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This new **PTS 60.2110 - Guidelines for Working in Inert Space (August 2009, Revision 0)** has been developed to provide a guideline covering mandatory safe work practices to protect employees entering and working in an oxygen-deprived atmosphere.

This PTS also includes PETRONAS Lessons Learnt and PETRONAS Best Practice for the subject matter **Working in Inert Space**.

The custodian of this PTS is: Manager - HSE MS, Standards & Regulations, GHSED.

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PREFACE

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1.0 INTRODUCTION

These guidelines cover mandatory safe work practices to protect employees entering and working in an oxygen-deprived atmosphere.

Entry into an inert space is strongly discouraged and should only be considered as a last resort when all other practical means have been exhausted.

The requirements in this procedure shall be applicable to all PETRONAS and PETRONAS Joint Ventures (JVs) plants and installations carrying out work in a confined space where the atmosphere is inert. In addition other existing procedures e.g. hazard identification, risk assessment and control and environmental procedure may apply.

Confined space requirements not specifically spelt out in this procedure should be referred to PTS 60.129 Guidelines for Working in a Confined Space.

2.0 SCOPE

These guidelines are mandatory where inert gases are used to make the atmosphere suitable for confined space entry.

This standard provides guidelines for safely entering and working in and near confined spaces that have inert atmosphere. It applies to confined spaces that have been intentionally purged with an inert gas until:

- a. The oxygen level in the vapour space is too low to support combustion, and
- b. Any gases in or flowing out of the confined space are below flammable or reactive levels.

Typical inert entry work in the petroleum and petrochemical industry includes work to service or replace catalyst in reactors.

This document complements PTS 60.049 PETRONAS Group Guidelines for Permit to Work System and PTS 60.129 Guidelines for Working in a Confined Space.

3.0 DEFINITIONS

3.1 Oxygen Deficient Atmosphere

An atmosphere in which the oxygen content is below that needed for normal human function without impairment. For inert entry, the typical oxygen content (below 5% in inert entry situations) is very much less than the oxygen-deficient definition often used of "atmosphere containing less than 19.5 percent oxygen by volume." Inert entry requires much lower oxygen concentration percentages to provide a working environment, minimizing fire hazards by maintaining the oxygen level low enough to prevent combustion.

3.2 Inert Gas

A gas which is not toxic which does not support human breathing and which reacts scarcely or not at all with other substances. Inert gases are mainly nitrogen and the rare gases like helium, argon, neon, xenon and krypton.

3.3 Inerting

The process of eliminating the potential for a flammable atmosphere by using an inert gas such as nitrogen or carbon dioxide to displace oxygen required for ignition.

3.4 Inert Confined Space

A confined space where the existing atmosphere is intentionally displaced with a nonflammable gas, such as nitrogen, creating an inert atmosphere in the confined space. As used in this standard, an inert atmosphere is oxygen deficient (typically below 5%) and is an immediate asphyxiation hazard.

3.5 Inert Entry

Entry into a confined space with an inert atmosphere starts as soon as any part of the entrant's body breaks the plane of an opening into the space. "Entry" includes all subsequent activities in the inert confined space.

3.6 Asphyxiant

A chemical (gas or vapour) that can cause death or unconsciousness by suffocation. Simple asphyxiants such as nitrogen, displace oxygen in air. They become especially dangerous in confined or enclosed spaces. Chemical asphyxiants, such as carbon monoxide and hydrogen sulphide, interfere with the body's ability to absorb or transport oxygen to the tissues.

3.7 Stand-By Person For Inert Confined Space

An individual stationed outside an inert confined space who monitors the authorised entrants and who performs all standby person's duties defined in Section 6.2.4 Contractor standby person.

3.8 Approving Authority (AA)

The person authorized by the company to approve and issue PTW in the area concerned. Work involving increased / unusual hazards (e.g. Open fire, hot tapping, entry to confined space etc.) shall require review and authorization at a higher level in the organization. His/her responsibilities among others include:

- assign Authorised Gas Tester and other required competent persons
- approves/revalidates permit
- receives permit hand back
- specifies controls/precautions for safe work
- specifies other certificates

Areas of the plants assigned to the Approving Authority shall be clearly defined to ensure clear boundary of authority is set covering all areas of the plants.

3.9 Receiving Authority (RA)

A person authorized by the company to receive approved permits and shall be responsible for supervising the execution of the work by Work Leaders as per the precautions in the permit. The RA can also be the Work Leader. The RA shall also specify controls for safe work and requirements of other certificates.

3.10 Confined Space Certificate

Written and signed statement that specified checks or tests have been carried out by an authorized person and that conditions are acceptable. Certificates do not replace the PTW but are complementary. Certificates are invalid without an accompanying PTW.

3.11 Approving Authority for Confined Space Certificates

A person authorized by the company to approve and issue Confined Space Certificate.

3.12 Authorized Gas Tester (AGT)

A person who is trained to meet the requirements of Department of Occupational Safety and Health (DOSH) Code of Practice for safe working in a confined space and industry practices on gas testing, and is authorized by the company to issue gas test certificates. If different tests are used, the authorization may be specific to the type of test.

4.0 REFERENCE

API Standard 2217A Third Edition, January 2005 Guidelines for Safe Work in Inert Confined Spaces in the Petroleum and Petrochemical Industries

1. Code of Practice for Safe Working In A Confined Space. JKKP COP (I/BM) 02/2001
2. PTS 60.129 Guidelines for Entry into Confined Spaces
3. PTS 60.049 PETRONAS Group Guidelines for Permit to Work System
4. IGC Doc 44/00/E European Industrial Gases Association (EIGA) Hazards of Inert Gases
5. BP Process Safety Series - Hazards of Nitrogen and Catalyst Handling BP 2004

5.0 REGULATORY REQUIREMENTS

5.1 Malaysia

Occupational Safety and Health Act, 1994

PART IV GENERAL DUTIES OF EMPLOYERS AND SELF-EMPLOYED PERSONS

Section 15 General duties of employers and self-employed persons to their employees.

(2) Without prejudice to the generality of subsection (1), the matters to which the duty extends include in particular:-

- (a) the provision and maintenance of plant and systems of work that are, so far as is practicable, safe and without risks to health;
- (b) the making of arrangements for ensuring, so far as is practicable, safety and absence of risks to health in connection with the use or operation, handling, storage and transport of plant and substances;
- (c) the provision of such information, instruction, training and supervision as is necessary to ensure, so far as is practicable, the safety and health at work of his employees;
- (d) so far as is practicable, as regards any place of work under the control of the employer or self-employed person, the maintenance of it in a condition that is safe and without risks to health and the provision and maintenance of the means of access to and egress from it that are safe and without such risks;
- (e) the provision and maintenance of a working environment for his employees that is, so far as is practicable, safe, without risks to health, and adequate as regards facilities for their welfare at work.

PART VI GENERAL DUTIES OF EMPLOYEES

Section 24 General duties of employees at work

(1) It shall be the duty of every employee while at work-

- (a) to take reasonable care for the safety and health of himself and of other persons who may be affected by his acts or omissions at works;
- (b) to co-operate with his employer or any person in the discharge of any duty or requirement imposed on the employer or that other person by this Act or any regulation made thereunder;
- (c) to wear or use at all times any protective equipment or clothing provided by the employer for the purpose of preventing risks to his safety and health; and
- (d) to comply with any instruction or measure on occupational safety and health instituted by his employer or any other person by or under this Act or any regulation made thereunder.

Regulation 13 Factories and Machinery (Safety, Health and Welfare) Regulations, 1970

Code of Practice for Safe Working In A Confined Space. JKKP COP (I/BM) 02/2001

5.2 International Operations

These guidelines shall be applicable to all international operations. Where the legal requirements of the host country exceeds or are more stringent than that of these guidelines, then the respective country's legislation shall prevail.

6.0 ROLES AND RESPONSIBILITIES

6.1 Company

Work involving entry into a confined space or inert space shall require review and authorization of Approving Authority for Confined space or Inert Confined Space Certificate.

6.1.1 Approving Authority (AA)

This person has authority and responsibility for the overall implementation of safe management of work activities for which he issues the permit. Before signing the PTW form to authorise work, he should verify and satisfy himself that:

1. He understands the nature of the work being applied for, all the hazards associated with the job are identified and the risk has been reduced to as low as reasonably practicable (ALARP);
2. The work being authorised does not jeopardise ongoing operations of the facility;
3. Assign Approving Authority Representative (AAR) to prepare all the necessary precautions required, before work begins are being verified to be in place, monitor work progress and compliance to PTW;
4. Other permits (jobs) ongoing do not conflict with the permit for the work that he is issuing and permits for tasks that may interact with other permit/activities are cross-referenced;
5. All supporting certificates and documents that will enhance information and add-value to the safe execution of the work are attached and made known to all concerned parties carrying out the work;
6. All required equipment and PPE are adequate to carry out the work safely;

7. The Receiving Authority is competent and is able to understand the conditions stipulated in the PTW form and other supporting Certificates (if required) and that these are conveyed as necessary to other personnel involved with the work and under his control;
8. All people who may be affected by the work are informed before the work begins, when the work is suspended and when the work is completed
9. That effective organisation exists to ensure that the work site to be examined before work begins, on completion of work and when work is suspended;
10. Sufficient time is spent on shift/crew hand over to discuss all ongoing or suspended permits with the incoming permit Approving Authority;
11. Joint site visit and verification are conducted by Approving Authority Representative (AAR) and Receiving Authority Representative (RAR) prior to approval of PTW.

6.1.2 Receiving authority (RA)

Receiving Authority (RA) shall ensure that:

1. They have received PTW training, assessed and authorised as Receiving Authority (RA);
2. The people working for them have received adequate training/instruction in PTW system;
3. They discuss the job fully with Approving Authority (AA);
4. The permit/certificate is posted at work site;
5. The work party is briefed on the details of the permit/certificate including any potential hazards, and all the precautions taken or to be taken;
6. The precautions are maintained throughout the work activity;
7. The worker understands that if circumstances change, work must be stopped and advice sought;
8. The work group stays within the limitations set on the permit/certificate (physical boundaries, type of work and validity time);
9. On completion or suspension of the work, the site is left in a safe condition and the Approving Authority (AA) is informed.

6.1.3 Company Supervisor

The Company Supervisor shall be a member to the risk assessment team and he/she shall ensure that followings are available before commencement of work:

1. Confined space and inert entry competency training records of contractors.
2. Health Fitness certificates for inert entry workers.
3. Inert entry equipment inspection and approval for use records.
4. Emergency plan for contractor including a drill for rescue.
5. Medical surveillance record if applicable

6. Risk assessment such as Job Safety Analysis/Job Hazard Analysis/Job Method Statement (JSA/JHA/JMS) and include Chemical Health Risk Assessment (CHRA) requirements where applicable which shall be briefed to and understood by all inert entry workers.

6.1.4 Company Authorised Gas Tester

The Company Authorised Gas Tester shall:

1. Have the knowledge of the hazards that may be faced during entry, including information on the mode, signs and symptoms, and consequences of the exposure;
2. Be familiar with all confined space entry equipment used;
3. Tests and interprets the gaseous reading level in the confined space;
4. Records the initial test results and sign the "Gas Test Results" section after conducting the gas test in the confined space;
5. Extend and cancel the Confined Space Certificate of the Permit to Work.

6.2 Contractors for Inert Entry Works

To ensure the safe and smooth execution of highly hazardous inert entry activities, close co-operation by company and contractor staff is required from the pre-planning stage until the demobilisation of the inert entry activities. Areas of responsibilities in the execution of work must be clearly defined, understood and strictly adhered to.

6.2.1 Contractor Management

Contractor management shall ensure that the followings are in place before commencement of work:

1. Specific health, safety and environmental (HSE) plan for each and every inert entry including risk assessment, work method statement, incident reporting procedure and job specific emergency plan.
2. Work organisation including adequate manning, training and experience of workers.
3. Health Fitness certificates from approved Occupational Health Doctor of workers
4. Workers attendance to company's site specific training, for example, NIOSH PETRONAS Safety Passport (NPSP), Permit-to-work, Working at Height, Inert Confined Space etc.
5. Inert entry and inert entry equipment checklists are available.

6.2.2 Contractor Work Supervisor

The requirements and duties of Contractor Work Supervisor include:

1. Have the knowledge of the hazards that may be faced during entry, including information on the mode, signs and symptoms, and consequences of the exposure;
2. Have awareness of possible behavioural effects of hazard exposure to unauthorised entrants;
3. Ensure all equipment are inspected and tagged by company;
4. Apply for PTW and comply with PTW requirements;

5. Prepare JSA/JHA/JMS and include CHRA requirements where applicable;
6. Supervise inert entry work;
7. Coordinate with company's focal person on work activities;
8. Approve contractor checklists; Pre-Inert Entry Checklist and Daily Inert Entry Checklist.

6.2.3 Contractor Work Leader

The requirements and duties of Contractor Work Leader include:

1. Have the knowledge of the hazards that may be faced during entry, including information on the mode, signs and symptoms, and consequences of the exposure;
2. Have awareness of possible behavioural effects of hazard exposure to unauthorised entrants; Prepare and test all equipment for site inspection;
3. Conduct JSA/JHA/JMS and include CHRA requirements where applicable briefing to all inert entry workers before commencement of work;
4. Conduct daily tool box briefing;
5. Conduct daily operational check using Pre-Inert Entry and Daily Inert Entry checklists;
6. Supervise inert entry work closely;
7. Act as contact person during emergency.

6.2.4 Contractor Stand-by person

The requirements and duties of the stand-by person(s) outside the confined space include:

1. Have the knowledge of the hazards that may be faced during entry, including information on the mode, signs and symptoms, and consequences of the exposure;
2. Have awareness of possible behavioural effects of hazard exposure to unauthorised entrants;
3. Continuously maintains an accurate count of authorised entrants in confined spaces, and means of identification of inert entry worker who is in the confined space;
4. Remains outside his assigned confined space during entry operations until relieved by another standby person;
5. Communicates with authorised entrants as necessary to monitor entrant status and to alert entrants of the need to evacuate their space;
6. Monitors activities outside and inside every space to determine if it is safe for entrants to remain in the space and orders the authorised entrants to evacuate a confined space immediately under any of the following circumstances:
 - a. If the stand-by person detects a dangerous or potentially dangerous situation;
 - b. If the stand-by person detects the behavioural effects of hazard exposure to any authorised entrant;