SOHAR Specifications and Manual for Utility Crossings

Document No: SIPC-F 7.1-AM-PRC-027
Revision: 1
Date: January 2024

DOCUMENT INFORMATION

DOCUMENT TITLE	SOHAR Specifications and Manual for Utility Crossings
REVISION NUMBER	1.0
DOCUMENT NUMBER	SIPC-F 7.1-AM-PRC-027
REVIEW FREQUENCY	When Changes Occur

DOCUMENT AUTHORIZATION

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DOCUMENT REVISION HISTORY

REVISION NUMBER	REVISION DATE	REVISION DESCRIPTION
1.0	January 2024	First Version

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DISCLAIMER

Compliance with these guidelines will not relieve the Applicant, their contractors and the consultants of any of their legal and contractual obligations. SOHAR acts as a mediator and port authority without any responsibility on other parties' actions.

Any plans or other information provided by SOHAR must be used as a guide only. Plans (including the location of pipes and other assets) are approximate only and it is the Applicant and its contractor's responsibility to identify the exact location of existing assets before commencing any work. SOHAR does not warrant or make any representation as to the accuracy, completeness, reliability, currency, quality or fitness for purpose of any plans or other information (including, but not limited to, the accuracy of the scale of, or the location of, anything shown on any plan or diagram).

Abbreviations and Definitions

Abbreviations	
EHV	Extra High Voltage
ELV	Extra Low Voltage
GIS	Geographic Information System
GRP	Glass Reinforced Polymer
kV	Kilo Volts
LV	Low Voltage
m	Meter
mm	Millimeter
NC	Notification Certificate
NOC	No Objection Certificate
OHL	Overhead line
PTW	Permit to Work
PVC	Polyvinyl Chloride
ROW	Right of Way
RSJ	Rolled Steel Joist
RTR	Reinforced Thermosetting Resin
SIP	Sohar Industrial Port
SIPC	Sohar Industrial Port Company
SOHAR	Sohar Port and Freezone
ToR	Top of Rail

Term	Definition
Applicant	Any legal entity which intends to cross any existing utility line/corridor and applies to SOHAR for this work.
Brittle Pipe	Material of the pipe that suddenly breaks, instead of deforming or straining under load, impact force, or shock. Brittle materials absorb less energy before breaking or fracturing, despite the material having a high strength.
Clearance	Clear distance between utility corridors to plot/line or between adjacent utility building boundary

Term	Definition
Common Area	All the areas in SOHAR Port (SP), Freezone, and Public Corridor other than the plots
Common Area Work Permit	Means a permit, issued by SOHAR to a Tenant, to execute Work in common areas, or work in a plot which may affect the Common areas
Competent Person	A person who has, through a combination of training, education and experience, acquired knowledge and skills enabling that person to correctly perform a specific task and possess valid certifications to do so.
Consultant	Physical or legal person in charge of providing consulting advice during design or construction, or both and licensed to practice consulting in Sultanate of Oman in accordance with the applicable legislation.
Contractor	Physical or legal person in charge of carrying out construction works and licensed to practice contracting activities in Sultanate of Oman in accordance with the applicable legislation.
Critical Project	A project identified by SOHAR whose approval, consideration, permitting, and implementation shall be expedited and streamlined.
Guideline	Guidelines are minimum requirements and are considered preferred in typical situations.
Horizontal Clearance	The horizontal width that is maintained free of obstacles.
International Standards	Published, governed, and followed locally by the COMPANY. Covers oil and gas/Utility applications owned by Public / Private Sectors, referred for capturing the minimum clearance/ distance requirements between existing and newly proposed pipelines/ cables or utilities at all crossing locations.
Pipeline	Means all pipes used for the transport of fixed substances, liquids and gases as well as all cables, in each case located in or above the ground in the Common areas, and all the ancillary or related installation as with the Common areas.
Pipeline Corridor	This means a reserved corridor in the common areas in which one or more pipelines are located or proposed to be located.
Plot	This means an area within the SOHAR area with respect to which SOHAR has entered into a Provisional plot agreement, a Sub-usufruct agreement, or a License Agreement.
Plot Work Permit	This means a permit, issued once by SOHAR to a tenant, allowing such a Tenant to start work with in a plot area.
Principal/ Company/ Owner	SOHAR

Term	Definition
Right-of-Way (RoW)	Publicly operated corridor (between plot boundaries) for transport of all modes and utilities; acquired, dedicated, or reserved for construction, operation, and maintenance of a road or street.
Service Corridors	A reserved corridor owned by SOHAR in the common area in which Pipelines/ Cables or Other services are located or proposed to be located.
Special Transportation Permit	A permit, issued by the Permit Authority to execute the transportation of a load through the Common Areas, not satisfying applicable road design criteria.
Tasheel	The electronic permits application system, which is accessible through web site, which different types of permits can apply through
Tenant	This means any entity with which SOHAR has entered into a Provisional plot plan Agreement, a sub-usufruct agreement, or a License Agreement.
Utility	A commodity or service, such as electricity, water, telecommunication, gas, oil, etc. is provided by a utility provider or other parties.
Utility Corridor	Space within the ROW allocated for a specific service installation including pipe, cable, and ducts.
Utility Provider	An organization, subject to government regulations, provides an essential commodity or service, such as water, electricity, telecommunication, gas, oil, etc.
Vertical Clearance	The vertical width/ space that is maintained between existing utilities while crossing.

1 | INTRODUCTION

With growing business activity in SOHAR, it is foreseen that there will be a lot of requirements to cross the existing utilities (belonging to various authorities and organizations) such as Telecommunication, Gas, Petroleum, Wet services etc.

Need to cross any existing utility may arise from any works that causes changes to the ground such as, but not limited to, the construction of transport infrastructure, or installing of wet and dry buried services (potable and recycled water pipelines, wastewater and drainage systems, district cooling pipes, oil and gas pipelines, underground electrical cables, fiber optical cables, etc.), changing of the finishes above existing SOHAR assets (by pavement, asphalt, concrete) or railways.

SOHAR is the sole owner of the Right-of-ways (ROW) where these utilities are housed. Crossing of these utilities can cause damage to SOHAR or other tenant's/ service provider's assets, which can be expensive, and highly disruptive to the community as well as hazardous to Applicant's employees and the general public. Damage can include physical damage such as rupturing of an asset, as well as preventing or restricting access for operation and maintenance.

The objective of the Sohar Specifications and Manual for Utility Crossings is to provide minimum safety, technical and legal requirements which need to be followed while crossing the utilities in the SOHAR utility corridors.

It also highlights the permitting process including Notification Certificate (NC) requirements that will be centrally controlled by SOHAR.

This manual is prepared after a careful study of various utilities and corridor crossing standards being practiced in the region as well as benchmarking against the practices followed by other port authorities and oil and gas companies around the world.

It should be noted that, this manual does not cover crossing standards for larger infrastructure such as seawater return canal, surface drainage system, flood protection channels, and extra high (220/400kV) voltage power lines. Applicant shall conduct a specialized study for crossing such facilities.

2 | TECHNICAL REQUIREMENTS

2.1 Utility Crossings

2.1.1 Wet Utility

Wet utilities are piped networks that conveys water or other liquids from source to the point of usage or point of discharge. In general, potable water, sanitary sewer, storm sewer, processed water, and irrigation water networks are referred as wet utilities.

The sanitary sewer system mainly relies on gravity or occasionally a pressurized force main that transport sewage from the buildings to an off-site treatment facility. Storm drain is also relying on gravity to collect and safely discharge the stormwater. Potable, processed, and irrigation water networks are pressurized lines to transmit and distribute water to the various facilities and buildings.

2.1.1.1 Sewer and Potable Water Pipelines Crossings

Sewers that are parallel to potable water lines shall be separated from such lines by a minimum distance of 3 m (subject to availability of the corridor and SOHAR's approval); and shall be located below the potable water lines as shown in Figure 2–1.

Sewer crossing a potable water line shall be oriented such that the sewer crosses under the potable water line with a minimum vertical surface clearance of 0.30 m as shown in Figure 2–2.

Any one of the following requirements must apply to sewer piping that, due to existing conditions must crossover a potable water line regardless of vertical separation; and must have less than 0.30 m clear separation even though running beneath the potable water line.

The sewer piping crossing a potable water line shall be one continuous joint of pipe and both ends of that sewer pipe shall be at least 3 meters (subject to availability of the corridor and SOHAR's approval) beyond the point of crossing.

The sewer piping shall be encased in a Concrete, Steel, PVC or RTR pipe for a minimum distance of 3 m (subject to availability of the corridor and SOHAR's approval) in both directions beyond the crossing point. The concrete sheath shall be at least 0.15 m thick.

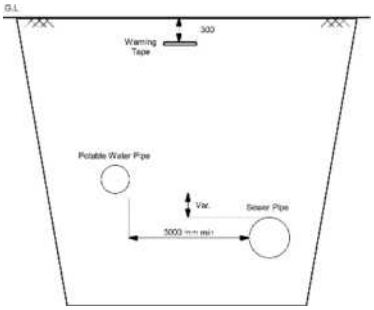


Figure 2–1. Horizontal Clearance for sewer pipeline running below the potable water pipe

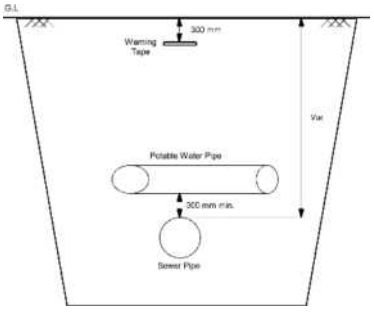


Figure 2–2. Vertical Clearance for sewer pipeline crossing below the potable water pipe.

2.1.2 Dry Utility

Dry utilities are defined as the infrastructure required to service residential, industrial, or commercial developments that does not deal with the transport of any liquid, for example, electric power and telecom cables etc.

2.1.2.1 Telecommunication and Power

Separations between buried power facilities and metallic member telecommunication cables shall not be less than 300 mm as shown in Figure 2-3. In areas where this is not possible, 75 mm of concrete or 100 mm of solid masonry is required.

Where the power exposure at the crossing is greater than 15 kV phase to phase, buried metallic member telecommunication cables shall be placed inside a buried conduit (Minimum size 10mm). Each end of the conduit shall extend a minimum distance of 1.5 meters from the power cable.

When a metallic member telecommunications cable is buried under aerial power lines having a phase-to-phase voltage of more than 15 kV, the cable must be placed in a buried conduit under the aerial power line. The conduit shall extend for 2-times the power line height on each end of the crossing.

Telecommunication cables shall not be in the same trench with a power cable having a phase-to-ground voltage of more than 15 kV. This is required to avoid electromagnetic interference and signal distortion.

Separation between subsurface facilities or structures (water, sewer, etc.) and buried telecommunication cables when paralleling shall be 300 mm as shown in Figure below.

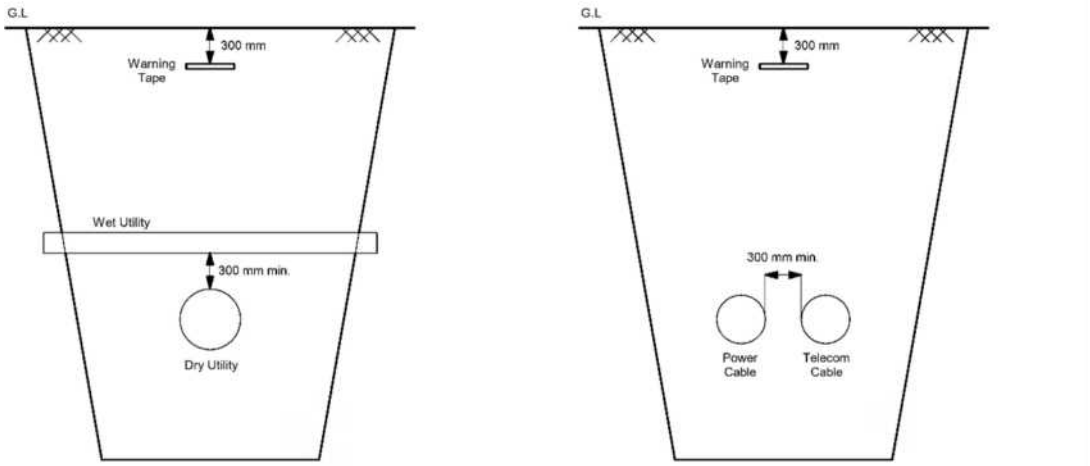


Figure 2–3. Vertical and Horizontal Clearance for dry services

2.1.2.2 Crossing Below the Existing Lines

The new pipelines shall pass below the existing buried facilities such as pipelines, cables, and other utilities. The minimum clearance required between new pipeline and the existing facility shall be 1.0m as shown in Figure 2-4, and as provided in the tables in Section 2.2 as applicable. If minimum clearance cannot be achieved, an alternative method such as concrete encasement or other suitable material as per design requirements, shall be used with SOHAR approval.

Whatever buried services in the ROW are to be crossed by a new pipeline, the Applicant and its contractor shall safeguard the buried facilities and the required protecting precaution shall be executed as per the design.

The Applicant shall submit the proposed crossing details to SOHAR as part of the permitting process along with NC.

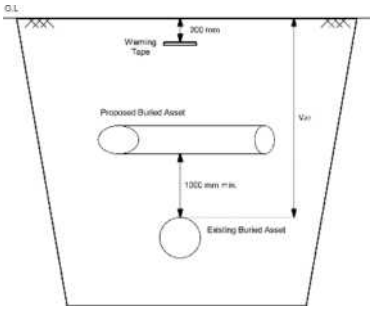


Figure 2–4. Minimum Clearance between existing and proposed buried asset.

2.2 Utility Corridor Crossings

Below tables presents the clearance details for various utilities. Local standards shall prevail in case of any discrepancy. The actual value shall depend on the available corridor and subject to SOHAR's approval.

Potable Water vs other utilities (HC - Horizontal Clearance in meter, VC - Vertical Clearance in meter)																					
	Potable Water	Potable water pipe		Sanitary sewer		Storm sewer		Gas		Oil		Power				Telecom		Storm channel		Road*	
												LV-11KV-33KV		132KV		all sizes		all widths		all widths	
S.No	sizes in (mm)	HC	VC	HC	VC	HC	VC	HC	VC	HC	VC	HC	VC	HC	VC	HC	VC	HC min	VC min	HC min	VC min
1	<=200	1.0	0.3	3.0	0.45	3.0	0.4	3.0	1.5	3.0	0.75	1.5	1.0	2.5	1.5	3.0	1.5	1.5	1.5	1.5	2.0
2	225																				
3	250																				
4	280																				
5	315											2.0									
6	355																				
7	400										1.3										
8	450			3.5	0.75	3.5		4.0		3.5											
9	500																				
10	560										1.5										
11	630											3.0		3.0	2.0						
12	800									4.0											
13	>800			4.0	1.0	4.0		4.5	2.0	4.5	1.7	3.5	1.5	3.5							

Table 2–1. Clearance details for potable water crossing other utilities.

** VC for roads shall be determined as per vehicle loading*

Sanitary Sewer vs other utilities (HC - Horizontal Clearance in meter, VC - Vertical Clearance in meter)																					
	Sanitary sewer	Sanitary sewer		Potable water pipe		Storm sewer		Gas		Oil		Power				Telecom		Storm channel		Road*	
												LV-11KV-33KV		132KV		all sizes		all widths		all widths	
S.No	sizes in (mm)	HC	VC	HC	VC	HC	VC	HC	VC	HC	VC	HC	VC	HC	VC	HC	VC	HC min	VC min	HC min	VC min
1	<=160	1.0	0.45	3.0	0.45	1.5	0.4	3.0	1.5	3.0	0.75	1.5	1.0	2.5	1.5	3.0	1.5	1.5	1.5	1.5	2.0
2	200																				
3	250																				
4	280					2.0						2.0									
5	315										1.3										
6	355									3.5		3.0		3.5							
7	400																				
8	450 to	1.5	0.75	3.5	0.75	2.5	0.75	4.0													
9	>800	2.0	1.0	4.0	1.0	3.0	1.0	4.5	2.0		1.7	3.5	1.5	4.0	2.0						

Table 2–2. Clearance details for sanitary sewer

** VC for roads shall be determined as per vehicle loading*

Storm sewer vs other utilities (HC - Horizontal Clearance in meter, VC - Vertical Clearance in meter)																					
	Storm sewer	Storm sewer		Sanitary sewer		Potable water pipe		Gas		Oil		Power				Telecom		Storm channel		Road*	
												LV-11KV-33KV		132KV		all sizes		all widths		all widths	
S.No	sizes in (mm)	HC	VC	HC	VC	HC	VC	HC	VC	HC	VC	HC	VC	HC	VC	HC	VC	HC min	VC min	HC min	VC min
1	<=160	1.5	0.4	1.0	0.45	3.0	0.45	3.0	1.5	3.0	0.75	1.5	1.0	2.5	1.5	3.0	1.5	1.5	1.5	1.5	2.0
2	200																				
3	250																				
4	280	2.0										2.0									
5	315										1.3										
6	355									3.5		3.0		3.5							
7	400																				
8	450 to 800	2.5	0.75	1.5	0.75	3.5	0.75	4.0													
9	>800	3.0	1.0	2.0	1.0	4.0	1.0	4.5	2.0		1.7	3.5	1.5	4.0	2.0						

Table 2–3. Clearance details for Storm water pipelines

** VC for roads shall be determined as per vehicle loading*

Oil pipeline vs other utilities (HC - Horizontal Clearance in meter, VC - Vertical Clearance in meter)																					
	Oil pipeline	Oil		Gas		Storm sewer		Sanitary sewer		Potable water pipe		Power				Telecom		Storm channel		Road*	
												LV-11KV-33KV		132KV		all sizes		all widths		all widths	
S.No	sizes in (mm)	HC	VC	HC	VC	HC	VC	HC	VC	HC	VC	HC	VC	HC	VC	HC	VC	HC min	VC min	HC min	VC min
1	<=160	3.0	1.00	3.0	1.0	varies refer to storm sewer table	varies refer to storm sewer table	varies refer to sanitary sewer table	varies refer to sanitary sewer table	varies refer to portable water table	varies refer to portable water table	3.0	1.0	3.5	1.5	3.0	1.5	1.5	1.5	1.5	2.0
2	200																				
3	250																				
4	280	3.5		3.5								3.5		4.0							
5	315																				
6	355																				
7	400		1.5																		
8	450 to 800	4.0		4.0								4.0		4.5							
9	>800	4.5	2.0	4.5	1.5							4.5	1.5	5.0	2.0						

Table 2–4. Clearance details for Oil Pipeline

** VC for roads shall be determined as per vehicle loading*

Gas pipeline vs other utilities (HC - Horizontal Clearance in meter, VC - Vertical Clearance in meter)																					
	Gas pipeline	Gas		Storm sewer		Sanitary sewer		Potable water pipe		Oil		Power				Telecom		Storm channel		Road*	
												LV-11KV-33KV		132KV		all sizes		all widths		all widths	
S.No	sizes in (mm)	HC	VC	HC	VC	HC	VC	HC	VC	HC	VC	HC	VC	HC	VC	HC	VC	HC min	VC min	HC min	VC min
1	<=160	3.0	1.0	varies refer to storm sewer table	varies refer to storm sewer table	varies refer to sanitary sewer table	varies refer to sanitary sewer table	varies refer to portable water table	varies refer to portable water table	3.0	1.0	3.0	1.0	3.5	1.5	3.0	1.5	1.5	1.5	1.5	2.0
2	200																				
3	250																				
4	280	3.5								3.5		3.5		4.0							
5	315																				
6	355																				
7	400																				
8	450 to 800	4.0								4.0	1.5	4.0		4.5							
9	>800	4.5	2.0							4.5	2.0	4.5	1.5	5.0	2.0						

Table 2–5. Clearance details for Gas Pipeline crossing other utilities.

** VC for roads shall be determined as per vehicle loading*

Power & Telecom lines vs other utilities (HC - Horizontal Clearance in meter, VC - Vertical Clearance in meter)																							
	Power & Tele-com	Power								Oil		Gas		Storm sewer		Sanitary sewer		Portable water pipe		Telecom		Storm channel		Road*	
		LV		11KV		33KV		132KV												all sizes		all widths		all widths	
S.No	sizes in (mm)	HC	VC	HC	VC	HC	VC	HC	VC	HC	VC	HC	VC	HC	VC	HC	VC	HC	VC	HC	VC	HC min	VC min	HC min	VC min
1	LV	0.4	0.4	0.45	0.45	0.5	0.5	1.0	1.0	varies refer to oil pipeline table	varies refer to oil pipeline table	varies refer to gas pipeline table	varies refer to gas pipeline table	varies refer to storm sewer table	varies refer to storm sewer table	varies refer to sanitary sewer table	varies refer to sanitary sewer table	varies refer to portable water table	varies refer to portable water table	0.3	0.3	1.5	1.5	1.5	2.0
2	11	0.45	0.45	0.5	0.5	0.55	0.55	1.2	1.2											0.4	0.4				
3	33	0.5	0.5	0.55	0.55	0.6	0.6	1.5	1.5											0.5	0.5				
4	132	1.0	1.0	1.2	1.2	1.5	1.5	2.0	2.0											0.6	0.6				
7	Telecom all sizes	0.3	0.3	0.4	0.4	0.5	0.5	0.6	0.6	3.0	1.5	3.0	1.5	3.0	1.5	3.0	1.5	3.0	1.5	0.5	0.5	3.0	1.5	1.5	2.0

Table 2–6. Clearance details for Power and Telecom lines

** VC for roads shall be determined as per vehicle loading*

2.3 Railway Crossing Specifications

The Applicant shall conduct a service search to identify any existing services that may be affected by the proposed railway crossing installation. The full survey shall be undertaken to ascertain the existence, location and nature of services.

The Applicant shall contact all service/utility providers and obtain As-Built information. All utility locations, depth, type, etc. must be recorded.

Should any unknown unexpected service be discovered or uncovered, work in the vicinity of the service shall stop, ownership established, and both owner of the railways and the owner of the service informed.

2.3.1 Crossing Methods

The installation of pipes and cables can be done by using 'open cut', 'jacking', 'augured', 'directional-bored' or 'tunnelling' – methods as practicable. For utility crossings the Applicant shall propose the construction method. The method of construction should be chosen following the hierarchy:

- All rail crossing executed prior the construction of a railway may be crossed by open cut and sleeving methods.
- Existing railway lines may be crossed only by trenchless crossing methods such as micro tunnelling or horizontal directional drilling methods as approved by Rail Authority. Any settlements have to be assessed and require approval.

- Frame structures, box culverts or tunnels may be used for excessive loading conditions as approved by Rail Authority.
- Depending on the particular site conditions, alternative methods for installing underground services under tracks within the rail corridor such as cased auger boring, laser-guided micro tunneling, pipe jacking, directional drilling tunnel boring and tunneling can be employed subject to approval from the Rail authority.
- Jetting under the railway will not be permitted. This does not prohibit the use of boring or driving techniques which use water to only remove cuttings and does not permit the water to remove material outside the designed bore dimensions. In all cases where water is used, the discharge shall be captured and disposed of or otherwise controlled such as not to violate the Sultanate of Oman's water quality regulations.
- For all boring and jacking installations under main and passing tracks, a geotechnical study will need to be performed to determine the presence of granular material and/or high-water table elevation, at the sole expense of the Applicant.
- When unstable soil conditions exist, boring or tunnelling operations shall be conducted in such a manner as not to be detrimental to the live railroad being crossed.
- Jacking/boring pits shall be located at minimum of ten (10) meters from the nearest bridge, culvert, track switch, building or other major structure.
- If excessive voids or too large a bored hole is produced during casing or pipeline installations, or if it is necessary to abandon a bored or tunneled hole, prompt remedial action should be taken on urgent basis.
- All voids or abandoned holes caused by any kind of boring or jacking are to be filled by pressure grouting as advised by current standards, codes, regulations. Installation procedures and equipment details shall be submitted to Rail Authority for review and approval.

2.3.2 Crossing Location

2.3.2.1 General

Utilities shall cross the railway corridor at locations as described within this document, and at locations where the impact on the railway line, its neighboring areas and the environment is considered as minimal after detailed review and evaluation of the proposed design/work. Where other conditions warrant the location of the utility installation it shall be reviewed jointly with the owner of these conditions and Railway Authority.

2.3.2.2 Utilities on Bridges and Structures

Utilities shall not be located on any bridge or structure carrying Rail tracks. Utilities on Rail bridges and structures shall only be considered over the Rail Protection Zone when underground installation is not feasible. When no other alternative exists, utilities shall be permitted as exception provided the following criteria are met:

- Utilities shall be located to minimize the possibility of damage from railroad equipment, vehicles, vandalism, and other causes. They shall be encased as directed by Rail Authority.
- Absolute minimum dimensions of carrier pipe, casing pipe, cables and any other structures/fixings/supports and related parts shall not be used to compromise health, safety and/or environmental rules and regulations and/or structural integrity.
- Maximum safety clearances shall be used as reasonably practical.
- Complete structural plans and design calculations for the structure and foundations, signed and sealed by a professional engineer, independently checked shall be submitted with the application.

A separation shall be provided which prevents access by unauthorized personnel as directed by Rail Authority.

All related costs will be to the expense of the Applicant.

2.3.3 Depth of Installation

Casing pipes shall be in general follow the four (4) criteria's (it is the Applicant's responsibility to prove compliance and provide written confirmation), unless otherwise directed by Rail Authority:

- Positioned a minimum of 2.00 m below track (from ToR to top of casing pipe) from the closes point or double diameter of pipe (whichever is larger)
- Extend as a minimum outside the railway fence line + 5.00 m (Critical Zone)
- Cross below any railway duct bank
- Compliance with limits on the attached 'Load Diagram' + static calculation

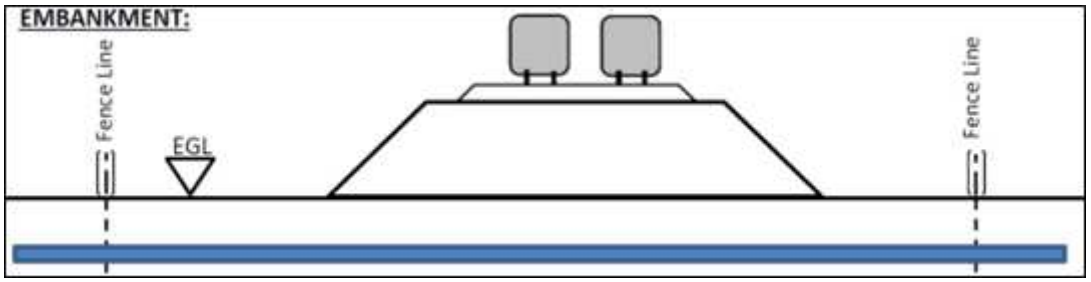


Figure 2–5. Casing Pipe under an Embankment

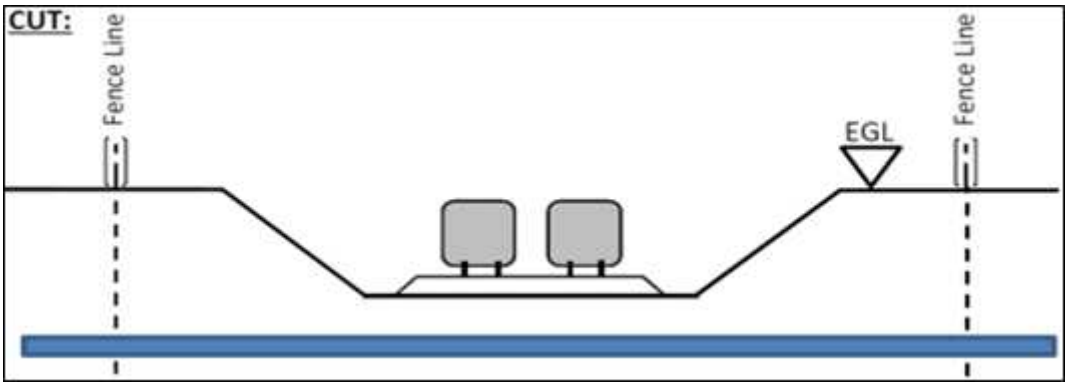


Figure 2–6. Crossing Pipe Under Cut

Where less than the minimum cover is made necessary to avoid obstacles, the utility shall either be rerouted or protected with a casing, concrete slab or other method acceptable to Rail Authority.

The general installation depth and requirements as per industry standards and local requirements shall be maintained unless stated otherwise within this document.

Deeper installations may be required to avoid conflicts with other buried facilities and/or railroad facilities.

If the installation depth under the railway track is less than 2.00 m a static calculation and/or evidence, that the proposed utility crossing is withstanding the static and dynamic loads from the railway within the zone of influence, should be provided to the Engineer for review and approval prior works commence.

2.3.4 Angle and Installation of Crossing

For all crossings the angles of crossing should be as near a right angle to the railroad centerline as practicable, however, lesser angles may be permitted, subject to detailed proposals.

Utility crossings shall not have bends within the rail corridor.

Carrier pipe and ducting for cables shall be designed and placed following the shorts possible route across the railway line.

Carrier pipelines and cable ducts shall be continuous between draw pits and all joints shall be impermeable.

2.3.5 Category of Utility Crossing

There are four (4) distinguished types of utility crossings under railway tracks.

Category	Definition/Pipeline Crossing Carrying	Casting	Recommendation
C1	communication cables, power cables (telephone, TV, fiber Optic)	HDPE, RCC, PSC, steel pipes	Max diameter 350 mm; min spacing 600 mm
C2	Water, sewage, toxic content or other non-flammable substances PSC, steel pipes non-pressurized / pressurized	RCC, PSC, steel pipes	Box culvert preferred; avoid bridges, buildings, and similar structures
C3	Water, sewage, toxic content or other non-flammable substances pressurized	RCC, PSC, steel pipes	Box culvert preferred; avoid bridges, buildings, and similar structures
C4	Inflammable substances like petroleum, oil, gas, etc. non-pressurized / pressurized	RCC, steel pipes	Box culvert, portal structure preferred

Table 2–7. Utility Crossing Category

Casings may be required for the following conditions:

- To provide access for maintenance personal
- As an expediency in the insertion, removal, replacement, or maintenance of a carrier line crossing or other locations where it is necessary to avoid open trench construction.
- As a protection for carrier lines from external loads or shock either during or after construction of the railway assets that mandate 'heavy loading' conditions
- As a means of conveying leaking fluids or gases away from the area directly beneath the travelled way to a point of venting or drainage
- Jacked or bored installations of coated carrier lines will be contained within a casing unless assurance is provided to the railway organization that there will be no damage to the protective coating.
- To prevent any potential settlements that may be happened in case of pipe leakage or pipe damage.

Suitable bridging, Reinforced Cement Concrete slabs (RCC) or other appropriate measures as approved by Rail Authority shall be used to protect existing dry carriers which by reason of shallow bury or location makes them vulnerable to damage from the developer's construction or maintenance operations.

Existing dry carriers may be permitted to remain in place without further protective measures if…

i. they are of adequate depth.
ii. they do not conflict with any Rail utility, construction, or asset.
iii. the utility owner and Rail Authority mutually agree that the lines to stay.
iv. all assets remain structurally sound and operationally safe.
v. future sleeve/ R.C pipe is provided to ensure future replacement or for future use/expansion.

Existing wet carriers shall require suitable protection or diversion protection (like portal frame or secant piles with protection slab).

Pressurized carriers shall require suitable protection or diversion protection.

Exception: On request of the Applicant and for simple configurations for dry carriers (i.e., concrete surrounding proposals) may be permitted by Rail Authority.

2.4 EHV (220kV and 400kV) Crossing

This section is provided as a guidance to the Best Engineering Practices that need to be followed as a minimum requirement while planning and executing the EHV crossings. Any such situation shall be dealt with a case-by-case feasibility study. The Applicant needs to ensure that they are complying to all the necessary pre-requisites are as per the Local Authority requirements and associated international standards.

The below following points to be ensured as per Oman Electricity Transmission Company (OETC) safety standards prior to execution of the any works near to the EHV cables at 220V and 400V voltage level.

1. All necessary permits from the Authority shall be in place prior to commencement of work execution.
2. Minimum clearance between OETC cables and any other utilities shall be as recommended by O.E.T.C. SAOC.
3. Only manual excavation is allowed inside OETC cable corridors.
4. During the work at site, the competent person must be available at the location to ensure safety.
5. Avoid any cable or water pipeline joints inside high voltage OETC cable corridors.
6. Necessary precautionary measures to be taken to contain and control the dust pollution under the transmission line.
7. Care shall be taken to protect the cables from abrasion no matter what method is used.
8. Proper Toolbox Talk shall be done by the Permit holder and the same shall be recorded.
9. Ensure that Proper lighting is available near the area of work.
10. Proper Signages and Barricades shall be available as per the standard safety procedure.

The System Safety Rules must always be applied when working on or near to items of Equipment which are part of a System. General Safety must be established before any work starts. The Authorized Person shall be responsible for arrangements of the General Safety.

When work is to be carried out on Equipment, the primary means of achieving safety is always by securing isolation. Where practicable, the isolating devices shall be immobilized and locked in the isolated position. In case of High Voltage Equipment, earthing must always follow, and the Earthing Devices locked where practicable. It is not allowed for anybody or objects to approach within the specified Safety Clearances to exposed Live High Voltage conductors.

When Points of Isolation have been established and exposed conductors could be subject to High Voltage, the only objects permitted to approach within the Safety Clearances shall be:

a. Approved voltage measuring devices.
b. Earthing Devices

When Points of Isolation have been established and all Danger has been totally excluded by the application of Earthing Devices, approach is allowed under an appropriate Safety Document to within the specified Safety Clearances:

Rated System Voltage Rated (kV)	Safety Clearance (cm)
220	400
400	550

Table 2–8. Safety Clearance

** VC for roads shall be determined as per vehicle loading*

A minimum distance of 6m is recommended from the EHV cable corridor. The same is subjected to the Authority approval. It's advised to have any services crossing the EHV cable corridor unless until there is no other alternate solution. Each such requirement shall be approached with an individual case study done to check the feasibility of the works. As mentioned in the in Section 1 of this document, this manual does not cover the detailing of the crossing standards for larger infrastructure including extra high (220/400kV) voltage power lines.

3 | NOTIFICATION CERTIFICATE (NC) PROCESS

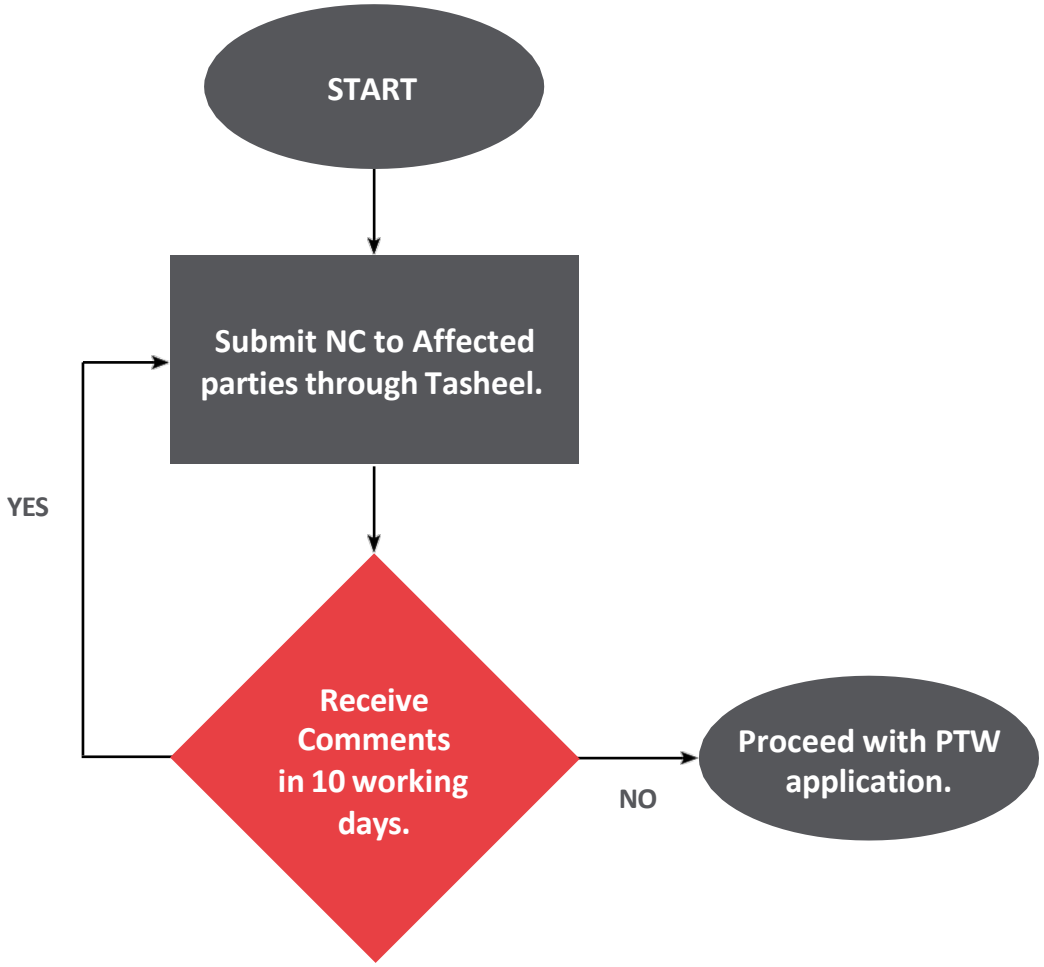
The Applicant shall check the information and as built drawings for all the existing services as per the drawings received and collected from SOHAR through permitting process/stage. Any existing services that may be affected due to Applicant's work shall be studied carefully to allow adequate clearances.

The Applicant shall check actual asset alignment with non-destructive methods being aware that the alignments of the assets as shown in the as-built drawings are indicative only. Although it is SOHAR's intention to provide the Applicant with the most up-to-date information, it cannot be guaranteed that the information on the assets recently finished or under construction has been incorporated in the central GIS records. The Applicant shall make use of suitable non-destructive detection methods to ascertain as accurately as possible the alignments and depths of underground assets near the work, before applying for permit to work including submission of NC and before digging trial holes.

The Applicant shall submit the NC through the electronic system (Tasheel) to the owners of the affected utilities along with proposed layout plans, method statements for crossing/protecting the existing pipeline (as / if required) and all other required documents.

In case, the applicant received any comment within ten working days, he will resubmit the NC application after making necessary changes.

If no comment is received in ten working days, it will be deemed acceptable to the affected parties and the Applicant can proceed with the PTW application to SOHAR.



4 | INSTALLATION REQUIREMENTS

4.1 Buried Installation

All utility lines at following locations to be laid underground only.

- Crossings of existing above-ground services/ pipelines or underground services/pipelines.
- Asphalt road crossings/ track crossings/ rig track crossings/ overhead lines right of way crossings.
- ROW of existing pipelines.
- Locations where the pipeline crosses new pipelines or pipelines to be installed as part of the same project.
- Locations where the pipeline crosses planned roads, pipelines, railways and utilities corridor.
- Existing or planned overhead lines crossings along with its right of way.
- Existing surface laid flowlines and their access tracks.

The utilities shall be installed as underground restrained lines, buried directly in the ground with proper bedding, padding material, and berm with identification marker posts.

Standard method of compaction shall be used as per the site conditions.

Pipe joints shall be avoided at utility crossings and under any chamber to facilitate operation and maintenance activities when needed.

In case of any specialized activity e.g., welding. jointing etc., the Applicant should carry a valid certificate to perform such activities.

The Applicant shall carry out construction risk assessment sessions for the pipeline's Non-Destructive Testing (NDT) & hydro testing overlapping activities.

The Applicant shall submit a procedure for material handling & protection for each line pipe material type (metallic & non-metallic) and shall ensure safe handling of each type of material.

The Applicant shall specify the following details in the construction method statement:

- Permanent ROW for these pipeline bundles.
- Method of crossing the existing roads (Trenchless technologies).
- Types of pipelines laying machines and their spans.
- Welding and NDT crews' arrangement in each construction site.
- The minimum pipeline section length for hydrotest and the sequences of hydrotest for each pipeline section.

Open cutting under roads is not permitted. The Applicant needs to establish that no other feasible solution is available before proposing it and shall employ proper measures for the pipeline stability.

In case the project scope of work specifies a certain number of pipelines to be placed in the same trench, the Applicant is responsible for the following:

- Carry out lateral buckling analysis of each pipeline to assure the applicable separation distances between pipelines.
- Provide adequate design measures for the roads, tracks, and facilities' crossings and installation of common culverts wherever specified in the project drawings.
- Submit transportation, storage, protection, and stringing method statements and procedures for the pipe material of the pipelines in the same trench.
- Prepare and submit sequential construction activities of pipelines and overlap between activities such as welding, Non-Destructive Testing (NDT), field coating, and hydro testing for each shared pipelines bundle in the same trench.

4.2 Aboveground Installation

In principle, the installation of above-ground utilities shall be avoided at all costs. In rare cases, where it is not feasible in the Applicant's opinion, a proper justification shall be submitted to SOHAR for their review and approval.

In case of above ground installation, pipelines shall be unrestrained lines, resting on grade surface/ sleepers/supports.

Expansion control for surface-laid pipelines shall be considered in terms of expansion loops or expansion offsets. Sections that have long straight lengths or are restricted by nearby consecutive road crossings shall be provided with expansion loops or expansion offsets. Means of expansion control shall also be applied to avoid resting of flowlines on top of each other due to excessive lateral expansion/ movement at limited separation distances between surface-laid pipelines.

4.3 Backfilling

The Applicant shall notify SOHAR, assets owner, and O&M staff to inspect the installations / protection before backfilling of trenches.

Backfill material shall consist of material which, after placement and compaction, will result in a stabilized soil condition capable of supporting the normal traffic and use loads that may be encountered.

To prevent ground settlements adjacent to or below existing pipeline asset, all backfills shall be properly deposited and adequately compacted as per the Standard Specifications for the respective pipe's materials.

The backfill material around the exposed pipeline asset shall be carefully compacted by hand-rammers or manually operated equipment.

The Contractor shall place the specified detectable warning tape/identification tape on top of the pipeline asset in conjunction with the Contractor's backfilling activity and as per Standard Specifications.

5 | GUIDELINES FOR PROTECTING EXISTING ASSETS

SOHAR may allow the Applicant to work closely to the existing assets subject to adequate protection of these assets. The Applicant shall as a minimum comply and follow the requirements, procedures and practices described below.

5.1 General

All excavation around an existing asset shall be done by hand tools since mechanical equipment for such excavation are not accepted. Trial pits/trial trenches by hand tools shall be carried out first to identify the exact details and conditions of the existing assets prior to the commencement of any Construction Works at the site.

Before any commencement of works at the site, the Applicant shall coordinate with the asset owner and inform them through TASHEEL about the construction plan. The Applicant shall setup a site kickoff meeting with all affected stakeholders and SIPC before commencing the site works.

The Applicant is responsible to verify and report to SOHAR the actual site conditions and real existing details of wet and dry assets in the vicinity of the project since some existing assets may not appear in the GIS records. Any existing asset in conflict or affected by the project scope shall be protected properly to avoid any damage.

The Applicant shall provide Method Statement with detailed sketches/drawings for each crossing case/ type including the proposed protection for existing and new assets.

Marker Post, Identification Plates & Warning Tape at the crossing points shall be provided as per Approved Project Specifications.

All protection works on the wet and dry assets shall be carried out as per Project Specifications and through an SOHAR approved Contractor.

The minimum depths measured vertically from the top of an underground assets to the finished surface shall be as per Project Specifications for the respective pipe's materials.

Access of 24x7 shall be provided to SOHAR staff and vehicles within the limit of construction. Any site obstructions / construction materials prevent the access to existing assets within the limit of construction shall be removed by the Applicant and no construction materials shall be stacked over any existing asset.

As per the Undertaking mentioned in NC, the Applicant confirms his responsibility in case of any damage to the existing assets. All repairs are to be done by an approved Contractor from SOHAR Vendor List.

The Applicant shall coordinate with SOHAR to obtain Permit to Work/ No Objection and official clearance before working near SOHAR or any other tenants'/service providers' assets.

The Applicant shall submit to SOHAR As Built Drawings in hard and soft copies (in the GIS format and requirements) as per the approved execution of the site works. As built drawings for the affected relocated/protected SOHAR or any other tenants'/service providers' assets shall be approved and signed by the consultant as well as SOHAR.

The Applicant shall reinstate the site to its original/final conditions as per the approval the Concerned Authorities.

5.2 Protection of Existing Structures

Due care should be given to the existing structures/foundations and above-ground assets such as pipe racks, conveyor belts, gantries and overhead lines. Specific measures required for protection of these assets shall be clearly defined by the Applicant and pre-approval from SOHAR shall be obtained before carrying out any construction activity in the vicinity of these assets.

5.3 Vibrations And Dynamic Effects

Excessive vibrations and dynamic effects can cause direct damage to an existing asset, such as damage of pipeline joints or can cause soil subsidence resulting in the collapse of and existing asset.

Common types of works that generate excessive vibrations or have dynamic effects include:

- Vibratory ground compaction
- Movement of heavy vehicles
- Pile driving and boring.
- Crane rail crossing

The risk of vibration or dynamic effects at the assets will vary depending on several factors including the intensity of the vibrations or the dynamic effects, asset condition, ground conditions, and distance from the source of vibration or dynamic effects.

In case of works that creates excessive vibrations, the Applicant is required, as a minimum, to:

- Perform an asset condition assessment to confirm the condition of the existing assets prior to starting work.
- Undertake prior testing of vibrations to establish safe limits for the specific conditions of the work.
- In the case of vibrations, undertake continuous monitoring of vibrations and asset condition during the work.
- Adhere to safe vibrations limits (peak particle velocities) which we may specify for a particular asset – in general, the maximum vibrations at the asset shall not exceed the limits provided in Table 4.1

Rated System Voltage Rated (kV)	Safety Clearance (cm)
220	400
400	550

Table 4–1. Safe vibration limits (PPV), refer to British Standard 5228-2:2009 Code of Practice for noise and vibration control on construction and open sites, part 2 Vibration.

5.4 Deep Excavations

Deep excavation is referred to an excavation where side cuts are not safe and there is a possibility of sides failure due to soil properties or nearby existing structure loads. Deep excavation can often cause ground movement that may damage or dislocate the existing assets.

Typically, more than 4.5 m depth of excavation is referred to as deep excavation that needs proper safety measures but, in some cases, even less than 4.5 m would need safety measures as per the site conditions.

In deep excavations all the effected assets shall either be relocated / diverted or to be protected properly to the satisfaction of SOHAR and asset owner. Otherwise, Non-Destructive Method (NDM) shall be utilized to avoid risks or damages of existing assets due to such deep excavation. All appropriate safety measure including warning signage and barricading shall be taken in such situations.

Deep excavation can often cause ground movement that may damage or dislocate the existing assets. either fracture the pipeline asset body or dislocate/pull out the pipeline asset joints. The ground movement depends on the type of retaining wall, bracing system, construction method, and whether temporary dewatering or lowering of ground water level is involved. In all deep excavations which are within 3 m around the existing pipeline asset, the assets shall either be relocated / diverted or to be protected properly to the satisfactory of SOHAR and asset owner.

Otherwise, Non-Destructive Method (NDM) shall be utilized to avoid risks or damages of existing assets due to such deep excavation.

All appropriate safety measures including warning signage and barricading shall be taken in such situations.

6 | STANDARD OF CARE

The Applicant shall exercise reasonable skill, care and diligence in the performance of the crossing works. SOHAR makes no warranties, guarantees or representations express or implied in respect of or in connection with the crossing works.

All the risks in each section or phase of the crossing works remain with the Applicant until the completion and acceptance of the crossing works.

The Applicant shall investigate the subsurface conditions to understand the actual ground characteristics and SOHAR shall not be liable for any additional cost and/or delay to the crossing work caused by altered and/or unforeseen ground conditions.

The Applicant shall reinstate all the areas removed/damaged during carrying out of crossing works to its original state upon completion of the crossing works at no additional cost to SOHAR. Work completion will only be issued on satisfaction of the affected stakeholders.

The Applicant shall be liable to SOHAR and any party , whether based on contract, warranty, negligence, strict liability or otherwise, for any special, direct, indirect, consequential, incidental or punitive damages of any kind or character including but not limited to loss of profits or revenues, loss of product, loss of use, cost of capital, and the like arising out of or related to any performance under or breach of this document.

The Applicant shall be responsible for the risk of all events, actions and circumstances, which may affect the mechanical integrity of existing pipes, cables or any other utilities and will be held liable for re-instating the damaged utility at their own cost. (The Applicant shall provide a warranty to this effect as part of NC submission). All such events shall be immediately reported to SOHAR and affected stakeholders.

The Applicant to arrange for insurance covers as per applicable SOHAR rules and regulations.

7 | LIABILITIES AND INDEMNIFICATION

The Applicant shall indemnify, defend and hold harmless SOHAR, its lenders, parent companies and affiliates, and the directors, officers, shareholders, agents, employees and representatives of each of them (individually, “indemnitee” and collectively, the “indemnitees”) from and against any and all losses, liabilities, claims, demands, costs and expenses, actions, third-party (including, without limitation, those by employees and agents of the Applicant suits, legal or administrative proceedings, (including, without limitation, court costs and attorneys’ fees) of any nature for bodily injury or death or physical damage to property of any of the indemnitees or third parties arising out of or in connection with the performance of the crossing works.

The Applicant shall defend, indemnify and hold harmless SOHAR from and against all claims, demands and liabilities arising from hazardous substances, including control and removal thereof, caused by the Contractor’s direct negligent act in performing the Contractor’s obligations in connection with the performance of the crossing works.

SOHAR will not be liable to any party , whether based on contract, warranty, negligence, strict liability or otherwise, for any special, direct, indirect, incidental or punitive damages of any kind or character including but not limited to loss of profits or revenues, loss of product, loss of use, cost of capital, and the like arising out of or related to any performance under or breach of this document.

8 | RISK ASSESSMENT AND MITIGATION

8.1 Risk Identification and Assessment

Risk management or risk control approaches are supposed to reduce both the impact and likelihood of inherent risk. Typically, risks cannot be eliminated completely, and the level of risk that remains after undertaking all controls and treatments is known as residual risk.

Unlike inherent risk, residual risk is lower in both the impact of an event on the SOHAR and the likelihood of the event occurring. Residual risk should be controlled within the range of SOHAR's risk appetite as the inherent risk is often beyond acceptable. If the inherent risk level's already been able to meet the risk appetite, treatment and control will not be required.

Risk identification for the SOHAR or any other tenants'/service providers' assets can be categorized as in the Figure 8 1 and the relevant risk category can referred to in Table 8.1

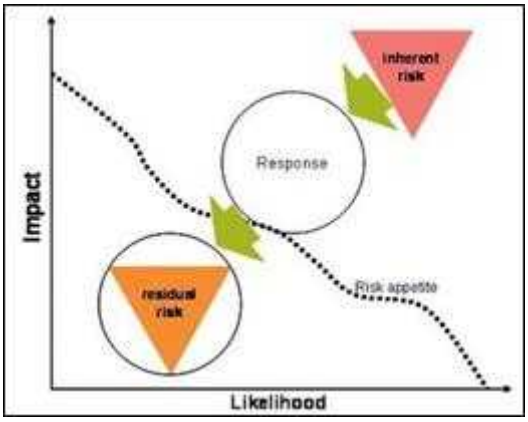


Figure 8–1. Risk Management (Inherent vs Residual Risk)

No	Risk Description	Inherent RA	Residual RA
1	Failure to align with SOHAR procedures, processes and systems.	4D	3C
2	Tasks are not completed in alignment with scope, time and cost constraints.	3D	2A
3	Failure to secure and protect SOHAR physical asset	4D	2D
4	Damage to the wet utility asset while carrying out excavation works	4C	2B
5	Damage to the potential risky dry utility asset (Power & Gas) while carrying out excavation works	5C	2C
6	Failure of power and water supply to the SOHAR port consumers	4C	2C
7	Unauthorized access to SOHAR assets or other asset owners	4D	2B

Table 8–1. Risk Assessment for SOHAR assets

INHERENT RISK ASSESSMENT							
			Likelihood				
			Very Unlikely	Unlikely	Possible	Likely	Very Likely
			A	B	C	D	E
Impact	Catastrophic	5	Medium	High	High	High	High
	Critical	4	Medium	Medium	High	High	High
	Major	3	Medium	Medium	Medium	High	High
	Moderate	2	Low	Low	Medium	Medium	Medium
	Minor	1	Low	Low	Low	Medium	Medium

Table 8–2. Risk Assessment Matrix

8.2 Risk Mitigation

To reduce the risk of potential damage to SOHAR or any other tenants'/service providers' assets, the Applicant and its Contractor and Consultant are recommended to consider the following options (in order of preference):

Redesign - The preferred option is to redesign the works to be outside the corridors.

Relocate - Where redesign is not feasible, assets may be able to be relocated, raised or reconfigured.

Protect - Where redesign and relocation are not feasible, SOHAR may allow the Contractor to work closely to the assets if the Contractor adequately protect them.

8.2.1 Assets Relocation

Where it is not feasible to redesign the SOHAR or any other tenants'/service providers' assets, relocation of the affected asset away from the work may be considered.

The Applicant shall ensure that any proposed relocations of the assets shall be designed by an engineer from Contractor's organization experienced in such works, or in case when such expertise does not exist by a design engineer from consultant companies with appropriate engineering experience and subject to SOHAR approval.

All proposed relocations shall be in accordance with all the applicable Standards Specifications and approvals.

SOHAR will not be responsible for any costs associated with asset relocation that is necessary to mitigate the effects of the Contractor's work. This includes the cost of any necessary isolations, connections, and inspections that may need to be performed by SOHAR personnel.

The relocations shall not affect the hydraulic performances of the wet utility piped system, or any other transmission loss in case of dry utility. It is the Applicant's responsibility to provide adequate calculations through the appointed design engineer.

8.2.2 Protect Assets

Where redesigning and relocating the works is not resulting in feasible options, SOHAR may allow the Applicant and its contractor to work closely after adequately protecting the existing assets.

SOHAR will only consider this option if the Applicant:

1. Demonstrate that redesigning the works and relocating SOHAR or any other tenants'/service providers' assets are not resulting in feasible options.
2. Demonstrate that there is a safe system of work in regard to any hazards associated with working on or near SOHAR or any other tenants'/service providers' assets.
3. Where necessary, employ methods that protect the asset and Applicant's work from potential damage:

   Temporary protections: this type of protections is typically used for temporary works that will only remain in position for a short time, and shall include:

   – Adapting work methods such as supporting an excavation with shoring to prevent loss of ground support around an asset.
   – Selecting alternative construction equipment such as using ground compaction equipment that generates smaller vibrations.
   – Provide a steel I-beam/RSJ beam properly sized to hang the pipeline asset.

   Permanent protections: this type of protection is typically used for permanent works like road crossings and could include reinforced concrete GRP ducts.

SOHAR will not be responsible for any costs associated with protection works that are necessary to offset the effects of the Applicant's work.

9 | SAFETY REQUIREMENTS

The Applicant shall determine how best to conduct the work in consideration of the information provided in this guideline, while ensuring that a safe system of work is always maintained. The Applicant shall ensure safety of general public and workers at site.

The Applicant shall protect all the affected utilities and shall have a duty of care to ensure that the works do not damage, interfere with SOHAR and other tenants'/service owners' assets, or cause hazards to any party.

The Applicant shall submit and follow the safety procedures with the method statement for any crossing activity during execution of the work. The Applicant shall also be responsible to comply with SOHAR and other applicable regional safety standards.

9.1 Potential Hazards

Potential hazards associated with SOHAR or other parties' assets within port and freezone includes, but are not limited to:

- Exposure to asbestos cement pipes.
- Fall hazards associated with accessing chambers or high structures.
- Hazards associated with the works during the raining/wet weather.
- Electric shock hazards arising from electrical infrastructure in the vicinity of pipelines, electrical faults or lightning.
- Secondary hazards arising from damage or disruption to other structures or services due to damaged pipelines.
- Explosions due to damaging life oil and gas pipelines. This risk is high due to its impact on human lives and assets damages not only in the incident location but into surrounding vicinity. Stoppages of operation of the damaged service and consequent operational effect of industries. Existing assets may also fail due to uncontrollable reasons i.e., are aging, corrosion, or mechanical failure, which can also have hazardous impacts.
- Site specific hazards to be considered: Working near power lines / Gas pipelines / High pressure utilities.
- Be mindful of overhead power lines.
- Movement of excavator should be safe not to hit the underground/over ground utilities.
- Working near road traffic
  - Traffic diversion
  - Safety signboards
  - Instructions to on-going traffic
  - Oversized moving equipment Safety measures during excavation works.
- Vertical excavations
  - Where due to site constraints, side slope is not achievable within the ROW and vertical cut is the only option, the Applicant shall ensue that proper shoring is provided, unless the excavation is made entirely in stable rock.
  - Any site where a protective system is not provided, the Applicant shall take advice from a competent person and provide proper justification to SOHAR.
- Proper support for the existing exposed utilities
- Use of proper PPE kit by the site personnel
- Proper and approved dewatering arrangements.

9.2 Authorized Access Only

Unauthorized interference with SOHAR (and other parties) assets including uncovering, opening or repairing is prohibited and may result in prosecution under the applicable laws.

9.3 OSH and Public Safety

The Applicant is also responsible for all Occupational Safety and Health (OSH) and public safety requirements associated with the works. All works must be carried out in accordance with the relevant Standard Specifications, standards and codes of practice, as well as arranging any necessary approvals, clearances, etc. as listed out in the notification certificate (NC).

9.4 Safe Working Requirements

The Applicant shall comply and follow the requirements, procedures and practices described below (as minimum) for safe working near SOHAR or any other tenants'/service providers' assets and take utmost care to avoid causing leakage/damage to the pipeline asset during the execution of their works. Refer Error! Reference source not found. for a flowchart showing the procedure of working near existing assets.

9.4.1 SOHAR O&M Department Consultation

The Applicant shall contact the relevant Engineers of SOHAR for assistance, especially wherever there are uncertainties or problems with regard to the locations and depth of existing underground assets as well as to obtain a Permit to Work.

9.4.2 Hand Trial Pits/Trenches

Only after obtaining clear official approval and necessary work permits through permitting process, Contractor shall start to dig trial pits/trenches by hand tools to ascertain the presence of any existing assets, their exact positions and depths. In no instance shall mechanical equipment be permitted to operate within three (3) m of any existing buried service for the excavation of trial pits/trenches.

9.4.3 Guidelines For Method Statement and Execution

The Applicant shall execute the works safely and through one of SOHAR approved Contractors by strictly observing the following requirements which shall be confirmed and mentioned clearly in details at Contractor's proposed method statement for protection of existing assets:

i. Careful Operation of Mechanical Plant: be careful in operating mechanical plant, especially in close proximity to existing pipeline assets and valves. Mechanical equipment shall be permitted to operate close to the assets only after proper identification of the assets and after obtaining clear official approval through permitting process.
   In any case, if required, the final excavation to expose the pipeline asset shall be carried out by hand digging method with special excavation tools.

ii. Protective Measures: Implement all necessary protective measures to protect the assets. The excavated trenches in the near proximity of the assets shall be stabilized to avoid any dislocations. In case a wet utility pipeline asset needs to be exposed, it shall be adequately supported and protected. Figure 8 2 depicts how to provide temporary support for an existing pipeline asset. The Applicant shall provide a detailed proposed method statement with detailed drawings for suggested protection approved from an engineering consultant as per the type, size, length, and site condition of the pipeline asset to be supported.

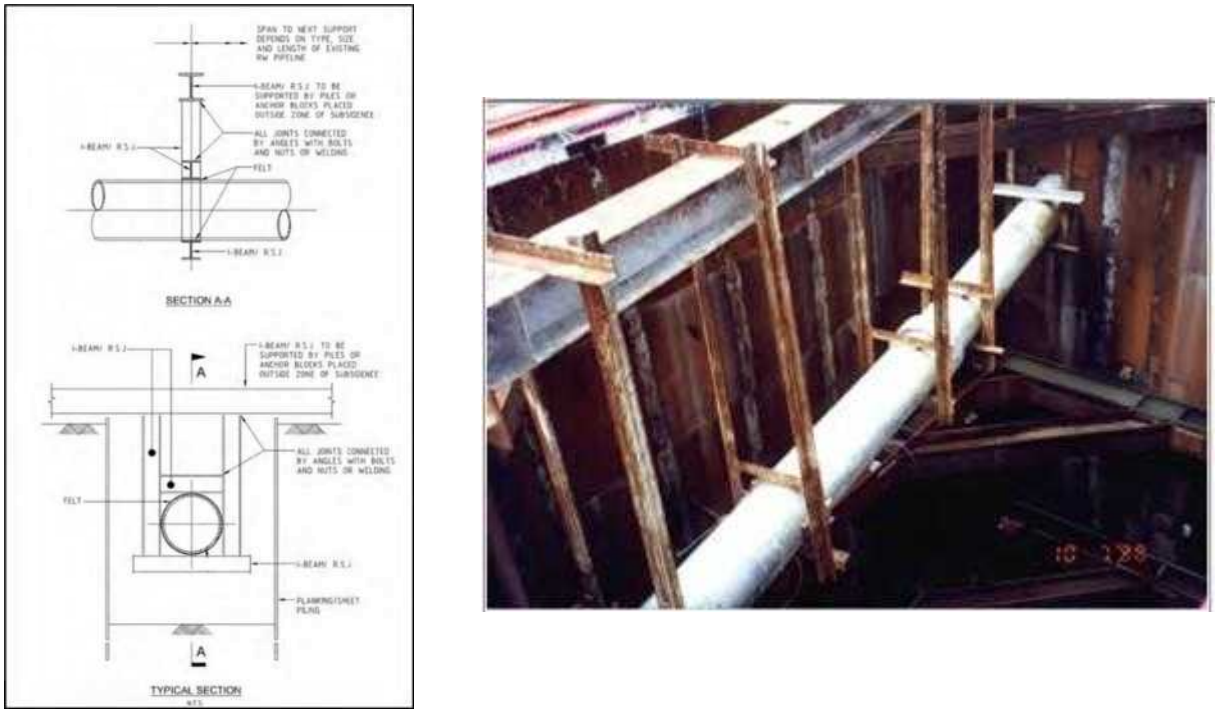


Figure 9–1. Existing Pipeline supported by Rolled Steel Joist (RSJ)

iii. Adequate Safety, Site Supervision and Control: Provide adequate safety measures/precautions, risk assessment, site supervision, and approved competent person and quality control engineer to ensure that all SOHAR requirements are closely observed and remind the workers from time to time of the importance of avoiding any damage/leak to the pipeline asset and the full consequences of the damage.

iv. Access: Provide free access at all times for SOHAR staff and their Contractors/consultants to carry out inspection, operation, maintenance or repair works on the asset.

v. Vertical Clearance for Service Connections: In some particular cases, when service connections are subject to level constrains, as the wet utility connections, or the crossing area is particularly crowded with other services, the requirements related to the minimum vertical clearance as mentioned in Section 7.2. The Applicant shall prepare a detailed proposal and obtain a clear official approval and work permits through permitting process before proceeding with the works.

vi. Horizontal Clearance: Horizontal clearance between SOHAR wet utility assets and other dry services shall be as per the requirements and guidelines as mentioned in Section 7.2. The Applicant shall prepare a detailed proposal and obtain a clear official approval and work permits through permitting process before proceeding with the works.

vii. Obtain Work Permit: for any site activity above or below the existing pipeline/assets or within the approved service corridor, no site works/excavations are allowed to start before obtaining official approval through permitting process from SOHAR.

9.5 Malpractices to Avoid

The Applicant should avoid the following malpractices during excavation to prevent damage to the assets:

– Passing heavy plants, such as an excavator or compaction roller, over buried assets after the road surfacing is removed or when the cover to the buried assets is much reduced. This is to prevent possible damage due to excessive loading.

– Disturbing or exposing any thrust block without SOHAR prior agreement. Exposure of a thrust block without providing proper support may result in its movement and detachment of the associated pipeline assets. SOHAR should therefore be consulted on all cases where exposure of thrust blocks is required, to enable suitable protective measures to be taken.

- Undermining other wet utilities when excavating trench alongside or across them. This is to prevent the settlement of ground adjacent to or below existing wet utilities.
- Stockpiling excavated materials within 1.5 m around above ground assets. This is to ensure that the assets can be accessed and always operated. They must not be buried under a stockpile of excavated materials or by road reinstatement. Excavated material should not be stockpiled over any utility to prevent settlement or incidents. Any construction debris that falls into the above ground pits should be cleared immediately.
- Carrying out blasting in the proximity of an existing asset shall be avoided whenever possible and non-explosive methods or rock breaking is preferred. Where explosive methods cannot be avoided, the Applicant must provide SOHAR with a blast plan that includes an engineering assessment of the impact of the blast on nearby assets and proposed risk mitigation actions.

9.6 Checklist

A typical checklist to ensure safe working near SOHAR or any other tenants'/service providers' assets is presented in Appendix A.

APPENDIX A – CHECKLIST FOR WORKING NEAR EXISTING ASSETS

Working near existing assets planning checklist	
Item	**Applicant Response**
Conduct a site meeting with one of the SOHAR representatives at project start-up.	
Establish arrangements for site marking and protection of assets (such as signage, barricades).	
Plan and conduct a briefing for site staff. Typical items that should be covered include: a) Utility locations b) Damage risks and protection actions c) Work methods to be used or modified (such as compaction methods) d) Compliance, control requirements (such as the use of excavation spotter) e) Site information pack (including utility maps and work permits) f) Site cleaning and house keeping g) Arrangements for handover to alternative staff	
Ensure site-related information and utility maps are current (especially if there is a delay between planning and construction). The Crossing drawings are expired within 2 months and shall be updated through Tasheel if work is delayed.	
Ensure availability of NC, Permits, Competent Persons, PPE etc.	
Ensure utility maps, work clearances, and any other related information are always available on site	
Review any asset protection issues which come up during the work for future improvements to the work procedures.	
Plan and conduct any required work to be undertaken by/with SOHAR (such as progress meetings, inspections, isolations, connections).	
Where required, provide as-built details for completed works to SOHAR.	
Conduct a project close-out meeting with one of SOHAR representatives.	

NOTIFICATION CERTIFICATE

Utility Crossing Works

APPLICANT INFORMATION			
Name of Applicant:		Applicant's Representative Name:	
Date:		Phone No:	
Email:			
PROPOSED WORKS INFORMATION			
A.	Location of the Proposed Works:		
B.	Is the location verified by the GIS Department? Provide ref document or document code to the tenant.	☐ YES	☐ NO
C.	Which of the following best describes the type of work being undertaken?		
D.	☐ POWER POLE OR STREET LIGHT REPLACEMENT ☐ DIRECTIONAL DRILLING ☐ EXCAVATIONS	☐ SITE ACCESS REQUEST ☐ INSTALLATION / REMOVAL OF EQUIPMENT ☐ MODIFYING THE FINISH GROUND LEVEL	☐ OTHER:
E.	What existing utility/feature is impacted? select all that apply.		
	☐ POWER ☐ GAS ☐ SEWERAGE ☐ OIL	☐ TELECOM ☐ POTABLE WATER ☐ STORMWATER/DRAINAGE ☐ ROAD	☐ OTHER:
F.	Will the existing utility remain operational during the excavation?	☐ Yes	☐ No
G	Will the work result in any disruption to the existing utility services to its current users? If yes, provide the details for the proposed mitigations.		
H.	Depth & size of the existing utility? What technique was/will be applied to find the depth & size of the existing utility? Mechanical excavation is not allowed within the crossing at same location.		
I.	Are the SIPC guidelines and specifications as stipulated in "SOAHR SPECIFICATIONS AND MANUAL FOR UTILITY CROSSINGS" fully complied including other SOHAR rules and regulations? If no, provide reasons and details of the alternative arrangement with justification.		
J.	Are the utility owner's and existing tenant's standards, policies, procedures, and guidelines fully complied? If no, provide reasons and details of the alternative arrangement with justification.		

NOTIFICATION CERTIFICATE

Utility Crossing Works

OPERATOR INFORMATION (SET-UP/PREPARATION ACTIVITIES)		
A.	Has the current operator been trained and certified by the employer on the equipment used?	☐ Yes ☐ No
	Construction Contractor:	**DATE:**
	Site Management Department:	**DATE:**
ATTACHMENTS		
B.	Please attach along with this Notification Certificate, the design plan that shall include but not limited to below information: • Detailed drawings. • Method statement adhering to the SIPC utility crossing specifications, which should also include corrective actions (if any), risk assessment matrix, and safety procedures. • Pre-construction photographs.	

Important notes:

1. *If the utility owner provides any comments, the contractor shall address those and resubmit the NC.*
2. *In case, no comments provided by the utility owner within ten working days, the proposed work will be deemed acceptable to the utility owner.*
3. *Procedures, policies, standards, and practices adopted by utility owner and the existing tenants shall be applicable during approvals and construction.*
4. *Validity of permit is 60 days.*
5. *By signing this NC, the applicant is accepting all the warranties.*
6. *CONSEQUENTIAL LOSS: the Applicant shall be liable to SOHAR and any party , whether based on contract, warranty, negligence, strict liability or otherwise, for any special, direct, indirect, consequential, incidental or punitive damages of any kind or character including but not limited to loss of profits or revenues, loss of product, loss of use, cost of capital, and the like arising out of or related to any performance under or breach of this document.*

APPENDIX C – REFERENCES

1. Saudi Aramco Ref Doc- SAES-S-010
2. Saudi Aramco Ref Doc- SAES-T-928
3. Abu Dhabi National Oil Company Ref Doc- AGES-SP-10-003
4. Qatar Energy Ref Doc- Guideline for Corridors and Corridor Crossing in RLC- IML-ENG-GDL-001
5. Qatar Rail- Specification for Utility Crossings for Railway Lines
6. SOHAR Port & Freezone “Land Based Developments” Stage 1 Report- Oct 2017