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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 32857-2025

Replacing GB/T 32857-2016

Application directives for layer of protection analysis (LOPA)

保护层分析（LOPA）应用导则

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Foreword

This document complies with the provisions of GB/T 1.1-2020 "Standardization Work Guidelines Part

1. Structure and Drafting Rules of Standardization Documents". Drafting. This document replaces GB/T 32857-2016 "Application Guide for Layer Protection Analysis (LOPA)". Compared with GB/T 32857-2016, except for... Aside from structural adjustments and editorial changes, the main technical changes are as follows:

---Added conditional correction factor (see 3.2), original risk (see 3.5), intermediate event (see 3.7), residual risk (see 3.12), and risk. Point (see 3.13), risk reduction factor (see 3.14), composite scenario (see 3.16), safety instrumented function (see 3.17), (SIF) operation Ten terms and definitions, including action mode (see 3.20) and safety-critical actions (see 3.21);

---Changes have been made to the basic process control system (see 3.1, 3.1.2 in the 2016 version), enabling events, or enabling conditions (see 3.4, 2016 version). 3.1.12), initial events (see 3.6, 3.1.5 in the 2016 edition), protection layer analysis (see 3.8, 3.1.1 in the 2016 edition), protection Layers (see 3.9, 3.1.3 of the 2016 edition), independent protection layers (see 3.10, 3.1.7 of the 2016 edition), security integrity levels (see 3.18, 3.1.11 of the 2016 edition), safety instrumented systems (see 3.19, 3.1.13 of the 2016 edition), tolerable risks (see 3.22, 3.1.18 (2016 edition), and 9 other terms and definitions; 3.1.4 in the 2016 version), frequencies (see 3.1.6 in the 2016 version), and common cause failures (see 3.1.6 in the 2016 version) have been removed. 3.1.14) and other 3 terms and definitions;

1 Scope

GB/T 32857-2025 is the Chinese national standard covering layer of protection analysis - taking a hazard scenario from the HAZOP, counting the independent protection layers that stand between the initiating event and the consequence, giving each one a credible failure figure, and seeing what risk is left over for the safety instrumented function to carry. At 42,840 words this is the largest document in this group, and LOPA is the step that decides the SIL of every interlock in a plant. Issued on 2 December 2025, it has been in force since 1 July 2026, replacing GB/T 32857-2016.

This document specifies the general requirements, basic procedures, analysis process, and

documentation requirements for Layer of Protection Analysis (LOPA). This document is intended to guide various industries in conducting protective layer analysis.

2 Normative references

The contents of the following documents, through normative references within the text, constitute essential provisions of this document. Dated citations are not included. For references to documents, only the version corresponding to that date applies to this document; for undated references, the latest version (including all amendments) applies. This document.

GB/T 20438.4-2017 Functional safety of electrical/electronic/programmable electronic safety-related systems - Part

3 Terms and Definitions

The terms and definitions defined in GB/T 20438.4-2017 and GB/T 21109.1-2022, as well as the following terms and definitions, apply to this document.

3.1 Responding to input signals from the process and its associated equipment, other programmable systems, and/or operators, and generating output signals to enable the process to... The system and its related equipment operate as expected, but it does not perform any SIFs.

Note 1: BPCS includes all necessary equipment to ensure that the process operates in the expected manner.

Note 2: BPCS typically supports multiple functions, such as process control, monitoring, and alarms. [Source: GB/T 21109.1-2022, 3.2.3]

3.2 conditional modifiers One of the probabilities used in scenario risk calculation.

Note. This usually manifests as consequences affecting the outcome (e.g., personal injury, probability of ignition, fatality rate) rather than the consequences of the primary loss event (e.g., leakage, container rupture). use.

3.3 Consequence The result of a specific event.

Note. This typically includes personal injury, property damage, environmental pollution, and reputational damage.

3.4 Enable event or enable condition Events or conditions that do not directly cause the consequences of a scenario to occur.

Note. This refers to a necessary operational state or condition that transforms an initial event into a scene consequence.

4 Definitions and abbreviations abbreviation

GB/T 21109.1-2022 Functional safety of safety instrumented systems for process industries
- Part

1.Framework, definitions, systems, and hardware Component and application programming requirements

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