

# Pipeline Impact Protection Questionnaire

## Introduction

National Grid, on behalf of the UK Onshore Pipeline Operators Association (UKOPA), has asked Germanischer Lloyd Industrial Services Ltd. (GL) to conduct a study into the effectiveness of installing concrete slab impact protection above pipelines. UKOPA / National Grid have decided to seek input from construction contractors to provide valuable information for the study. The full scope of the request is provided in the following section.

We would be most grateful if you could review this document and provide responses to the attached questionnaire. Should you need any assistance with the completion of any sections, please contact the following:

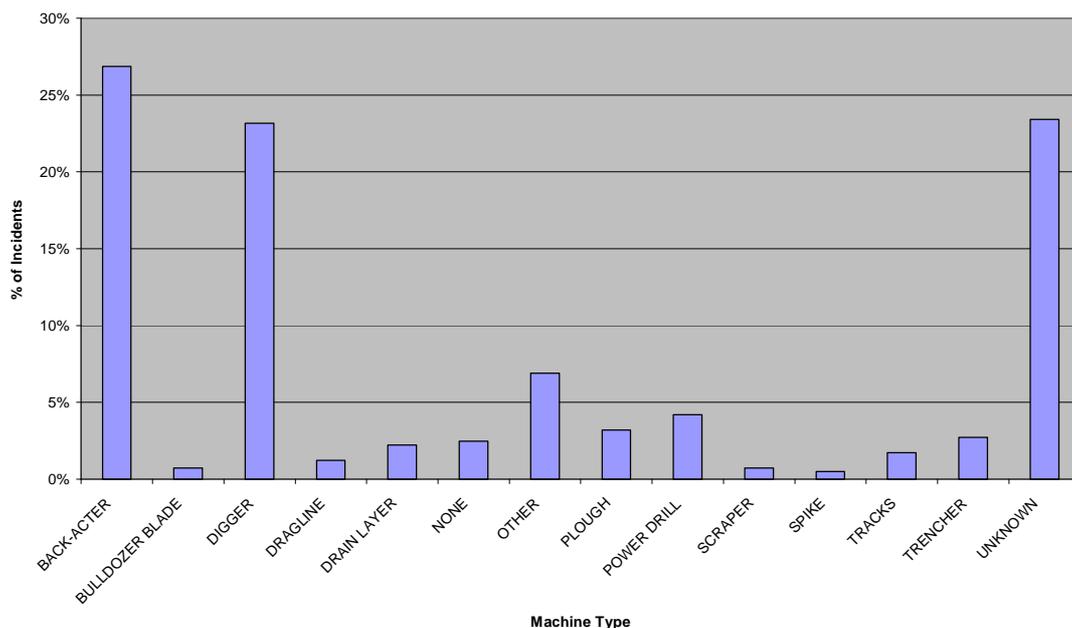
**Gary Toes**  
**Manager, Safety & Risk**  
**GL Industrial Services**  
[Gary.Toes@gl-group.com](mailto:Gary.Toes@gl-group.com)  
**01509 282439**

Please return completed questionnaires to the above by e-mail (cc. [Michael.Acton@gl-group.com](mailto:Michael.Acton@gl-group.com)), providing your name and return contact details in case of queries.

## Scope

One of the most common, and difficult to control, threats to the integrity of hazardous pipelines is *third party damage*. Many incidents are due to third parties using large machinery in the vicinity of the pipelines without knowing that the pipeline is there.

A wide range of machine types have been involved in pipeline damage incidents. Figure 1 below shows the proportion of recorded incidents caused by different machine types in rural areas of the UK.



**Figure 1: Third Party Damage by Machine Type in Rural Areas**

In order to reduce the risk of third party damage, pipeline operators sometimes lay *pipeline protection slabs* over the pipeline. These reinforced concrete slabs provide a physical barrier that is intended to prevent heavy machinery hitting the pipeline. A typical arrangement is shown in Figure 2. The slabs are typically 3m x 2m and 200mm thick with steel reinforcement at the top and bottom. They are usually buried 1.3m below ground level.

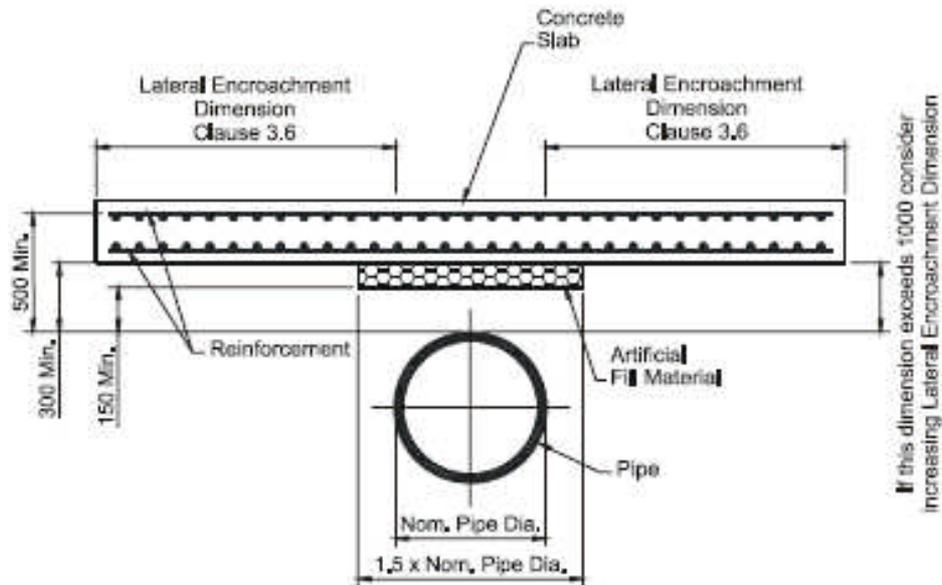


Figure 1

Arrangement of pipeline protection slab over pipeline.  
Impact and crossing-point slabs

Figure 2: Pipeline Protection Slab Arrangement

UKOPA has conducted research on the effectiveness of pipeline protection slabs. This has highlighted significant uncertainty about how effective slabs would be against certain machine types, namely:

- Drills
- Scrapers
- Spikes
- Trenchers
- Draglines
- Bulldozers
- Drainlayers

The uncertainty is associated with the response of the machines on impact with a slab (i.e. whether or not the operator would be aware that an impact with a slab has occurred) and whether or not the machines would be physically capable of breaking through a slab and damaging a pipeline.

In order to assist the research, it would be helpful to obtain the responses of experienced machine operators on the following two questions:

**If a machine of the type listed above was to impact a pipeline protection slab and the operator had no prior knowledge of the presence of the pipeline or the slab:**

- 1. Would the machine be capable of breaking through / breaching the slab and subsequently hitting the pipeline?**
- 2. Would the machine operator notice the impact with the slab?**

It is recognised that the answer to the above questions may depend on the size of the machines in use and the specific activities being undertaken in some cases.

As a result of the abovementioned uncertainties, UKOPA has decided to approach contractors with experience of operating these types of machines in order to obtain guidance on how effective a pipeline protection slab might be in protecting pipelines. This questionnaire is intended to focus on the specific questions associated with the response of the machines on impact with a pipeline protection slab and not on the response of the operator.

The contractor is asked to consider the scenario where the activity being undertaken is one that *would* have hit the pipeline had the slab not been present, i.e. deep enough, above the pipeline, operator unaware of the pipeline presence, etc.

In the following sections, space is provided for responses to the above questions for *each* of the machine types of interest. Examples of the types of machines that are *believed* to represent the categories above are also provided for reference.

## **Questionnaire**

Please complete the attached contact details and the questionnaire that follows. Please contact GL via the details provided if you have any questions.

Name: \_\_\_\_\_

Company: \_\_\_\_\_

Position: \_\_\_\_\_

E-mail: \_\_\_\_\_

Telephone: \_\_\_\_\_

Mobile: \_\_\_\_\_

## Drill

### Description

This category is believed to represent machines similar to that shown on the right. Typical size ranges for the UK are unknown.



### Questions

1. Ability of machine to breach slab:

a. Would the machine be capable of breaking through the slab?

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b. If dependent on size, what size (tonnes) of machine would be required to breach a slab?

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2. Ability of operator to notice impact with barrier:

a. Would the machine operator notice an impact with the slab?

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b. If dependent on size, what size (tonnes) of machine would be required for the operator *not to notice* slab?

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3. Other comments that may be of use?

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# Spike

## Description



There is significant uncertainty about what this category represents. From research the following description is believed to be appropriate:

*Spikes are long, thick, sharp-pointed fasteners made of metal or plastic. They are similar to heavy nails and used in railroad ties and other heavy-duty construction applications. There are many types of spikes. Examples include metal spikes, plastic spikes, railroad spikes, standard cut spikes, and stakes. A metal spike is made of aluminium, brass, or nickel and is stable, durable, and strong. A plastic spike is made of plastic materials and suitable for light-weight applications. A railroad spike has an L-shaped head and a square shank with a wedge-shaped tip. A standard cut spike can be driven through planking or heavy timber, and can be used for deck or bridge work. A stake is made of wood or metal and sharpened at one end for driving into the ground as a marker, fence pole, or tent peg.*

It is assumed that spikes generally involve manual installation, although installation by machine may be a possibility which is of particular interest to this study due to the higher forces involved.

## Questions

1. Ability of machine to breach slab:

a. Would the machine be capable of breaking through the slab?

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b. If dependent on size, what size (tonnes) of machine would be required to breach a slab?

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2. Ability of operator to notice impact with barrier:

a. Would the machine operator notice an impact with the slab?

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b. If dependent on size, what size (tonnes) of machine would be required for the operator *not* to notice slab?

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3. Other comments that may be of use?

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# Dragline

## Description

A dragline and bucket are shown in the figures to the right. It is understood that these machines vary in size from smaller types, used for road and port construction, to larger types, used in strip mining operations to extract coal. It is understood that the larger types can be upwards of 10,000 tons.



## Questions

1. Ability of machine to breach slab:
  - a. Would the machine be capable of breaking through the slab?  
\_\_\_\_\_
  - b. If dependent on size, what size (tonnes) of machine would be required to breach a slab?  
\_\_\_\_\_
2. Ability of operator to notice impact with barrier:
  - a. Would the machine operator notice an impact with the slab?  
\_\_\_\_\_
  - b. If dependent on size, what size (tonnes) of machine would be required for the operator *not to notice* slab?  
\_\_\_\_\_

3. Other comments that may be of use?  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

## Trencher/Drainlayer

### Description

This category is believed to represent machines similar to those shown to the right. It is understood that chain (top right) and wheel (bottom right) types are available. Size ranges for these machine types are unknown however it is believed that very large examples do exist.



### Questions

1. Ability of machine to breach slab:
  - a. Would the machine be capable of breaking through the slab?  
\_\_\_\_\_
  - b. If dependent on size, what size (tonnes) of machine would be required to breach a slab?  
\_\_\_\_\_
2. Ability of operator to notice impact with barrier:
  - a. Would the machine operator notice an impact with the slab?  
\_\_\_\_\_
  - b. If dependent on size, what size (tonnes) of machine would be required for the operator *not to notice* slab?  
\_\_\_\_\_

3. Other comments that may be of use?

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## Scraper

### Description

This category is believed to represent machines similar to that shown on the right. Typical size ranges for the UK are unknown.



### Questions

1. Ability of machine to breach slab:

a. Would the machine be capable of breaking through the slab?

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b. If dependent on size, what size (tonnes) of machine would be required to breach a slab?

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2. Ability of operator to notice impact with barrier:

a. Would the machine operator notice an impact with the slab?

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b. If dependent on size, what size (tonnes) of machine would be required for the operator *not to notice* slab?

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3. Other comments that may be of use?

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## **Bulldozer**

### **Description**

This category is believed to represent machines similar to that shown on the right. Typical size ranges for the UK are unknown.



### **Questions**

1. Ability of machine to breach slab:

a. Would the machine be capable of breaking through the slab?

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b. If dependent on size, what size (tonnes) of machine would be required to breach a slab?

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2. Ability of operator to notice impact with barrier:

a. Would the machine operator notice an impact with the slab?

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b. If dependent on size, what size (tonnes) of machine would be required for the operator *not to notice* slab?

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3. Other comments that may be of use?

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