

***IGEM/TD/2 Edition 2 with amendments July 2015  
Communication 1779***

# ***Assessing the risks from high pressure Natural Gas pipelines***



*Founded 1863  
Royal Charter 1929  
Patron: Her Majesty the Queen*



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Communication 1779***

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## SECTION 1 : INTRODUCTION

- 1.1 This Standard revises and supersedes IGE/TD/2 Edition 2, Communication 1764 which is obsolete.
- 1.2 This Standard has been drafted by a Panel appointed by the Institution of Gas Engineers and Managers' (IGEM) Gas Transmission and Distribution Committee, subsequently approved by that Committee and published by the authority of the Council of IGEM.
- 1.3 IGE/TD/1 Edition 5, Section 4 on planning and legal considerations, provides guidance on the route selection and location of new pipelines including the need to identify the population area classification of the proposed route.

IGEM/TD/1 Edition 5, Section 6 on design, categorizes locations adjacent to pipelines into Type R, S and T according to population density and/or nature of the immediate surrounding area.

IGEM/TD/1 Edition 5, Section 12 on operations and maintenance, provides requirements for surveillance and inspection which will reveal encroachment into areas of interest adjacent to a pipeline. Significant developments or infringements may require risk assessment using societal risk analysis for comparison with suitable risk criteria to allow the operator to assess whether the risks remain within acceptable limits.

IGEM/TD/1 Edition 5, Appendix 3 on risk assessment techniques, describes the application of risk assessment and includes a description of societal risk assessment with a sample of an actual F-N criterion based upon extensive application of previous editions of IGE/TD/1. IGE/TD/2 aims to support pipeline operators when carrying out risk assessments to assess safety risks including those associated with planning developments in close proximity to pipelines.

- 1.4 The general approach to the risk assessment process follows the stages outlined in IGE/TD/1 Edition 5 Appendix 3. IGE/TD/2 includes guidance on:
- determining failure frequencies
  - consequence modelling
  - standard assumptions to be applied in the risk assessment methodology
  - conducting site-specific risk assessments
  - risk reduction factors to be applied for mitigation methods
  - benchmark results for individual and societal risk levels.

This Standard provides guidance for the risk assessment of major hazard pipelines containing Natural Gas. The need for undertaking a pipeline risk assessment may typically arise as a result of the need to:

- assess hazards and risks in support of the pipeline operator's Major Accident Prevention Document (MAPD);
- assess the acceptability of a development or developments that do not comply with proximity requirements or the population density requirements of IGE/TD/1;
- support operational changes to a pipeline e.g. uprating (increasing the operating pressure) of a pipeline;
- assess the risks associated with specific operational issues;
- assess the implications of a Land Use Planning Application (see below).

Under the Town and Country Planning Act in England and Wales, and the Town and Country Planning Act (Scotland) in Scotland, it is the Local Planning Authority's responsibility to determine the acceptability of individual planning applications including developments in the vicinity of high pressure gas pipelines. These decisions would take account of safety advice provided by the HSE. In coming to a decision the Local Authority would weigh local needs and benefits and other planning considerations alongside the HSE's advice. The HSE's advice on land use planning in the vicinity of high pressure pipelines is delivered through PADHI (Planning Advice for Developments near Hazardous Installations). A summary of the HSE's risk methodology upon which the PADHI advice is based is provided in Appendix 3 of this document.

In the event of a Local Planning Authority determining that a planning application not be allowed based on the HSE's advice, the developer may approach the pipeline operator or seek independent guidance on the measures that can be taken to further reduce the risk. Alternatively there may be pipeline risk reduction features at the location of the proposed development that were not fully taken into account by the Local Planning Authority or the HSE when applying PADHI. These could, for example, include sections of pipeline with wall thicknesses greater than the notified pipeline wall thickness. The approaches detailed in this document can be used to undertake further detailed quantitative risk assessments in relation to land use planning applications.

As outlined in Reference 19, the HSE take a different approach when assessing the acceptability of a proposed development that has not yet received planning permission compared with an existing development. Not allowing the development is seen by the HSE as being relatively inexpensive when compared to the costs entailed in requiring existing developments with similar risks to introduce remedial measures. Pipeline operators and developers need to be aware of these differences in approach when undertaking assessments in relation to land use planning applications. Further details on the HSE's approach for assessing the acceptability of proposed developments in the vicinity of high pressure pipelines are provided in Appendix 3.

The guidance in this document does not cover environmental risks.

#### 1.5 An overview of this Standard's content is given in Figure 1.

The guidance in this Standard is provided for the benefit of pipeline operators, local planning authorities, developers and any person involved in the risk assessment of developments in the vicinity of existing high pressure Natural Gas pipelines. It is based on the established best practice methodology for pipeline risk assessment, and is intended to be applied by competent risk assessment practitioners.

Where significant numbers of people are exposed to the risk, the pipeline operator may wish to carry out risk assessment using societal risk analysis for comparison with suitable risk criteria to allow the operator to assess whether the risks remain within acceptable limits. Section 6 describes the application of societal risk, and includes reference to the recommended F-N criterion envelope in IGEM/TD/1 Edition 5.

#### 1.6 This second Edition has been updated to more clearly differentiate between the assessments that would be undertaken by pipeline operators to justify the safe operation of the pipeline and those undertaken for land use planning purposes. Additionally some of the technical information within the Standard, including:

- risk reduction factors for concrete slab protection over pipelines
- the risk reduction factors assumed for increased depth of cover over the pipeline have also been updated.

1.7 It is now widely accepted that the majority of accidents in industry generally are in some measure attributable to human as well as technical factors, in the sense that actions by people initiated or contributed to the accidents, or people might have acted better to avert them.

It is therefore necessary to give proper consideration to the management of these human factors and the control of risk. To assist in this, it is recommended that due cognisance be taken of HSG48 and HSG65.

The primary responsibility for compliance with legal duties rests with the employer. The fact that certain employees, for example "responsible engineers", are allowed to exercise their professional judgement does not allow employers to abrogate their primary responsibilities. Employers must:

- a) Have done everything to ensure, so far as is reasonably practicable, that there are no better protective measures that can be taken other than relying on the exercise of professional judgement by "responsible engineers".
- b) Have done everything to ensure, so far as is reasonably practicable, that "responsible engineers" have the skills, training, experience and personal qualities necessary for the proper exercise of professional judgement.
- c) Have systems and procedures in place to ensure that the exercise of professional judgement by "responsible engineers" is subject to appropriate monitoring and review.
- d) Not require "responsible engineers" to undertake tasks which would necessitate the exercise of professional judgement that is beyond their competence. There should be written procedures defining the extent to which "responsible engineers" can exercise their judgement. When "responsible engineers" are asked to undertake tasks that deviate from this, they should refer the matter for higher review.

*Note: The responsible engineer is a suitably qualified, competent and experienced engineer or a suitably qualified, competent and experienced person acting under his or her supervision, appointed to be responsible for the application of all or part of this Standard.*

1.8 This Standard makes use of the terms "must", "shall" and "should" when prescribing particular requirements. Notwithstanding Sub-Section 1.9:

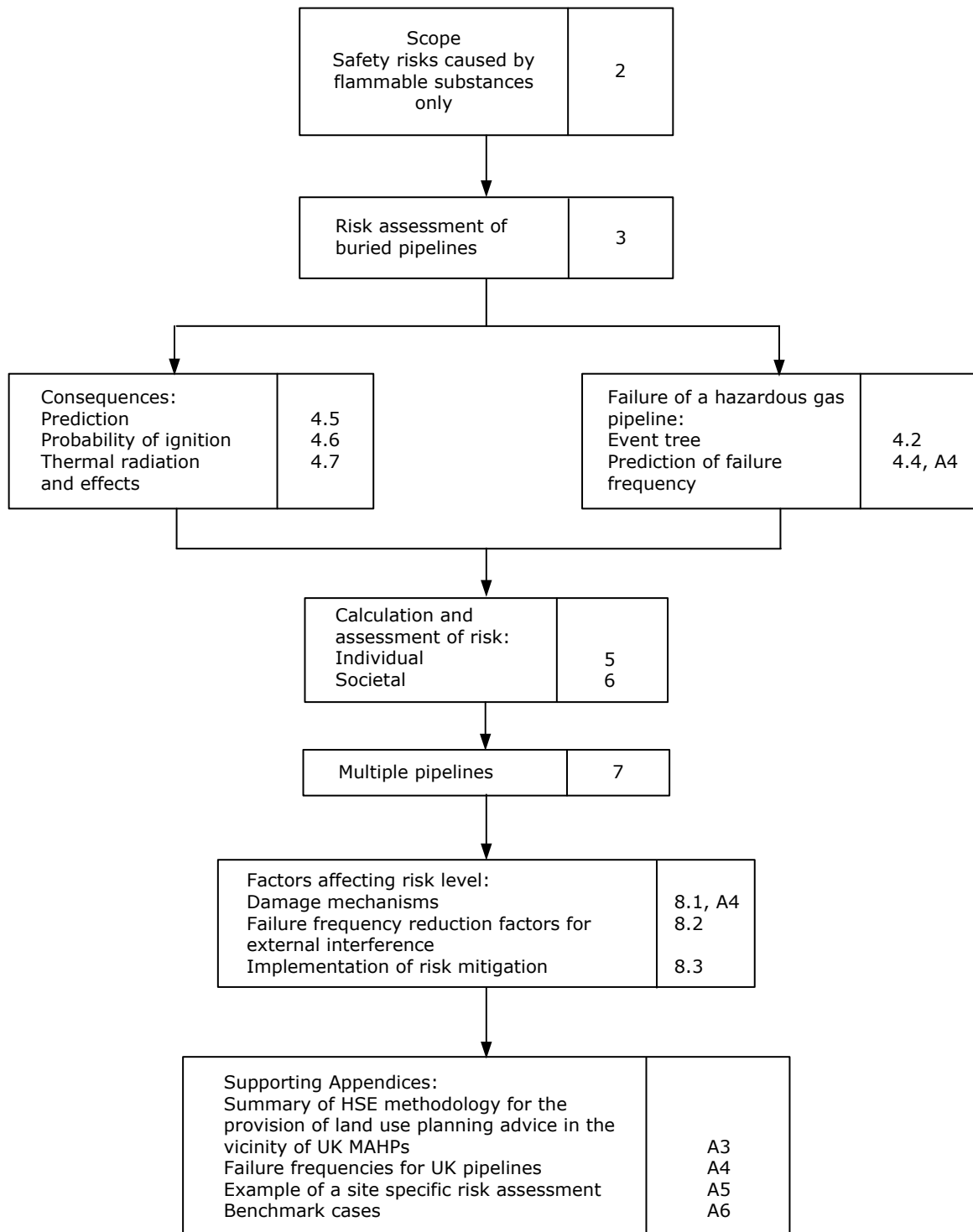
- the terms "must" identifies a requirement by law in Great Britain (GB) at the time of publication
- the term "shall" prescribes a requirement which, it is intended, will be complied with in full and without deviation
- the term "should" prescribes a requirement which, it is intended, will be complied with unless, after prior consideration, deviation is considered to be acceptable.

1.9 Notwithstanding Sub-Section 1.8, this Standard does not attempt to make the use of any method or specification obligatory against the judgement of the responsible engineer. Where new and better techniques are developed and proved, they should be adopted without waiting for modification to this Standard. Amendments to this Standard will be issued when necessary and their publication will be announced in the Journal of Igem and other publications as appropriate.

1.10 Requests for interpretation of this Standard in relation to matters within its scope, but not precisely covered by the current text, should be addressed to Technical Services, Igem, Igem House, High Street, Kegworth, Leicestershire, DE74 2DA, and will be submitted to the relevant Committee for consideration and advice, but in the context that the final responsibility is that of the engineer concerned. If any advice is given by, or on behalf of, Igem, this does not relieve the responsible engineer of any of his or her obligations.



- 1.11 As with any risk assessment, judgement has to be employed by the risk assessor at all stages of the assessment. IGEM/TD/2 is intended to support the application of expert judgement. The final responsibility for the risk assessment lies with the assessor, and it is essential that the assessor be able to justify every key assumption made in the assessment and document these assumptions as part of the assessment.
- 1.12 This Standard was published in July 2015. Amendments are shown throughout the document by ► ◀.



**FIGURE 1 - OVERVIEW OF CONTENTS OF THE STANDARD**

## **SECTION 2 : SCOPE**

2.1 IGEM/TD/2 provides a framework for carrying out an assessment of the acute safety risks associated with major accident hazard pipelines (MAHPs) containing high pressure Natural Gas, as defined in the Pipelines Safety Regulations. It provides guidance on the selection of pipeline failure frequencies and on the modelling of failure consequences for the prediction of individual and societal risks.

The principles of this Standard are based on best practice for the quantified risk analysis of new pipelines and existing pipelines. It is not intended to replace or duplicate existing risk analysis methodology, but is intended to support the application of the methodology and provide guidance on its use.

2.2 This Standard is applicable to buried pipelines on land that can be used to carry high pressure Natural Gas, which is hazardous by nature, and therefore liable to cause harm to persons. It is limited to cross country pipelines and is not intended for application to pipelines and pipework forming part of above-ground installations, nor to associated equipment such as valves. The Standard does not cover environmental risks.

2.3 This Standard is intended for use in assessing the risks from high pressure gas pipelines including the additional risks that arise as a result of new developments in the vicinity of pipelines. This Standard provides a framework to help inform the pipeline operator on the acceptability, or otherwise, of these risks.

2.4 All references to gas pressure are gauge pressure, unless otherwise stated.

2.5 Details of all standards and other publications referenced are provided in Appendix 2.

Where standards are quoted, equivalent national and international standards, etc. equally may be appropriate.

2.6 Italicised text is informative and does not represent formal requirements.

2.7 Appendices are informative and do not represent formal requirements unless specifically referenced in the main sections via the prescriptive terms "must", "shall" or "should".