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شرکت ملی گاز ایران
مدیریت پژوهش و فناوری
امور تدوین استانداردها

IGS

دستورالعمل بازرسی

مخازن تحت فشار

Pressure Vessels



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شرکت ملی گاز ایران



دفتر مدیر عامل



ابلاغ مصوبه هیأت مدیره



مدیر محترم پژوهش و فناوری

باسلام.

به استحضار می‌رساند در جلسه ۱۷۶۷ مورخ ۱۳۹۶/۱۱/۱۵ هیأت مدیره، نامه شماره گ. ۱۴۷۹۹۱/۰۰۰/۹ مورخ ۹۶/۱۱/۸ مدیر پژوهش و فناوری در مورد تصویب نهایی استانداردها به شرح زیر مطرح و مورد تصویب قرار گرفت:

۱. مشخصات فنی خرید عمل کننده هیدرولیکی شیرآلات

IGS-M-IN-304(1)

۲. دستورالعمل نگهداری و تعمیرات پوشش خطوط لوله تحت بهره‌برداری

IGS-O-TP-001(0)

IGS-I-GN-008(0)

۳. دستورالعمل بازرسی لیفتراک

۴. دستورالعمل نگهداری و تعمیرات برپایه ریسک و طبقه‌بندی پیامدها

IGS-O-MN-002(0)

۵. دستورالعمل بازرسی مخازن تحت فشار در زمان بهره‌برداری

IGS-I-PM-001(0)

۶. دستورالعمل بازرسی سیستم زمین (Earthing system)

IGS-I-EL-007(0)

این مصوبه به منزله مصوبه مجمع عمومی شرکت‌های تابعه محسوب و برای کلیه شرکت‌های تابعه لازم الاجرا می‌باشد.

الهام ملکی

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FOREWORD :

This standard is intended to be mainly used by NIGC and contractors, and has been prepared based on interpretation of recognized standards, technical documents, knowledge, backgrounds and experiences in natural gas industry at national and international levels.

Iranian Gas Standards (IGS) are prepared, reviewed and amended by technical standard committees within NIGC Standardization division and submitted to the NIGC's "STANDARDS COUNCIL" for approval.

IGS Standards are subject to revision, amendment or withdrawal, if required. Thus the latest edition of IGS shall be checked/inquired by NIGC employees and contractors.

This standard must not be modified or altered by NIGC employees or its contractors. Any deviation from normative references and / or well-known manufacturer's specifications must be reported to Standardization division.

The technical standard committee welcomes comments and feedbacks about this standard, and may revise this document accordingly based on the received feedbacks.

GENERAL DEFINITIONS :

Throughout this standard the following definitions, where applicable, should be followed:

- 1- "STANDARDIZATION DIV." is organized to deal with all aspects of industry standards in NIGC. Therefore, all enquiries for clarification or amendments are requested to be directed to mentioned division.
- 2- "COMPANY": refers to National Iranian Gas Company (NIGC).
- 3- "SUPPLIER": refers to a firm who will supply the service, equipment or material to NIGC whether as the prime producer or manufacturer or a trading firm.
- 4- "SHALL ": is used where a provision is mandatory.
- 5- "SHOULD": is used where a provision is advised only.
- 6- "MAY": is used where a provision is completely discretionary.

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1. Scope:

This procedure applies to all Company unfired pressure vessels whatever are the type, service and the location (onshore, offshore). It applies to all the steam vessels, associated to the steam generation and to the steam distribution network, such as deaerators, BFW storage tanks, blow down drums. It also applies to all metallic tanks designed and constructed to similar codes and standards as pressure vessels (ASME VIII). It excludes all type of equipment which are mentioned in Annex "A" API 510.

This procedure affects departments and divisions involved in specific activities related to the Inspection:

- Inspection (inspection).
- Maintenance (access, opening, repair, cleaning,...).
- Operation (decommissioning ,isolation, purging, recommissioning,...).
- HSE (safety parameter monitoring, supply of safety equipment, work and entry permit,...).
- Engineering (repairs, modifications,...).

2. References :

All codes and standards are subject to periodic revision, and the most recent revision available should be used.

- **API 510**," Pressure vessel inspection code "
- **API RP 572**," Inspection of unfired pressure vessels."
- **API RP 571**," Damage Mechanisms Affecting Fixed Equipment in the Refining "Industry
- **API RP 576** ," Inspection of pressure –relieving Devices"
- **API RP 577**," Welding Processes, Inspection, and Metallurgy"
- **API RP 583** ,"Corrosion Under Insulation and Fireproofing"
- **API 579-1/ ASME FFS-1** ,"Fitness For service "
- **API Recommended Practice 580**," Risk-Based Inspection"
- **API Recommended Practice 581** , "Risk-Based Inspection Methodology"
- **API RP 945** ," Avoiding Environmental Cracking in Amine Units"
- **ASME PCC-2** , "Repair of Pressure Equipment and Piping"
- **ASME Pressure Vessel Code Section V Non Destructive Testing.**
- **ASME Pressure Vessel Code Section VIII Div. I and II.**
- **PD 5500 / BS EN.13445** ," Unfired Fusion Welded Pressure Vessels"

3. Terms and Definitions:

3.1.Unfired pressure vessel:

Unfired pressure vessel means, in this procedure, a static vessel submitted to internal or external pressure (pressure limitation as per the pressure vessel code), designed and manufactured under the requirements of a recognised pressure vessel code - ASME section VIII or PD 5500 / BS EN.13445 .

All external attached components/parts, such as supports, access ladders, stairways, platforms, nozzles and piping up to the next isolating valves, lifting and handling gears, electrical and instrument equipment, pipe supports (guide, anchoring, hangers) are included in the definition of unfired pressure vessel for inspection purposes.

3.2.On line inspection (On-Stream Inspection) :

On line inspection means here, in this procedure, an inspection which can be carried out without shutting down the pressure vessel. This inspection includes the visual /or NDE external inspection, any thermographic survey and the foundations and the structure surveys.

3.3.Thorough inspection (Internal Inspection) :

Thorough inspection means, in this procedure, an inspection which requires the shut down and decommissioning of the unfired pressure vessel. This includes an internal visual inspection and any NDT tasks.

3.4.Thorough external inspection (External Inspection) :

Thorough external inspection means, in this procedure, an inspection carried from outside. The external inspection may be done either while the vessel is operating or while the vessel is out-of-service and can be conducted at the same time as an on-stream inspection , using extensively the NDT methods in order to find conditions that could impact the vessel's ability to maintain pressure integrity or conditions that compromise the integrity of the supporting structures (e.g. ladders, platforms, supports).

3.5.Corrosion under Insulation (CUI) Inspection :

External corrosion of carbon steel piping, pressure vessels, and structural components resulting from water trapped under insulation. ECSCC of austenitic and duplex stainless steel under insulation is also classified as CUI damage.

3.6.Thickness Inspection :

Thickness measurements are taken to verify the thickness of vessel components. This data is used to determine the corrosion rates and remaining life of the vessel.

3.7.Risk-Based Inspection (RBI) :

A risk assessment and management process that considers both the probability of failure and consequence of failure due to material deterioration and that is focused

on inspection planning for loss of containment of pressurized equipment in processing facilities due to material deterioration. These risks are managed Primarily through inspection in order to influence the probability of failure but can also is managed through various other methods to control the probability and consequence of failure. RBI assessments should be in compliance with the recommended practices of API 580 & 581.

3.8.Fitness For Service (FFS):

A methodology whereby flaws and other deterioration/damage or operating conditions contained within a pressure vessel are assessed in order to determine the integrity of the vessel for continued service. FFS evaluations, such as those documented in API 579-1/ASME FFS-1, may be used for this evaluation and can be applicable to the specific damage observed.

For more Definitions see section 3 (Terms and Definitions) contained in API 510 .

4. Objectives:

The objectives of this procedure are :

- To ensure that the Company unfired pressure vessels are periodically inspected in order to assess their suitability to perform safely their function and to predict their likely behaviour until next inspection, based on the history of the said equipment and/or similar systems.
- To provide the guidelines on the inspection scope and methods.
- To define the reporting system.

5. Limitations:

This procedure shall not be used as a substitute for the original construction requirements governing a pressure vessel before it is placed in-service; but shall it be used in conflict with any prevailing regulatory requirements.

6. Inspection Frequencies and Grades:

As per the result of the RBI study and of the shut-down , an inspection grade associated with a maximum interval have been allocated to each unfired pressure vessel.

Grade 0 applies to the first thorough inspection after commissioning. After completion of the first and subsequent inspections the pre-defined interval and grade allocation will have to be amended, if necessary, in the light of the inspection results by application of the following inspection grade rules:

The relation established between grade and interval is given in the table hereafter for thorough inspection or thorough external inspection.

Table1.Inspection Grade and Maximum interval Relations

Grade Items	Grade 0	Grade I	Grade II
Critical items	18	36	36
Non critical items	18	36	72

Note: Maximum Interval in months

6.1. Internal Inspection Grades :

Inspection Grade 0 : This is the grade in which all graded equipment should normally be deemed to be, following the pre-commissioning or commissioning inspection and until the first initial thorough inspection is carried out.

Inspection Grade I : This grade should be applied when the conditions of service are such that :

- Deterioration in whole or in part is possible at a relatively rapid rate or at a known mean rate which restricts service life,
- or
- There is little evidence or knowledge of operational effects on which to predict behaviour in service.

Inspection Grade II : This grade should be applied when the conditions of service are such that :

- Deterioration in whole or in part is possible at a reasonable and predictable rate justifying an inspection interval.

And - Knowledge of facts or actual behaviour in service is sufficiently reliable to justify an increased inspection interval.

Note1: On-stream inspection may be acceptable in lieu of internal inspection for vessels under the specific circumstances and the discretion of the inspector defined in API 510 Sec. 6.5.2.

Note2: Pressure-relieving devices should be inspected, tested, and maintained in accordance with API 576.

Note 3: An alternative method to establish the required inspection interval if an RBI assessment is not performed, the period between internal or on-stream inspections and thickness measurement inspections shall not exceed one-half the remaining life of the vessel or 10 years, whichever is less.

Whenever the remaining life is less than four years, the inspection interval may be the full remaining life up to a maximum of two years.

External Inspection: A maximum 2 year interval is allocated to all the vessels for the on line external inspection.
The on line external Inspection must take place several months prior any thorough internal inspection in order to amend, as required, the inspection and the remedial work scopes.

7. Deferral of Inspection due Dates:

an inspection or pressure relief device servicing interval may be deferred by the inspector, without other approvals, based on a satisfactory review of the equipment history and appropriate risk analysis, when the period of time for which the item is to be deferred does not exceed 10 % of the inspection/servicing interval or six months, whichever is less. The deferral of scheduled inspections should be the occasional

Exception not a frequent occurrence. Deferrals need to be approved by owner/user management and Pressure equipment operated beyond the inspection due date without a documented and approved deferral is not permitted by this procedure. For more details refer to API 510 (part 6.7).