safe crossing of HDD pilot and reamer below hydrocarbon pipeline.		
Open Cut	Open cut excavation is a traditional method of excavation by opening up the surface of the ground to the required depth.	
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.	
Pipe Jacking(PJ)	Pipe Jacking is a method of laying underground pipeline by assembling the pipes at the foot of an access shaft and pushing them through the ground using hydraulic jacking rig.	
Pipeline Representative, Pipeline Operator or Patrol staff	The staff designated by DUSUP the duties of witnessing NOC works for compliance with NOC conditions and monitoring the safety of the pipelines.	
Risk	A situation involving exposure to danger	
Risk Assessment         A report prepared by the Applicant/Customer seeking DUSUF           identifying potential risks and mitigation measures involved in           out any Construction or Restricted Activity within the DUSU           Zones.		
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.	
Shielding	Trench Shield also called Trench boxes which is installed inside the trench to protect the worker from potentially dangerous soil collapse, Shielding does not prevent the trench collapse.	
Shoring	Shoring is the provision of a support system for trench faces used to prevent soil collapse, cave-ins.	
Sloping	Sloping (sloping system) is a type of safe excavation method in which sides of an excavation that are inclines away from excavation so as to prevent cave-ins.	
Trenchless Crossing	The method of construction of underground utility crossing between the two defined points without continuous, open cut excavation between them and without causing disturbance to the ground or assets above. (e.g. Pipe Jacking, Thrust Boring, Micro Tunnelling, horizontal directional drilling etc.,)	
Thrust Boring(TB)	Thrust boring is jacked and drilled trenchless boring method used for the installation of utility between the Entry and Exist pit.	
Utilities	Utilities are means of supply of essential services such as electricity & communication through cables, water, drainage and natural gas or fuel oil through the pipelines.	

Utility Owners	Owners of utilities such as: drainage lines (DM), Electricity & Water(DEWA), ITS Services(RTA), Telephone(Etisalat, Du), Other communication cables(UAE Armed Forces), etc.,		
Walkover System This method of HDD monitoring system utilizes an electron signal from a transmitter located directly behind the drilling he signal is received by an antenna (handheld locator) being able Over the top of the drill head to accurately monitor its progres information received on the surface details the drill's lateral depth, pitch and roll. This data allows the drilling team to stee along the desired path/route.			
Wire-Line System	In this method of HDD monitoring, information on position, inclination and roll is relayed from the steering probe (tool) back to the drill rig via a continuous wire connection installed inside each individual drill rod, allowing accurate steering where overhead locating is not possible. To overcome magnetic interferences and increase overall positional accuracy a surface cable loop is laid above the axis of the bore and connected to a power source to generate an artificial magnetic field. The measurement probe can now be referenced to this known field eliminating outside interference.		
Witnessing Zone	Work within 10 meters of hydrocarbon pipeline can only be carried in the presence (witnessing) of DUSUP Pipeline Representative in order to witness and record safe implementation of NOC work.		

# 6 UTILITIES CROSSING EXISTING HYDROCARBON PIPELINES

New utilities may cross existing DUSUP/DPE pipelines or DUSUP corridor in various locations of DUBAI. The design and construction of such crossings within the DUSUP NOC zones require review and approval through NOC process.

Approval of other utilities crossing through the DUSUP corridor shall not infringe upon DUSUP's right to unrestricted use of corridor for the operation and maintenance of existing pipelines and construction of future pipelines.

Following are the various types of utility crossings covered under this guideline document:

- Open Cut Utility Crossings
- Trenchless Utility crossings
- Overhead Lines (OHL) Crossings.
- Note: Only two layer of utilities must be present at each crossing location. i.e. once an approval is granted for third party utility to cross below the existing pipeline, all subsequent third party utilities shall only cross below existing pipeline. Similarly once an approval is granted for third party utility to cross above the existing pipeline, all subsequent third party utilities shall only cross above existing pipeline.

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

# 7 NOC TYPES & SUBMISSION REQUIREMENTS

For the Utilities crossing DUSUP/DPE pipelines or DUSUP corridor within NOC zone, following DUSUP NOC's are applicable:

- Information NOC
- Route Design NOC/Preliminary Design NOC
- Final Design NOC
- Trial Pit NOC.
- Construction NOC
- NOC Close-out

# 7.1 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 proposed utility crossing work through e-NOC.

# 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: <u>https://www.dusup.ae/noc</u>
- 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.

# 7.2 Route Design NOC/Preliminary Design NOC

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

# **Route /Preliminary Design - Submission Requirements**

- a) Key Plan showing project location.
- b) General Layout Plan/Route Plan incorporating existing site condition, existing other utilities and proposed work, DUSUP corridor limit, pipelines/ facilities as provided in Information NOC.
- c) AutoCAD file of General Layout Plan/Route Plan drawing prepared on DLTM coordinates datum.
- d) Typical Cross Section drawings showing existing site condition, existing utilities and proposed crossing including DUSUP corridor information provided through the Information NOC.
- e) Method of proposed crossing (i.e., Open cut or Trenchless method).

f) Include applicable notes from the DUSUP Standard NOC Conditions and DUSUP Guidelines in the drawing.

# 7.3 Final Design NOC

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

#### **Final Design NOC - Submission Requirements**

- a) Key Plan showing project location.
- b) General Layout Plan/Route Plan incorporating existing site condition, existing other utilities 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) Cross Section drawings showing the existing site condition, existing utilities and proposed utility crossing including DUSUP corridor information provided through the Information NOC, minimum clear vertical separation from the existing pipeline to the proposed utility crossing and any element of work that may have direct or indirect effect on the existing DUSUP pipeline or DUSUP assets.
- e) ROW Cross section drawing for Corridor intersection area must show the existing road & ground profile extending to DUSUP corridor, existing and proposed utilities.
- f) The layout and details of permanent structure, man holes/valve chambers/shafts in the proximity of corridor and separation distance from the corridor/existing pipelines must be included in the drawings.
- g) Method of proposed crossing (i.e., Open cut or Trenchless method).
- h) HV OHL crossing must include separation distance from the foundations to DUSUP corridor / HC Pipeline.
- i) HV OHL cross section drawing must show minimum clearance from the lowest conductor level to the ground.
- proposed HV OHL constructed parallel to DUSUP corridor or pipeline and falls within 300 meters distance from the corridor or pipeline must be included in submission.
- k) Include applicable notes from the DUSUP Standard NOC Conditions and DUSUP Guidelines in the drawing.
- I) Applicable design requirements mentioned in this document shall be considered for the design and drawing.
- m) Checklist for Route Design / Preliminary Design NOC conditions compliance.

# 7.4 Trial Pit NOC:

In order to finalize the crossing details and to proceed with Construction NOC submission, existing HC pipeline location shall be verified by trial pit. A separate Trial Pit NOC request with a plan drawing and proposed location of trial pits must be submitted for DUSUP approval prior to commencement of any trial pit work.

For Trial Pit NOC Requirements refer to:

DUSUP Guidelines for Trial Pit: DP-OPSON-0148

# 7.5 Construction NOC

Valid Construction NOC must be available at site before commencement of any construction activities within the DUSUP NOC Zones.

# 7.5.1 Construction NOC - Submission Requirements

Separate Construction NOC submission may be required for each crossing location as the location specific hazards may require separate control measures and procedures.

Construction NOC submission must include but not limited to following:

- a) Completed check list for Design NOC condition compliance.
- b) Key Plan Showing Project Location.
- c) General Layout Plan/Route Plan incorporating existing site condition, existing other utilities and proposed work, DUSUP corridor limit, pipelines/ facilities as approved in Final Design NOC.
- d) Detail Cross Section drawings showing :
  - i. All existing utilities.
  - ii. Temporary support and protection details of affected DUSUP Pipeline (for Open cut only) and utility owners approved protection to any other affected utilities.
  - iii. The elevation of existing ground, pipeline berm, proposed finished ground and DUSUP corridor limit as per trial pit verification (attach a copy of DUSUP verified trial pit record).
  - iv. Vertical separation from the existing pipeline to the proposed crossing, elevations and location coordinates consistent with the trial pit verification.
  - v. Trench protection details, as applicable.
  - vi. Dewatering details, if applicable.
  - vii. Job specific and location specific method statement and risk assessment reviewed and approved by the consultant or client.
- e) Concrete slab between the existing HC pipeline and proposed utility and cable marker tape above cables for open cut crossing.
- f) The layout and details of man holes/valve chambers/shafts and proposed separation distance from the corridor/existing pipelines must be included in the drawings.
- g) DUSUP patrolling access layout for utility crossing above HC pipeline (if affected).
- h) Include applicable notes from the DUSUP Standard NOC Conditions in the drawing.

# 7.5.2 Specific Construction NOC Submission Requirements for Trenchless Crossings

- a) The trenchless crossing must be risk assessed by clearly identifying the existing HC pipeline and hazard associated with the crossing of existing HC pipeline. RA must also cover construction of entry and exist pit, dewatering works and any equipment failures such as breakage or trapped pilot / reamers at the drilling route and its retrieving procedure. RA shall be approved by the Consultant or competent client's representative before submission.
- b) Method Statement (MS) shall be job specific, location specific, task based and approved by the Consultant or competent client's representative before submission.
- c) MS for HDD shall describe safe execution of observation pit requirements including backfill and compaction to the approval of DUSUP/DPE.

- d) HDD crossing profile drawing shall be submitted as per the DUSUP approved sample drawing (See Attachments 6)
- e) Dewatering proposal at entry and exit pits of Non-HDD crossing must be included in the submission.
- f) Non-HDD Trenchless crossing submission must include construction details of Entry/Launching Pit and Exit/Receiving Pit, including all proposed concrete work with thickness, dimensions and corresponding elevations for easy verification at site.
- g) Crossing Coordinates (DLTM) and Elevations at top & bottom of pipeline(s), elevation of existing ground surface, top of berm & bottom of berm.
- h) Proposed minimum clearance from bottom of gas pipeline to top of utility/sleeve/conduit depicted as below:
  - For HDD and Non-HDD minimum 2.0m for diameters up to and including 1.0 m and 2.0 times sleeve/casing size if greater than 1.0m diameter
  - For HDD, clear distances measured from the bottom of HC pipe to crown of maximum size reamer.
  - Proposed minimum clearance for HDD crossing without observation pit and with Wireline & or Gyro Systems shall be 5.0m.
- i) Minimum horizontal distance between edges of launch/receive pit to edge of pipeline shall be 15 meters minimum, preferred 20 meters. (refer to Design Requirements)
- j) Detail of survey bench mark (i.e. for trial pit & construction, for HDD DUSUP post pull xy-z survey) shall be provided in the drawing.
- k) Trenchless Specialist Contractors shall show evidence of "qualification" i.e. a copy of valid RTA approval to carryout proposed Trenchless crossing works in Emirates of Dubai.
- All Trenchless crossing (HDD, PJ, TB, and MT) works must be carried out by the certified Operator under the qualified Supervisor. Project consultant or Client representative must confirm the verification of qualification of Machine Operator and Supervisor. A copy of Project consultant or Client representative's confirmation must be included in the Construction NOC submission.
- m) Main Contractor and Trenchless Contractor quality management system and Contingency plan in case of equipment failure must be included in submission.
- n) NOC engineer shall complete the trenchless crossing checklist and upload the completed checklist in e-NOC in order that field staff can verify the details at site (see Attachment 8).

#### 7.6 General Design Requirements - Open Cut Crossings

While trenchless method is preferred for utility crossing of DUSUP corridor, crossing below existing pipeline(s) and corridor by open cut excavation may be permitted under special

circumstances after justification by the applicant and detail review of method statement and risk assessed and residual risk is reduced to ALARP.

DUSUP future pipelines at the existing major roads (ROW) are constructed by trenchless method, therefore crossing of other utilities above existing pipelines via open cut crossing method is typically permitted within the corridor intersection area in order that future pipeline crossing depth can be limited.

In order to avoid having the HC pipeline in between other utilities, all utilities within the crossing location shall cross the existing pipeline either above or below. Compliance to this requirement must be verified during the design stage. Any deviation to this requirements such as drainage line of gravity flow design may be accepted provided the proposed crossing design ensure that DUSUP/DPE operation and maintenance of existing pipeline and construction of future pipeline are not restricted.

Proposed utility crossing of planned ROW crossing existing fenced DUSUP corridor may be treated as ROW for the purpose of utility crossing. However existing and final ground elevation including DUSUP access over the proposed utility shall be reviewed.

General design requirements for open cut crossings are as follows:

- 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) Where possible utilities shall cross the DUSUP corridor at an angle of 90 degrees or as close to 90 degrees as practicable.
- d) For the crossing of utility below existing pipeline by open cut method, a minimum vertical separation of one (1.0) meter or minimum separation requirement of the owner of proposed utility; whichever is greater must be maintained between the bottom of lowest HC pipeline and the top of the proposed utility or sleeve. This clearance elevation must be maintained across the entire width of the DUSUP pipeline corridor to avoid any conflict with future pipeline construction and maintenance of pipeline.
- e) For the crossing of utility above existing pipeline by open cut method, a minimum vertical separation of one (1.0) meter or minimum separation requirement of the owner of proposed utility; whichever is greater must be maintained between the top most HC pipeline and bottom of the proposed utility or sleeve. This clearance elevation must be maintained across the entire width of the DUSUP pipeline corridor to avoid any conflict with future pipeline construction and maintenance of pipeline.
- f) For the utility crossing by open cut method, a reinforced concrete slab of minimum 600mm wider than the size of the HC pipeline and 150mm thick shall be provided between the proposed crossing and existing DUSUP pipeline. Alternatively, the concrete

protection slab(s) may be provided in smaller sections of 500mm x 500mm x 50mm thick. (Refer to standard crossing detail drawings mentioned in design requirements item 7.6.1 below.)

- g) If a protection berm to be constructed over the proposed utility crossing or ground level to be raised over the proposed utility, any impact on the existing or proposed DUSUP access between the corridor gate and road to be assessed and mitigated to DUSUP approval.
- h) The cable shall be sleeved in heavy wall PVC or HDPE pipe, extending a minimum of 6 meters either side of the pipeline or full width of corridor, whichever is greater. Sleeve joints may not occur directly above or below the pipeline. Protection of cable(s) may include cable duct bank with or without concrete surround.
- i) Proposed water / drainage main line crossing of DUSUP corridor /pipeline must be adequately designed and protected in order to ensure that, no additional permanent protection to water/drainage line will be required during the operation and maintenance of existing HC pipelines and construction of future HC pipeline. The future HC pipeline may be constructed at the same level of lowest pipeline in the corridor or minimum 3.0m below existing grade, whichever is lower and minimum 1.0 meter unrestricted maintenance space is required 360° of existing HC pipeline.
- j) Protection of water/drainage main at the DUSUP corridor/HC pipeline crossing may include but not limited to; provision of protection slab over the crossing water/drainage line, housing within the heavy duty carbon steel sleeves or specialist designed concrete surround/grouted sleeve; extending minimum 5 meters on both sides of DUSUP pipelines or corridor, whichever is greater.
- k) Joints (collars) in the water or drainage secondary line shall be spaced at least 3 meters from the pipeline.
- I) Manholes/shaft, bends, thrust block or any type of structure other than proposed water pipeline/drainage line are not permitted within the DUSUP corridor limit. However manhole or foundations up to maximum 1.5m depth outside the "NOC No Go Zone" may be permitted within the ROW crossing of DUSUP corridor.
- m) In desert areas; where existing ground elevation varies considerably across the width of corridor, the top of the proposed crossing shall be minimum 1.0m below existing pipeline and 4.0m below existing grade; whichever is greater. Such proposal shall be verified and assessed as per the actual site condition before approval.
- n) In desert areas, back filling around the HC pipeline must be with clean "sifted" dune sand of low chloride content, compacted to at least original density by hand. In other areas, a Minimum 300mm around the existing pipeline shall be backfilled with dune sand or clean sand of low chloride content (less than 0.05 percent) mixed with sufficient water and manually compacted to minimum 90% of relative density for non-traffic areas. Minimum 95% of relative density of compaction must be achieved at the traffic area.

- excavated material may be reused for backfill over and above 300mm sand cover, provided the back material is free of large stone (i.e., less than 3" or half the size of backfill layer whichever is less) all organic material, debris or other deleterious material. Maximum thickness of manual backfill layer shall be limited to 150mm (0'-6").
- p) Utility owner's standard underground utility crossing signs must be installed at either side of the crossing, at any change of direction within the corridor and at the edge of the pipeline corridor to assist future identification of the crossing.
- q) For the crossing of gravity flow drainage lines, DUSUP corridor crossing design must be based on the (trial pit) verified elevation of existing DUSUP pipeline.
- r) For laying proposed utility crossing below existing pipeline by open cut method, adequate support and protection must be provided to the existing pipeline(s) to the approval of DUSUP. The pipeline should not be left unsupported at any time including during installation of temporary or permanent support mechanisms. For maximum allowed span for pipeline supports for DUSUP/DPE pipelines refer to Table below:

S. No	PIPELINE ID	Span Limit (m)
1	16" HP Gas Pipeline (MARGHAM-DUGAS)	14.0
2	20" HP Gas Pipeline (MARGHAM-GCS)	16.0
3	36" HP Gas Pipeline (MARGHAM-GCS)	17.0
4	16" Condensate PL	13.0
5	10" Condensate PL	11.0
6	24" Sharjah Dubai Pipeline	11.0
7	36" DEWA-H Gas Pipeline	20.0
8	20" DPE Pipeline (GCS-DUGAS)	18.0
9	20" LP Dubal Gas Pipeline	17.0
10	24" LNG PL	17.0
11	24" DUSUP RM Gas Pipeline	17.0
12	48" Hassyan Pipeline	17.0
13	48" RM1	17.0
14	48" RM2	20.0

Notes:

- i. For pipeline with significant wall loss defects, detailed stress analysis shall be undertaken to establish permissible unsupported lengths
- ii. When planned excavations will exceed or are to be extended close to or beyond limits established in above Table, pipe support requirements shall be assessed and agreed with the DUSUP. Any proposal to exceed the maximum unsupported span lengths shall be justified by stress calculations sufficiently detailed to demonstrate that at no stage of the work will stresses exceed the levels permitted in the applicable Pipeline Design Code.

- iii. If a support must be moved for any reason, e.g. to enable access to the pipe at the support location, its removal shall not increase the unsupported pipe span length beyond the limit specified.
- iv. Upon completion of the backfill activity, the depth of cover above the gas pipeline should be same as the depth of cover prior to the original excavation activity or more and in compliance with DUSUP approved berm specification.
- s) A separate Trial Pit NOC request with a plan drawing and proposed location of trial pits must be submitted for DUSUP approval prior to commencement of any trial pit work.
- t) For cable crossing above or below the existing HC pipeline by open cut method, utility owner approved cable identification marker tape must be provided above the cable.
- u) No cable joint bay shall be located within the DUSUP corridor.
- v) At HC pipeline crossings, a 12-meter length of prefabricated pipeline (new HC pipeline) shall be placed under the existing pipeline so that the tie-in welds will be made at least 6-meters from the existing live pipeline. The Contractor shall carry out a mandatory LEL gas test prior to and during any welding procedure.
- w) For new HC pipeline crossing of existing HC pipeline, a 150mm thick precast concrete slab, reinforced with A393 mesh reinforcement shall be installed between the new and existing pipeline and slab shall be coated with minimum two coats of approved bitumen emulsion paint. Concrete slab can be in smaller sections to assist easy handling as shown on DUSUP Standard drawing: 900-08-062 (Attachment 5).
- x) Specific approval is required to install a CP test post that commonly bonds across the two HC pipelines. The CP connection must be carried out by cad welding or other approved method. A third party company hired by the contractor or operator of proposed pipeline will supply cad weld procedure for review & approval. The procedure must include the ultrasonic wall thickness check of DUSUP/DPE pipeline by qualified third party.
- y) Due care and diligence is required throughout the work to ensure no damage occurs to the existing pipeline/pipeline assets and pipeline coating. If any such damage occurs, the Pipeline Representative shall be informed immediately and the pipeline and / or coating repaired to the DUSUP/DPE specifications at the Contractor's expense.

# 7.61 Standard Crossing Details Drawings

Refer to following standard crossing details drawings for open cut utility crossings:

Attachment No.	Drawing Title	Drawing Number	Revision
1	Cable Crossing Above Existing Pipeline	900-08-057	0
2	Cable Crossing Below Existing Pipeline	900-08-058	0

3	Water/Drainage Line Crossing Above Existing Pipeline	900-08-060	0
4	Water/Drainage Line Crossing Below Existing Pipeline	900-08-061	0
5	Hydrocarbon Pipeline Crossing Below Existing Pipeline	900-08-062	0

# 7.7 General Construction NOC Requirements for Open Cut Crossings

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

# 7.7.1 Construction NOC Conditions

- a) The construction contractor shall comply with DUSUP Standard NOC Conditions and above mentioned design requirements.
- b) The construction contractor shall comply with Dubai Municipality safety regulation for excavation safety.
- c) Gas test shall be performed by trained personal at the DUSUP pipeline crossing location for excavation exceeding 1.2m (4'-0"). Test to be conducted before employees / workers enter the trench and regularly thereafter.
- d) Shoring, step cutting (benching) or sloping (battering) must be provided for the excavation deeper than 1.2 meters to eliminate the risk of cave-in or trench collapse or Shielding (Trench Box) may be provided where suitable.
- e) For benching protection in excavation, if the soil type is not confirmed the soil must have a slope of 1 ½ horizontal to 1 vertical (34 degrees). Type of trench protection must be identified in TRA.
- f) The trench deeper than1.2 m (4 feet) must have a safe means for workers to get in and out of the trench. (E.g. stairway, ladder, ramps). Means of egress must be fixed and secure and shall be within 7.6m (25 feet) of lateral travel. Ladders must extend a minimum of 0.9m (3 feet) above the landing.
- g) Plastic spades must be used while excavating within 0.50 meters of existing hydrocarbon pipeline.
- h) Spoil and debris must be placed at least 1.2 m (4 feet) away from the edge of the excavation.
- i) Approved barriers must be provided at a minimum 1.0 meter distance from the zone of influence or angle of repose line of excavation and no vehicle or storing of excavated material are permitted between the barrier and the edge of excavation.

- j) The methods of backfill and compaction shall be clearly described in method statement and shall be approved by DUSUP in advance.
- k) DUSUP pipeline must be protected with approved temporary protection as per TRA and pipeline must be supported with the approved temporary support within the limit of span mentioned in above Design Condition item 7.6(r).
- I) Immediately after exposing the pipeline and before backfilling, the pipeline must be inspected by the DUSUP pipeline representative for condition of coating and any damage to the coating. Senior Pipeline Engineer or his delegate typically performs assessment of the coating condition and repairs should they be necessary during trial pit excavations and prior to proceeding with the backfilling. Condition of the pipeline on exposing and before backfill shall be recorded with photographs.
- m) Any damage to the coating shall be repaired by DUSUP approved contractor as per DPE/DUSUP procedure.
- n) Existing pipeline berm must be restored to the original conditions.
- o) DUSUP must be notified before pressure testing of proposed drainage / water pipeline crossing DUSUP pipeline.
- p) Consultant or Client representative must inspect the proposed crossing of water /drainage line under/above the existing hydrocarbon pipelines at the entire width of DUSUP corridor and certify that the construction of crossing is satisfactorily completed as per the design and adequately protected in order that the presence of water/drainage line(s) will not in any way restrict the operation and maintenance of existing DUSUP pipeline(s) including construction of future hydrocarbon pipeline(s) crossing over the water /drainage line(s) without providing any additional protection to water/drainage line in future.

#### 7.8 Trenchless Utility Crossings

Trenchless crossing is also called as NDRC, NDCM or NDC and trenchless crossing method is widely used for utility crossing under the HC pipeline/DUSUP corridor.

Following are the commonly used Trenchless Crossing methods in Emirates of Dubai:

#### a) Pipe Jacking

Though the thrust boring and micro tunnelling are also advanced forms of Pipe Jacking methods, traditionally Pipe Jacking is referred to an early form of technique for installing underground utilities using powerful hydraulic jacks to push specially designed man entry size pipes through the ground behind an open ended cutting shield and at the same time manual excavation is taking place within the shield. Monitoring of line & level is done by the use of survey equipment.

The limitation of this method is that little control of the excavation face was possible and running ground especially below the water table could flow easily along the cutting shield and lead to large settlements. Therefore this method is only recommended for crossing above water table.

#### b) Thrust Boring

Thrust boring is an improved version of Pipe Jacking, wherein crossing is done by combination of jacking and augur drilling, excavation is within the cutting shield and soil is transferred out of the casing pipe by a cased screw auger's blade.

# c) Micro Tunnelling

Micro tunnelling is an advance form of Thrust Boring which uses highly sophisticated guidance system, remotely operated from the control room on the ground. Monitoring of line & level is by laser target system with fixed pipe jacking laser in the entry shaft and active laser target in the machine. Most machines also have video cameras set up to give more information. Slurry system is used to protect from over excavation and stabilizing the ground around drilling. Micro tunnelling cutting shield is water tight therefore suitable for drilling under water table.

# d) Horizontal Directional Drilling

Horizontal Directional Boring, commonly called as HDD, is a steerable trenchless method of installing underground pipes, conduits and cables in a shallow arc along a prescribed bore path by using a surface launched drilling rig, with minimal impact on the surrounding area. However drill route need to be shallow, curved along a prescribed bore path before it reaches its intended grade or elevation. The method comprises a three stage process:

- Drill a pilot hole on the designed path.
- Enlarges the hole by passing a larger cutting tool known as the back reamer.
- Place the product or casing pipe in the enlarged hole.

# 7.8.1 Specific Design Requirements for Trenchless Crossing

When crossing existing infrastructure such as HC pipelines, other utilities and road etc., by trenchless crossing method, a lack of understanding of the geotechnical setting or improper design of the path below surface could lead to excessive heave or surface settlement may cause damage to the existing infrastructure above. A significant risk of an improperly planed trenchless crossing is cross boring into the existing subsurface pipeline or utility.

- a) Trenchless crossing risk management requires a thorough understanding of potential problems that are site specific to each crossing on a project. Appropriate risk mitigation measures can then be incorporated into the design and crossing details of the selected crossing method can be stipulated.
- b) Geotechnical investigation must be carried out to determine the physical properties of soil and rock below surface including ground water table at each crossing location as per the RTA approved specialist NDRC consultant's recommendation and best industry practice. (Note: Detail design of Trenchless crossing may be carried out during the construction stage by the specialist trenchless crossing contractor to the approval of RTA approved Consultant).
- c) Non-HDD trenchless crossing design must include detail of entry pit and exit pit including size & thickness of thrust wall and elevations and other corresponding information for verification at site.

d) For trenchless crossings the minimum vertical separation between the bottom of lowest hydrocarbon pipeline in the corridor and the top of crossing sleeve/utility must be 2.0 meters for crossing sleeves up to and including one (1.0) meter diameter and minimum of 2.0 times the sleeve diameter for trenchless crossing sleeve greater than one (1.0) meter diameter as shown in sketch below:



- e) The minimum horizontal separation distances between the nearest edges of the launch and receive pit to the edge of the hydrocarbon pipeline(s) is 15 meters with a preferred separation of 20 meters.
- f) Reduction in horizontal separation distance from the entry pit to existing pit is not recommended. However where minimum 15 meter horizontal separation from the pipeline to the entry pit is not possible, separation distance may be reduced provided the design is carefully reviewed considering the safety of pipeline by an approved third party specialist consultant at no cost to DUSUP/DPE. Specialist recommended reduction in separation distance shall be further risk assessed and accepted only after hazard affect is mitigated to reach ALARP.
- g) The design and selection of trenchless crossing by HDD method must consider the existing interferences in the crossing route.
- h) Cross Bore risk in HDD may be removed by using a Wireline Locating System with a (closed loop) such as AC AMF (Paratrack-2) or a Gyro Compass/Gyro Steering System" with minimum (clear) vertical separation of 5.0M from the pilot drilled to the bottom of lowest pipeline

Or

Removal of Cross Bore risk for HDD crossing can be achieved by implementing "Observation pit" where cross boring is expected. The observation pit must be dug up to the depth of minimum 1.0m below bottom of the HC pipeline being crossed and extended by 2.0m on either sides of drilling route. The Observation pit must be available during both pilot bore and reaming activities such that DUSUP Pipeline Representative can witness (take photographs) safe passage of both pilot and all reaming activities under the pipeline/s".

- i) While Observation pit is preferred at the HDD crossing location, it may be excavated at maximum distance of 5.0 meters from the existing pipeline on the drilling side.
- j) Where excavation of Observation pit is not feasible (e.g. due to hard soil or proximity to road etc.,) a sheet pile or steel sheet barrier may be driven at 5.0m distance from the HC pipeline to the depth up to 1.5m below the bottom of pipeline and extended minimum 2.0m on either sides drilling route. Vibration for the installation of sheet file shall be monitored to ensure that particle velocity remain below 40mm/sec.
- k) If an excavation of Observation pit to the full depth is not feasible (e.g.: due to the presence of high water table), a partial observation pit can also be implemented as shown on sketch below:





- I) If the crossing is under more than one pipeline, the bottom elevation of Observation pit shall be one meter below the lowest pipeline to be crossed.
- m) A common Observation pit may be accepted for the parallel pipelines provided separation distance is equal or less than the length of 2 drill rods, provided common Observation pit is risk assessed and after hazard affect is mitigated to reach ALARP.
- n) Crossing design must consider minimum clear horizontal separation of 2.0m or 2 times the diameter of bore; whichever is more for parallel bore/drill under the existing HC pipeline.

 New underground crossing utility marker signs must be installed either side of the pipeline crossing and at corridor limits to assist future identification of the crossing after the completion of works.

# 7.8.2 Specific Trenchless Crossing Construction NOC Conditions

- a) Trenchless crossing (HDD & PJ, TB, and MT) works must be carried out by the certified Operator under the qualified Supervisor. Project consultant or Client representative must confirm the verification of qualification of Machine Operator and Supervisor. A copy of Project consultant or Client representative's confirmation must be available at site for the DUSUP site representative verification before commencement of the work.
- b) Refer to Trenchless Crossing NOC review Check list (Attachment 8), approved operators details shall be included in the checklist and completed checklist shall be uploaded in e-NOC by the DUSUP NOC processor.
- c) The supervisor and trenchless crossing equipment operator must attend DUSUP Pipeline Safety Training and carry valid Pipeline Safety Supervisor card from DUSUP during the work.
- d) A copy of maintenance history of equipment (not older than 6 months old) verified by the project consultant or clients representative shall be available on site for DUSUP representative checking.
- e) The specialist non-HDD trenchless crossing contractor must inspect and certify the preparation of the drive pit and receiving pit and a copy of the specialist signed inspection document must be provided to the DUSUP site representative before commencement of the work.
- f) Before commencement of the non-HDD crossing works, blinding, top elevations, railing top elevations and alignment monitoring system for PJ & TB or laser guidance system axis elevation for MT must be verified to ensure that the crossing levels matches with the approved drawing and the elevations checked must be recorded in the presence of DUSUP representative and a copy of the verified document must be submitted along with the as built submission.
- g) Elevation ground surface along the drilling route must be recorded before and after the drilling operation and a copy of elevation check must be submitted to DUSUP for record.
- h) Any settlement of ground that occurs due to the proposed trenchless crossing works must be repaired / rectified to the satisfaction of DUSUP at no cost to DUSUP.
- Any stoppages or abnormality found during the trenchless crossing must be brought to the notice of DUSUP site representative and must be recorded in the trenchless crossing log. Abnormality such as ground settlement during the crossing work and disproportionate soil recovery may require further assessment before proceeding with work.
- j) The drive and receiving pits for crossing work may be located outside the corridor, but to ensure the safety of personnel working within the drive and receiving pits, the works

within the drive and receiving pits must be covered under the project safety / permit system.

- k) Drive pit and receiving pit must be adequately barricaded with approved safety barriers with "deep excavation" warning and barricade flashing safety lights.
- The proposed trenchless crossing alignment must be maintained as per the approved drawing and any changes or deviation of works from the submitted drawings will require review and separate approval from DUSUP.
- m) Within 10.0 (ten) days of completion of the crossing works, contractor shall submit a post construction report along with a copy of drilling log and details of any problems encountered during the crossing activities and the measures that were taken to solve or mitigate any problems.

Note: As per standard RTA e-NOC requirement for NDRC works, all proposed trenchless crossing of HC pipelines must be supervised by RTA approved NDRC consultant.

# 7.8.3 Specific NOC Construction NOC Conditions for HDD Crossing

- a) Approved HDD route must be marked on the ground before commencement of drilling and shall be staked at the pipeline crossing location and at each drill rod intervals as shown on approved profile drawings in order to record the depth and elevations for logging in drill log and as built record.
- b) The existing ground / berm surface elevations at the proposed crossing locations 5.0 (five) meters either side of the crossings, each drill rod intervals and at the limits of DUSUP pipeline corridor along the HDD route must be recorded before commencement of drilling the presence of DUSUP site representative. Any changes in elevation of ground must be informed to the DUSUP site representative and the approved minimum vertical separation from the drill profile to the existing pipelines must be maintained.
- c) Whenever possible HDD should be planned such that back reaming and pulling the pipe / conduit is completed on the same day. If necessary, it is permissible to drill the pilot hole and pre-ream one day and complete both the final ream and the pullback on the following day.
- d) The contractor shall provide a forecast and report to DUSUP including; planned activities for next 2 (two) days, daily reports and logs of all HDD activities undertaken.
- e) Prior to the commencement of reaming activities, the contractor must furnish an as built plan and profile of the actual pilot drill crossing to confirm the installation is in compliance with the approved bore path drawings. Pilot hole alignment shall require DUSUP representatives acceptance prior to reaming and pipe/conduit installation.
- f) The operator must perform HDD operations under the constant direction of a drilling supervisor who shall remain on site and be the responsible person in charge throughout the drilling operation.
- g) HDD operator must have a clear line of sight between the entry and exit points.

- h) HDD entry and exit points shall not deviate from the approved drawing, nor shall the drill path deviate from the staked bore path centreline. Any HDD installation that deviates from an approved path may be rejected by DUSUP without any liability and cost to DUSUP.
- i) Reasonable limits shall be placed on maximum fluid pressures in the annular space of the bore to prevent inadvertent drilling fluid returns to the ground surface, particularly at the observation pit(s).
- j) In the event that the contractor must abandon the drill hole before completion of the crossing, the contractor shall seal the borehole with neat cement grout starting at the low point or end of the drill hole.
- k) Drilling fluids / cuttings that may by means of hydraulic fracture (hydro-frac or frac-out) collect into the observation pit(s) shall be removed and disposed of immediately such that the safe passage of both pilot and reaming activities can be continuously witnessed.
- Actual drilling profile information must be updated on approved profile drawing in the presence of DUSUP pipeline representative and a copy of same must be submitted to DUSUP pipeline representative at site.
- m) The drill string shall be pulled back to the drill rig anytime the ability to steer / track is lost, including when the Walkover transmitter batteries fail or the drill string breaks.
- n) While drilling, the bore hole assembly (BHA) shall be tracked at least every full length of drill rod, more frequently depending on existing underground infrastructure congestion in the area. Each tracking location shall be marked and progress checked to ensure the bore is maintaining the approved / design bore path.
- Depth, pitch / inclination and roll / azimuth readings of the BHA shall be taken after drilling every single joint; such readings being required to calculate the horizontal and vertical coordinates of the BHA as it progresses.
- p) Should any corrections be made to remain on the design drill path then such shall also be recorded on the Locating / Steering Record Pro-forma
- q) Drilling operations shall cease if an unidentifiable, abnormal or unanticipated resistance or sudden movement of the drill string is encountered. Further, if other conditions develop (lightning, etc.) that could affect the safe operation of the equipment and personnel, drilling operations shall cease. Works may resume only after the source of the disturbance has been identified and / or eliminated.
- r) Following completion of a HDD near an existing hydrocarbon pipelines, if any abnormality found in the observation pit, DUSUP may require the contractor expose the pipeline(s) and perform a coating defect survey and or a leak survey.
- s) The contractor must assist DUSUP to carry out a post-pulled conduit and pipe installation (x-y-z) survey of as built using gyroscope mapping tool; which includes contractor's assistance in providing accurate survey (x-y-z) tool entry and exit coordinates and elevations.

t) The contractor shall allow any DUSUP or DUSUP appointed representative(s) to perform inspection on contractors QA/QC program and drilling operations related to the proposed HDD works.

# 7.9 General Design Requirements - OHL Crossing

- a) Design of minimum vertical clearance at crossing of DUSUP corridor /pipeline route must allow for unrestricted passage of regular DUSUP patrol and operation of maintenance equipment/excavation plant up to 5.5 meter high under the OHL crossing.
- b) For minimum vertical and horizontal clearances refer to DUSUP drawing reference 900-08-059 (Attachment- 7).
- c) No OHL support poles of any type (e.g. wood, concrete or metal) are permitted within the corridor or within the minimum separation distance from the pipeline as mentioned in DUSUP Standard drawing 900-08-059 (Attachment- 7).
- d) To mitigate AC interference from high voltage power cable , where possible cable shall cross DUSUP/DPE's HC pipeline at an angle of 90 degrees or as close to 90 degrees as practicable.
- e) An interference study of the H.V. Cables on existing pipeline(s) must be conducted by the initiating party to determine the possible impact on the existing hydrocarbon pipelines. Study shall include crossing of corridor/pipeline and parallel installation within DUSUP NOC Zone (i.e., 300m from the existing HC pipeline or corridor for parallel OHL Installation). As a minimum the study should consider the following;
  - Danger to people who come in direct contact or contact through conductive parts with the metallic pipeline or the connected equipment
  - Damage of the pipeline or to the connected equipment; (i.e. AC corrosion)
  - Disturbance of electrical/electronic equipment connected to the pipeline.
- f) A report supported with calculations, proving that any electrical induced effects / issues related to the existing pipeline(s) have been satisfactorily considered, together with detail of any actions necessary to mitigate the effects must be submitted for DUSUP review. The report shall consider all aspects of electrical conditions on the pipeline (coating, CP, insulating joints, etc.), safety of the public, DUSUP personnel, and include sections (as a minimum) as follows:
  - Effect of "steady state" condition.
  - Effect of switching and/or other transient conditions with the frequency and duration.
  - Effect of peak load conditions with the frequency and duration.
  - Effect of extreme load (phase) imbalance, or phase to earth faults with the frequency and duration.
  - Influence of earthing system in that it shall not load or de-stabilize the pipeline CP system.

Note: Internationally accepted codes / practices for performing these calculations can be advised upon request

g) The design and installation of the OHL shall ensure that the levels of AC voltage do not cause AC corrosion on DUSUP pipeline. Corrosion likelihood may be negligible if

alternating current density referred to a 1 cm<sup>2</sup> bare surface (e.g. an external test coupon/probe) is lower than 30 A/m<sup>2</sup>. If current density is greater than 30 A/m<sup>2</sup>, monitoring/mitigation measures should be installed to limit the impact of AC corrosion.

- h) With respect to personnel safety, the design and installation of the OHL shall ensure that the AC touch voltage on the pipeline is kept below 15V.
- i) The calculation or mathematical modelling provided within the report shall be conservatively based, transparent and detail as a minimum the following:
  - Parallel length & separation distance of cable to pipeline/crossing angle to pipeline.
  - Fault current.
  - Location and design of earthing points.
  - Cable specification.
  - Soil Resistivity
  - the current flowing in the AC power line
  - the configuration of AC power line phase conductors
  - the voltage the AC power line system
- j) DUSUP reserve the right to have an independent expert review of any submission for completeness & accuracy.

#### 7.10 Construction NOC Requirements - OHL Crossing

- a) Approved AC mitigation measures must be implemented before commissioning of the OHL at contractor's cost and to the satisfaction of DUSUP.
- b) AC mitigation works may require separate hot work permit from DUSUP. The contractor must ensure that DUSUP trained Permit holder is available for the execution of work.
- c) Installation of approved monitoring/mitigation measures shall be verified and tested at site to confirm and/or determine any extent of AC influence on the pipeline once the electrical cabling has been installed. This may include the following:
  - Field verification of test procedure used.
  - Electrical measurement of induced AC potentials between the pipeline and ground.
  - Electrical measurement of induced AC current on the pipeline. Note that the current density can only be accurately estimated by means of installed coupons or probes.
  - Calculation of the potentials and currents to which the pipeline may be subjected under steady state and fault conditions.
- d) Permanent warning boards indicating the presence of overhead transmission lines and their height must be installed on the corridor at either side of the crossing at a distance of 20 meters or as approved by DUSUP.

# 8 UTILITIES PARALELL TO DUSUP PIPELINE/CORRIDOR

a) Typically no utilities other than HC pipelines are permitted within 10 meters of existing HC pipelines. However other utility corridor may exist within 10 meters of parallel distance from the existing HC pipeline/DUSUP corridor and "DUSUP No Go Zone"; in such cases design and construction of other utilities require specific technical review and shall be risk assessed and accepted only after hazard affect is mitigated to reach ALARP. b) Existing DUSUP corridor fence in the proximity of proposed utility must be protected during the construction to the satisfaction of DUSUP. Any damage to the existing fence must be rectified or replaced as per DUSUP standard fence drawing.

# 9 HOT WORK

- a) 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).
- b) All permit designated personnel shall be trained in relevant DPE trainings.

# **10 DUSUP NOC CLOSEOUT**

All NOC issued for the work within DUSUP corridor, "No Go Zone" and Utilities constructed close proximity of DUSUP corridor limit/fence must be formally closed as described in DUSUP NOC Standard Conditions.

Any intrusive work such as Trial Pit on existing HC pipeline, excavation parallel to and within 5.0M of DUSUP corridor fence or property shall be field verified by Pipeline Representative during the execution of work and at the completion such work, to ensure that necessary reinstatement work is completed as specified in NOC and no damage incurred to DUSUP property from the work.

For DUSUP NOC Close-Out Requirements refer to:

DUSUP NOC Standard Conditions - DP-OPSON-0056

# 11 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:

Title	Classification
DUSUP Guidelines for Trial Pit	Public
DUSUP Guidelines for Road & Rail Infrastructure Crossing	Public
DUSUP Guidelines for Road & Rail Infrastructure Parallel to Pipeline	Public
DUSUP Guidelines for Utilities Crossing Existing Pipeline	Public
DUSUP Guideline for Structures Close to DUSUP Corridor	Public
DUSUP Guidelines for Dewatering Works	Public
DUSUP Guidelines for Hydrocarbon Pipeline Integrity Management	Public
DUSUP Guidelines for NOC Management and Work Supervision	Internal
DUSUP Guidelines for Hydrocarbon Pipeline Patrolling	Internal
DUSUP Guidelines for Hydrocarbon Pipeline Emergency Management	Internal
DUSUP Guidelines for Land Use Planning	Internal

# LIST OF ATTACHMENTS

# **Attachment 1- Cable Crossing Above**



# **Attachment 2- Cable Crossing Below**



# Attachment 3 - Water/Drainage Line Crossing Above



# Attachment 4 - Water/Drainage Line Crossing Below



#### Γ WIDTH = PIPE DIAMETER + 600 (MINIMUM) PIPELINE MARKER (REFER NOTE 5) TABLE 1 : MAXIMUM SPAN FOR PIPE SUPPORT EXISTING GAS/OIL PIPELINE LIFTING HOOK -LOCATION (TYP) 300 S. NO. PIPELINE SPAN LIMIT (M) 16" HP Gas Pipeline (MARGHAM-DUGAS) 14.0 20\* HP Gas Pipeline (MARGHAM-GCS) 16.0 \_ \_ 200 36" HP Gas Pipeline (MARGHAM-GCS) 17.0 16\* Condensate Pipeline 13.0 1 В В 10" Cond 11.0 5 sate Pipelin Δ GAS/OIL PIPELINE Δ 00 6 24" HP Gas Pipeline (GCS-SHARJAH) 11.0 7 36\* DEWA-H Gas Pipeline 20.0 C 8 20" DPE Pipeline (GCS-DUGAS) 18.0 9 20" LP DUBAL Gas Pipeline 17.0 A٨ 10 24" LNG Pipe 17.0 00 UNIN 17.0 DETAIL 1 : IDENTIFICATION SLAB PLAN 11 24" DUSUP RM Gas Pipeline ⊿ A 12 48" Hassyan Gas Pipeline 17.0 13 48" Gas Ring Main 1 17.0 Below PL.dwg 14 48" Gas Ring Main 2 20.0 $\boxtimes$ MESH 10@200 / A393 100 (TYP.) Î PLAN LIFTING HOOK (NOTE 7) 8 8 Crossing Ŧ REINSTATE THE PIPELINE BERM TO THE ORIGINAL CONDITION 7D HC PL SECTION B-B SCALE=1:20 -80 ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED. SUITABLE CATHODIC PROTECTION BONDING AND TEST POINT SHALL BE PROVIDED BETWEEN CROSSING PIPELINES. IN SOME CASES, THE NEW PIPELINE MAY REQUIRE ELECTRICAL. SECTIONALIZATION. CATHODIC PROTECTION DEFILIS ARE COVERED SEPARATELY. REFER TABLE 1 FOR MAXIMUM SUPPORT SPAN FOR EXPOSED PIPELINES. FOR NEW HO PIPELINE CROSSING EXISTING HYDROCARBON PIPELINE, REINFORCED CONCRETE SLAS OF 150 MM THICK MUST BE INSTALLED BETWEEN THE NEW PIPELINE AT THE CROSSING LOCATION AND THE EXISTING PIPELINE. CROSENET SLAS CAN BE IN SMALLER SECTIONS. AND LOCATION AND THE EXISTING PIPELINE, CROSENT SPAN FOR EXPOSED DIVING AND AT CONTS OF APPROVED BITUMEN EMILISION PANT. PIPELINE CONTRACTOR SHALL PREAME SEMANTING CONTOR WITH MAINIMUM TWO CONTS OF APPROVED BITUMEN EMILISION PANT. HE EDNOS WITHIN THE CORRIDOR. THE CONTRACTOR SHALL PREAME SEMANTE JOB SPECIFIC SHOP DRAINING USING THIS STANDARD DETALS FOR DUSUP APPROVAL. SMM DIA. GLI LIFING HOOK SHALL BE WRAPPED WITH DENSO TAPE AND COVERED WITH CEMENT MORTAR BEFORE BITUMEN CANLIE WRAPPED WITH DENSO TAPE AND COVERED WITH CEMENT MORTAR BEFORE BITUMEN CANLIES WRAPPED WITH DENSO TAPE AND COVERED WITH CEMENT MORTAR BEFORE BITUMEN CONTING NOTES: OD+600 1. 2. OD REINSTATE EXISTIN SAND BED OF PIPELINE EXISTING GAS/OIL PIPELINE 5. IDENTIFICATION SLABS (GRADE C40) 6. S CIMI, 2022 8 PROPOSED GAS/OIL PIPELINE - General\08 January 26, : R: \900 -SECTION A-A SCALE=1:50 Location STANDARD DRAWING dusup HYDROCARBON PIPELINE CROSSING BELOW EXISTING PIPELINE (OPEN CUT) RS 1/ \*\*\* RRN Dubai Supply Authority AutoCAD®File Printed By BV CAD THE Name State Area Code Doc Code Strink Name Sheet of Sheets 900-DH-063-001-48 KF, CLOSSING 82:DW A3 AS SHOWN 9 0 0 8 0 6 2 0 0 1 0 0 1 0 26.01.20 Rev. No. First Issue

# **Attachment 5 - Hydrocarbon Pipeline Crossing Below**

# **Attachment 6 - HDD Profile Drawing Template**



#### **Attachment 7- Minimum Separation for OHL**



# **Attachment 8 - Trenchless Crossing NOC Review Checklist**

NOC Reference :		
Crossing Type		
Location:		
ITEM	CHECK	COMMENTS
Verified copy of Trial Pit details/copy of field survey record		
Cross section drawings & detailed drawings submitted For HDD Locating/Steering Record Proforma drawing(DUSUP Standard drawing)		
Detail of survey bench mark/s (for trial pit & construction, for HDD DUSUP post pull x-y-z survey)		
Crossing Coordinates(DLTM) and Elevations at top & bottom of pipeline(s), elevation of existing ground surface, top of berm & bottom of berm. Proposed clearance from bottom of gas pipeline to top of		
utility/sleeve/conduit depicted. 2.0m for diameters up to and including 1m and 2.0 times sleeve/casing size if greater than 1m diameter		
Observation Pit); Wireline & or Gyro Systems 5m(without Observation Pit)		
Distance between launch/receive pits to gas pipeline depicted. Minimum 15m from edge of pit(preferred 20m), unless deviation is assessed and approved.		
Job specific detailed method statement included		
Construction material and method of construction of launch/receive pits		
Dewatering details and method statement included		
Method of monitoring line & level during machine operation stated		
Company Approved by RTA(Specialist Contractors shall show evidence of "qualification")		
Project Consultants confirmation for HDD Contractor personnel "Proof of Training" (a current VOC certificate and card) by a "recognized" Trenchless training organization/Institute or manufacturer of machine is available( for Supervisor, Operator, Locator Man, Guidance Engineer for Gyro system) and Locator current calibration certification		
Maintenance history of equipment to be sued on site (not older than 6 months old)		
Main and HDD Contractor quality management system.		
Contingency plan in case of equipment failure		