
Ice plug isolation of piping in nuclear power plant

Mise en œuvre de la technique d'obturation cryogénique sur les tuyauteries de centrales nucléaires



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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 85, *Nuclear energy, nuclear technologies, and radiological protection*, Subcommittee SC 6, *Reactor technology*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

This document provides terms and definitions for basic concepts of nuclear energy, nuclear technologies, and radiological protection. Terminological data are taken from ISO standards developed by ISO/TC 85 sub-committees and other technically validated documents.

In the field of nuclear power, when the equipment or pipeline is to be disassembled or removed to overhaul, it is often necessary to isolate the equipment or pipeline. Under normal circumstances, the upstream and downstream of the equipment will be isolated or the internal media will be sprinkled. Taking into account the safety (some reactor systems like the hot trap needs to be filled at any time and care need to be taken as some liquid systems are radioactive) and economy (system mass, sparse for a long time, heavy water degradation, etc.) during the maintenance it is necessary that there will be no isolation equipment or isolation equipment near the equipment or pipeline.

Based on years of practical experience, the development of this document is feasible. At the theoretical level, the relevant literature has been studied and reported on the ice plug isolation technology. In the actual maintenance work, the use of ice plug technology to the pipeline equipment isolation achieve good results. Based on these theoretical and practical experiences, it is recommended that some technical indicators in the process of ice plug operation be standardized.

This document is designed to provide a standardized procedure for on-line isolation through the freezing of the internal medium of the pipeline. This document includes methods for technologies to isolate equipment without isolation facilities by ice plug technology. Standardized ice plug isolation technology will facilitate the maintenance work.

Ice plug isolation of piping in nuclear power plant

1 Scope

This document specifies requirements for the ice plug technique with liquid nitrogen or dry ice as refrigerant (cryogenic medium) on metal pipes of nuclear power plants. The freezing liquid can be water or water mixture (e.g. boric acid mixture).

This document specifies technical requirements of ice plug generation, formation judgment and removal, measures before, during and after ice plugging and requirements for personnel and non-destructive testing.

The application of the ice plug isolation technique is principally not allowed on clad pipes or pipes with internal coatings. The application for pressure test is not in the scope of this document and will be qualified separately.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 3452 (all parts), *Non-destructive testing — Penetrant testing*

ISO 9934 (all parts), *Non-destructive testing — Magnetic particle testing*

ISO 16810, *Non-destructive testing — Ultrasonic testing — General principles*

ISO 17637, *Non-destructive testing of welds — Visual testing of fusion-welded joints*

ISO 20769 (all parts), *Non-destructive testing — Radiographic inspection of corrosion and deposits in pipes by X- and gamma rays*

3 Terms and definitions

For the purposes of this document the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

3.1

ice plug

solid block of ice in the pipe that can withstand a certain system pressure to isolate the pipeline temporarily

Note 1 to entry: The ice plug can be used for the convenience of maintaining downstream pipelines, valves and other equipment.