

GUIDE FOR BUILDING AND CLASSING

DROPPED OBJECT PREVENTION ON OFFSHORE UNITS AND INSTALLATIONS MAY 2017

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GUIDE FOR

DROPPED OBJECT PREVENTION ON OFFSHORE UNITS AND INSTALLATIONS

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ABS Plaza
16855 Northchase Drive
Houston, TX 77060 USA**

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Foreword

The prevention of dropped objects is an important component of safeguarding personnel, property and the environment. The *ABS Guide for Dropped Object Prevention on Offshore Units and Installations* has been developed to provide users with specific guidance and criteria on the dropped object prevention program, which corresponds to a growing industry-wide development to mitigate and eliminate the hazards imposed by dropped objects.

This Guide specifies the ABS requirements for an onboard dropped object prevention program to be implemented on an offshore asset, and provides the design requirements for equipment primary securing, secondary retention methods and securing for specific equipment, etc. This Guide is intended for use by installation Owners, Operators, and Companies requesting an optional **DOPP** or **DOPP+** notation.

The following describes the general scope of the ABS **DOPP** and **DOPP+** notations:

- i) The ABS **DOPP** notation is for ABS-classed offshore installations with an onboard dropped object prevention program approved, surveyed, and commissioned in full compliance with the applicable sections of this Guide.
- ii) The ABS **DOPP+** notation is for ABS-classed offshore installations with an onboard dropped object prevention program integrating equipment designs that meet the requirements for primary securing, secondary retention, and specific equipment securing, which are approved, surveyed, and commissioned in full compliance with this Guide.

This Guide is to be used in conjunction with other Rules published by ABS and recognized international Regulations.

This Guide becomes effective on the first day of the month of publication.

Users are advised to check periodically on the ABS website www.eagle.org to verify that this version of this Guide is the most current.

We welcome your feedback. Comments or suggestions can be sent electronically by email to rsd@eagle.org.



GUIDE FOR

DROPPED OBJECT PREVENTION ON OFFSHORE UNITS AND INSTALLATIONS

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CHAPTER 1 Scope and Conditions of Classification

SECTION 1 Classification

The requirements for conditions of classification are contained in the separate, generic *ABS Rules for Conditions of Classification of Offshore Units and Structures (Part 1)*.

Additional requirements specific to the dropped objects prevention for offshore installations are contained in the following Sections of this Guide.



CHAPTER 1 Scope and Conditions of Classification

SECTION 2 Classification Symbols and Notations

1 Class Notations

Units with a dropped object prevention program that complies with this Guide and have been surveyed and commissioned to the satisfaction of the Surveyors in full compliance with this Guide and where approved by the Committee may be classed and distinguished in the *Record* by the appropriate notation for the intended service as follows.

1.1 DOPP Notation

Units with a dropped object prevention program approved in accordance with the requirements and criteria established in Chapter 2 and Chapter 4 of this Guide will be assigned a notation of **DOPP**.

1.3 DOPP+ Notation

Units that comply with **DOPP** and possess equipment designs that meet the requirements for primary securing, secondary retention, and specific equipment securing, and which are approved, surveyed, and commissioned to the satisfaction of the Surveyors in full compliance with this Guide, will be assigned a notation of **DOPP+**.



CHAPTER 1 Scope and Conditions of Classification

SECTION 3 Rules for Classification

1 General

This Guide is applicable to the optional classification of dropped object prevention programs and associated equipment used to control and prevent dropped objects from height, and supports dropped object prevention activities on mobile offshore drilling units, offshore installations, tendering vessels, mobile offshore units and other offshore units and installations that are classed with ABS. This Guide is intended for use in conjunction with the *ABS Rules for Building and Classing Mobile Offshore Drilling Units (MODU Rules)*, the *ABS Rules for Building and Classing Offshore Installations (Offshore Installations Rules)*, *ABS Rules for Building and Classing Floating Production Installations (FPI Rules)*, and the *ABS Guide for Drilling Tender Barges*, *ABS Guide for Building and Classing Mobile Offshore Units (MOU Guide)*, as well as other applicable ABS Rules and Guides.

If requested by the manufacturers, Owner/Operator, or designers, ABS can provide approval of individual equipment or components associated with a dropped object prevention program in accordance with the requirements of this Guide where the installation unit may not be classed with ABS.



CHAPTER 1 Scope and Conditions of Classification

SECTION 4 Plans and Data to be Submitted for Review

1 Submission of Plans

Typical documentation that is required to be submitted for review for the dropped object prevention program, equipment, and/or components for the ABS Classification process is provided in Chapter 2 and 3 of this Guide.

- i) Detailed plans and documentation of the onboard dropped object prevention program in accordance with 2-1/5 is to be submitted.
- ii) The documentation and plan for design, installation, and maintenance of equipment in accordance with 3-1/3 is to be submitted.
- iii) Dropped object prevention program documentation, equipment and/or component-related drawings and related calculations are required to be submitted to ABS for review by the contracting party or the party assigned by the contracting party to substantiate that the dropped object prevention program and the design of the equipment and/or components are in compliance with this Guide, and applicable codes or standards, as listed in this Guide.

Upon satisfactory completion of ABS review of the submitted documentation, plans, and data, ABS will issue an approval letter verifying the completion of the review in accordance with the provisions of this Guide. This letter, in conjunction with ABS approved documentation, will be used and referenced during surveys. Subsequently, the ABS Surveyor will issue appropriate survey reports.

Upon satisfactory completion of all of the required engineering design review and survey processes, ABS may issue the Classification Certificate to the operating unit, including the Class notation **DOPP** or **DOPP+**.



CHAPTER 1 Scope and Conditions of Classification

SECTION 5 Alternatives

1 Novel Features

Dropped object prevention programs and related equipment which contain novel features of design or monitoring provisions to which the content of this Guide is not directly applicable may be classed, when approved by the Committee, on the basis that this Guide insofar as applicable has been complied with and that special consideration has been given to the novel features, based on the best information available at that time. The *ABS Guidance Notes on the Review and Approval of Novel Concepts* provides a methodology for requesting approval of a novel design.

3 ABS Type Approval Program

3.1 Type Approval

Products that are used as components for the dropped object prevention program and can be consistently manufactured to the same design and specification may be Type Approved under the ABS Type Approval Program. The ABS Type Approval Program is a voluntary option for the demonstration of compliance of a system or product with the Rules, Guides, or other recognized standards. It may be applied at the request of the designer or manufacturer.

Specific requirements and details regarding the ABS Type Approval Program can be found in 1-1-4/7.7 and Appendix 1-1-A3 of the *ABS Rules for Conditions of Classification (Part 1)*.

3.3 Unit-Certification

Unit-Certification is a review of individual materials, components, products, and systems for compliance with ABS Rules, Guides, or other recognized standards. This allows these items to be placed on a vessel, marine structure, or system to become eligible for classification. Certification is a “one-time” review. The process is:

- i) A technical evaluation of drawings or prototype tests of a material, component, product, or system for compliance with the ABS Rules, Guides, or other recognized standards
- ii) A survey during manufacture for compliance with the ABS Rules, Guides or other recognized standards and results of the technical evaluation
- iii) Alternatively, a certificate of type approval will expedite the requirements of i) and ii) above
- iv) Products found in compliance are issued “Individual Unit Certification”



CHAPTER 1 Scope and Conditions of Classification

SECTION 6 Acronyms, Abbreviations, Definitions, and References

1 List of Acronyms, Abbreviations, and Definitions

Assemble. Fit together the separate component parts of a machine or other object.

BOP. Blowout preventer.

BRC. Bridge racking crane.

Dropped Object [Dynamic]. Any object that falls from its previous position due to applied force. For example: collisions involving travelling equipment or loads, snagging on machinery or stacked items, motion, helicopter downdraft, or severe weather.

Dropped Object [Static]. Any object that falls from its previous position under its own weight (gravity) without any applied force. For example: a failure caused by corrosion, vibration, or inadequate securing.

DROP. The term used to indicate Dropped Objects Prevention.

DROPS. Dropped Object Prevention Scheme. The global, independent oil and gas industry initiative focus entirely on the prevention of dropped objects.

External Specialist. A person or company approved by ABS in accordance with ABS procedures for approval of External Specialist. The results of their inspections are used by Surveyors in making decisions affecting classification or statutory certification.

Fastening. A device that closes or secures an object.

Fixing. Screws, bolts, or other items used to fix or assemble equipment.

HAZID: Hazard identification study is a process to find, list, and characterize hazards. This is the first step of a risk assessment.

Hierarchy of Controls. The dropped object control hierarchy from most effective to least effective is elimination, substitution, engineering controls, administrative controls, and personal protective equipment.

JSA. Job safety analysis.

Mitigating Controls. Methods, actions or policies that reduce the rate and/or consequences of an incident if preventive controls fail or are not effective.

Non-Through Bolted Connection. Connection type where screw/bolt is screwed into hole drilled and tapped directly in the material.

OEM. Original Equipment Manufacturer.

PHM. Pipe handling machine.

PLS. Position location system.

PPE. Personal protective equipment.

Preventive Controls. Preventing dropped object incidents by reducing the likelihood that an incident will occur by drop resistant design, reliable securing, management of change, training, etc.

Primary Securing Methods. The fixing methods by which an item is fixed so as to prevent it from dropping or falling by using primary securing devices, such as nuts, bolts, screws, claps, brackets, turnbuckles, welding, etc.

PRS. Pipe racking system (rig).

Risk Zones. Area on the offshore asset identified as having the potential for a dropped object incident.

Retain. To maintain in place; hold fixed.

Secondary Retention. The method for securing a part from unintended loosening resulting in loss of clamping force, pre-tension, backing out, displacement, or loss of any part.

Securing. Fixed or fastened so as not to give way, become loose, or be lost.

Securing Devices. Components part of drops preventive systems.

Through Bolted Connection. Connection where two or more mating surfaces are kept together by a bolt penetrating through the parts and locked by nut engaged on the thread.

WWW.DROPSONLINE.ORG. The online resource providing access to a broad range of DROPS Best Practice, Guidance, Campaigning and Presentation materials.

3 References

1. *ABS Rules for Building and Classing Floating Production Installations (FPI Rules)*
2. *ABS Rules for Building and Classing Mobile Offshore Drilling Units (MODU Rules)*
3. *ABS Rules for Building and Classing Offshore Installations (Offshore Installations Rules)*
4. *ABS Rules for Building and Classing Facilities on Offshore Installations (Facilities Rules)*
5. *ABS Guide for Drilling Tender Barges*
6. *ABS Guide for Building and Classing Mobile Offshore Units (MOU Guide)*
7. *ABS Guidance Notes on Job Safety Analysis for the Marine and Offshore Industries*
8. *ABS Guidance Notes on Accidental Load Analysis and Design for Offshore Structures*
9. *ABS Guidance Notes on Management of Change for the Marine and Offshore Industries*
10. Drops Reliable Securing Booklet, www.DROPSONline.org/resources-and-guidance/
11. ABC Guide to Dropped Object Prevention, vol. 1 and 2, Shell
12. Design Guideline – Secondary retention and Prevention of Dropped Objects, internal report, National Oilwell Varco.
13. Dropped Object Prevention Program, internal report, Ensco.
14. Dropped Objects Prevention Programme (DOPP), OES Oilfield Services Group
15. Dropped Objects Prevention, Greater Gulf of Mexico, Chevron



CHAPTER 2 Onboard Dropped Object Prevention Program

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CHAPTER 2 Onboard Dropped Object Prevention Program

SECTION 1 General

1 Introduction

Dropped objects have been identified as a potential hazard in a variety of offshore operational activities. In response, an industry-wide effort is underway to decrease the associated risks to health, safety, environment, and the facility itself. Statistical data shows that dropped objects are one of the leading causes of safety incidents. Dropped objects can occur due to design, manufacturing, installation, maintenance, operation, or dismantlement activities throughout the lifecycle of equipment installed at height. The major contributing factors to prevent dropped-object incidents are personnel awareness and training, work process, management, equipment design, environment, and securing of equipment and tools.

An effective dropped-objects prevention (DROP) program can reduce the risk of dropped-object related incidents by identifying potential dropped object hazards and risks, applying appropriate corrective actions, providing awareness through effective personnel training, and making use of good practices and lessons learned for continual improvement.

The requirements and acceptance criteria for a fundamental DROP program are outlined in this Chapter.

3 Objective

This Chapter provides requirements for the dropped object prevention program and intends to enable members of the offshore industry to take verifiable steps to protect personnel, assets, and the environment from dropped object incidents.

5 Application

This Chapter applies to the DROP program implementation of asset management for drops prevention on board an ABS classed offshore unit with the **DOPP** or **DOPP+** notation.

The DROP program on an offshore asset may be implemented in different location zones. The minimum locations for each type of offshore units are described in 2-1/5.1 through 2-1/5.7. The program may be extended to additional locations. Examples of typical dropped object zones on a drilling unit can be found in Appendix 2-A2.

For all dropped object zones, the following documents are to be submitted to ABS for review:

- Equipment and Outfitting Register listing items included in the DROP program
- Risk assessment reports for each listed item in the DROP equipment register
- An Onboard Drops Prevention Program that covers the required functions described in 2-1/7
- Implementation and audit of the onboard dropped objects prevention program by recognized external specialists
- A system of record keeping that includes auditing, inspection, accidents reporting, feedback, and lessons learned

5.1 Dropped Object Zones for Fixed Installations

The following locations on a fixed offshore asset are required to be included in the DROP program as a minimum:

- i) Derrick/mast equipment area 1 (A frame, crown block, water table)
- ii) Derrick/mast equipment area 2 (derrick – crown to monkey board)
- iii) Derrick/mast equipment area 3 (derrick – monkey board to driller)
- iv) Derrick/mast equipment area 4 (traveling equipment, traveling block, top drive, kelly spinner, etc.)
- v) Stabbing board
- vi) Sub-structure, under cantilever area
- vii) Moon pool
- viii) Vent/flare masts and booms
- ix) Cranes and associated equipment

The following locations are optional:

- i) Machinery spaces
- ii) Deck working and access areas with overhead equipment
- iii) Accommodation block, all external levels
- iv) Any other areas identified by the Owner

5.3 Dropped Object Zones for Self-Elevating Units

The following locations on a self-elevating drilling unit are required to be included in the DROP program as a minimum:

- i) Derrick/mast equipment area 1 (A frame, crown block, gin pole, water table, etc.)
- ii) Derrick/mast equipment area 2 (derrick – crown to monkey board)
- iii) Derrick/mast equipment area 3 (derrick – monkey board to driller)
- iv) Derrick/mast equipment area 4 (traveling equipment, traveling block, top drive, PRS, PHM, PLS, VDM, etc.)
- v) Stabbing board
- vi) Sub-structure, under cantilever area
- vii) Cranes and associated equipment

The following locations are optional:

- i) Jack houses
- ii) Machinery spaces
- iii) Accommodation block, all external levels
- iv) Any other areas identified by the Owner

5.5 Dropped Object Zones for Floating Units and Installations

The following locations on a floating asset are required to be included in the DROP program as a minimum:

- i) Derrick/mast equipment area 1 (A frame, crown block, gin pole, water table, etc.)
- ii) Derrick/mast equipment area 2 (derrick – crown to monkey board)
- iii) Derrick/mast equipment area 3 (monkey board platform)

- iv) Derrick/mast equipment area 4 (derrick – monkey board to driller)
- v) Derrick/mast equipment area 5 (traveling equipment, traveling blocks, top drives, PRS, PHM, PLS, BRC, VDM, etc.)
- vi) Derrick/mast equipment area 6 (drill floor, iron roughneck, dog house, etc.)
- vii) Stabbing board/basket
- viii) Sub-structure
- ix) Moon pool area, bop handling and service areas
- x) Riser bridge cranes, cranes and associated equipment

The following locations are optional:

- i) Shaker areas
- ii) Machinery spaces
- iii) Main deck area
- iv) Raised catwalks/conveyors/walkways
- v) Accommodation block, all external levels
- vi) Columns, thruster compartments, ballast pump rooms
- vii) Any other areas identified by the Owner

5.7 Dropped Object Zones for Production Units

The locations on a production unit are to be included in the DROP program as follows:

- i) Any locations defined in 2-1/5.1 through 2-1/5.5.
- ii) Locations of hydrocarbon production and/or processing facilities with high risk assessment identified in the *Facilities Rules*.
- iii) Any high risk locations identified in the *FPI Rules*, the *MODU Rules* and the *MOU Guide*.
- iv) Any other areas identified by the Owner.

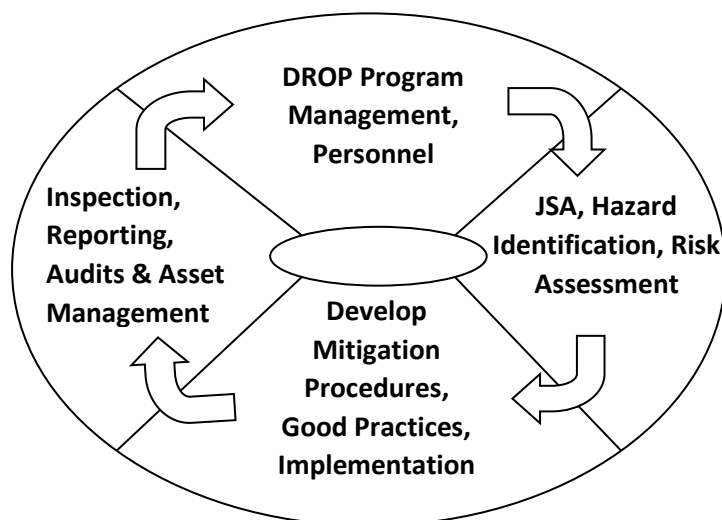
7 Dropped Object Prevention Program Elements

This Section identifies the basic aspects and functions required to establish a firm foundation for the DROP program. An organizational process can be built off this foundation incrementally based on safety needs, staff competencies and organizational maturity in the DROP program.

2-1/Figure 1 illustrates the primary functions that are required to build a dropped object prevention program. At the core of the program is the goal to protect personnel, property, and the environment. The functions are:

- Dropped object program management and personnel training
- Job safety analysis (JSA), hazard identification, and risk assessment
- Mitigation procedures and implementation
- Continual improvement through inspection, audit, reporting, and corrective actions

FIGURE 1
Basic Elements of a DROP Program



Within each basic function of a dropped object prevention program refined, detailed operations and procedures are essential. The completed program is to be developed and submitted to ABS for review, verified on site by an ABS-approved External Specialist, and surveyed by the attending Surveyor.

The basic functions shown in 2-1/Figure 1 are critical to establishing a reliable dropped object prevention program, and they are considered by ABS to be the minimum required to evaluate, analyze, and provide a measurable program on board offshore assets. These functions are required to be developed and implemented on board with results documented, approved work practices employed, and lessons learned implemented.

The basic functions are:

- i) Define roles and responsibilities for DROP program management
 - a) Define and exercise good practices
 - b) Develop DROP program management
 - c) Provide dropped objects prevention awareness and training
- ii) Perform Risk assessment
 - a) Develop Equipment and Outfitting Register
 - b) Identify potential sources of dropped objects
 - c) Perform risk assessment
 - d) Establish and map out risk zones
 - e) Management of Change
- iii) Implementation of DROP program
 - a) Exercise DROP program practices
 - b) Implement DROP inspection plan
- iv) Continual improvement
 - a) Monitor and audit the established program
 - b) Enhance reporting and corrective action procedures
 - c) Continual improvement through lessons learned



CHAPTER 2 Onboard Dropped Object Prevention Program

SECTION 2 Roles and Responsibilities

1 General

The onboard dropped object prevention program is to be organized by the responsible person designated by the Owner/Operator. The responsible person is to exercise good dropped object prevention practices, develop the program management system, and provide to personnel dropped object prevention awareness and training. A description of the onboard dropped object program management system is to be submitted for ABS review.

1.1 DROP Program Management System

The dropped object program management system is to include:

- i) A methodology to develop the dropped object prevention program to match tasks to required skills and build personnel skill for long-term development of experience
- ii) Provisions for performing periodic capability assessments to confirm that the management leadership understands current dropped objects safety status, personnel and organizational capabilities, and plans for development
- iii) Guidelines for carrying out all activities described within the dropped object prevention program

1.3 Dropped Objects Prevention Awareness and Training

The dropped object prevention program training for any personnel (employee, contractor, consultant, or visitor) that accesses the offshore asset is essential in order to enable personnel to identify dropped objects hazards and risks.

The dropped object prevention program management organization is to:

- i) Maintain an acceptable use policy or dropped objects prevention manual that is designed to prevent harm to personnel and damage to offshore equipment from dropped objects in the execution of offshore activities
- ii) Have enforcement mechanisms in place to confirm that acceptable use policies are applied, acknowledged, monitored, audited, and enforced throughout the worksite environment
- iii) Conduct periodic dropped object prevention program awareness trainings so that personnel understand the program policies, procedures, inspections and safeguards needed to minimize dropped objects hazards
- iv) Provide DROP program training

3 Roles and Responsibilities

Considering the functions of a dropped object prevention program and tasks, suggested roles, and responsibilities involved in the DROP program are as follows.

The onboard dropped objects prevention program is to define the roles and responsibilities for the following:

- DROP Program Management
- Personnel and Safety Management
- Quality Assurance Management
- DROP Training Management
- Management of Change
- Supply Chain Management

Examples of these roles and responsibilities can be found in Appendix 2-A1.



CHAPTER 2 Onboard Dropped Object Prevention Program

SECTION 3 Risk Assessments for Dropped Object Hazards

1 Introduction

Every offshore asset involves a large amount of equipment and outfitting devices. Risk assessments for dropped object hazards on an offshore asset mainly focus on the typical dropped objects zones described in 2-1/5 and areas identified by the Owner/Operator. The equipment and outfitting devices in these areas are to be identified, catalogued, and photographed to form an Equipment and Outfitting Register of all overhead equipment. This may include derrick pins, tong sheaves, turnbuckles, light fixtures, antennas, handrails, tools, etc. All items are collected with a risk profile including their weight and height, their exposure to energy sources (e.g., vibration effects, corrosion, etc.) and details of job activities and operations that may include the amount of time that personnel spend under them. All items in the Equipment and Outfitting Register are assessed for their dropped risk potential and consequence.

Furthermore, based on the risk assessment, the dropped object risk zones can be established to control the unauthorized access to the designed areas. The DROP inspection plans are to be developed to be carried out for routine inspections.

3 Dropped Objects Risk Assessment

The dropped object risk assessment is an overall process consisting of the following three steps:

- i) Risk Identification
- ii) Risk Analysis
- iii) Risk Evaluation

The details regarding these three steps are presented in the following Paragraphs.

3.1 Risk Identification

An asset-specific dropped object HAZID is to be carried out to identify potential dropped object sources and corresponding scenarios. All items listed in the Equipment and Outfitting Register are to be considered. For further guidance on the hazard identification study, refer to Section 2 of the *ABS Guidance Notes on Accidental Load Analysis and Design for Offshore Structures*.

The scenarios considered are to include, but are not limited to, the following:

- i) Dropped objects on lifting equipment due to lifting and hoisting
- ii) Dropped objects during drilling operations
- iii) Dropped objects during equipment installation and maintenance
- iv) Falling objects such as hand tools used at height
- v) Derrick temporary equipment
- vi) Equipment securing at height, bolted connections
- vii) Failure of equipment in operation causing parts to drop
- viii) Collision or striking of equipment at height
- ix) Vibration
- x) Environment, rain, wind, snow, ice, hail, lightning, sea action, etc.

The dropped object incident is to be fully characterized, as far as practicable, by including:

- i) On-going operations or jobs (e.g., moving equipment, drilling, or working at height)
- ii) Dropped object description:
 - Description of structure, location, and mass of object
 - Drop characteristics (including location of anticipated impact, height of drop, impact angle, and velocity, as applicable)
- iii) Dropped object scenario definition:
 - Energy source or environmental conditions (e.g., weather and sea state)
 - Prevention controls (including safety devices, securing design)
 - Potential consequences with respect to personnel safety, asset damage or environmental damage
 - Mitigating measures present (including structural and operational safeguards when impact occurs and safety/environmental barriers after event)

3.3 Risk Analysis

The dropped object risk analysis is the evaluation of the level of risk associated with the identified dropped object so that proper attention is given to prevent or mitigate the recurrence of high risk events. Additional dropped object prevention plans are to be developed as needed to avoid lower risk events as well. Risk is a function of the likelihood of a hazard to occur and the severity of the resulting consequence. The effectiveness and efficiency of the existing preventive controls and mitigating measures are also taken into account while determining the risk level. For the purpose of the dropped object prevention program, the risk evaluation can be a qualitative estimation.

The dropped object risk analysis evaluates the consequence severity with respect to personnel safety, asset damage, and environmental damage. For each dropped object incident identified, the risk assessment process is to determine the worst-case outcome that can result from the hazard. For example if the identified risk has potential consequences ranging from a minor first-aid treatment to a fatality, then the most severe case, the fatality, is to be selected and the risk identified according to this outcome. The likelihood of occurrence may be based on statistical data and/or current industry practice.

3.5 Risk Evaluation

The dropped object risk analysis results can be compared to the acceptable criteria approved by ABS to clarify what level of risk can be tolerated and what risks cannot; such as the Risk Matrix and Tolerability Criteria based on hazard severity. Reference can be made to 4/7.3 of the *ABS Guidance Notes on Job Safety Analysis for the Marine and Offshore Industries*.

3.5.1 Acceptance Criteria

The dropped object acceptance criteria within the DROP program are to be defined by the Owner. The acceptance criteria define the acceptable risk level for a dropped object incident considering both the frequency and the consequence of the event. The acceptance criteria are to take into account the potential impact on personnel safety, environment, and the asset. The risk acceptance criteria defined by the Owner is to be submitted and approved by ABS prior to initiating the risk assessment.

The frequency of dropped object incidents can be estimated based on historical data. If applicable frequency data cannot be found, it may be necessary to estimate the frequency by analytical models (e.g., fault tree analysis). A common benchmark in the classification of potential consequence severity to personnel safety from a dropped object is provided by the DROPS calculator and shown in 2-3/Figure 1. This DROPS calculator as a consequence evaluation tool is endorsed by DROPS Workgroup (dropsonline.org). The DROPS calculator uses the mass of the dropped object and the height from which it falls to classify the potential consequence severity in terms of First Aid, Medical Treatment Case, Lost Time Injury, or Fatality. Dropped objects may also cause asset damage. Analytical methods (e.g., closed form equations and tabulated data or nonlinear finite element analyses) may be used to assess the damage to an asset.