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Gas-Specific Environmental Document — Guideline for incorporating within standards to minimize the environmental impact of gas infrastructure across the whole life cycle

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National foreword

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Gas-Specific Environmental Document - Guideline for incorporating within standards to minimize the environmental impact of gas infrastructure across the whole life cycle

Document environnemental spécifique au gaz - Lignes directrices à incorporer dans les normes afin de réduire l'impact environnemental des infrastructures gazières lors de leur cycle de vie

Gasspezifisches Umweltdokument - Leitfaden, der die Aufnahme von Empfehlungen in Normen beschreibt, welche die Umweltauswirkungen der Gasinfrastruktur über den gesamten Lebenszyklus vermindern

This Technical Report was approved by CEN on 9 July 2012. It has been drawn up by the Technical Committee CEN/SS S12.

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Management Centre: Avenue Marnix 17, B-1000 Brussels

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Foreword

This document (CEN/TR 16388:2012) has been prepared by the CEN Sector Forum Gas Infrastructure.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

1 Scope

The gas supply companies, in the widest sense of their activities (production, transport, distribution), have a long tradition in ensuring that networks and facilities are operated according to well-defined procedures. These procedures are the centrepiece of quality management systems. They are based on the general criteria of the series ISO 9000 and are currently being developed gas-specifically as EQAS (European Quality Assurance System) in CEN/TC 234 in order to adhere more efficiently to the procedures peculiar to the gas activities. Companies are more and more inclined to take into account environmental aspects since the series ISO 14000 resulting in EMAS (Environment Management System). As both the series and the system possess a similar structure, the measures to be taken are directly linked to the technical operations and therefore cannot be dissociated from them.

Environmental issues are expected to feature increasingly in CEN standardisation as the European Commission and its affiliated Member States press ahead with an array of proposals for potential directives. These directives are aimed at boosting the reduction of energy consumption, reducing emissions to air/water and, more generally, at forcing industry to consider any process which may have adverse impacts on the environment.

The CEN Sector Forum Gas Infrastructure (CEN/SFG_I) will take this opportunity to demonstrate through EQAS, the effectiveness of gas companies in this area who are continuously looking for the best technologies (although natural gas is by nature an environmentally friendly energy in comparison with other fossil fuels).

Environmental guides are other tools which CEN has introduced through its Technical Board Resolution C108/2000, by requesting the sector forums and their attached Technical Committees to implement the European Commission policy regarding standardisation.

This Technical Report, intended to be used when drafting or reviewing the standards of CEN/TC 234, does not claim to either lay down dedicated requirements for each operation described in each standard nor to set limit values (e.g. emissions) that would be the specific task of the experts in the working group concerned.

Rather, it serves the purpose of triggering an in-depth reflection on the environmental consequences whenever an operative action is planned or being executed. As a way of implementing the basic scheme it was agreed to accommodate the environmental indicators (EIs marked a to i) in the fields of Table 1 (numbered 1 to 49) which match operations/processes with installation/plant. For each field of the Table referenced then by a number and letters, the corresponding requirements are precisely described in Table 2 "Gas-specific Environmental Requirements".

2 Guidance tables

2.1 List of environmental indicators

Table 1

Ref.	Environmental Indicator (EI)	Definition of impact	Examples of source of impact
a	Resources used	All resources to carry out the work, including pipeline materials (steel, PE…) and reinstatement of materials. In particular those resources that come from non-sustainable sources.	Building new equipments (pipes, terminal, compressor station…)
b	Energy consumption/use	All fuels and other energy sources used to complete the work, particularly those from non-sustainable sources e.g. electricity, vehicle fuel, natural gas.…	Civil engineering, (compressors, motorized tools)
c	Emissions to air	All gaseous and vapour releases to atmosphere that may have a detrimental effect upon Air Quality or Greenhouse Gas effect, essentially CO_2, CH_4, NO_X, CO, Volatile Organic Compounds (VOC) for natural gas.	Venting of gas, flaring (NO_x, CO_2, CH_4,…); actions of 3rd
d	Emissions to water	All liquid discharges resulting from the work and in particular those that are released to controlled waters, i.e. streams, rivers, groundwater, seas etc. All emissions to water, defined by Chemical Oxygen Demand (COD), Biological Oxygen Demand (BOD), metal concentration…	Waste water of treatment process, …

Ref.	Environmental Indicator (EI)	Definition of impact	Examples of source of impact
e	Waste	All unwanted materials and equipment removed for disposal or recycling, e.g. Excavated materials, removed equipment, oil.	Excavation, removal of equipment, use or maintenance of engines, welding
f	Nuisances	The release of unpleasant odours, dust or the generation of noise and vibration.	Installation, operation, maintenance or removal of the gas plant and equipment (regulating stations, compressors, pipelines)
g	Risk to environment by accident or misuse	The impact on the normal operation of gas plant and equipment from unwanted and uncontrolled acts. The effect of these acts should be considered on the other environmental indicators in this table.	Third party intervention (excavator) natural risks (earthquake,…), human or equipment failure
h	Environmental impact on land	The requirement to enter temporarily or to permanently take land to install, operate, or maintain the gas network and the impact this may have on the biodiversity of the area, including environmentally sensitive areas (e.g. forests, protected areas, etc.).	The impact of activities (e.g. construction of station on a protected land)
i	Migration of dangerous substances Impact on soil	The exceptional release of inappropriate substances to the ground with the potential to migrate into the soil.	The impact of past, present or future activities (e.g. decommissioning and removal of mostly former gas production plants)

2.2 Gas infrastructure specific Environmental Requirements

Table 2

Reference	**Guidance for implementing Environmental Requirements** (See subsequent matrix "*Environmental scheme for gas companies*" for the numbering of activities 1 to 49)
TRANSMISSION AND DISTRIBUTION	
Planning Designing (1 and 8)	*general risk assessment* (a to i) : considering the use of natural resources required by the new asset across its life cycle and seek minimising their use; equally considering the use of energy required ; considering the quality of materials with respect to the life time for 8: giving particular attention to con-urbanisation

Reference	Guidance for implementing Environmental Requirements (See subsequent matrix "*Environmental scheme for gas companies*" for the numbering of activities 1 to 49)
Construction (2 and 9)	*natural resources* (a) : limiting importation of materials (sand, stones), considering possible deviation from planning and higher impact on environment *energy consumption* (b) : using high efficiency equipment and targeting the best use of equipment *water contamination* (d) : taking into account weather conditions, avoiding potential contamination of ground water *waste* (e) : using separation of disposal (materials, welds, soil) for 9 : considering the variety of materials the pipelines are made of, including still existing obsolete ones (e.g. tar-coated metal sheets) *noise, dust* (f) : particularly for 9 giving attention to con-urbanisation, minimizing disturbances and impact on local surroundings (noise, dust, traffic) *risk assessment* (g) : following procedure to eliminate/mitigate any possible accident/incident *land* (h): limiting the access to sites
Commissioning (3 and 10)	*resources* (a) : choosing a source of water not used for another activity *air* (c) : minimizing the release of CH_4, N_2, CO_2 *waste water* (e) : using a disposal of test water *risk assessment* (g) : following procedures to eliminate/mitigate any possible accident/incident

Reference	**Guidance for implementing Environmental Requirements** (See subsequent matrix "*Environmental scheme for gas companies*" for the numbering of activities 1 to 49)
Operation (4 and 11)	*air –CH_4* (c) : minimizing gas leakages/losses *risk* (g) : mitigating the risk of 3rd party interference, failure of pipeline, natural occurrences (landslide, flooding) for 11 :particularly with regards to cast iron and polyethylene
Maintenance (5 and 12)	*air* (c) : minimizing the release of CH_4 (e.g. valves) *waste* (e) : reducing to small quantities → consideration at the discretion of the gas companies *dust* (f) : avoiding dust emissions during pigging operations *risk* (g) : minimizing the risk during maintenance operations (spillage)
Repair Renovation (6 and 13)	*resources* (a) : limiting importation of materials (sand, stones), considering possible deviation from planning *energy* (b) : using high efficiency equipment and targeting at the best use of equipment *water* (d) : taking into account weather conditions to avoid potential contamination of ground water *waste* (e) : use separation of disposal (materials, welding, soil) *noise* (f) : minimizing disturbances and impact on local surroundings (noise, dust, traffic), particularly for 13 given con-urbanisation *risk* (g) : following procedures to eliminate/mitigate any possible accident/incident *land* (h) : limiting access to sites

Reference	Guidance for implementing Environmental Requirements (See subsequent matrix "*Environmental scheme for gas companies*" for the numbering of activities 1 to 49)
Decommission-ing, Disposal (7 and 14)	*air* (c) : minimizing release of CH_4 by using appropriate techniques (e.g. recompression) e, h, g: considering all environmental (and safety) risks, including long-term, of the decommissioning and disposal activities; selecting the most appropriate solutions, preferably recycling
STORAGE	
Planning Designing (15)	*resources* (a) : for seismic and geological study; considering the quality of materials with respect to the life time *energy* (b) : limiting use of fuels, possibly explosives *air* (c) : limiting emissions from fuels and explosives *waste* (e) : removing debris, reusing salty water *noise* (f) : limiting disturbances (mainly noise) and vibrations *risk* (g) :avoiding access to explosives *land* (h) : avoiding to site in sensitive surroundings (e.g. groundwater, natural reserves), restoration

Reference	Guidance for implementing Environmental Requirements (See subsequent matrix "*Environmental scheme for gas companies*" for the numbering of activities 1 to 49)
Construction (16)	*resources* (a) : optimizing the use of water, drilling fluids materials *energy* (b) : optimizing the use of diesel, electricity *air* (c) : limiting emissions from fuels *waste* (e) : removing cuttings from drilling, drillings fluids (treatment) *noise* (f) : limiting noise from drilling rig *risk* (g) : avoiding possible contamination of groundwater due to an incorrect drilling, blow-out of gas or oil *land* (h) : ensuring an appropriate restoration (see 15)
Commissioning (17)	*resources* (a) : using preferably CO_2 for cushion gas *energy* (b) : optimizing the use of diesel, electricity *risk* (g) : avoiding failure of new equipment

Reference	Guidance for implementing Environmental Requirements (See subsequent matrix "*Environmental scheme for gas companies*" for the numbering of activities 1 to 49)
Operation (18)	*resources* (a) : optimizing the use of resources during gas treatment (dehydration fluids, active carbons…) *energy* (b) : optimizing the use of diesel, electricity *air* (c) : optimizing the efficiency of compressors for injection and compression of gas (CO_2, NO_x) *waste* (e) : using specific disposal facilities for oil from compressors, optimizing treatment of outgoing gas (e.g. methanol), ensuring the recycling of oil and other chemicals *noises* (f) : limiting the noise from compressors, burners for gas treatment by using a good isolation *risk* (g) : avoiding failure of wellhead and sub-surface safety valve
Maintenance Repair Renovation (19 and 20)	*resources* (a) : optimizing resources during drilling fluid materials (workover) *air* (c) : limiting venting (CH_4) and flaring of gas (CO_2) *waste* (e) : using specific disposal facilities for materials from well (e.g. tubing, valves) *noise* (f) : limiting noises from workover drilling (see 16 – shorter span of time) *risk* (g) : avoiding particularly blow-out (see 16) *land* (h) : ensuring an appropriate restoration

Reference	Guidance for implementing Environmental Requirements (See subsequent matrix "*Environmental scheme for gas companies*" for the numbering of activities 1 to 49)
Decommission-ing, Disposal (21)	*cement* (a) : optimizing the use of cement b and c: see 19/20 *waste* (e) : using specific disposal facilities and trying to recycle materials from well head, surface casings *risk* (g) : avoiding accidental spillage of additives to cement and liquid cement *land* (h): ensuring an appropriate restoration
COMPRESSION AND PRESSURE REGULATING STATIONS	
Planning Designing (22 and 29)	*general risk assessment* (a) : considering the use of natural resources required by the new asset across its life cycle and seeking to minimise their use; equally considering the use of energy required for 22 : prime mover, power turbines, generators; for 29: pre-heater *air* (c) : using correct procedure when assembling to avoid adverse impact on environment, particularly emissions to air *waste* (e) : using separation of disposals (particularly lubrication system, electrical equipment) *noise* (f) : avoiding or limiting noise (by adequate sound insulation) *risk* (g) : using the correct assembling procedure *land* (h) : verifying if protected area

Reference	Guidance for implementing Environmental Requirements (See subsequent matrix "*Environmental scheme for gas companies*" for the numbering of activities 1 to 49)
Construction (23 and 30)	*resources* (a) : limiting importation of materials (e.g. kind of ground) *energy* (b) : choosing high efficiency equipment for building the housing (energy used) *waste* (e) : separating waste from housing, packing of equipment
Commissioning (24 and 31)	*resources* (a) : optimizing the use of test fluid *energy* (b) : optimizing the use of gas, electricity (running time)
Operation (25 and 32)	*lubricants* (a) : optimizing the use of lubricants *energy* (b) : optimizing compressors to limit use of gas, electricity *air* (c) : for 25: limiting emissions from compressors (CO_2, NO_x); for 32: limiting emissions from breather lines (CH_4) *waste* (e) : recycling lubricants (e.g. oil) *noise* (f) : for 25: limiting noise from compressors, turbine (using sound insulation); for 32: considering flow rate, turbulences
Maintenance (26 and 33)	*resources* (a) : optimizing use of lubricants, spare parts (e.g. filter) *air* (c) : checking impact with regard to the location of the spare part *waste* (e) : using specific disposal facilities for removed equipment, lubricant tool

Reference	Guidance for implementing Environmental Requirements (See subsequent matrix "*Environmental scheme for gas companies*" for the numbering of activities 1 to 49)
Repair Renovation (27 and 34)	*resources* (a) : choosing equipment with regard to material(s), optimizing use of nitrogen (purging) *energy* (b) : optimizing use of engine, motorized tools *air* (c) : limiting venting (CH_4)
Decommission-ing, Disposal (28 and 35)	*energy* (b) : optimizing pipe cutting tool, choosing a low impact transportation for removal of materials *air* (c) : limiting venting (CH_4), choosing low energy consumption vehicles for transportation *waste* (e) : sorting out and disposing of waste : building debris, dismantled equipment (possible recycling), lubricants (oil), electrical equipment ; recycling as possible *risk (*g) : avoiding accidental spillage of lubricants *land* (h) : ensuring an appropriate restoration
GAS CONDITIONING	
Planning Designing (36)	*resources* (a) : choosing chemical constituents of the odorants/additives/drying agent used, considering diminution of resources *energy* (b) : minimizing gas consumption for the regeneration of drying agents (e.g. glycol) *air* (c) : choosing adequate odorants (e.g. without sulphur) and chemical agents (e.g. additives, cohesive agents) minimizing adverse effects *waste* (e) : planning the less damaging disposal of chemical, possibly toxic agents; conditions of storage

Reference	Guidance for implementing Environmental Requirements (See subsequent matrix "*Environmental scheme for gas companies*" for the numbering of activities 1 to 49)
	smell (f): estimating the extent of smell *risk* (g) : planning measures in case of failure of equipment or third party interference *land* (h) : limiting impact of the activity on land considering areas close to the stations *soils* (i) : avoiding possible migration into soils, particularly during cleaning operations (*)
Construction (37)	*energy* (b) : minimizing the use of motorized tools *air and noise* (c, f) : using correct installation with regard to the tightness of equipment (e.g. glands at injection inlet, lift check valves, pumps) *risk* (g) : avoiding failure to follow the procedures *soils* (i) : avoiding possible migration into soils (*)
Commissioning (38)	*energy* (b) : optimizing injection of odorants, tightness tests; adequate storage facilities for odorants and additives *smell* (f) : adjusting odorants, eliminating other smell sources *risk* (g): avoiding failure to follow the procedures *land* (h) : using adequate measures if sensible area close to the station

Reference	**Guidance for implementing Environmental Requirements** (See subsequent matrix "*Environmental scheme for gas companies*" for the numbering of activities 1 to 49)
Operation (39)	*risk* (g) : checking the efficiency of the measures taken in case equipment (e.g. injection) fails; avoid failure to follow the procedures *soils* (i) : avoiding possible migration into soils (*)
Maintenance (40)	*air* (c): taking into account the cleaning of pipes and vessels with chemical agents (e.g. iso-propanol) *waste* (e) : using disposal of cleaning remnants *risk* (g) : avoiding failure to follow the procedures *soils* (i) : planning measures preventing migration into soils (*)
Repair Renovation (41)	*air and smell* (c, f) : planning a correct installation with regard to the tightness of equipment: e.g. glands at injection inlet, lift check valves, pumps, compatibility check by replacing some of them, tightness, re-injection and adjusting of odorants *waste* (e) : using specific disposal facilities for cleaning remnants and other replaced materials *risk* (g) :avoiding failure to follow the procedures

Reference	Guidance for implementing Environmental Requirements (See subsequent matrix "*Environmental scheme for gas companies*" for the numbering of activities 1 to 49)
Decommission-ing, Disposal (42)	*air* (c): minimizing emissions when removing equipment *waste* (e) : using adequate disposal of materials and remain chemical agents *smell* (f): minimizing smell propagation *risk* (g):avoiding failure to follow the procedures *soils* (i) : avoiding possible migration into soils (*)
(*) : in case of accidental spillage of chemical agents (such as methanol, glycol, oil, odorant agents) off retention ponds.	
LNG	
Preliminary note: Concerned installations : - Liquefaction plants (export terminals), import terminals and others installations with a storage capacity ranging 5 to 200 tons (of LNG, ref. EN 13645) - LNG carriers : specific regulations from principally IMO (International Maritime Organization) Implementation of Quality, Health, Safety and Environment management system as described in EN ISO 9000 and 14000 series. Safety Management System in accordance with European SEVESO Directives	

Reference	**Guidance for implementing Environmental Requirements** (See subsequent matrix "*Environmental scheme for gas companies*" for the numbering of activities 1 to 49)
Planning Designing (43)	*Planning/Routing and design* (a to i except b which is an economical issue since electricity is the principal energy). For main installations : 1) Environmental impact assessment, principally: - increased population, permanent and temporary ; - increased road, rail and ship traffic ; - increased noise levels, sudden and intermittent noise ; - increased vibration levels, sudden and intermittent ; - increased night working, effect of lights and their intermittent use ; - flaring, intermittent and/or continuous ; - heating or cooling of water. 2) Hazard assessment with hazard identification : - external origin (natural event, adjacent premises,…); - internal origin (hydrocarbon hazards, on-site work,…); - provisions to reduce the risk if necessary. 3) Environmental protection approach : - Plants are to be designed around the principle of no continuous flaring or venting; - Efficient process designs shall be preferred to limit in particular gaseous hydrocarbons (methane, ethane, etc.), CO, H_2S, CO_2, NO_X and SO_X emissions to the atmosphere and the level of toxic substances in liquid effluents; - Emission shall be controlled during operation.
Construction (44)	*Construction* (a,,d,e,f,g,h,i)

Reference	Guidance for implementing Environmental Requirements (See subsequent matrix "*Environmental scheme for gas companies*" for the numbering of activities 1 to 49)
Commissioning (45)	*Commissioning* (c,f,g,i)
Operation (46)	*Operation* (b,c,d,e,f,g,i) – greenhouse emission report every year; – updating of hazard assessment every five years; – operation report with saving and efficiency energy use every ten years.
Maintenance (47)	*Maintenance* : included in operation
Repair Renovation (48)	*Extension or renovation* : see design, construction and commissionning
Decommission-ing, Disposal (49)	*Dismantling* (a,c,e,f,g,i)

2.3 Environmental Scheme for Gas Companies

Table 3

Technical Installations/ Plant	**Operation, Process, Life cycle**							
	Planning/ Routing	Designing	Construction	Commissioning	Operation	Maintenance	Repair, Renovation	Decommissioning Disposal
Transmission	1- a to i		2- a, b, d, e, f, g, h	3- a, c, e, g	4- g	5- c, e, f, g	6- a, b, d, e, f, g, h	7- c, e, h, g
Distribution	8- a to i		9- a, b, d, e, f, g, h	10- a, c, e, g	11- g	12- c, e, f, g	13- a, b, d, e, f, g, h	14- c, e, h, g
Storage	15- a, b, c, e, f, g, h		16- a, b, c, e, f, g, h	17- a, b, g	18- a, b, c, e, f, g	19- a, c, e, f, g, h	20- a, c, e, f, g, h	21- a, b, e, g, h
Compression Stations	22- a, c, e, f, g, h		23- a, b, e	24- a, b	25- a, b, c, e, f	26- a, c, e	27- a, b. c	28- b, c, e, g, h
Metering and Pressure Regulating Stations	29- a, c, e, f, g, h		30- a, b. e	31- a, b	32- a, b, c, e, f	33- a, c, e	34- a, b, c	35- b, c, e, g, h

Technical Installations/ Plant	**Operation, Process, Life cycle**							
	Planning/ Routing	Designing	Construction	Commissioning	Operation	Maintenance	Repair, Renovation	Decommissioning Disposal
Gas Condtioning	36		37	38	39	40	41	42-
- odorizing	- a, c, e, f, g, h, i		- b, c, f; g, i	- c, f, g	- g	- c, e, g, i	- c, e, f, g	- c, e, f, g, i
- drying	- a, b, c, e, f, g, h, i		- b, f, g, i	- c, g	- g	- c, e, g, i	- c, e, f, g	- c, e, f, g, i
- blending	- a, b, c, f, g, h		- f, g	- c, f, g	- g	- g	- c, e, f, g	- c, e, f, g
- leakage prevention	- a, c, e, g, h, i		- f, g, i	- c, f, g	- g	- c, e, g, i	- c, e, f, g	- c, e, f, g, i
LNG	43- a, c, d, e, f, g, h, i		44- a, d, e, f, g, h, i	45- c, f, g, i	46- b, c, d, e, f, g, i	47- b, c, d, e, f, g, i	48- a, c, d, e, f, g, h, i	49- a, c, e, f, g, i
	EI = Environmental Indicator (see list)							

NOTE The digits **1 to 49** refer to the activities in the matrix above (e.g. 9 is distribution/construction) and **a to i** relate to gas infrastructure requirements in reference to the environmental indicators.

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