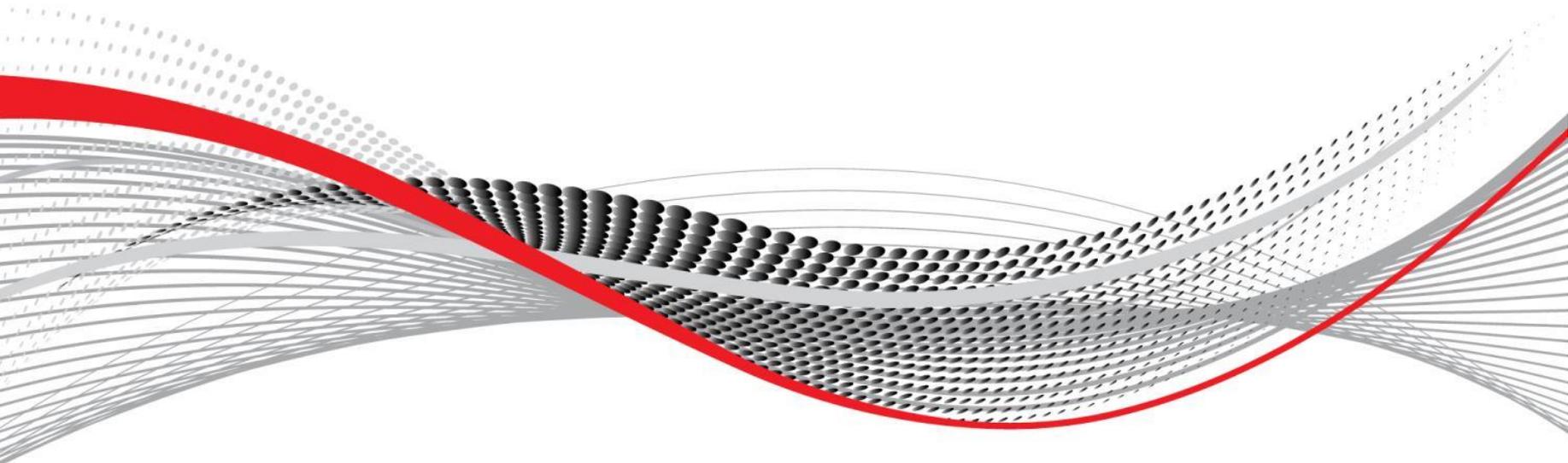




PD8010 Code Review Summary



Experience that Delivers



Background

- PD 8010-1:2004 and PD 8010-2:2004 were published in 2004
- EN 14161 is the European version of ISO 13623:2000, with the exclusion of 'gas supply on land'
- The national foreword to BS EN 14161 makes reference to BS Technical Committee PSE 17/2
- a more comprehensive approach to the design of pipelines is possible through using BS EN 14161 in association with
 - PD 8010-1:2004, Code of practice for pipelines - Part 1: Pipelines on land
 - PD 8010-2:2004, Code of practice for pipelines - Part 2: Subsea pipelines
- The revised version of ISO 13623:2009 was introduced into Europe in 2011 as EN 14161:2011
- PSE 17/2 as the BS Technical Committee responsible for managing PD 8010 and all its parts, recognise that Part 1 and Part 2 should be revised

Stage 1 &2 Deliverables



- Stage 1 Deliverables
 - List of reference documents
 - List of proposed principal changes and the reasons behind each
 - Attendance at a PSE 17/2 work group meeting to present and discuss above
- Stage 2 Deliverables
 - Completed Code Consultant's draft of the revised PD 8010 Part 1 and Part 2.
 - Attendance at a PSE 17/2 work group meeting to present and discuss the draft.

Stage 3 Deliverables

- Stage 3 will allow the Code Consultant to participate in the following:
 - The process of collating and resolving comments from PSE 17/2, and resolving editorial comments from the BSI Content Developer, thereby enabling the Code Consultant's Final Draft to be issued as a committee draft for public comment; and
 - The process of resolving public comments (which will be collated by the BSI Content Developer), thereby enabling the committee draft for public comment to be finalised and handed over to BS for publication.

Scope of PD8010 Review

- Normative References
- Other Codes including EN 14161:2011, IGE TD1: Edition 5 and EN 1594
- Regulations, Bibliography, Trenchless Technology, Other Publications, Further Reading
- Guidance regarding major accident hazard (MAH) pipelines associated with legislation and as set out in the HSE website
- Guidance with regard to conveying CO₂ in pipelines in connection with carbon capture, storage and sequestration projects and as set out in the HSE website
- The review will include the new DNV guideline on design of onshore and offshore CO₂ pipelines
- References will be added to recent onshore and offshore pipeline research and Joint Industry Project results
- References will be added to recent research on CO₂ material behaviours and release modelling

Schedule

Stage 1	Review references	Start	01/08/2013
		End	30/09/2013
	Workshop		04/10/2013
		End	31/10/2013
Stage 2	Drafting	Start	01/11/2013
	Complete First draft		31/01/2014
	Workshop		4/02/1014
	Review comments	End	28/02/2014
Stage 3	Complete committee Draft		28/02/2014
	PSE/17/2 review		14/03/2014
	Issue DPC		31/03/2014
	DPC comment period	End	31/05/2014
	Review comments	Start	01/06/2014
	Comments resolution meetings		June/July
	Finalize text		31/7/2014
	PSE/17/2 approval		31/7/2014
Publication			

PD8010 Part 1

Reference Changes

- 55 Normative references
 - 45 updates mainly material related that do not change text in code
 - 5 not updated and 5 with drawn
 - Major update to IGE/TD/1
- 19 other codes
 - 11 updates
 - 6 not updated and 2 with drawn
 - Detailed comparison EN 14161:2011, IGE TD1: Edition 5 and EN 1594 on-going
- 24 Regulations – check for updates on-going – no expected impact on code
- 31 Bibliography – check for update on-going – no expected impact on code
- 14 Trenchless technologies – check for updates on-going
- 42 Other publications and further reading - no changes
- Are all these still relevant?

PD8010 Part 2

Reference Changes

- 98 Normative references
 - 67 updates mainly material related that do not change text in code
 - 14 not updated, 11 replaced and 4 with drawn
- 19 other codes
 - 12 updates
 - 5 not updated and 7 with drawn
 - Detailed comparison EN 14161:2011, DNV-OS-F101 and DNV-RP-E305
- 19 Regulations – check for updates on-going – no expected impact on code
- 27 Bibliography – check for update on-going – no expected impact on code
- 43 Other publications and further reading - no changes
- Are all these still relevant?

IGEM/TD/1 5th Edition

Scope and Main Changes



- Applies to the design, construction, inspection, testing, operation and maintenance of pipelines and associated installations
- Removal of the upper limit to maximum operating pressure (MOP) (formerly limited to 100 bar)
- Inclusion of advice on the relevant safety evaluation when MOP > 100 bar
- Addition of requirements for certain associated installations
- Removal of requirements for methanol swabbing, except where there is no practicable alternative
- Guidance on alternating current (AC) corrosion and application of new technology associated with corrosion protection
- Inclusion of equations for proximity curves
- An alternative approach for reaffirmation of MOP, avoiding the requirement for pressure raising in all circumstances
- Revision of the requirements for TD/1 audits
- The updating of numerous references to legislation and standards.

PD8010 Parts 1 and 2

CO2 Requirements

- **C.1.2 Substances conveyed as a gas** Nitrogen and carbon dioxide readily mix with air but can form a heavier-than-air cloud on release (due to temperature reduction), increasing the risk of asphyxiation in the immediate vicinity. In addition, carbon dioxide has a degree of toxicity (see HSE publication EH 40)
- **Categorization of fluids according to hazard potential – C - Non-flammable fluids that are non-toxic gases at ambient temperature and atmospheric pressure conditions.**

- Current UK experience in CO2 pipelines is limited, and only some pipeline design codes appear to capture CO2 as a relevant fluid within their scope of application
- HSE attaches particular importance to reducing risks to people as a result of appropriate consideration of health & safety in design and the use of good practice
- The use of good practice at the design stage is essential in demonstrating achievement of ALARP and in judging compliance HSE expects duty holders to apply relevant good practice as a minimum
- HSE will take a precautionary approach by giving more weight to the use of sound engineering and operational practice than to arguments about the probability of failure
- Ongoing work suggests that the hazards involved with the bulk transport of CO2 are similar to the hazards transporting natural gas
- <http://www.hse.gov.uk/pipelines/resources/designcodes.htm>

HSE CO2 Guidance

European Codes

- IP6, BS EN 14161, BS PD 8010 and DNV OS-F101 are all applicable to pipelines transporting CO₂ with the latter three categorising it as a non flammable, non toxic fluid which is gaseous at ambient temperature and pressure. IP6 also treats it as a gas.
- None of these standards specifically address CO₂ transported at a pressure above its critical point as a dense phase fluid.
- HSE recommends that any pipelines designed to BS EN 14161 should be supported by good industry practice as presented in BS PD 8010 Parts 1 and 2. DNV OS-F101 is specifically an offshore standard and its scope is limited to Submarine Pipeline Systems

HSE CO2 Guidance

US Codes

- The US Federal Code of Regulations, Title 49, Volume 3, Part 195 – Transportation of Hazardous Liquids by Pipeline and the associated ASME standard B31.4 and B31.8 are the main codes which address the transportation of liquids and gases by pipeline respectively
- The US Code of Regulations only applies to pipelines transporting CO2 in the supercritical phase. The Code therefore may only be relevant to pipelines conveying supercritical CO2
- There appear to be no US Regulations addressing the transport of CO2 in the gaseous or liquid phase. Furthermore the standard B31.8 specifically excludes pipelines carrying CO2 (in any phase), and whilst the standard
- B31.4 does not specifically exclude pipelines transporting CO2, it does not include CO2 within the list of fluids to which the code is intended to apply
- It may therefore be concluded that there may be limited technical benefit in adopting the US Code or standards in either their entirety or in part

- J202 provides guidance and sets out criteria for the concept development, design, construction and operation of steel pipelines for the transportation of CO₂
- It is written to be a supplement to existing pipeline standards and is applicable to both onshore and offshore pipelines.
- A precautionary approach to risk management is recommended, and it is recommended that, until sufficient knowledge and experience is gained with CCS pipeline design and operation, a more stringent categorization should be applied in populated areas.
- For onshore pipelines the allowable hoop stress design factors (yield strength utilization factor) should be specified according to ISO 13623; Annex B5, with reference to location classes and factors for category D fluid
- Category C can be used for remote locations and offshore

PD8010 Part1

Major Accident Hazard Pipelines

- **5.4.2 Safety evaluation** Where a safety evaluation is required, it should be carried out in accordance with Annex E. NOTE Attention is drawn to the Pipelines Safety Regulations 1996 [12] in respect of the requirement to carry out a safety evaluation for major accident hazard pipelines.
- **13.1.3 Incident and emergency response plan** NOTE 1 Attention is drawn to the Pipelines Safety Regulations 1996 [12], Regulations 12, 24 and 25 in respect of emergency procedures. Guidance is also available in HSE publication *Further guidance on emergency plans for major accident hazard pipelines* [33].
- **13.3.1 Maintenance programme** NOTE 1 Attention is drawn to the Pipelines Safety Regulations 1996 [12], Regulation 7 in respect of maintenance access; Regulation 10 in respect of work on the pipeline; Regulation 13 in respect of maintenance; and Regulation 23 in respect of major accident prevention documents and safety management systems.

Major Accident Hazard Pipelines

- [33] HEALTH AND SAFETY EXECUTIVE. *Further guidance on emergency plans for major accident hazard pipelines*. London: HSE Books, 1997.
- [37] HEALTH AND SAFETY EXECUTIVE. *Risk criteria for land-use planning in the vicinity of major industrial hazards*. London: HSE Books, 1989.

PD8010 Part 2

Major Accident Hazard Pipelines

- **13.3 Integrity assurance management**
- **13.3.1 Maintenance programme** NOTE 1 Attention is drawn to the Pipelines Safety Regulations 1996 [14], Regulation 7 in respect of maintenance access; Regulation 10 in respect of work on the pipeline; Regulation 13 in respect of maintenance; and Regulation 23 in respect of major accident prevention documents and safety management systems.
- NOTE 2 Attention is drawn to the Pressure Systems Safety Regulations 2000 [16] in respect of written schemes of examination.
- **A.3.1 Pipe** For major accident hazard pipelines, each accepted pipe should be given a unique identification number, cross-referenced to the inspection certification so that it can be identified and its quality verified.
- NOTE Attention is drawn to the Pipelines Safety Regulations 1996 [14] in respect of major accident hazard pipelines.
- **D.8.3 Societal risks**
- Societal risk criteria recognize the need to ensure that major incidents that could lead to a significant number of casualties in a single event occur far less frequently than those that could lead to an individual casualty.