



# **Guidance Notes on Job Safety Analysis for the Marine and Offshore Industries**

# Outline

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- What is Job Safety Analysis (JSA)?
- Why is JSA important to the marine and offshore industries?
- What is in the ABS GN for JSA?
  - Flexible JSA Approach
    - Informal JSA
    - Formal JSA
  - Getting the Most out of the JSA Program
  - JSA Program Implementation
  - JSA Program Monitoring
  - Samples, Examples, Hazards > Cause > Control Tables
- Questions

# What is Job Safety Analysis?

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- Risk assessment applied to work tasks
- Goal is to prevent harm to individual(s) carrying out task
- Risk Management Best Practice
- JSA Process
  - Identify basic job steps of task
  - For every job step, review potential safety and health hazards
  - Plan for effective risk control

- 33 Outer Continental Shelf accidents between 2000 -07
- Resulted in 14 fatalities and 7 injuries
- Absence of job hazard analysis cited as a contributing cause

*Source: 30 CFR 250 Safety and Environmental Systems (SEMS)*

# Standards and Regulations Requiring JSA

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- The International Safety Management (ISM) Code, 2010 edition
  - Safety management objective to “assess all identified risks to its ships, personnel and the environment and establish appropriate safeguards”.
- Occupational Health and Safety Assessment Std OHSAS 18001
  - Requires “procedure(s) for the ongoing hazard identification, risk assessment, and determination of necessary controls” as the basis for OH&S system
- ILO Maritime Labour Convention, 2006
  - Mandates risk evaluations for occupational health and safety risks.

# Standards and Regulations Requiring JSA (continued)

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- Tanker Management If-Assessment (TMSA)
  - Requires program for systematic identification of hazards
- 30 CFR 250 Safety and Environmental Management Systems (SEMS)
  - 33 OCS accidents between 2000 -07 resulting in 14 fatalities and 7 injuries – absence of job hazard analysis one of the contributing causes
  - Requires a JSA program to analyze tasks performed as part of most offshore activities
    - drilling, production, processing, construction, well services (workover, completion, servicing), and pipelines.

Deepwater Horizon

Piper Alpha

# Overview of ABS GN on JSA

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- Best practices and concepts for developing, optimizing and maintaining a successful JSA Program
  - Philosophy and approaches
  - Roles and Responsibilities
  - Models and examples
- Audience
  - Management / personnel responsible for safety management, risk controls, maintenance tasks, etc.
- JSA Industry Guidance
  - Limited marine and offshore industry guidance
    - Distinct philosophy, could be less effective than on-shore industries
  - Nothing from other Class Societies
  - Some embedded in SEMS

# GN JSA Philosophy

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- Identify and control hazards associated with **all** tasks
  - JSA all tasks? Some? Which ones?
- Some tasks require a more detailed JSA than others.
- Flexible approach that can accommodate any level of detail
- Tiered approach:
  - i. An informal JSA (mental or verbal)
  - ii. A formal JSA (comprehensive and documented)
- Criteria to decide what type of JSA is needed for each task
- Basic parts of any JSA
  1. Understand the task to be performed
  2. Identify potential hazards for the task
  3. Identify risk control measures for each hazard

# Informal JSA

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- Mental or verbal individual risk assessments carried out by the worker(s) before starting any job.
- Most basic, quickest and simplest of task risk assessment
- Planning tool help workers perform even the most mundane of tasks without getting hurt.
- When?
  - Routine and simple tasks involving only one or two individuals and little equipment

# Informal JSA

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- Before starting job, consider
  - i. Task
  - ii. Work area/environment
  - iii. Equipment
  - iv. People
  - v. Controls
- Try to identify inherent hazards or what can go wrong with the above
- Identification of hazards leads to methods to manage the risks associated with the hazard

# Characteristics of Informal JSA

Leader	Individual working on the task
Number of people on JSA Team	Typically 1-3. All conducting the task should participate in the JSA
Supervisor during JSA development	Not necessary
Documentation	None
Level of detail on breakdown of job steps	Mental or verbal outline of task
Approvals	None
Risk Estimation	Mental. Worker feels confident that risks are acceptable.
Location for Conducting the JSA	Shipboard/facility and close to task location
Timing for conducting JSA	Immediately before task

# Informal JSA Process Checklist



## (1) Identify Steps

Mentally or verbally understand the steps that need to be accomplished

**TASK**

- Are the job description and instructions clear?
- Do task participants have sufficient knowledge or experience to handle the job safely?
- Do task participants feel comfortable about the job?
- Will completion of the task lead to the creation of other hazards that will need to be controlled?



## (2) Identify Hazards

Identify hazards associated with the work area and surroundings

Check if tools/equipment essential for performing the task safely and appropriately are at hand

Consider people who may be, advertently or inadvertently, at risk from the performance of the task

**WORK AREA / ENVIRONMENT**

- What else is happening nearby that can affect task (simultaneous operations)?
- Is place tidy for the work, free from protruding, sharp objects and with minimal obstructions?
- Is lighting appropriate?
- Is weather a factor (e.g., rain, heat, cold)?
- Is vessel / facility motion a factor?
- Environmental conditions pose a danger?
- Scan 360° - top, bottom, front, sides. Any hazards?

**EQUIPMENT**

- What equipment needed to safely complete task?
- Is equipment available and in working order?
- Are the task participants familiar with its use?
- Is the personal protective equipment (PPE) to be used in good condition?
- Is test / monitoring equipment available, properly calibrated, and in working order?
- Are electrical leads / cables in working order?

**PEOPLE**

- Is there need to communicate with other personnel prior to conducting the task?
- How will the task participants communicate with others who may inadvertently interact with the job?
- Does this task require more people / equipment to be carried out safely?
- Are warnings, barriers or controls necessary to protect others?



## (3) Identify Controls

Examine the need for controls to reduce or eliminate hazards, and evaluate existing controls for adequacy

**RISK CONTROLS**

- Can I eliminate the hazards from the work task?
- If not, how can I control these hazards?
- Am I satisfied that the hazards are controlled?
- If so, start the task

# Formal JSA

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- Expanded level of detail and is documented.
- Documents the job steps, the identified hazards, and the means by which the risk of these hazards is eliminated or mitigated.
- Documentation becomes a means of communicating information about the job.
- All personnel involved in the job and assessment have access to results and can provide input.
- Filed for future reference whenever the same, or similar, task arises

# When to do a Formal JSA?

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- Non-routine tasks
- Tasks with known potential for harming crew, equipment or environment, including near-misses, or tasks that have been associated with recurring HSE events
- Complex/difficult tasks
- Tasks requiring the interaction of many people or systems
- Routine tasks performed under unusual or unfavorable situations
- Tasks involving a change from the norm, or something/someone new or different
- Work on critical equipment
- Tasks that generate employee complaints

# Tasks Typically Requiring a Formal JSA

TABLE 3 (continued)  
Tasks Typically Requiring a Formal JSA

<i>Criteria for Formal JSA</i>	<i>Examples</i>
iv) Task requiring interaction between many people or systems	<ul style="list-style-type: none"> <li>• Simultaneous and potentially conflicting operations (SIMOPS)</li> <li>• Tasks requiring crew and outside vendors working together or with different departments on board.</li> <li>• Stores transfer at the dock or at sea</li> <li>• Fueling operations</li> <li>• Offshore lightering</li> <li>• Ship assist and ship mooring</li> <li>• Personnel transfers at sea</li> <li>• Tank-cleaning operations</li> <li>• Routine and repetitive tasks where risk of complacency may be a factor (e.g., tripping 10,000 feet of drill pipe in or out of the hole, change of the watch or for supper relief, etc.)</li> </ul>
v) Routine tasks performed under unusual or unfavorable situations	<ul style="list-style-type: none"> <li>• Work during adverse weather conditions</li> <li>• Ice operations</li> <li>• Work in areas of high temperatures</li> </ul>
vi) Task involving a change from the norm, or something/someone new or different	<ul style="list-style-type: none"> <li>• New job/task</li> <li>• Tasks with new procedures</li> <li>• Newly modified jobs, operations or processes</li> <li>• Tasks associated with newly modified or new equipment</li> <li>• Tasks performed by new or inexperienced workers</li> </ul>
vii) Work on critical equipment	<ul style="list-style-type: none"> <li>• Tasks associated with disabling of critical equipment or disabled/suppressed safety or environmental systems</li> </ul>
viii) Employee complaints	<ul style="list-style-type: none"> <li>• Tasks that generate employee complaints as they may be the result of underlying problems such as ergonomic issues, procedures that are not feasible to carry out in real life, etc.</li> </ul>

# Formal JSA Characteristics

Characteristics	Philosophy	Section
JSA Leader	Individual experienced in the task to be carried out and in the JSA process. It could be an individual working on the task, a supervisor, or an HSE person from shore with indirect knowledge of the task.	4/3, "Roles and Responsibilities"
Number of people on JSA team	All individuals involved in the job should participate in the JSA development. In addition, the presence of external support such as shoreside, HSE, or other departments may be needed for certain tasks.	4/3, "Roles and Responsibilities"
Use of not task-specific, generic JSA forms	Generic JSA can be used as reference, but a new JSA should be conducted prior to commencing the task which addresses all hazards associated with the task, including time of day, personnel experience, change of personnel during the task, environmental considerations, etc.	3/5, "Library of JSAs"
Supervisor present during JSA development	Yes. In addition to supervisor/officer in charge, for large-scale, complex tasks, consideration should be given to oversight by the Master, Offshore Installation Manager or by shore-office HSE expert	4/3, "Roles and Responsibilities"
Detailed breakdown of job steps	Breakdown performed in conjunction with detailed tasks or process instructions and referenced to Company procedures	2/5.7, "Formal JSA Step 2: List the Job Steps"

# Formal JSA Characteristics

Characteristics	Philosophy	Section
Risk Estimation	Explicit risk estimation required, according to company procedures. Usually, it involves a qualitative assessment of consequence and likelihood with the help of a risk matrix	2/5.13, "Formal JSA Step 5: Hazard Ranking"
Timing and Location of JSAs	In close proximity to the task location, as well as shortly before commencing the task. If a JSA was performed well in advance of the task in order to allow time to install any recommended engineering controls, such JSA must be reviewed again prior to commencing the task with all the personnel involved in the task	3/3. "A Word about Proximity in Time and in Location"
Approvals	Yes, approval of the JSA analysis needed before starting the task. Approval process according to company procedures, usually by the relevant member of offshore facility management, Master, Offshore Installation Manager, HSE or shore-office.	4/3.3.2, "Approvals"
Documentation and recordkeeping	Yes, according to company procedures. Records stay on vessel and usually shore-side also.	5 / 5 "Recordkeeping"

# Formal JSA Process

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1. Define the job specifically.
2. List steps of the job.
3. Identify hazards for each job step.
4. Identify existing **risk control measures** for each hazard.
5. Rank the hazards.
  1. If ranking indicates that hazard is not adequately controlled, identify **additional risk controls**.
  2. Re-rank the hazards.
6. **Verify implementation of the controls.**

Some of parts of the JSA process may be simplified or skipped for a simplified version of the formal JSA

# Hazards List / Potential Causes

TABLE 1  
Hazard List

<i>1. Chemical Hazards</i>	<i>4. Physical Hazards</i>
Toxicity	Moving, falling, or overhead material/equipment
Corrosivity	Slips and trips
Reactivity	Falls
Flammability/Combustibility	Pinch points, crushing, and cuts
	Excessive strain/posture
<i>2. Biological Hazards</i>	<i>5. Work Environment</i>
Blood-borne diseases	Noise
Food-borne diseases	Vibration
Water-borne diseases	Lighting
Airborne diseases	Extreme Heat
Carrier-borne diseases	Extreme Cold
Surface contamination	Dangerous Atmosphere/Asphyxiation
<i>3. Energy</i>	<i>6. External</i>

Pressure	Heavy Seas
Electrical	Heavy Winds
Static Electricity	Rain/Storm/Lightning
Inadvertent startup of equipment	Snow Storm/Ice
Fire/Explosion	
UV, IRA, visible light radiation	
Electromagnetic fields (non-ionizing radiation)	
Ionizing (gamma) radiation	



<i>Energy</i>		
Pressure	Rupture of bottled gases under pressure	Tank collapse as a result of vacuum
	Leaks from high-pressure equipment	Impact from objects to pressure vessel
	Line rupture as a result of water hammer	Entry into a high-pressure testing area
Electrical	Current/Voltage	Removal of electrical safety interlocks
	Unexpected energization of system	Exposed energized electrical parts
	Damaged insulation/tools	Faulty electrical equipment
	Damaged wiring on hand tools	Overheating of electrical equipment
Static Electricity	Overloaded outlets	Contact with bare conductors
	Splash filling a vessel with hydrocarbons	Transfer of liquids
	Fueling operations	Conductive tools
	Painting	Clothing
Inadvertent startup of equipment	Bulk movement of grain	Low humidity conditions
	Safety devices removed for maintenance	Isolation not provided
Fire/Explosion	Void spaces with trapped gasses	Leaking adjacent tanks with flammable chemicals
	Volatile hydrocarbons or chemicals in heated spaces causing them to gas more rapidly	Stowage of chemical cargo/hazardous substances/ munitions in vehicles
	Hazardous cargo breaking free	
	Hydrocarbons under pressure (i.e., aerosols)	
Spontaneous combustion from oily rag or cargo	Welding	

# Formal JSA Worked Example

## JSA Example: List Job Steps

Job: Replacing fall cable on davit-fall lifeboat no. 1

Step 1: Secure lifeboat with pendants

Step 2: Remove chafed fall cable

Step 3: Install new fall cable

Step 4: Test installation

Step 5: Place lifeboat in readiness status

## JSA Example: Identify Hazards Associated with Each Step

The replacement of the aft-fall cable on a davit-fall lifeboat has potential for major injury and death. It is important for the worker to recognize that things could go wrong with the equipment being relied upon for its safety. Causes of injury or death associated with maintaining a lifeboat include the following:

- Inadvertent release or failure of release lever
- Operator error or failure of gripes, bowsing tackle, or tricing pendants
- Failure of falls/sheaves/blocks and chains
- Fouling gripes
- Winch failure
- Davit failure

Steps	Hazards
<b>1. Secure lifeboat with pendants</b>	
Go up scaffolding Secure lifeboat with safety pendants	<i>Struck by.</i> Potential for boat to fall out of the davit.  <i>Fall from heights and Drowning.</i> Potential for the worker to fall onto the deck or into the water.  <i>Caught in/under/between.</i> Potential for pinching hazards. If an emergency occurs while fall cable work is being done, potential for being <i>caught in/under/between.</i>
<b>2. Remove chafed fall cable</b>	
Disconnect old wire from falls-block. On deck, spool old fall cable onto spool Transfer old cable spool to storage locker	<i>Slips and Trips and fall from heights.</i> Slippery surfaces due to contact with grease used for coating wire.  <i>Cuts/Puncture/ Scrapes.</i> Frayed fall cable and slivers. Potential hand injuries while handling wire ropes.  <i>Overexertion/strains and Struck by.</i> Back strains and foot injuries from carrying/dropping weight.
<b>3. Install new fall cable</b>	
Transport spool to muster location Connect new fall cable to winch	<i>Overexertion/strains and Struck by</i>

# Incorporating What-If Analysis in ID of Hazards

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- Incidents commonly result from deviations from work practices or from deviations in the expected operation of equipment (failures).
- Comprehensive JSAs include a “What-If” analysis of what could go wrong in each particular job step
- “What-If” analysis considers failures and deviations that are reasonably possible, and omit highly unlikely ones.
- Example:
  - What if a hoisting step requires reliance on a limit switch to stop the hoisting otherwise, there may be an accident.
  - Ask “What if the limit switch fails to work as intended?”
  - A recommendation would be to do a functional test of the limit switch prior to hoisting, or
  - Switch to using a manual winch for the final steps of hoisting

# Types of Risk Control

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- Most to least effective:
  1. Elimination or substitution
  2. Engineering
  3. Administrative
  4. Personal protective equipment
- Additional information on each type of hazard control. e.g.,
  1. Elimination or Substitution
    - Is task really necessary?
    - Can task be carried out less frequently?
    - Can task be accomplished in some other way that poses less risk

# Getting the Most out of a JSA Program

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- Environmental, Security and Emergency Considerations in a JSA
- A Word about Proximity in Time and Location
- Library of JSAs
  - Generic
- Synergism between JSA and Permit-to-Work
- Synergism between JSAs and Standard Operating Procedures
- JSA as a Tool to Develop SOPs
- Stop Work Authority and Ultimate Work Authority

# JSA Program Implementation

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- Roles and Responsibilities
  - Shore Management Involvement
    - Providing JSA training and awareness programs
    - Internal audits of JSA process
    - Self-evaluations of the JSA process by ship personnel
    - Review effectiveness of JSA process when correlated to incidents
    - Occasional participation, support and oversight of JSAs as needed
  - Shipboard/Offshore Personnel Involvement and Responsibilities
    - Participation
    - Approvals
    - Contractors
  - JSA Program Manual
    - JSA Form
    - Risk Tolerance

# Sample Risk Matrix with Risk Tolerability Criteria

- Sample Criteria 1

		<i>Consequence</i>		
		<i>Minor</i>	<i>Serious</i>	<i>Severe</i>
<i>Likelihood</i>	<i>Unlikely</i>	Low	Low	Medium
	<i>Seldom</i>	Low	Medium	High
	<i>Frequent</i>	Medium	High	High

<i>Risk</i>	<i>Risk Tolerability Criteria</i>
<i>Low</i>	Existing controls satisfactory. Work can proceed.
<i>Medium</i>	Consider available additional controls to further reduce the risk. Work can proceed once the additional controls, if any, are in place.
<i>High</i>	Risk reduction controls are mandatory. Work cannot start until the risk has been reduced.

- Sample Criteria 2

<i>Consequence</i>	<i>Tolerability Criteria</i>
<i>Minor</i> <i>Examples: First aid, minor injury</i>	<ul style="list-style-type: none"> <li>Consider available controls to further reduce the risk. At least one type of risk control option (engineering, administrative, or PPE) must be present.</li> </ul>
<i>Serious</i> <i>Severe injury. Possibly lost-time</i>	<ul style="list-style-type: none"> <li>Consider available controls to further reduce the risk. For example, at least one, but preferably two types of risk control options (engineering, administrative, and PPE) should be present.</li> <li>Risk controls must be adequately tested and verified prior to commencing the work (e.g., functional tests, verification by supervisor, etc.).</li> </ul>
<i>Severe</i> <i>Fatality or permanently disabling injury</i>	<ul style="list-style-type: none"> <li>Enough independent controls to prevent or mitigate the consequence. For example, at least two types of risk control options (engineering, administrative, and PPE) must be present.</li> <li>Risk controls must be adequately tested and verified prior to commencing the work (e.g., functional tests, verification by supervisor, etc.).</li> </ul>

# Appendix 1: Sample JSA Forms: Basic & Comprehensive

## Sample Comprehensive JSA Form

**Job Name:** \_\_\_\_\_  
**Job Location:** \_\_\_\_\_ **Date:** \_\_\_\_\_ **JSA #:** \_\_\_\_\_ **For Permitted Work, indicate PTW#:** \_\_\_\_\_  
**Supervisor:** \_\_\_\_\_ **Participants:** \_\_\_\_\_  
**Summary of Job:** \_\_\_\_\_  
**List Associated SOPs or SEMS procedures:** \_\_\_\_\_  
**Standing Orders/Restrictions/Special Issues:** \_\_\_\_\_ **Supervisor Approval Signature:** \_\_\_\_\_

Risk Tolerability Matrix	Severity		
	Minor	Serious	Severe
<b>Potential Likelihood</b>	<ul style="list-style-type: none"> <li>Insignificant to first aid injury</li> <li>Slight leak, spill contained</li> </ul>	<ul style="list-style-type: none"> <li>Serious injury and loss time</li> <li>Significant Spill</li> </ul>	<ul style="list-style-type: none"> <li>Fatalities</li> <li>Major uncontained spill</li> </ul>
<b>Unlikely</b> (less than 1 in 100,000 chance of occurrence)	Low	Low	Medium
<b>Seldom</b> (between 1 in 1,000 and 1 in 100,000 chance of occurrence)	Low	Medium	High
<b>Frequent</b> (more than 1 in 1,000 chance of occurrence)	Medium	High	High
<b>Risk Tolerability Criteria &gt;&gt;</b>	<input type="checkbox"/> Existing controls satisfactory. Task can proceed.	<input type="checkbox"/> Consider available additional controls to further reduce risk. Task can proceed under careful monitoring	<input type="checkbox"/> Task cannot proceed under normal circumstances. Risk must be reduced

Sequence of Tasks	Potential Hazards	Potential Safety & Envir. Consequences	Controls and Barriers	Severity	Likelih'd	Risk	Responsible for Control Verification (Name and Signature)
Task 1....	a) b)	a) b)	a) b) b.1 b.2				
Task 2...	a)	a)	b) a.1 a.2				
Task 3...	a)	a)	a)				

**Other ENVIRONMENTAL/ SECURITY concerns:**

**Controls and barriers:**

**Verified by:**

 Fall Arrest Harness  
   Face/Eye Protection  
   Hearing Protection  
   Hard Hat  
   Respirator  
   Gloves  
   Protective Clothing  
   Safety Shoes  
   Goggles  
   Type V/III PFD

**List Additional PPE required**

**I have participated in this JSA and understand the information contained herein.**

**Signature:** \_\_\_\_\_

# Appendix 2: Hazards and Controls Checklist

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- Tables expand the list of typical hazards to include possible
  - Causes/situations that can create/realize the hazard
  - Consequences/end-results if the hazard is realized,
  - Controls that can be used to prevent or mitigate the hazard
- Aid for hazard identification and planning of controls during a JSA
- Made available to the workers
  - In print or electronically if a JSA software tool is implemented

# Appendix 2: Hazards and Controls Checklist

<i>Biological Hazards</i>	<i>Possible Causes</i>	<i>Potential Consequences</i>	<i>Possible Controls</i>		
			<i>Engineering</i>	<i>Administrative</i>	<i>PPE</i>
Airborne	Contact with infected person Circulation through the HVAC system	Severe illness Fatality	Incorporation of filters in HVAC systems Airborne pathogen kit Use of bio-safety hoods with ventilation systems	Isolation of infected persons Testing procedure for biological hazards Trained medical personnel on board/offshore Periodic health examinations for fit-for-duty Immunization program to provide vaccinations for personnel Proper washing requirements and monitoring Proper housekeeping	Respiratory protection Antibacterial hand cleaner
Carrier-borne diseases	Mosquito bites Rodent bites	Severe illness	Repellants Drainage systems	Training crew for awareness of vector-borne diseases Emergency vector control procedures Prevent stagnation of water in areas Proper housekeeping Periodic health examinations for fit-for-duty Immunization program to provide vaccinations for personnel	Protective clothing
Surface contamination	Lack of hygiene Poor housekeeping Contaminated tools and work surfaces	Illness Fatality	Use of protective coverings of appropriate type	Implementation of a contamination control program Proper washing requirements and monitoring Good housekeeping practices Procedure for decontamination of tools and equipment Antibacterial hand cleaners or towelettes	Protective clothing Gloves



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