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Introduction

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BS 14300, Safe use of machinery – Vision panel inspection and replacement

Foreword

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The guidance in this document is presented in roman (i.e. upright) type. Any recommendations are expressed in sentences in which the principal auxiliary verb is “should”.

Additional commentary, explanation and general informative material is presented in smaller italic type.

Where words have alternative spellings, the preferred spelling of the *Shorter Oxford English Dictionary* is used (e.g. “organization” rather than “organisation”).

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Introduction

To date, standardisation in the machinery sector has mainly been driven by CEN and the European Commission mandates for supporting standards for the Machinery Directive [1]. This has left a void in the maintenance and use of older machines across all manufacturing sectors. The use of machine tools is covered by the Provision and Use of Work Equipment Regulations (PUWER) [2], but in many areas, there is a lack of information and guidance to assist users and maintainers of machines in their efforts.

Vision panels in machine tools offer primary protection to the machine operator from high-speed tool breakages and ejection of workpiece fragments/swarf. A failure of the vision panel puts the operator at risk of injury. Often, it is not possible to visually determine if the vision panel is compromised due to age and contamination, or if it still provides the protection envisaged when first designed.

NOTE Vision panels on machine tools designed to international standards are not considered to offer protection to full workpiece ejection. Typical maximum ejection forces are given in relevant C-type standards.

Given the critical role of vision panels as safety components on machine tools, this document provides specific targeted guidance to machine users, maintainers, and inspectors on good practice to minimize the risk of injury to machine operators.

While a machine tool might have passed a conformity assessment as having met the essential health and safety requirements, it is the responsibility of the end user to ensure that it is safe to use. This involves considering the local environment and process operations, and managing subsequent hazards.

1 Scope

This British Standard provides guidance on the inspection and replacement of machine tool vision panels.

It covers vision panels used for safety, which are designed to contain fluids, swarf/chips or other projectiles on machine tools already in use.

NOTE While the guidance in this document is focussed on vision panels used for safety on machine tools already in use, the general principles could be applied elsewhere.

It does not cover risk assessment methods or general machine maintenance.

This standard is for use by vision panel users and inspectors.

It might also be of use to designers, manufacturers and safety consultants.

2 Normative references

There are no normative references in this document.¹⁾

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1 substantial modification

change of a machine by physical or digital means not foreseen or planned by the manufacturer, and which affects the safety of a machine by creating a new hazard, or by increasing an existing risk, requiring the:

- a) addition of guards or protective devices to a machine, which necessitates the modification of the existing safety control system; or

¹⁾ Documents that are referred to solely in an informative manner are listed in the Bibliography.

- b) adoption of additional protective measures to provide the stability or mechanical strength of a machine

[SOURCE: BS 14200:2023, 3.19]

3.2 vision panel

transparent panel, barrier or window forming part of the safeguard, through which the operator can view the work zone or other areas of the machine

3.3 vision panel support framework

frame surrounding the vision panel securing it to the rest of the safeguard

NOTE Parts supplied may be a vision panel, vision panel and framework or vision panel as part of a greater safeguard.

3.4 technical specification

document outlining the requirements, design, and functionality of a machine tool intended by the manufacturer

4 Inspection of vision panels

4.1 General

Any deviation from the machine tools' original specification, intended use, or other changes implemented that could influence or compromise the level of risk mitigation provided by the vision panel should be suitability risk assessed (including accelerated pattern of wear/damage). If the changes made are considered a substantial modification to the machine tool, then appropriate remedial action should be taken.

NOTE 1 Attention is drawn to the Supply of Machinery (Safety) Regulations 2008 [3] regarding re-assessment following change of use and/or substantial modification.

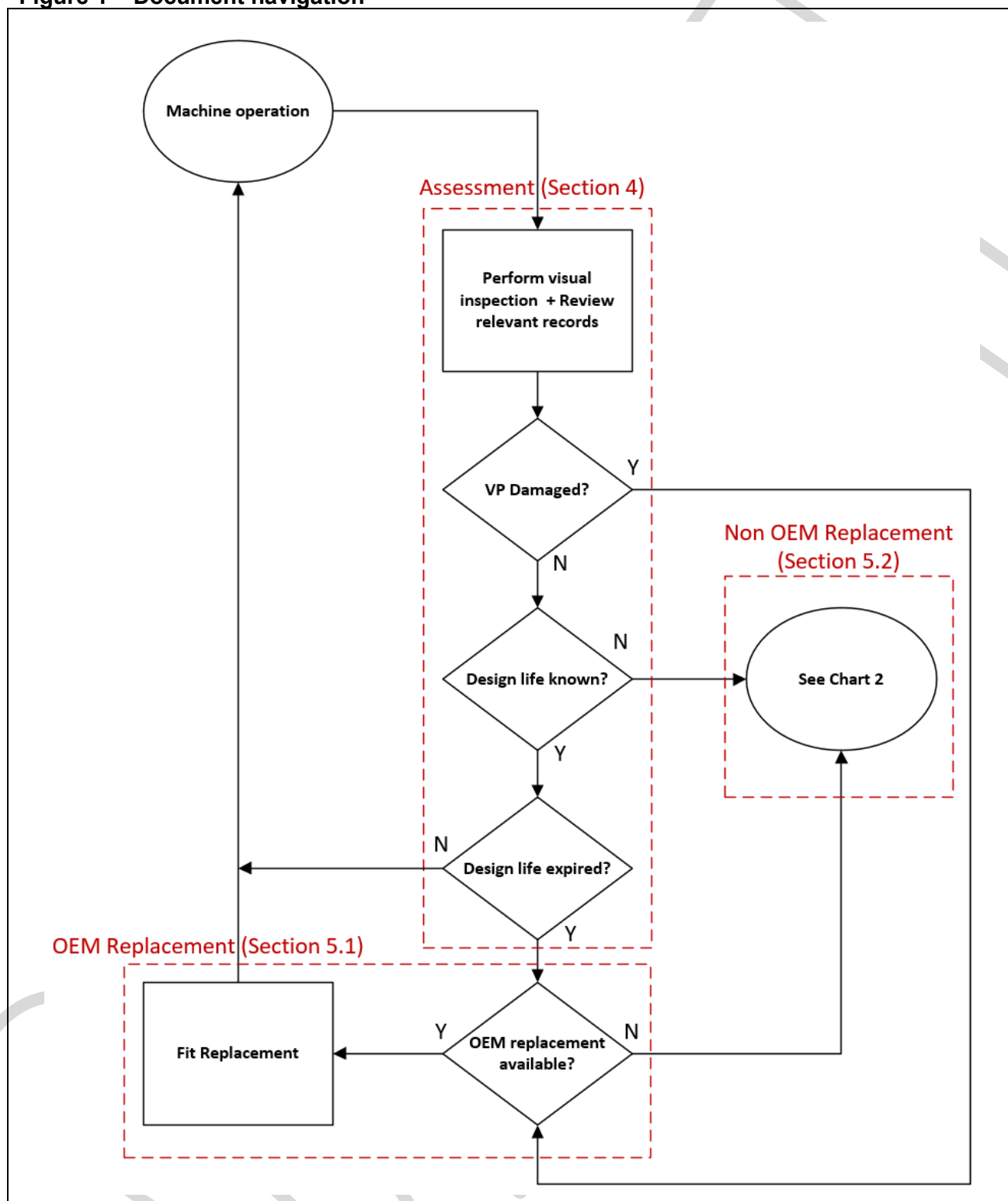
Refurbishment of machinery amounting to disassembly and a rebuild to original specification, albeit with replacement parts which might be newer designs, does not usually attract the provisions of the machinery supply regulations [3]. Repainting a machine, undertaking servicing and routine maintenance, changing motors, replacing parts such as guards with essentially identical new ones, or replacing original safety critical parts with newer better ones (e.g. modern higher quality interlocks wired into the control system in the same way as before) are not substantial modifications.

NOTE 2 Attention is drawn to POWER [2] with regards to suitability for ongoing use and ongoing supply.

During machine service life, the user should undertake a periodic visual inspection of all the machine's vision panels in-line with the machine manufacturer's guidelines. These inspections are necessary to monitor known vulnerabilities that could compromise the safety related function of the vision panels, such as structural defects or where the environment, process or operating conditions have potential to introduce a critical fault in the polycarbonate. See Figure 1 for how to navigate this standard which includes periodic inspection.

In the absence of machine manufacturer guidelines, an assessment should be undertaken following the principles outlined in 4.2.

Figure 1 – Document navigation



4.2 Inspection strategy

4.2.1 General

To support the assessment and determine if the vision panel is still fit for purpose, the user should carry out both pre-use checks and detailed inspections as given in **4.2.2** and **4.2.3** respectively.

4.2.2 Pre-use checks

Pre-use checks should be completed each time prior to use, looking for obvious signs of change in the vision panel material or its support framework. The person undertaking the pre-use check should document and report any defects or deterioration noted (see 4.3). This is essential to enable safe operation of the machine. It is preferable to document pre-use checks which, when suitably managed, provide an auditable record to demonstrate checks are performed and can be referred to when monitoring changes to the vision panels over time.

As part of a pre-use check, the user should check for obvious signs of damage to the vision panel panes (e.g. polycarbonate, glass, etc.) including:

- a) plastic deformation (e.g. bulges, dents);
- b) cracks, deep scratches;
- c) cracks or crazing at mounting point(s), high stress areas or where the pane has been drilled;
- d) other damage to protective layers (e.g. blistering);
- e) minor scratches (such as those from general wear and tear); and
- f) the panel remains secure in its mounting frame.

All inspections should be performed by an individual/s suitably trained to identify the defects listed in a) to f).

4.2.3 Detailed inspections

A detailed inspection of the vision panel should be completed and documented to assess the ongoing suitability of the vision panel as a safeguard, given the risks, environment, and process operating conditions of the machine tool.

A competent person should be appointed who has suitable knowledge of vision panels and machine tools to assess the suitability of the vision panel for continued use.

The competent person should use their knowledge of the appropriate guarding requirements and mounting arrangements to review the design, construction, material thicknesses and induced/inherent stress points or cracking, by physical contact with the vision panel surface. The extent of the detailed inspection of a vision panel may also extend to the surrounding elements of the guarding arrangement to include direct mounting or the adjacent vision panel support framework.

NOTE 1 Examples of induced/inherent stress points include where material has been drilled, cut or formed, mounting arrangements that induce stresses in the guarding assembly, handles that are mounted directly on the vision panel, or areas that have contact with hot/sharp materials (e.g. metal swarf).

NOTE 2 An example of a detailed inspection sheet is given in Annex A.

Vision panels should be cleaned on both sides via a non-abrasive or non-solvent based cleaning product to allow the transparency and surface characteristics on both sides to be visually assessed. The vision panel support framework should be visible for inspection.

NOTE 3 Accessing the vision panel support framework can require intervention from machine maintainers.

The frequency of detailed inspections should be based on machine usage and not exceed three months.

The following should form part of the vision panel inspection:

- a) construction (i.e. single or multi-layer), materials and mounting arrangements;
- b) purpose of vision panel type:
 - 1) work zone ejection protection; or
 - 2) process viewing and access prevention;