

PETRONAS TECHNICAL STANDARDS

HEALTH, SAFETY AND ENVIRONMENT

STANDARD

WORKING AT HEIGHT

PTS 60.2104

JULY 2009



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This new PTS **60.2104 - Working at Height (July 2009, Revision 0)** has been developed to provide a standard on the minimum requirement for all working at height activities conducted at PETRONAS and JV's (with operational controls) facilities and installations.

This PTS also includes PETRONAS Lessons Learnt and PETRONAS Best Practice for the subject matter **Working at Height**.

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

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PREFACE

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They are based on the experience acquired during the involvement with the design, construction, operation and maintenance of processing units and facilities. Where appropriate they are based on, or reference is made to, national and international standards and codes of practice.

The objective is to set the recommended standard for good technical practice to be applied by PETRONAS' OPU in oil and gas production facilities, refineries, gas processing plants, chemical plants, marketing facilities or any other such facility, and thereby to achieve maximum technical and economic benefit from standardization.

The information set forth in these publications is provided to users for their consideration and decision to implement. This is of particular importance where PTS may not cover every requirement or diversity of condition at each locality. The system of PTS is expected to be sufficiently flexible to allow individual operating units to adapt the information set forth in PTS to their own environment and requirements.

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Acknowledgement

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1.0 INTRODUCTION

PETRONAS is committed to minimising risks associated with the requirements for the employees and contractors to work at heights. The primary risks associated with working at height are persons and objects falling and safe access to all work areas.

This standard provides the minimum requirement for all working at height activities conducted at PETRONAS and JV's (with operational controls) facilities and installations. It shall be used in conjunction with local guidelines, regulations and statutory requirements.

1.1 Objectives

This standard details the requirement for working at height at PETRONAS and JV's (with operational controls) facilities and installation. The requirements defined within this standard are to ensure compliance with the local guidelines, regulations and statutory requirements.

The Working at Height requirements are based on a hierarchy whereby work at height should be avoided so far as reasonably practicable; if work at height shall proceed the job owner shall ensure compliance to the requirements stated in this standard to prevent any injury arising from working at height incidents.

2.0 SCOPE

This standard shall apply to:

- i. work at height from which workers can fall 2 metres or more from where they stand or sit to perform work; this includes potential falls to lower levels; and
- ii. Gaining access to the work at height.

This standard does not apply to:

- i. Buildings having facilities that are designed to take into account Working at Height, for example stairways and walkways with handrails.

The following special situations of Working at Height are handled differently:

- i. Helicopter access work or steeplejack work is done by specialists who have specific skills, Procedures, equipment and rescue Plans to manage the Risk of Working at Height.
- ii. The movement of people between marine vessels or between marine vessels and facilities present some unique and variable situations. For such operations, refer to site specific procedures or instructions to manage the Risk of Working at Height.

3.0 DEFINITIONS

Anchorage: A component cast or fixed into a building or structure for the purpose of attaching a scaffold or safety line. It can also mean the holding-down system for cantilevered, hanging or suspended scaffolding and platforms.

Anchorage Line: A rigid or flexible line secured to an anchorage point along which a fall arrest device travels, or a flexible line which unreels from a fall arrest device.

Boatswain's Chair: A seat to support a workman in sitting position by rope slings attached to a suspension rope.

Brittle Roofing: Consists of any flat, trough, or corrugated material such as mineral fiber board, plastic or glass, whether reinforced or otherwise, or any other roofing material that, due to its properties, age or weathering, will not safely support a person at all points on its surface.

Bump Rail: A rail or substantial rope barrier suspended at a height of between 0.9 and 1.1 metres to act as a boundary around a work area to prevent access to a hazard. When used as fall protection, it shall be at least 2 metres from the fall hazard. Persons shall not cross or work on the wrong side of the barrier without additional protection.

Please note: The barrier shall be capable of sustaining, without failure or undue deflection, a force at any point of .69kN (70kg) vertically and .44kN (45kg) horizontally.

Building Operation: means the construction, structural alteration, repair or maintenance of a building (including re-pointing, re-decorating, and external cleaning of the structure), the demolition of a building, and the preparation for and the laying of the foundation of an intended building, but does not include any operation which is the work of engineering construction within the meaning of the Act.

Competent: capability of identifying existing and predictable hazards in the surroundings or working condition which are unsanitary, hazardous, or dangerous to employees and has authorisation to take prompt corrective measures to eliminate them.

Confined Space: A space which:-

- i. is not intended as regular workplace (i.e. continuous employee occupancy);
- ii. has restricted means of entry and exit;
- iii. is large enough and so configured that an employee can bodily enter and perform assigned work; and
- iv. is at atmospheric pressure during occupancy.

In addition, this space has at least one of these characteristics:

- i. it contains or has a potential to contain a hazardous atmosphere;
- ii. it contains material (solid or fluid) that has potential for engulfing an entrant;
- iii. it has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section; or
- iv. it contains any other recognised serious safety and health hazards, for example exposed rotors blades, noise etc.

Construction Work: the carrying out of any building, civil engineering or engineering construction work and includes any of the following:

- i. the construction, alteration, conversion, fitting out, commissioning, renovation, repair, upkeep, redecoration or other maintenance (including cleaning which involves the use of water or an abrasive at high pressure or the use of substances classified as corrosive or toxic for the purpose of Regulation 7 of the Occupational Safety and Health (Classification, Packaging and Labelling of Hazardous Chemical) Regulations 1997, decommissioning, demolition or dismantling of a structure;
- ii. the preparation for an intended structure, including site mobilisation, site clearance, exploration, investigation (but not site survey) and excavation, and laying or installing the foundations of the structure;
- iii. the manufacturing of articles on-site or the assembly of prefabricated elements to form a structure or the disassembly of prefabricated elements which, immediately before such disassembly, formed a structure;
- iv. the removal of a structure or part of a structure or of any product or waste resulting from demolition or dismantling of a structure or from disassembly of prefabricated elements which, immediately before such disassembly, formed a structure;
- v. the removal of any articles resulting from any excavation or blasting or site clearing, and the installation, commissioning, maintenance, repair or removal of mechanical, electrical, gas, compressed air, hydraulic, telecommunications, computer or similar services which are normally fixed within or to a structure, but does not include the exploration for extraction of mineral resources.

Crane-Lifted Work Platform: That portion of equipment from which employees carry out their work which is attached to or suspended from the crane's hook block.

Edge Protection: Some form of guardrail or restraint designed to prevent a person reaching or falling over an exposed edge.

Employee: a person who is employed for wages under a contract of service on or in connection with the work of an industry to which the Act applies and

- i. who is directly employed by the principal employer on any work of, or incidental or preliminary to or connected with the work of, the industry, whether such work is done by the employee at the place of work or elsewhere;
- ii. who is employed by or through an immediate employer at the place of work of industry or under the supervision of the principal employer or his agent on work which is ordinarily part of the work of the industry or which is preliminary to the work carried on in or incidental to the purpose of the industry;
- iii. whose services are temporarily lent or let on hire to the principal employer by the person with whom the person whose services are so lent or let on hire has entered into a contract of service;

Employer: the immediate employer or the principal employer or both.

Enclosed Work Environment: A work area free from the risk of falls which includes:

- i. A safe means of access and ingress or a bump rail placed 2 metres from the edge of the fall edge;
- ii. Edge protection such as guardrails around all perimeters and openings; and
- iii. A fall protection barrier, such as safety mesh or a work platform.

Factor of Safety: The ratio of the load that would cause failure of a member or structure to the load that is imposed upon it in service, and, unless otherwise prescribed or directed, shall be a minimum of three.

Fall-Arrest Harness (Safety Harness): An assembly of interconnected shoulder and leg straps, with or without a body belt, and used where there is likelihood of free or restrained fall.

Free Fall: Any fall or part of a fall where the person suffering the fall is under the unrestrained influence of gravity over any fall distance, either vertically or on a slope on which it is not possible to walk without the assistance of a handrail or line.

Fall-Arrest System: A system designed to support and hold a person in the event of a fall.

Fall Protection Barrier: A barrier other than a work platform that will safely support a person without the risk of falling through.

Guard-rail: A railing of metal or wood, supported by stanchions, of sufficient strength and good construction.

Handrail: A rail at a height of between 0.9 and 1.1 metres designed to assist a person to retain their balance.

Hazard: An activity, arrangement, circumstance, event, occurrence, phenomenon, process, situation, or substance (whether arising or caused within or outside a place of work) that is an actual or potential cause or source of harm and "hazardous" has a corresponding meaning.

Height: In relation to a working platform, means the greatest distance from which an article may fall before coming to rest. In determining the distance that an article can fall, no account shall be taken of any obstruction that may delay or stop the fall unless there is no possibility of the fall continuing after the obstruction is reached.

Hung Scaffold: A working platform suspended by tubes, fixed ropes, slings or other methods and not intended to be raised or lowered while in use.

Lanyard: A line used, usually as part of a lanyard assemble which includes a personal energy absorber, to connect a fall arrest harness to an anchorage point or static line.

Restrained Fall: Any fall where the person suffering the fall is under less than the fall influence of gravity due to the action of a restraint device such as a pole strap, or is sliding down a slope less than that described for a free fall.

Safety Belt: A belt secured around the waist that may include butt or groin straps and is not suitable to arrest a free fall.

Safe Working Load (SWL): The maximum load, calculated in accordance with sound and accepted engineering practice, which can be supported safely under normal working conditions.

Scaffold: any temporarily provided structure on or from which persons perform work in connection with operations or works to which this guideline apply, and any temporary provided structure which enables persons to obtain access to or which enables materials to be taken to any gangway, skip, ladder or step-ladder which does not form part of such structure together with any guard-rail, toe-board or other safeguards and all fixing, but does not merely to support such an appliance or such machine as to support other plant or equipment.

Secure Footing: means that the combination of the type of shoes worn and the slope and surface friction of the surface being walked on will prevent the possibility of a person slipping or needing a handrail to assist balance.

Standing Scaffold: A working platform which is supported wholly or partly from its base.

Static Line: In relation to fall protection, means a rope, wire strop, or rail secured between two points and possibly at various points along its length in order to support anchor lines, fall arresters or other fall protection devices. It shall have a minimum breaking strength of 44kN.

Suspended Scaffold: A scaffold support from above, the platform of which is supported at more than two points by steel wire cables suspended from overhead outriggers which are anchored to the steel or concrete frame of the building and it may be equipped with a hoisting drum or machine, so that the platform can be raised or lowered.

Toe Board: A barrier placed along the edge of a scaffold platform, runway, etc., and secured thereto to guard against the falling materials.

Travel Restriction System: A system used to prevent a person reaching a place from where a fall is possible. It can consist of a safety belt and anchorage line.

Work at height – work in any place at or below ground level or means of obtaining access to or egress from such place while at work, except by staircase in a permanent workplace where a person could fall a distance liable to cause personal injury.

Work of Engineering Construction: means the construction, extension, installation, repair, maintenance, renewal, removal, renovation, alteration, dismantling, or demolition of:-

- i. any erection, edifice, structure, caisson, mast, tower, pylon, wall, fence or chimney, whether constructed wholly or partly above or below ground level;
- ii. any road works, dock, harbour works, railway, siding, cableway, tramway line, inland navigation, air field or aerodome;
- iii. any drainage, sewer, sewage works, irrigation, river control works, sea defence work or earth retaining structure;
- iv. any electrical, mechanical, water, gas, petrochemical or telecommunication works; or
- v. any bridge, viaduct, dam, reservoir, lagoon, earthworks, pipeline, sewer, aqueduct, culvert, drive, shaft, tunnel or reclamation works, and includes
 - a. any formwork, falsework, scaffold or any works which form an integral part of, or are preparatory to or temporary to, the works described in paragraphs (a) to (e);
 - b. site clearance, soil investigation and improvement, earth-moving, excavation, laying of foundation, site restoration and landscaping; and
 - c. such other works as may be specified by the Minister.’.

Work Positioning System: A system designed to provide a primary means of support and restraint to allow work to be carried out in reasonable comfort.

4.0 REFERENCE

- i. ABF Working At Height Procedure
- ii. Industrial Rope Access Trade Association (IRATA) UK
- iii. Lifting Operation and Lifting Equipment Regulation 98 (UK)
- iv. The International Working at Height Handbook (UK)
- v. The Work at Height Regulations, 2005 (HSE, UK)
- vi. DOSH Guideline for the Prevention of Fall at Workplace 2007
- vii. Working at Height Procedure, BP Chemicals Limited
- viii. Working at Height, Shell
- ix. PTS 60. 2001 PTW

5.0 REGULATORY AND OTHER REQUIREMENTS

- i. Factories and Machineries Act (BOWECS)
- ii. The Work at Height Regulations, 2005 (HSE, UK)
- iii. DOSH Guideline for the Prevention of Fall at Workplace 2007

6.0 ORGANISING

6.1 Roles and Responsibilities

- i. Senior Management

The Working at Height requirements are based on a hierarchy whereby work at height should be avoided so far as reasonably practicable; if work at height shall proceed the job owner shall ensure compliance to the requirements stated in this standard to prevent any injury arising from working at height.

The Senior Management shall:

 - a. Establish a site procedure on Working at Height in line with the requirements of this PTS and regulatory requirements
 - b. Ensure resources including manpower and equipment for Working at Height activities are made available

- c. Ensure all personnel including emergency responders are trained on Working at Height
 - d. Ensure availability of Emergency Response Plan in the event of an emergency
 - e. Ensure availability of site inspection / audit plan to check compliance to procedure and standards
 - f. Conduct Working at Height system review based on the incident reports, inspection, audit findings and new regulatory requirements
- ii. HSE Department
The HSE Department shall:
 - a. Coordinate training and promote awareness on Working at Height procedure to all staff and contractors
 - b. Coordinate Working at Height audit on a regular basis and ensure close-out of audit findings
- iii. Engineering
Project/Office engineering shall:
 - a. Be the custodian of the Working at Height procedure
 - b. Arrange Working at Height inspection on a regular basis and ensure close-out of inspection findings
 - c. Ensure engineering design and execution of work including installation of plants and equipments meet the specification of PTS on Working at Height and other relevant standards
- iv. Scaffolders
Scaffolding supervisor shall:
 - a. Specify the types of the scaffold including access / egress system to be used
 - b. Ensure Pre Task Review Assessment being carried out by the person erecting or dismantling the scaffold considering the following:
 - Scope and location of work
 - Access and egress to and from the ladder and working platform
 - The position of the working platform
 - Access to the plant, equipment or emergency facilities are not obstructed
- v. Person working at height
The person working at height shall:
 - a. Be trained and competent for the job
 - b. Comply with the Working at Height procedure
 - Ensure tools and equipment are safely stored and secured
 - Be familiar with the safe access and egress and emergency response procedures
 - Inspect, use and maintain the correct PPE for the jobs ensure the working platform is inspected and tagged
 - Report any defect of the working platform to the supervisor
- vi. Contractor Management
Contractor management shall:
 - a. Ensure all personnel including emergency responders are trained on Working at Height
 - b. Ensure resources including manpower and equipment for Working at Height activities are made available
 - c. Ensure availability of Emergency Response Plan in the event of an emergency
 - d. Ensure their workers comply with the Working at Height procedure

- e. Communicate and enforce the requirements on Working at Height procedure on their workers
 - f. Ensure only safe tools and equipment (certification may be required) are mobilised to company's work site and shall take them to the company's various trade authorities for inspection
 - g. Ensure that all tools and equipment have valid tags and send the tools and equipment for re-inspection before the expiry date. All damaged tools and equipment shall be removed from site
 - h. Conduct regular inspection and audit to check compliance to procedure and standards
 - i. Report any incident and submit investigation report
- vii. Contract Owner
- The contract owner shall:
- a. Be responsible for controlling all activities relating to working at height
 - b. Ensure the work is properly planned, appropriately supervised and carried out in a safe manner by adopting the principles defined in the hierarchy of control (Section 3)
 - c. Ensure the work carried out has a valid Permit to Work complete with Risk Assessment/Job Method Statement

6.2 Communication

The Approving Authority and Receiving Authority of PTW shall ensure that all involved with working at height are fully understand the requirements of PTW and associated Risk Assessment/Job Method Statement. Permit/Certificate requirements briefing shall be conducted before commencement of work.

6.3 Competence

All work at height shall be organised, planned, supervised and conducted by a competent person. Each Appendix in this standard defines the competency requirements associated with the particular activity.

7.0 RULES AND PERFORMANCE STANDARDS

7.1 Hierarchy of control

When a job owner is planning any work they shall consider all working at height activities. The following principles shall be adopted during the planning phase:

- i. Avoid work at height (if you don't have to go up there then don't).
- ii. Prevent falls (work safely if it is possible to do so from an existing place of work at height: adopt the most suitable equipment for work at height): and then;
- iii. Mitigate the consequences of a fall (have measures in place to arrest a fall should it occur).

At all stages give collective protective measures precedence over personal protective measures.

The guiding principle behind working at height, if it is necessary, should be performed from a safe place of work.

7.2 Risk Assessment and Planning

A risk based approach is adopted to ensure that the measures taken are proportionate to the risk involved.

Job Owner is required to:

- i. Identify and assess the hazards associated with the task before work begins
- ii. Follow the Hierarchy of Control for safe work at height (Avoid-Prevent-Mitigate)
- iii. Make use of the most appropriate work equipment
- iv. Plan and organise the work properly taking account of weather conditions, possibility of emergencies, etc
- v. Ensure that those carrying out the work at height are competent
- vi. Manage the risks from working on or near fragile surfaces and from falling objects
- vii. Inspect and maintain the work equipment before and during its use
- viii. Inspect the work area before and during the work

7.3 Fragile surfaces

Job owner need to ensure that any surface from which work at height is carried out is stable and of sufficient strength to support all foreseeable loads.

Before commencing any work at height all fragile surfaces shall be identified and the area assessed. Warning notices should be affixed at the approach to the place where the fragile surface is situated, were this is not reasonably practicable then persons shall be made aware by other means.

Steps should be taken to prevent persons from working on or near a fragile surface. Where this is not possible then suitable platforms, coverings, guard rails or other means of protection shall be used to support any foreseeable loading. Foreseeable loading includes people standing on, equipment / materials being stored on, people or objects falling onto a fragile surface.

If after implementing the above controls there still remains a risk of a person or objects falling then controls shall be implemented to minimise the distance and consequence of the fall.

7.4 Falling Objects - Tools/Equipment

Tools or equipment falling from height always has the potential to cause serious injury or damage to plant.

It is the responsibility of those carrying out or controlling work to ensure that their risk assessment considers the probability of objects falling from height. It shall also assess the consequence of such an incident and ensure adequate provisions are in place to avoid such incidents occurring.

The potential modes of failure are those caused by loss of control over handling (persons dropping objects) or objects falling due to improper storage or housekeeping.

High-risk areas are those areas that due to their location or design have the potential that in the event of an object been dropped or falling it is unlikely to be contained in a safe manner. Grated areas, areas around vessels and columns, areas over walkways and roads are examples of high-risk areas.