ICS 13.100

CCS E09

National Standard of the People's Republic of China

GB 46995-2025

Safety protection specification for natural gas well containing hydrogen sulfide

Issued: December 31, 2025

Effective: July 1, 2026

State Administration for Market Regulation (SAMR)

Standardization Administration of the People's Republic of China (SAC)

Issued

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Foreword

This document was drafted in accordance with the provisions of GB/T 1.1—2020 Standardization Work Guidelines—Part 1: Structure and Drafting Rules for Standardization Documents.

Attention is drawn to the fact that some contents of this document may involve patents. The issuing body of this document shall not be held responsible for identifying any such patents.

This document was proposed and administered by the Ministry of Emergency Management of the People's Republic of China.

Safety protection specification for natural gas well containing hydrogen sulfide

1 Scope

This document specifies the general requirements for safety protection of natural gas wells containing hydrogen sulfide, the classification of public hazard level and safety protection distance, as well as the requirements for safety protection and emergency management during onshore and offshore production and operation processes. It also describes the corresponding verification methods.

This document applies to the safety protection of natural gas wells containing hydrogen sulfide.

2 Normative References

The contents of the following documents are incorporated into this document as essential provisions through normative reference in the text. For dated referenced documents, only the edition corresponding to that date applies to this document; for undated referenced documents, the latest edition (including all amendments) applies to this document.

GB/T 29639 Guidelines for Compiling Emergency Plans for Work Safety Accidents of Production and Business Operation Units

3 Terms and Definitions

The following terms and definitions apply to this document.

3.1 natural gas well containing hydrogen sulfide

A natural gas well in which the hydrogen sulfide content in the formation gas medium is greater than or equal to 75 mg/m³ (50 ppm); or a natural gas well with a total gas pressure of greater than or equal to 0.4 MPa and a hydrogen sulfide partial pressure of greater than or equal to 0.003 MPa.

3.2 natural gas well containing high hydrogen sulfide

A natural gas well in which the hydrogen sulfide content in the formation gas medium is greater than or equal to 1500 mg/m³ (1000 ppm).

3.3 release rate of hydrogen sulfide

The amount of hydrogen sulfide released into the atmosphere per unit time from a natural gas well containing hydrogen sulfide in the event of an accident.

Note: Under standard conditions (temperature of 0 °C and pressure of 1 standard atmospheric pressure), the unit is expressed in m^3/s.

3.4 hydrogen sulfide environment

An area that contains or may contain hydrogen sulfide.

Note 1: The maximum concentration of hydrogen sulfide gas that will not cause harm to human health without any personal protective measures is 15 mg/m^3 (10 ppm).

Note 2: The acceptable maximum concentration of hydrogen sulfide gas for an 8-hour exposure period without any personal protective measures is 30 mg/m^3 (20 ppm).

Note 3: The minimum concentration of hydrogen sulfide gas that will cause irreversible or delayed effects on human health without any personal protective measures is 150 mg/m^3 (100 ppm).

[Source: GB 42294—2022, 3.1, with modifications]

4 General Requirements

4.1 Safety Management

4.1.1 A safety management system shall be established and implemented, and a hydrogen sulfide protection management system shall be formulated, including but not limited to the following contents:

a) Training and education of practitioners;

b) Management of personal protective equipment;

c) Management of hydrogen sulfide concentration detection;

d) Emergency management of hydrogen sulfide poisoning.

4.1.2 On-site hydrogen sulfide environment files and records shall be established, including but not limited to the following contents:

a) Certification and education registration files of personnel;

b) Files of personal protective equipment;

c) Inspection records of personal protective equipment;

d) Hydrogen sulfide concentration detection records;

e) Emergency drill records for hydrogen sulfide poisoning.

4.2 Personnel Training

4.2.1 Personnel engaged in operations in a hydrogen sulfide environment shall receive hydrogen sulfide protection training in accordance with the requirements specified in 4.2.2 before taking up their posts. They shall not start work until they obtain a training qualification certificate, and shall participate in regular refresher training.

4.2.2 Hydrogen sulfide protection training shall include but not be limited to the following contents:

a) Basic knowledge, including the physical and chemical properties, toxicity, health hazards and poisoning symptoms of hydrogen sulfide, as well as the spontaneous combustion conditions and preventive measures of ferrous sulfide;

b) Standards and management regulations related to hydrogen sulfide protection;

c) Operational requirements, including hydrogen sulfide prevention during operations, equipment configuration and daily inspection;

d) Requirements for the use and maintenance of safety facilities, including fixed hydrogen sulfide detection and alarm systems, ignition (venting) devices, breathing air compressors, wind direction indicators, ventilation and exhaust devices, alarm devices, escape facilities and safety warnings;

e) Requirements for the use and maintenance of personal protective equipment, including portable hydrogen sulfide detectors, eyewash stations and positive-pressure air breathing apparatus;

f) On-site emergency response, including types of emergency events, main contents of emergency plans (emergency organization structure and responsibilities, emergency response, emergency support, etc.) and on-site emergency response plans;

g) On-site emergency first aid, including on-site first aid methods for poisoned personnel and cardiopulmonary resuscitation (CPR);

h) Case studies, including typical domestic and foreign accident cases of hydrogen sulfide leakage and poisoning.

4.2.3 Safety risk notification shall be provided to non-operational personnel entering station yards and well sites. The notification shall include potential hydrogen sulfide hazards, demonstrations of the correct use of personal protective equipment and emergency facilities, and clarification of emergency escape routes. Non-operational personnel shall sign a safety commitment letter. The number of non-operational personnel entering the operation area of an onshore well site at the same time shall be controlled, with a maximum limit of 3 people.

5 Classification of Public Hazard Level and Safety Protection Distance

5.1 Classification of Public Hazard Level

5.1.1 The public hazard level of natural gas wells containing hydrogen sulfide shall be classified in accordance with Table 1 based on the hydrogen sulfide release rate.

Table 1 Classification of Public Hazard Level for Natural Gas Wells Containing Hydrogen Sulfide

Public Hazard Level Classification	Hydrogen Sulfide Release Rate m^3/s
Level 1	$R_R \geqslant 5.0$
Level 2	$5.0 > R_R \geqslant 1.0$
Level 3	$1.0 > R_R \geqslant 0.01$