

Risk assessment of glass reinforced plastic (GRP) pipe installation

Kambiz Alempour – Hosein Gholamzadeh-Abbas Zareh

Shiraz – Farhangshahr-25 alley-safir apadana 4th floor

alempour@gmail.com

Abstract:

The purpose of this paper is to guide field teams to perform a proper risk assessment of installation of GRP pipes, couplings and fittings. While using this paper, solid engineering practices and common sense should always be taken into consideration and information provided on this paper should only be used as a guidance for risk in pipe installation. The definition of a risk assessment is a systematic process of identifying hazards and evaluating any associated risks within a workplace, then implementing reasonable control measures to remove or reduce them.

Keywords: risk assessment ,GRP pipe, installation

Introduction to risk assessment

Risk is defined as the probability of harmful consequences, or expected losses (deaths, injuries, property, livelihoods, economic activity disrupted or environment damaged) resulting from interactions between natural or human-induced hazards and vulnerable conditions. Risk can be presented conceptually with the following basic equation indicated.

Risk assessment is a process to determine the probability of losses by analyzing potential hazards and evaluating existing conditions of vulnerability that could pose a threat or harm to property, people, livelihoods and the environment. Risk identification is the process that is used to find, recognize, and describe the risks that could affect the achievement of objectives. Risk analysis is the process that is used to understand the nature, sources, and causes of the risks that have been identified and to estimate the level of risk. It is also used to study impacts and consequences and to examine the controls that currently exist. Risk evaluation is the process that is used to compare risk analysis results with risk criteria in order to determine whether or not a specified level of risk is acceptable or tolerable.

The method of risk analysis for GRP pipe installation

This method statement covers the risk assessment of involved in handling and installation of underground GRP piping in trench. The purpose is intended to assist the client, customer/ installer in understanding the requirement for the successful GRP pipe handling and installation. The recommendations given in this statement are easy to follow and implement. This procedure provides detailed for underground pipe installation in soil conditions as prevalent in the project area. The type of installation proposed based on the site conditions and terrain in the project area is Underground installation in trenches . In this document, the generalities of implementation and related risks are briefly analyzed. All items regarding risk assessment are presented separately.

Table 1: RISK IMPACT

	IMPACT LEVEL	DESCRIPTION
1	NOT SIGNIFICANT	Negligible injuries not needing medical treatment
2	MINOR	Minor injuries causing temporary impairment needing medical treatment
3	MODERATE	Illness and/or injury requiring hospitalization
4	MAJOR	Illness and/or injury resulting in permanent impairment
5	SEVERE	Fatality

Table 2: RISK PROBABILITY

	PROBABILITY LEVEL	DESCRIPTION
1	HIGHLY UNLIKELY	Rare chance of an occurrence
2	UNLIKELY	Not likely to occur under normal circumstances
3	POSSIBLE	May occur at some point under normal circumstances
4	LIKELY	Expected to occur at some point in time
5	HIGHLY LIKELY	Expected to occur regularly under normal circumstances

Table 3: RISK SEVERITY MATRIX *based on Impact and Probability Levels*

IMPACT x PROBABILITY	NOT SIGNIFICANT	MINOR	MODERATE	MAJOR	SEVERE
HIGHLY UNLIKELY	LOW	LOW	LOW / MED	MEDIUM	MEDIUM
UNLIKELY	LOW	LOW / MED	LOW / MED	MEDIUM	MED / HIGH
POSSIBLE	LOW	LOW / MED	MEDIUM	MED / HIGH	MED / HIGH
LIKELY	LOW	LOW / MED	MEDIUM	MED / HIGH	HIGH
HIGHLY LIKELY	LOW / MED	MEDIUM	MED / HIGH	HIGH	HIGH

Table 4- risk assessment of grp pipe installation on transportation phase

EF ID	RISK DESCRIPTION	PROJECT PHASE	IMPACT DESCRIPTION	PROBABILITY	IMPACT	RISK LEVEL
1A	Improper loading of pipes and imbalance	TRANSPORTATION	Possibility of damage to the pipe	1	3	3
2A	Do not use plastic straps and use metal chains	TRANSPORTATION	Possibility of damage to the pipe	1	3	3
3A	Lack of packing sheets on the pipes	TRANSPORTATION	Lack of identification	2	2	4
4A	Do not use suitable wooden pallets under the pipes	TRANSPORTATION	Possibility of damage to the pipe	1	4	4
5A	Improper loading using an axis	TRANSPORTATION	Possibility of damage to the pipe	1	1	1
6A	Driver speeding on side roads (sandy and dirt roads)	TRANSPORTATION	Possibility of damage to the pipe	1	1	1
7A	Carry nest pipes (two or tree pipe inside) without proper covers	TRANSPORTATION	Improper store of pipe	1	2	2

Table 5- risk assessment of grp pipe installation on unloading phase

REF ID	RISK DESCRIPTION	PROJECT PHASE	IMPACT DESCRIPTION	PROBABILITY	IMPACT	RISK LEVEL
1B	Do not use of two lifting Straps	UNLOADING OF PIPES	Possibility of damage to the pipe	1	1	1
2B	Unloading in swampy and muddy ground	UNLOADING OF PIPES	Improper store of pipe	1	2	2
3B	Unloading in Rocky land	UNLOADING OF PIPES	Improper store of pipe	1	1	1
4B	Unloading in Sloping ground	UNLOADING OF PIPES	Improper store of pipe	1	2	2
5B	Unloading near village and Residential location	UNLOADING OF PIPES	Damage due to human factors	2	2	4
6B	Unloading In the strong wind	UNLOADING OF PIPES	Possibility of damage to the pipe	2	3	6
7B	Unloading in the dusty area	UNLOADING OF PIPES	Possibility of damage to the pipe	1	2	2

Table 6- risk assessment of trench excavation phase

REF ID	RISK DESCRIPTION	PROJECT PHASE	IMPACT DESCRIPTION	PROBABILITY	IMPACT	RISK LEVEL
1C	safety precautions to ensure a safe working environment	TRENCH EXCAVATION	Human injury and claim	3	3	9
2C	Prevent water penetration into the trench	TRENCH EXCAVATION	Stop executive operations	3	4	12
3C	trench walls keep vertical position	TRENCH EXCAVATION	Stop executive operations	1	2	2
4C	obstacles and sharp edges such as rocks, gravels, concrete, etc. from the trench.	TRENCH EXCAVATION	Stop executive operations	1	2	2
5C	organic items such as plants, tree roots, etc. from trench ground	TRENCH EXCAVATION	Stop executive operations	1	2	2
6C	the underground water level is high, it might cause pipes to float	TRENCH EXCAVATION	Rework and additional costs	3	4	12
7C	trench width is sufficient enough for bedding and backfilling compaction works	TRENCH EXCAVATION	Rework and additional costs	1	5	5
8C	excavated materials are piled at a distance from the trench to avoid the possibility of rolling back into the trench.	TRENCH EXCAVATION	Rework and additional costs	2	5	10
9C	Disconnect fiber optic and mobile critical installations	TRENCH EXCAVATION	Litigation - warrant Stop executive operations and	2	5	10
10C	Bad mapping of plans and profiles	TRENCH EXCAVATION	Rework and additional costs	3	3	9

Table 7- risk assessment of grp pipe installation phase

REF ID	RISK DESCRIPTION	PROJECT PHASE	IMPACT DESCRIPTION	PROBABILITY	IMPACT	RISK LEVEL
1D	unlicensed operators of bulldozer, grader, etc.	Pipe installation	Rework and additional costs and Human injury and claim	2	4	8
2D	Lack of daily safety Supervisor's permission.	Pipe installation	Human injury and claim	2	2	4
3D	Personnel having health problems and who are not willing should not be allowed to enter into a pipeline	Pipe installation	Human injury and claim	2	2	4
4D	Lack of standard of pressured pipelines, ensure that distance between the air valves	Pipe installation	Damage and cause major problems to the pipeline	1	2	2
5D	avoid sudden stopping and running of pumps, take necessary precautions	Pipe installation	which causes water hammer	1	2	2
6D	Avoid air penetration from water intake structure into the pipeline at gravity pressured pipelines	Pipe installation	Damage and cause major problems to the pipeline	2	1	2
7D	Tear and problem in EPDM gaskets of GRP couplings	Pipe installation	Improper connection of two pipe ends	4	3	12

8D	unclean the rubber gasket and stones, gravel or dust from the grooves of the gasket	Pipe installation	Improper connection of two pipe ends	4	3	12
9D	Bad joining of two pipe with coupling Joint(Bad action of the director in the field of connection and lack of proper connection)	Pipe installation	Improper connection of two pipe ends	4	5	20
10D	Un flattened Trench bedding	Pipe installation	Damage and cause major problems to the pipeline	2	2	4
11D	Insufficient distance During installation of multiple pipes in a single trench	Pipe installation	Damage and cause major problems to the pipeline	2	2	4
12D	Insufficient minimum distance In case of cross over of pipes (one pipe crossing over the other pipe), between 2 pipes	Pipe installation	Damage and cause major problems to the pipeline	2	2	4
13D	Insufficient depth for trench	Pipe installation	Trench depth should be sufficient to prevent conveyed fluids to freeze	1	3	3
14D	Bad lamination of butt warp joint	Pipe installation	Damage and cause major problems to the pipeline	3	4	12
15D	Bad pushing the pipe with backhoe bucket or bulldozer blade	Pipe installation	Damage and cause major problems to the pipeline	4	5	20

Table 8- risk assessment of hydrotest phase

REF ID	RISK DESCRIPTION	PROJECT PHASE	IMPACT DESCRIPTION	PROBABILITY	IMPACT	RISK LEVEL
1E	Insufficient resistant soil for hydro test	Hydrotest	Danger of explosion and high damage of pipeline	2	5	10
2E	Do not use a calibrated pressure gauge	Hydrotest	Bad test results and lack of understanding of the real situation	2	5	10
3E	Lack of proper backfill of pipelines before testing	Hydrotest	Danger of moving pipes and destroying pipelines	1	5	5
4E	Improper use of a powerful water pump to increase water pressure	Hydrotest	Prolongation of time	1	5	5
5E	Prolonged trial and error due to ambient temperature changes	Hydrotest	Bad test results and lack of understanding of the real situation	2	5	10
6E	Lack of careful inspection of pipelines during testing	Hydrotest	Bad test results and lack of understanding of the real situation	1	4	4
7E	Ignoring the pressure drop and injecting too much water into the pipelines	Hydrotest	Bad test results and lack of understanding of the real situation	1	3	3
8E	Inaction of Water pressure assurance valve	Hydrotest	Danger of explosion and high damage of pipeline	2	5	10

Table 9- risk assessment of backfill phase

REF ID	RISK DESCRIPTION	PROJECT PHASE	IMPACT DESCRIPTION	PROBABILITY	IMPACT	RISK LEVEL
10D	Use of locally soils with Insufficient mechanical property	Back filling	Gravels or crushed rocks can be used to form bottom foundation layers	3	5	15
11D	Use of highly plastic and organic soils	Back filling	This soil is not suitable for bedding or backfilling	2	4	8
12D	Soil shedding in the first stage of cover along with rock fragments	Back filling	Risk of pipe body fracture	2	2	4
13D	High speed in the process and carelessness	Back filling	Risk of pipe body fracture	2	2	4
14D	Lack of attention to rain and flooding and release of water in the canal	Back filling	Danger of rising pipes and destruction of the pipeline	3	5	15
15D	Excessive soil fall on the pipeline area	Back filling	Additional cost and vertical pressure to the pipe structure	1	2	2

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