



Department  
of Energy &  
Climate Change

# Fracking UK shale: safety from design to decommissioning

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Hydraulic fracturing, known as fracking, is a technique used in the extraction of gas and oil from 'shale' rock formations by injecting water at high pressure. The government is committed to ensuring risks to the workforce and the public are minimised. This guide explains what safety measures have been put in place.

## Safety in well design and construction

In the UK all offshore and onshore wells must be designed and constructed in accordance with [government regulations](#). These regulations seek to ensure that wells are structurally sound, strong and stable for their entire lifespan. The same regulations apply to offshore wells where the pressures and depths are generally much greater.

In the UK, it is standard practice for all oil and gas extraction wells to have three layers of 'casing'. Each layer is cemented into place:

- A outer 'conductor' casing
- An inner surface casing runs down below fresh water sources
- A production casing runs into the shale rock from where gas and oil flows

Where rock is under pressure or there is a risk of instability, operators may use an additional intermediate casing.

Where groundwater contamination has happened in the US, it has been generally due to faulty well construction and cementing, not the rock fracturing. There are generally three main types of well failure:

- A blowout from an uncontrolled escape of fracking fluids from the top of the well
- An annular leak, where fluids escape underground and run upwards along the well casing
- A radial leak, where the casing fails and fluids escape outwards into the rock

The focus in the UK is on operators to ensure that they design, construct and monitor wells to keep these risks as low as reasonably practicable in all situations. Well design and construction operations follow a recognised industry design and construction process, outlined in Oil and Gas UK's industry [guidelines](#). They include recommendations for safety features to be incorporated into the design, particularly in the cementing stage when the well casing is fixed in place using cement.

Inspectors from the Health and Safety Executive (HSE) and an independent well examiner check that the operators are following the regulations. They review the well design and monitor its construction to ensure it matches the design. When construction is complete, they continue to monitor its maintenance.

## Safety during drilling operations

The operator is responsible for safety at the site, including workers and members of the public in the vicinity. The HSE checks operators are meeting the requirements of the Health and Safety at Work Act 1974, and regulations made under the Act including the [Borehole Site and Operations Regulations 1995 \(BSOR\)](#).

HSE intend to jointly inspect drilling and fracking operations with the Environment Agency or Scottish Environmental Protection Agency during the exploratory phase<sup>1</sup>. HSE inspectors can visit any site at any time if there is a matter of concern.

Inspections will assess the operation at critical stages. Any change in the design, for example changing the depth of one of the layers of casing, would require a fresh round of inspections.

It is standard practice among operators to monitor well pressure. Well operators verify the well's integrity of each stage of the operation before beginning the subsequent stage.

In the long term, surface methane and groundwater monitoring ensures any anomalies will be reported to the appropriate environmental regulator, the HSE and the Department of Energy and Climate Change, and compared with data from the National Baseline Methane Survey run by the British Geological Survey.

## Safe use and storage of radioactive tools

Well logging tools – instruments used in oil and gas exploration – may contain radioactive material. The tools are robustly built with almost no chance of radioactivity release under normal operations.

There are stringent regulatory requirements on the transport, storage, handling, abandonment and eventual disposal of chemical radioactive sources. The UK radiological regulatory framework includes inspection programmes<sup>2</sup>.

Storing these tools requires security and safety procedures and special shielded containers to transport them. Access to such materials is strictly controlled.

## Effect of tremors on wells

Natural seismic activity or that released from hydraulic fracturing, will be well below what can damage the well or be felt at the surface.

In 2011, the Cuadrilla well at Preese Hall in Lancashire was inspected for damage after two small earthquakes caused by fracking operations at the same site. Inspections found that the well casing was distorted close to the depth of the fracking as a result of the tremor. However, there was no distortion in the sections of casing higher up the well that are critical to preventing the escape of gas<sup>3</sup>.

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<sup>1</sup> <http://www.hse.gov.uk/aboutus/howwework/framework/aa/hse-ea-oil-gas-nov12.pdf>

<sup>2</sup> <http://www.hse.gov.uk/radiation/ionising/doses>

<sup>3</sup> <http://royalsociety.org/policy/projects/shale-gas-extraction/report>

## Risk of flooding

It is unlikely that operators would want to put a shale gas well or facility in an area prone to flooding.

The relevant environmental regulator will assess flood risk where it is a significant risk to the site. The environmental regulator is a statutory consultee in the planning process, so their assessment will be considered in the local planning authority's decision to grant planning permission. The environmental regulators can also add conditions on the site's environmental permit to ensure that flood risk is managed appropriately.

## How operators manage incidents if something goes wrong

Operators must prepare a safety document with an assessment of risks and a plan for responding to incidents and emergencies on site.

If the following happens, it must be reported to the HSE:

- a blowout (an uncontrolled flow of well fluids)
- the unplanned use of blowout prevention equipment
- the unexpected detection of hydrogen sulphide
- failure to maintain minimum separation distance between wells
- mechanical failure of any safety critical element of a well

After an incident, the HSE will ensure appropriate investigations are made into the well safety and stability, and that well integrity is restored as necessary. Operators may then be required to make improvements to their operations.

## More information

The [Health and Safety Executive](#) is responsible for regulating the requirements that ensure operators manage and control safety risks.

Oil & Gas UK publishes guidelines on well integrity that the onshore industry has committed to meet. The guidelines describe what is believed to be good industry practice and refer to relevant legislation, standards and practices. The guidelines concentrate on "typical" wells and "standard" operations.

The American Petroleum Institute publishes information on well construction and integrity: [Hydraulic Fracturing Operations – Well Construction and Integrity Guidelines](#).

The Environment Agency and Health and Safety Executive have published a paper explaining their [joint approach to the regulation of unconventional oil and gas developments](#).

The Department of Energy and Climate Change, Environment Agency (England), Scottish Environment Protection Agency and Health and Safety Executive have worked with the UK Onshore Operators Group to agree guidelines for best practices for onshore shale gas wells.

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