

# PRACTICAL ASPECTS OF SECURITY LEVEL ASSESSMENT WORK FOR GAS TRANSPORT AND DISTRIBUTION NETWORKS

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**Abstract:** *This article approaches the technical aspects in managing gas distribution networks and connected installations. Delivering quality services to final users implies aspects of security level assessment in maintaining gas transport and distribution networks, to achieve reliability of delivery along the network life cycle. Assuring a correct security level imposes applying diagnostic methods of work system equation: knowing risk factors, organizing risk factors by importance level, identifying and build a hierarchy of prevention measures.. Each class of risk imposes different approaches and procedures, detailed further in article. Addressing risks and malfunctions is completed by analysis of risk sources, so intervention teams will be able to avoid future malfunctions by correcting damaged network segments and securing area, depending of terrain configuration and presence of risk factors.*

**Keywords:** *reliability, gas networks, security, life cycle, maintenance*

## 1. Goals and Attributions

This procedure establishes the working methodology for maintaining, exploring checking and repairing the gas distribution network in safety conditions for the distribution system. The attributions and responsibilities of the personnel working within distribution network are meant to coordinate, guide and be responsible for the activity developed within gas sectors on the proper functioning of the underground distribution system, maintaining the network securing valves depicting and overhauling the faults within the distribution system as well as maintaining the protection of the installations and securing the catholic protection. Thus, it is provided the optimum condition as to lead a complex maintaining system as well as the safe exploring of the distribution system. So, the main goal for the procedure is to set the methodology for all required steps, in line with law and specific regulations imposed by the market regulator and local regional conditions.

## 2. Procedure

The main compulsory measures to be taken into account or to be fixed within the natural gas system are: a) Training the personnel for the established phases and times by means of regulation, drawing and signing the certifying documents; b) Equipping the team with individual protection and working systems c) Checking the tools and devices and removing or repairing the broken ones d) Organization measures for protecting securing and hygiene of the gas specific works e) The transport of the pipes towards the sites provided specialized vehicles or trucks are used f) While transporting or manipulating the oxygen tanks or the acetylene ones it is necessary to take all the precautions measures as to prevent the falling or hitting while the maneuver is to be done by trained personnel g) The digging process and the complete working process is to be secured with day and night signaling while the specialized trained workers guide the traffic, if necessary; Within these procedures there are several situations

that need special attention: a) Checking the distribution network in order to depict possible gas leaking; b) Revision of natural gas distribution network c) Overhauling the likely faults within gas distribution network

### 3. Gas Distribution Network's Checking

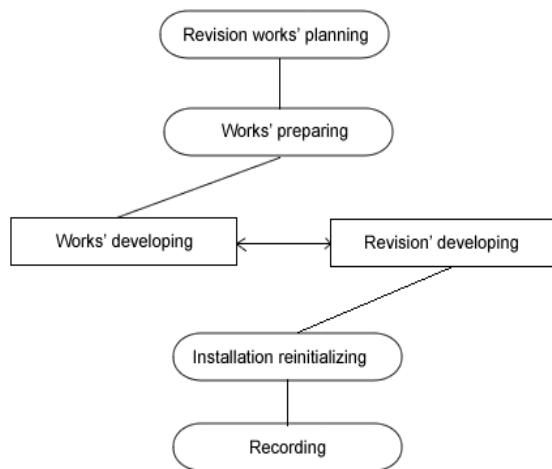
In order to assess likely gas leaking there are special operations within every ten working days while for the polyethylene materials network every month, using mobile electronic device and detection systems; this operation is performed on every route of the pipes and links as well as for the dwellings constructions of other underground networks up to a three meter distance from the natural gas installation according to the working instructions for the gas loss depicting and checking. The gas loss depicting is performed by teams lead by a team leader which are formed of two-three skilled workers as plumber or gas loss depicting specialist. These teams are coordinated by the district leader. Every working day, the team checks a particular route while the coefficient for the month check is the one for the polyethylene (PE) network and for the steel (OL) network. This represents the number of month days/10. Gases leaks' depicting workers will secure the route on foot and counter the traffic while, for their protection, they will compulsory wear warning suites and use warning triangles. When lifting the protection caps it is recommended to avoid the sparks creating as not to eventually lead to an explosion as a result of a 5% higher gas leaking. Natural gas depicting is to be noticed due to the gas bubbles coming out of the pool, causing dry land or dry vegetation or even noise in the case of strong leaking. The team is forced to urgently communicate any fault on the route regarding the state of the caps, pavements or any likely breaks for the network mechanical installations. When such leaking are noticed, imposing emergency intervention the specialized emergency office is to be contacted thus registering the complaint and the faults, according to a well set pattern, while the emergency team overtakes the first emergency measures as following: a) Stops or de-routes the vehicles traffic and the pedestrians in the area; b) Supervises the evacuation of the gas leaking out in the open by removing the caps or any other pipes that may be preventing the airing; c) Removes the natural gas airing caps d) Supervises the area until the intervention team of the distribution system arrives; e) Checks the existence of the natural gas

accumulation in the neighboring blocks and disposes the necessary measures; f) Prevents the access with fire or any spark producing; g) Disconnects the natural gas fueling h) Refreshes the rooms; i) Extends the checking within the entire area where natural gas infiltration might take place;

### 4. Revision of Gas Network Distribution

This method is developed according to the yearly planning according to the working instructions for the natural gas distribution network revision and is to be developed by the modernizing departments. These departments are formed of skilled workers and perform these revisions once a year by attending the following procedures: a) Cleaning the pipe and its likely filling (caps); b) Handling the pipes and overhauling their faults; c) Cleaning the visiting rooms (where the tanks and the checking stations are) d) Adding new caps for the missing rooms. Planning the revision works – is to be done regardless of their capacity and is done according to Regulation NT/2004 [1], which establishes operations for every yearly division and is developed according to the yearly planning from the technical chart. Developing the revision works - contains the following stages which, in a very strict order are as following: works preparing, reconnecting and recording. Preparing the revision works- first of all the regulation NT/2004 must be obeyed as all the works in the field of natural gas must do, as well as the efficiency and labor productivity It is compulsory to purge the gas from the installation and to refresh the niche, before starting the works and obeying all the labor protection measures. The niche state must be checked for the checking-measuring stations, in case of leaking or breaks which communicate with the building's inside; it is also to be checked whether the installation is directly connected from the adjusting post to the inside of the building After the first protection measures have been taken all the clients were informed about the gas being stopped 24 hours ahead by a written notice placed at sight. For the adjustment posts the revision can be done without interrupting the station, by reducing the gas fueling, pre-informing the production, launching, maintenance department as well as the clients For the second stage a work order is issued representing the main document providing the legal status containing the works addresses which are to be informed the next day. The revision is performed within the informed

period while during the revision operation it is compulsory to permanently provide the room ventilation. The fuelling reconnecting – is to be done after all the necessary tests have been developed and according to regulation NT/2004[1] after obtaining the written confirmation which guarantees that the pipes in area are sealed and the regulator or the adjustment station are also sealed Before reconnecting the distribution network, the air is eliminated from the opposite end of the system or using the taps mounted prior to the pipe regulators with the regulation posts, while every operation is performed with a technical manual of the construction, which contains several plans and execution documents on the work in question. Next, there are several operations meant to check the proper functioning ad protection safety Recording is to be done including the unplanned revisions as a result of some accidental faults, as well as for the modernizing ones by recording the date of the revision in the technical chart and also in the revision computerized recording system. The scheme is represented in Figure 1:

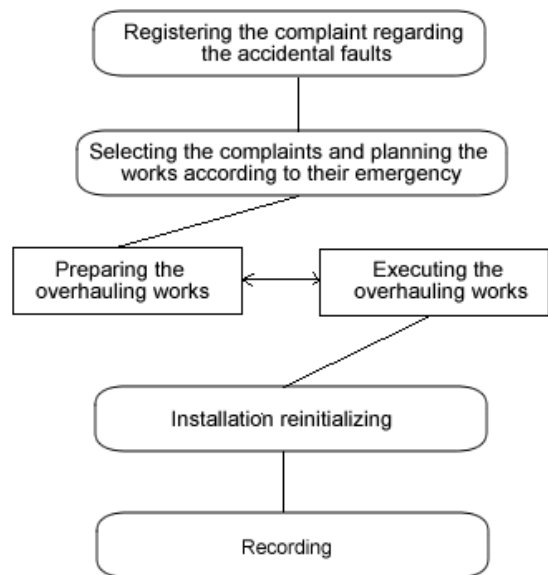


**Figure 1:** Logical scheme of intervention procedure step. The revision work's developing

### 5. Faults' remedy within the natural gas distribution network

The faults overhauling is performed by a specialized department according to the working instructions for faults' overhauling which occur in the distribution system and which is composed of different teams lead by a specialized engineer These teams are formed of specialized plumbers, welding workers and skilled workmen and develop the replacements of pipes or different other faults depending on the technical state faults' frequency

or pavement modernizing needs These processes are developed according to the complexity and nature of the works in question: a) shutting off the natural gas distribution b) specialized devices c) planned switching off the gas in order to develop certain works in a distribution area only after the clients had been announced regarding their disconnecting, 24 hour ahead while the reconnecting process is to take place at the earliest of three hours after its disconnecting d) eliminating the static electricity from the empty pipe e) the cutting and the welding on the installation is to be done once all the technical measures meant to exclude any accidents have been taken. The executing the reconnection of the pipes and installation to the new ones is to be done according to the complexity and nature of the works, according to the working instructions for gas connection performing and also according to special device (drilling machine, sealing device for different pipes or PE systems). Figure 2 illustrates the process of issue solving



**Figure 2:** Representing stages to fix the accidental faults.

Once this developed , there are several stages to be developed in order to fix the accidental faults for the 'Control stations' and stations which are presented by the previous figure, as following: a) setting overhauling works b) the overhauling activity of the accidental faults c) reinitializing the system and recording the work.

Setting the overhauling works: there are two means to establish the overhauling works as

following: requiring the works and selecting the complaints for distribution and planning.

Requiring the works – there are several stages to be developed: by the subscriber by means of phone calls or written complaints regarding the faults of the installation system and by the gas leaking specialized departments which teams depict gas leaking in the adjusting equipments or underground at the distribution network, thus depicting any gas leak by means of specialized device

By installation checks department which teams develop the installation revision and which can announce any miss-functionality at the adjustment stations and installations.

By network departments within different areas which can register gas leaking due to a odor in the air or different gas leaks within adjustment stations within areas where different works take place

All these complaints, either registered on phone or written are directed to a specialized department towards the network section responsible for the area in question.

Selecting the complaints for distribution and planning is to be done by specialized staff within area departments and are handled by the sector heads who will manage them as soon as possible but no longer than an hour

In the case of specialized complaints (explosions fires) the staff on duty who registered the call or the complaint will take the urgent necessary measures to limit the accident, thus turning off the natural gas, announcing the superiors on this matter and informing the emergency teams (firefighters, police department or any other competent departments). The staff on duty requires according to emergency the turning off of the natural gas if such an emergency is registered[2].

According to the organizing procedures, the faults are fixed not only by intervention teams but also by the revision stations and adjustment stations.

The overhauling activity of the accidental faults: this method must fulfill two stages in order to fix the faults, namely the training stage and the execution stage.

The training stage: - due to the operability required by this activity, this must be developed prior to the complaint which contains: planning the intervention teams 24 hours a day and providing a permanent sufficient staff for an operative solving of the complaints especially in the cold season; providing all the necessary

equipments for a proper intervention issuing an order containing the addresses where intervention works needs to take place while those remained unsolved are handed to the other shifts. The equipments used by the intervention teams are registered on these order which is issued and checked by the team head

Execution stage: - is done according to the working instructions for faults' overhauling taking into account the NT/2004 Regulation[1]. It is strictly necessary to clear the air from the installation ever before starting the overhauling process as well as obeying all the necessary measures of labor protection.

All these complaints must be solved by overhauling the non sealed fault or any other miss-functionality which has generated this. In the case of an adjustment station some faults impose the revision of the adjustment system and can be fixed on the spot while for the adjustment stations only the gas leaks can be fixed taking all the safety measures.

If the revision requires more time this will be scheduled as soon as possible

Reinitializing the system and recording the work: once all this faults are registered in the working instructions including the eye contact check the reinitializing of the system is done according to NT2004[1] regulation once the written confirmation is obtained. All the complaints are centralized in the specialized record also writing them down in the special order issued when returning from the field while the achievements are registered by the operators in a specialized database regarding the computerized evidence of the complaints and also the mean to solve and fix the faults according to working instructions for complaints evidence. According to the working instructions for revision evidence, these are also registered in the technical charts of the adjustment stations and must be taken off from the revision planning for the year in question.

## 6. Risk level assessment

The starting point in optimizing the prevention activity of labor accidents and of illnesses caused by professional activity in a certain system is represented by highly assessing the risks in that particular system.

The analysis as the result of these activity allows: getting to know the risk factors for accidents and illnesses; hierarchy of the risk factors according to the potential strictness of the

consequences held on the performer identifying and prioritizing the prevention measurements that must be applied;

The goal of risk level assessment – provides the opportunity to get to know the real situation for every particularly working place in terms of establishing the risk factors in order to take the accurate prevention measures for that time and place.

The prevention measures include: professional risk's preventing informing and training the employees upon the risks they are assuming , getting different departments/ services involved in order to accomplish the settled measures, selecting the best technical equipment, (ET) individual protection equipment (EIP), Measures to establish and organize the working place, Checking the efficiency of those measures according to their priority.

Basic principles and methodology: The method used in assessing the security level for different working places within Service Branch, is part of the method category used in assessing the pre-accident/ professional illness. The fundamental notion used in assessing the pre-accident is the accident risk itself and/or professional illness while the assessment criteria are based on qualitative or quantitative assessment of the risk.

The principle of the method – relies in identifying all the risk factors within the analyzed system (working place) based on pre-established checking list and on assessing the risk dimension according to the combination between the seriousness and maximum frequency predicted

The security level for the working place is reverse proportional with the risk level

The methods complies the following compulsory stages : defining the analyzed labor system, identifying the risk factors in the system, assessing the accident risk and professional illness , prioritizing the risks and setting the prevention priorities, proposing prevention measures

Working instruments – the list meant to identify the risk factors, the possible consequence of the factor risk actions on the human body, the assessment level of the seriousness an of the consequence probability, the risk assessment grid, the risk level assessment namely the security level, the job description which is regarded as the main document and also the measure chart for the measures previously proposed

Within the risk level assessment there are certain aspects to be taken into account: the assessment structure must cover all the dangers

and relevant risks; once the risk has been identified, the assessment starts by researching the possibility to eliminate from the very source;

The assessment organizing is part of Service Branch attributes in this stage which also complies the following obligations: to provide the technical assistance for all the information necessary for the proper development of the evaluation, provide participation and/or consulting the representatives of the works in the assessment action, monitor the prevention measures and supervise its efficient application, set supervising measures of the risk level namely the security one and also provide the re-assessment by means of specific persons when it is the case[3].

The implementing of this method implies the describing of the analyzed system (means of production, labor task, working environment) that was realized by means of : identifying and describing the components of the system and also the means of functioning, goal, describing the technological process, the operations within the labor process, the device and equipment (functional features and parameters) tools and used equipment; stating the labor task for every performer (according to job description, to the orders and written decisions to the oral current dispositions); describing the existing environment conditions; stating the security requirements for every component of the system, according to labor security regulations and standards, as well as according to any other guides and regulations.

## **7. Performing works in gas transport and distribution networks, assessing risk and maintenance.**

Working with gas transport and distribution networks implies risks and requires a highly trained team, respecting work and safety procedures. Having well trained teams on field is needed for deliver high quality services to final users. This means providing services continuously and without incidents. When interventions over the network occur, assuring a correct security level imposes applying diagnostic methods of work system equation: knowing risk factors, organizing risk factors by importance level, identifying and build a hierarchy of prevention measures. . Addressing risks and malfunctions is completed by analysis of risk sources, so intervention teams will be able to avoid future malfunctions by correcting damaged network segments and securing area, by

following and respecting work and safety procedures.

### References

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- [2] Technical normative for projecting and execution of gas distribution networks with polyethylene pipes i6-PE-98. *MO part I 170 / 25.07. 1997.*
- [3] Technical normative for projecting and execution of collecting and gas transport networks with polyethylene pipes 3915-1994. *MO part I 130 / 21.03. 1999.*