Guidance on Safe Isolation of Plant and Equipment

Ref: BG10

CEA
Combustion Engineering Association

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Provision and Use of Work Equipment Regulations 1998
Regulation 22 - Maintenance operations

Every employer shall take appropriate measures to ensure that work equipment is so constructed or adapted that, so far as is reasonably practicable, maintenance operations which involve a risk to health or safety can be carried out while the work equipment is shut down, or in other cases

(a) maintenance operations can be carried out without exposing the person carrying them out to a risk to his health or safety; or

(b) appropriate measures can be taken for the protection of any person carrying out maintenance operations which involve a risk to his health or safety.

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Foreword

This document, Guidance on the Safe Isolation of Plant and Equipment (Ref: BG10) has been developed and written by the Combustion Engineering Association (CEA) in consultation with other stakeholders within the combustion industry to help managers and operators of all types of plant and industrial equipment make health and safety improvements in the industry.

This publication should not be regarded as an authoritative interpretation of the law, nor a mandatory legal requirement. However, if the guidance provided is followed, it will normally be regarded as sufficient to comply with the relevant health and safety duties.

The CEA is an educational charity which promotes the science of combustion engineering in commercial and industrial sectors. The CEA is concerned with industry good practice and the safe and efficient operation of combustion related plant and equipment.

Examples of isolation techniques and procedures in this document have been developed from processes and situations that are common in boiler houses, energy centres and other combustion related installations, but the principles and the legislative references will apply to many other commercial and industrial services, plant and equipment.

Acknowledgments

The CEA acknowledges the contribution of several individuals, Member companies and partner organisations in compiling the information herein.

In this document the following words convey specific meaning:

Should: Compliance with this clause is not essential where supported by risk assessment and/or design calculation.

Shall: Compliance with this clause is required in order to claim compliance with this document.

Must: Compliance with this clause is a legal requirement within the United Kingdom.

Legislation may not be the same for other jurisdictions, but ‘best practice’ principles remain valid throughout industry.

His: The use of his in health and safety legislation includes male and female genders

One possible outcome if maintenance isolations are not properly managed.

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1 INTRODUCTION

Most industrial and commercial processes involve the use of services and fluids that are normally contained within pipes, ducts and wires, and they are generally safe to use if the systems that contain them are correctly designed and installed, and properly maintained. However, almost all such installations will require disconnection or dismantling at some stage in their life, sometimes many times over, for activities such as repair, replacement or routine maintenance. Equipment in normal operating mode will usually run safely without any problems, but as soon as the equipment is required to be maintained or repaired it is extremely likely it will need to be isolated from all its sources of energy and any danger.

The common factor is that any commissioning, maintenance or repair activity on those assets must be carried out with all due regard for the safety of people involved and those around them, and every intervention must therefore be preceded by a safe isolation procedure. However, taking equipment apart inevitably requires that it is put back together correctly, necessitating following of a safe process of reinstatement.

Guidance on the Safe Isolation of Plant and Equipment (Ref: BG10) is a document intended to assist managers, operators and maintenance personnel of new and existing industrial and commercial plant installations in addressing the following issues:

- How to assess risks associated with isolating services for repair and maintenance activities on industrial and commercial plant;
- Producing procedures to ensure a safe working environment for those activities;
- Safe methods of managing plant and equipment isolation activities including Permit to Work (PtW) systems.

The Health & Safety Executive (HSE) published HSG253 “The Safe Isolation of Plant and Equipment” in 1997, an informative document on this subject which was updated in 2006; it is still freely available on the HSE website. It was conceived and drafted by experienced industrial plant engineers but focussed on larger installations and somewhat complex industrial processes that rightly require rigorous control measures to be put in place for all operation and maintenance activities. Nevertheless, much of the information in HSG253 is relevant to other plant installations, and short sections are repeated where necessary in this guidance for consistency across industry.

1.1 Who should read this document

The CEA has produced this Guidance Document for managers and operators of small and medium sized installations who would benefit from clear advice on safe local isolation activities, often of short duration, whilst still appreciating that failures during isolation and reinstatement of plant items are one of the main causes of loss-of-containment incidents, and may lead to major accidents.

Examples of isolation procedures and techniques described herein will frequently refer to boiler houses, energy centres and other combustion related processes and services, but the techniques described and the legislative references will apply to many other factory services, plant and equipment.

Root cause analysis of many industrial accidents can be traced to human error being a major contributor. Not knowing or understanding the risks of planned activities and failing to properly prepare for apparently simple and often repetitive maintenance tasks can lead to personal injury and serious harm as well as loss of production and significant unplanned expenditure. Employers with responsibility for plant installations also have a duty to ensure that contractors they employ to work on those installations are competent and properly supervised.

Plant designers, manufacturers and installers also have a role to play; it is incumbent upon them to make safe operation and maintenance activities as straightforward as possible by incorporating effective isolation and disconnection features in their equipment and installations, and by providing accurate and comprehensive operation and maintenance documentation and drawings for all equipment.

> CDM Reg 9 - When preparing or modifying a design the designer must take into account the general principles of prevention and any pre-construction information to eliminate, so far as is reasonably practicable, foreseeable risks to the health or safety of any person maintaining or cleaning a structure, building or fixed plant.

Finally, employers and their managers have many duties in relation to the provision of a safe working environment for their staff and all those who come into contact with their organisation, and the provision of education, training and experience for all staff and contractors is a foundation for improving safe working practices for all involved.

As a duty holder, you must identify the risk reduction measures available and determine the level of risk reduction that can be achieved and the associated cost. Unless the sacrifice involved in implementing the risk reduction measure is grossly disproportionate to the benefits of the risk reduction, then you must implement the measure. Where available measures are not taken, you must justify this decision. (HSG 253 para 14)

Legislation referred to in this document is wide ranging and covers more activities than just maintenance of plant and equipment. The aim of this document is to guide plant managers and duty holders towards the specific requirements of legislation when they are considering plant maintenance activities. Other activities may require reference to other parts of the relevant legislation or to other documents.

2 SCOPE

This document applies to all plant and equipment used in industrial and commercial installations, but particularly in small and medium sized enterprises (SMEs) who may only have relatively small installations at their undertaking..

Almost all industrial equipment has an electrical connection for mains power, and frequently electrical connections for control or safety related systems. Many services include a gas or fluid used for innumerable industrial processes such as:

- compressed air,
- water, potable and process,
- fuels, gaseous and liquid,
- food ingredients, wet and dry,
- steam and condensate,
- chemicals in gaseous form,
- chemicals as liquids (acids, solvents etc.)
- refrigerants (ammonia etc.).

Many different hazards will need to be considered according to:

- the temperature of piped contents;
- the pressure of piped contents;
- the toxicity, flammability or other hazardous nature of the chemicals or associated dusts;
- the voltage and other characteristics of the electrical supply;
- the design of control systems, especially where software routines are embedded;
- the possibility of oxygen depletion, or presence of other toxic gases;
- the means used to normally enclose hazardous substances or activities such as pressure vessels. containers or cages; and
- the access required to achieve safe isolations.

This list is not exhaustive.

This document covers:

- Legal requirements for plant isolations, the relevant legislation and available guidance, and the need for suitable and sufficient risk assessments and method statements;
- The important difference between switching off and Isolation, and methods of securing safe isolation;
- Safe systems of work and work control routines (permit issue and cancellation, shift handover, reinstatement etc.);
- Isolation methods for different services and equipment;
- Records and Documentation;
- Human factors applicable to plant maintenance activities.

Appendices give an abridged list of relevant legislation current at time of publication, examples of risk assessments for certain routine tasks, and permit processes for different activities.