



GUIDANCE NOTES ON

JOB SAFETY ANALYSIS FOR THE MARINE AND OFFSHORE INDUSTRIES

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Foreword

Job safety analysis (JSA) is a risk assessment technique used to eliminate or reduce the occurrence of undesirable incidents during work tasks. The intent of these Guidance Notes is to lay out a job safety analysis (JSA) process that aims to achieve a reduction in personnel injuries by establishing more effective work procedures, addressing the specific challenges faced by the marine and offshore industries.

These Guidance Notes should assist companies wishing to implement a JSA program from the start, or optimize an existing program, by providing ideas and best practices that can be adopted by any marine or offshore company to strengthen their safety management system.

These Guidance Notes become 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 these Guidance Notes is the most current.

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

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SECTION 1 Introduction

1 General

Risk assessment, the proactive and systematic assessment of risks, is a standard element of most offshore and maritime companies' safety management systems. Risk assessment is a powerful and flexible tool to identify and control potential undesirable events that can have safety, environmental, quality, or financial repercussions.

The focus of these Guidance Notes is risk assessment applied to work tasks, commonly referred to as Job Safety Analysis (JSA).

The marine and offshore industries have implemented job safety analysis at varying levels of maturity and sophistication. These Guidance Notes provide considerations for any company desiring to strengthen their safety management system through the use of a job safety analysis. The best practices and concepts contained within this document can be applied by any marine or offshore company wishing to initiate or improve their JSA program.

1.1 Standards and Regulations Requiring JSA

A properly implemented JSA program constitutes an important risk management tool for compliance with several regulations, standards, and industry best practices, such as the ISM Code, the Occupational Health and Safety Assessment Standard OHSAS 18001, the Maritime Labour Convention, the Tanker Management Self-Assessment (TMSA), and the Safety and Environmental Management Systems (SEMS) regulations for the offshore industry in the United States.

- The International Safety Management (ISM) Code, 2010 edition, indicates that one of the safety management objectives of the Company shall be to “assess all identified risks to its ships, personnel and the environment and establish appropriate safeguards”. A JSA can assist in the shipboard risk identification process and the ensuing establishment of safeguards to appropriately control those shipboard risks.
- The Occupational Health and Safety and Assessment Series standard, OHSAS 18001:2007, in Section 4.3 (Planning), requires companies to develop and implement a “procedure(s) for the ongoing hazard identification, risk assessment, and determination of necessary controls” as the basis of the whole OH&S system.
- The International Labour Organization (ILO) has developed the Maritime Labour Convention, 2006 that has wide-spread applicability in the maritime industry. Part A of the Convention, Regulation 4.2 – Health and safety protection and incident prevention, mandates risk evaluations for occupational health and safety risks. Risks due to noise, vibration, disease, exposure to asbestos, fire, and dangerous cargoes and materials, are to be identified and risk reduction controls provided.
- The Oil Companies International Marine Forum (OCIMF) developed the Tanker Management Self-Assessment (TMSA), a Best Practice Guide for Vessel Operators (2008), as a tool to encourage vessel operators to assess and continuously improve their safety management systems by incorporating the provided best practice guidance. Risk assessments are incorporated in several elements of TMSA, but the most encompassing requirements are in Element 9 “Safety Management”, which suggests Companies should have a program for systematic identification of hazards.
- The United States regulation for Safety and Environmental Management Systems (SEMS) for the offshore sector, as specified in 30 Code of Federal Regulations 250, Subchapter S, requires among other things, the development and implementation of a JSA program to analyze tasks performed as part of most offshore activities, such as drilling, production, processing, construction, well services (workover, completion, servicing), and pipelines.

1.3 What is JSA?

A Job Safety Analysis is a task-oriented risk assessment used to review the hazards associated with a particular work task, and to verify that adequate safeguards are in place to control those hazards. The main goal of the analysis is to prevent harm to the individual(s) carrying out the task. JSAs are known by a variety of terms, including Job Hazard Analysis (JHA), Job Risk Assessment (JRA), Task Risk Assessment (TRA), Safe Job Analysis (SJA).

JSA is the analytical process of:

- Identifying the basic job steps of the task,
- For every job step, reviewing associated potential safety and health hazards, and
- Planning for effective controls or safeguarding mechanism to control (i.e., eliminate or mitigate) the effects the hazards may pose.

JSAs are primarily used for controlling risks to the safety and health of the workers. However, a JSA can be used as a tool to identify how the task can pose hazards to the environment or to the asset. Subsection 3/1 discusses this topic further.

In addition to identifying the inherent hazards of a task, a well-conducted JSA can uncover other subtle issues that pose risks to the individual, such as discrepancies between the way the procedures recommend a task to be carried out and the actual situation; problems with risk controls that supposedly act to reduce the risk but when brought to light during the JSA are found to be deficient, missing, inoperable, or bypassed; or the hazards associated with personnel change during the tasks.

The identification of these problems and the implementation of corrective actions before the task is performed can prevent undesirable incidents during the execution of the work task.

1.5 Approaches to JSA

A company promoting a risk-conscious safety culture will ideally want to go through a JSA exercise before performing any onboard/offshore activities. However, JSA exercises involve time and effort to develop and document. A program that requires a documented JSA for every task onboard/offshore may be seen by some as overly onerous, and the worker acceptance, rigor, and efficiency of the JSA program can diminish. On the other hand, if certain tasks are excluded from the JSA program, the workers may skip assessing the hazards associated with the task and the means by which they can be eliminated or reduced to an acceptable level.

To illustrate this, consider a simple task routinely performed onboard ships. A crewmember has been assigned the task of transferring large boxes of stores, approximately three-foot cubes, from the main deck to the shelves in the Dry Stores Room. The Dry Stores room is below the main deck and stairs must be used.

Hazards associated with descending the stairs include:

- Personal harm (e.g., bumps, bruises, back injury) from slipping and falling from the stairs
- Boxes slipping out of the person's hands and striking another person below
- Dropping the box and breaking containers of chemicals inside that when mixed produce toxic, lethal, or otherwise harmful vapors

Hazards associated with carrying the box in the passageways on the way to the Dry Stores Room include:

- Bumping into other personnel who cannot be seen over the top of the carried box
- Bumping into doorways and scraping fingers while going through
- Tripping over unseen objects in the passageway and dropping the box damaging contents

Hazards associated with placing the boxes on the shelves in the Dry Stores Room include:

- Scraping hands on the shelves
- Back injury from trying to lift boxes to a higher level

A JSA would identify these hazards and identify, for example, the need for a second or third person to assist in the transport of the boxes, or to use a handy-billy and approved strap to lower the boxes to the next level, or to erect a small platform in the Dry Stores Room so that the boxes would not have to be as high as when placing on the shelves. The inclusion of additional personnel could, during the JSA discussion, identify additional hazards and control measures. However, requiring a comprehensive and documented JSA for a task such as the one described would be too onerous on the workers.

Hazards associated with all tasks should be identified and controlled. However, some tasks require a more detailed JSA than others. Instead of suggesting a JSA program where certain tasks are left without the benefit of the JSA, or a program where all tasks are required to undergo a formal and comprehensive JSA, a tiered approach is recommended with two or more levels of JSA. Typically, two JSA levels could be defined:

- i) An informal JSA (mental or verbal)
- ii) A formal JSA (comprehensive and documented)

The JSAs can be carried out to varying degrees of detail, depending on the situation at hand.

A tiered JSA program necessitates criteria to decide what type of JSA is needed for each particular task depending on factors such as the type of task, its complexity, its regularity, etc. These Guidance Notes describe these two types of JSA along with guidance on when to use one versus the other, but ultimately, each company will develop their program and criteria according to their needs and goals.

3 Terminology

Several terms used throughout these Guidance Notes are defined below.

Consequence is the measure of the impact of an event occurrence in terms of people affected, property damaged, outage time, dollars lost, or any other chosen parameter. For purposes of a JSA, the focus is on impacts to safety and health, but impacts on environment and property can also be considered and mitigated.

Controls are the measures taken to prevent hazards from causing undesirable events. Controls can be physical (e.g., safety shutdowns, redundant controls, added conservatism in design), procedural (e.g., operating procedures, routine inspection requirements), and can also address human factors (employee selection, training, supervision).

Event is an occurrence that has an associated outcome. There are typically a number of potential outcomes from any one initial event that may range in severity from trivial to catastrophic, depending on other conditions and subsequent events. The terms *Event* and *Incident* are used interchangeably.

Hazards are conditions that exist that may potentially lead to an undesirable event.

Incident. Same as *Event*. Both concepts may include near misses (unsafe conditions) and injuries.

Job Safety Analysis (JSA) is an analytical process that focuses on a means to identify and control hazards inherent in job tasks before they can result in an accident. JSA also refers to the formal document that is developed as a result of the analysis process.

Likelihood indicates the potential that a hazard could be realized.

Risk is defined as the product of the frequency with which an event is anticipated to occur and the consequence of the event's outcome.

Risk Assessment is the process of understanding (1) what undesirable things can happen, (2) how likely they are to happen, (3) how severe the effects can be and (4) evaluating what is the risk of each undesirable event.

SECTION 2 Job Safety Analysis Process

1 JSA Process

A JSA focuses on identifying the tasks necessary to perform a specific job; the potential safety and health, and in some cases, environmental, hazards associated with each task; and the possible risk control measures needed to eliminate or reduce these hazards. The JSA process can be divided into a number of steps, the complexity of which can vary depending on the job being analyzed. As mentioned before, it can be used informally through a verbal discussion before performing a simple, routine job, or formally following a prescribed set of steps and a well-defined JSA form for more complex, non-routine, or new jobs. The JSA process presented in these Guidance Notes is a flexible approach that can accommodate any level of detail. A so called informal JSA process is described, as well as a formal JSA process for more complex jobs. Even within the formal JSA, the process can be applied at different levels of detail, depending on the complexity of the job. It can take minutes to several hours to complete. These Guidance Notes describe a range of options in terms of level of detail and complexity of each JSA process step. Each company can modify and adapt this JSA process to the appropriate level of detail for the different type of jobs applicable to them.

Regardless of the type of JSA to be performed, there are three basic parts that need to be completed:

- Understand the task to be performed
- Identify potential hazards for the task
- Identify risk control measures for each hazard

The following sections provide guidance on how to complete these basic parts, with varying levels of detail appropriate for each type of JSA approach.

3 Informal Job Safety Analysis

Informal JSAs are mental or verbal individual risk assessments carried out by the worker(s) before starting any job. They are the most basic, quickest and simplest of task risk assessment, which help promote a risk management culture through continual self-evaluation. They aid in the identification and control of immediate hazards as personnel conduct their day-to-day work, and assist personnel in maintaining situational awareness of their environment at all times.

The informal JSA described here is similar in nature to other planning tools that share the same intent: help workers perform even the most mundane of tasks without getting hurt. These personal planning tools include techniques such as Stop and Think, Take 5, Stepback 5 × 5, Good to Go, Every Minute Risk Assessment, or Toolbox Talk.

3.1 When to Perform an Informal JSA

The informal JSAs are generally used for routine and simple tasks involving only one or two individuals and little equipment. The following tasks are examples for which an informal JSA is appropriate:

- Routine materials and stores handling (e.g., moving dry stores from the storeroom to the galley, stocking storeroom shelves with received stores, etc.)
- Routine maintenance tasks (e.g., painting and chipping in open air, changing air conditioning filters, etc.)
- Routine housekeeping activities (e.g., mopping decks, cleaning up tank cleaning equipment, etc.).
- Routine and repetitive operations (e.g., tripping pipe in or out of the hole, connecting cargo hoses, applying securing devices to cargo or stores at deck level, etc.).

Personnel should be made aware that any time there is uncertainty regarding the risks, or a suspicion of high risks associated with the performance of a task, a formal JSA should be conducted.

3.3 How to do an Informal JSA?

A typical informal JSA involves taking a moment before starting the job to consider the following factors, trying to identify their inherent hazards, or what can go wrong with each one of them:

- i) Task
- ii) Work area/environment
- iii) Equipment
- iv) People
- v) Controls

The identification of hazards leads to methods to manage the risks associated with the hazard. The JSA should be repeated throughout the duration of the task to account for changing conditions or circumstances and prompt the worker to step back and think through emerging issues.

Personnel doing the work are responsible for carrying out the informal JSA and supervisors are responsible for encouraging and communicating the process.

Section 2, Table 1 provides a summary of the characteristics of an informal JSA.

TABLE 1
Informal JSA Characteristics

<i>Characteristics</i>	<i>Informal JSA</i>
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 and recordkeeping	None
Approvals	None
Risk estimation	Mental. Worker feels confident that risks are acceptable.
Level of detail on breakdown of job steps	Mental or verbal outline of the task.
Location for Conducting the JSA	Shipboard/facility and close to the task location
Timing for Conducting the JSA	Immediately before the task

Only identified hazards can be managed and controlled. A checklist for informal JSAs is shown in Section 2, Figure 1, with sample questions to help “prime” the hazard identification process. As a supporting tool, this informal JSA checklist, or a similar one customized for a company, can be laminated and provided to all workers to carry around or have handy at all times.

FIGURE 1
Informal JSA Checksheet



(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

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?

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

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?

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

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

5 Formal JSA

Like the informal JSA, a formal JSA focuses on identifying hazards associated with performing a specific job, the potential safety, health, and in some cases environmental hazards associated with each step; and the recommended risk control measures needed to eliminate or reduce these hazards.

The main difference between an informal and a formal JSA is that the latter process has an expanded level of detail and is documented. A formal JSA documents the job steps, the identified hazards, and the means by which the risk of these hazards is eliminated or mitigated. The documentation becomes a means of communicating information about the job. All personnel involved in the job and the assessment have access to the results and can provide additional input as appropriate. Formal JSAs should be filed for future reference whenever the same, or similar, task arises. These JSAs should be reviewed and adjustments made as necessary to fit the existing conditions at the later time (i.e., time of day, type of weather, experience level of task participants, time restraints, etc.).

Section 2, Table 2 provides a summary of the characteristics of a formal JSA.

TABLE 2
Formal JSA Characteristics

<i>Characteristics</i>	<i>Formal JSA</i>	<i>See Section</i>
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"
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 JSA	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 shoreside also.	5/5, "Documentation and Recordkeeping"

5.1 When to do a Formal JSA?

A formal JSA shall be carried out for new major tasks or groups of tasks, or when the informal JSA has been found not to suffice/ or when required by Company procedure. A task involving one or more of the factors below should normally trigger a formal JSA:

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

Section 2, Table 3 shows examples of typical tasks that are candidates for carrying out a formal JSA.

TABLE 3
Tasks Typically Requiring a Formal JSA

<i>Criteria for Formal JSA</i>	<i>Examples</i>
i) Non-routine tasks	• Asbestos abatement • Moving equipment around the deck at sea • Submerging or recovering equipment in the sea • Traveling in convoys in war zones
ii) Tasks with known potential for harming the crew, equipment or environment.	• Work over the side or at heights • Man-riding operations (carried aloft) • Complex and specialized lifts • Work on electrical systems or live electrical work • Pressure testing • Work around energy sources • Rigging and slinging • Bulk transfer of liquids • Crane and cargo boom operations, particularly heavy lifts • Crane and forklift operations • Hot work • Working in confined spaces • Working with dangerous substances such as explosives, toxic chemicals, or radioactive materials • Tasks associated with recurring safety near-misses, incidents or events
iii) Complex and difficult tasks	• Well workover (offshore industry) • Well completion (offshore industry) • Running casing (offshore industry) • Complex and specialized lift • Retrofitting of machinery • Commissioning of newly installed equipment or systems

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	• Simultaneous and potentially conflicting operations (SIMOPS) • Tasks requiring crew and outside vendors working together or with different departments on board. • Stores transfer at the dock or at sea • Fueling operations • Offshore lightering • Ship assist and ship mooring • Personnel transfers at sea • Tank-cleaning operations • 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.)
v) Routine tasks performed under unusual or unfavorable situations	• Work during adverse weather conditions • Ice operations • Work in areas of high temperatures
vi) Task involving a change from the norm, or something/someone new or different	• New job/task • Tasks with new procedures • Newly modified jobs, operations or processes • Tasks associated with newly modified or new equipment • Tasks performed by new or inexperienced workers
vii) Work on critical equipment	• Tasks associated with disabling of critical equipment or disabled/suppressed safety or environmental systems
viii) Employee complaints	• 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.

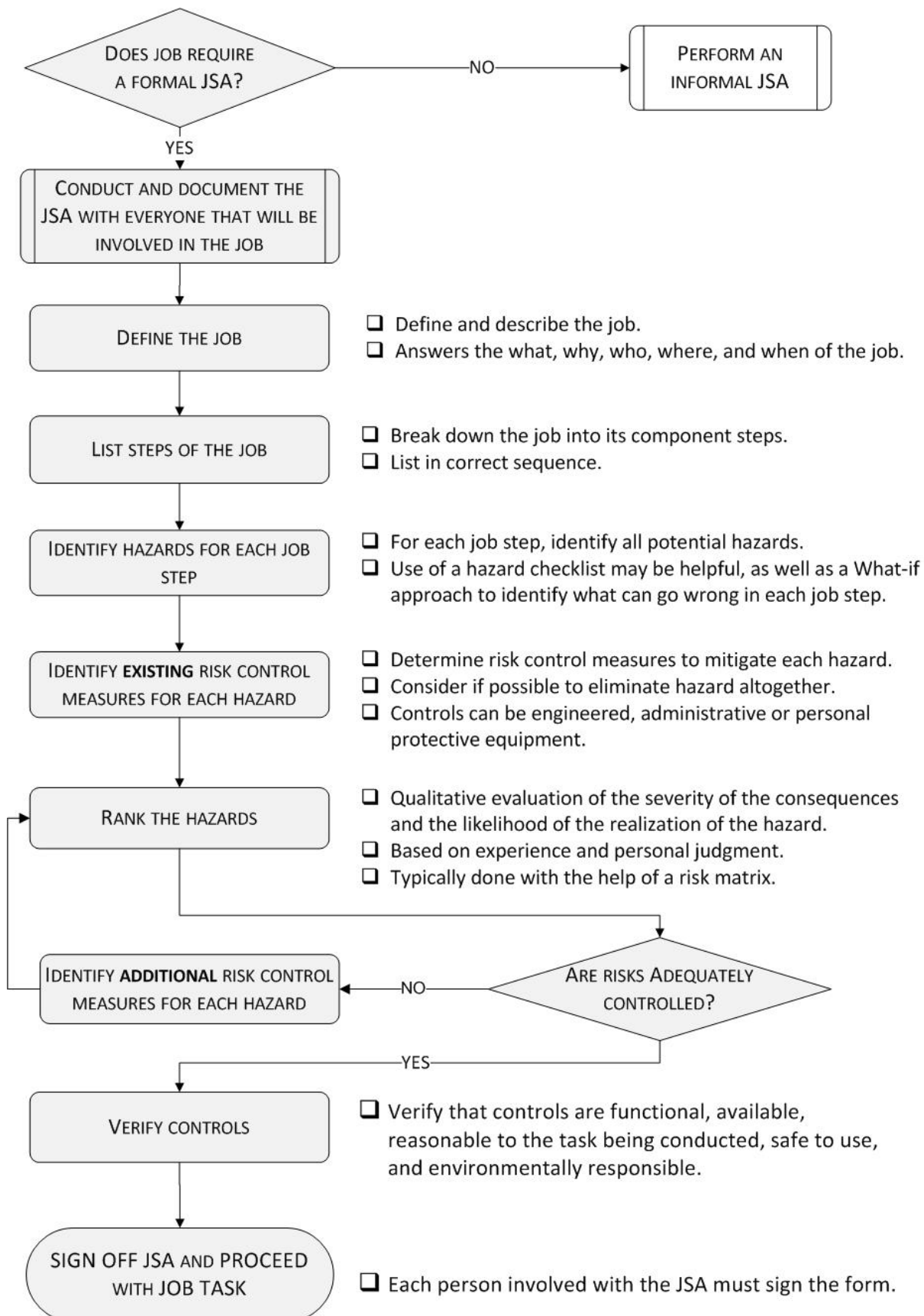
5.3 How to do a Formal JSA?

The formal JSA process is conducted in a series of sequential parts, all of which are to be documented. In its most comprehensive form, as shown in Section 2, Figure 2, the formal JSA will include all of the following parts:

- 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.
 - 5.1) If ranking indicates that hazard is not adequately controlled, identify additional risk controls.
 - 5.2) 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, which will be discussed in more detail in Subsection 2/7, "Simplified Formal JSA".

FIGURE 2
Formal JSA Process



5.5 Formal JSA Step 1: Define the Job

The first part of all JSAs is to define and describe the job to be performed. It should answer the what, why, who, where, and the when of the job. It provides a clear understanding of the following aspects:

- Specific job to be performed and the scope (i.e., “Welding” is not a specific job; but “Cropping and renewing a handrail on top of the starboard kingpost” is)
- Reason for the job
- Personnel that will be involved and their competence and experience
- Types of tools and equipment that will be used in the job
- Physical location of the job, work area, environment
- Time period for the job

Clear communication and understanding of the task with all concerned, is in itself an important action to reduce the likelihood of incident occurrence.

JSA Example: Defining the Job

The fall cable on one of the lifeboats is chafed and needs to be replaced. Launching, retrieving and maintaining a lifeboat can be a high-risk activity leading to injury and death, particularly while at sea. As a high risk activity, a formal JSA should be conducted. The first step of the JSA process is to clearly define the job by answering the what, where, why, who, and when.

What: Replace fall cable on davit-fall lifeboat No.1

Where: Muster area No. 1

Why: Fall cable shows visible signs of wire fraying

When: Morning shift

Who: Second Mate, Rob Mate, and Deck Department crew members J.J. Crew and Bosun Salty.
Supervised by Chief Mate, under the authority of the Master with a permit to work

Tools and equipment:

- Two preventer wire strap pendants of the correct length and four safety shackles within the safety working capacity of each to hold each end of the lifeboat in place during the fall replacement;
- A box of rags for clean-up, including degreasing liquid (Material Safety Data Sheet for the degreaser);
- PPE (leather gloves, safety goggles, steel-toed shoes/boots, Company coveralls or pants/shirt; hard hats with chin straps; fall-arrest gear when working at height);
- Wrenches necessary to disconnect the cable from the drum;
- Channellocks or other type of pliers for working with safety shackle cotter pins,
- Empty spool to coil the old fall to be removed,
- Power to the davit winch to turn the fall off the davit and take-up drum;
- Crane and rigging straps to hoist the new fall drum to the working area and to remove the old fall to the ship’s disposal area;
- Walkie-talkies for communicating with each other and the bridge as necessary

5.7 Formal JSA Step 2: List the Job Steps

This part of the JSA process addresses in greater detail how the job will be executed. It breaks down the job into its smaller sequential parts or steps. As most jobs have multiple steps, each step of the job should be discreetly identified and listed in correct sequence. Each step should be described in terms of what is to be done, but avoiding excessive detail. Care should be taken not to combine several steps into one step, (e.g., remove old pipe and install new pipe in the fire line). Generalizing the steps in this manner may lead to inability to identify hazards that would be more easily recognizable in separate steps. Note the use of the word “and” as it provides a clue that steps are being combined. Action verbs are well-suited for identifying steps (e.g., open, install, retrieve, etc.). If a job has a large number of steps (ten or more), consider splitting the job into multiple tasks, each with its own JSA.

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

5.9 Formal JSA Step 3: Identify the Hazards Associated with Each Job Step

Hazards for each job step need to be identified to determine if there are any potential risks which require control. Personnel should give consideration to the following information and resources in their quest for potential hazards:

- Crew skill
- Location/work area/environment
- Equipment/tools materials
- Process/materials used
- Past incidents/near misses
- Checklists of hazard

Section 2, Table 4 below provides a sample checklist of hazards that the JSA team should consider, as applicable, during hazard identification. Appendix 2 expands on this hazard checklist by giving examples of specific tasks, their anticipated hazards and potential consequences, and their possible controls.

TABLE 4
Checklist of Hazard Types and Potential Causes (Non-Exhaustive)

<i>Chemical Hazards</i>		
Toxicity	Entry into void spaces with trapped gases	Overfilling of tanks
	Chemicals under pressure (i.e., aerosols)	Splashing from open chemicals
	Inadvertent release of toxic chemicals	
Corrosivity	Exposure to corrosive acids while handling batteries	Poor housekeeping
	Leak of corrosives from damaged containers	
Reactivity	Inadvertent mixing of reactive chemicals	Filling a storage tank with incompatible chemicals
Flammability/ Combustibility	Leak of flammable cargo from tanks, pipes	Inadvertent release of flammable cargo
	Chemicals under pressure (i.e., aerosols)	Grease fire while cooking in the galley
<i>Biological Hazards</i>		
Blood-borne	Accidental sharps-related puncture/injury	Exposure to body fluids
	Contaminated laundry soiled with blood	
Food-borne	Uncooked food	Poor housekeeping
	Lack of hygiene	
Water-borne	Unclean or contaminated water	Inadvertent drinking of non-potable water
	Showers and faucets	Testing/treatment of marine sanitation device
Airborne	Contact with infected person	Circulation through the HVAC system
Carrier-borne diseases	Mosquito bites	Rodent bites
Surface contamination	Lack of hygiene	Contaminated tools and work surfaces

TABLE 4 (continued)
Checklist of Hazard Types and Potential Causes (Non-Exhaustive)

<i>Energy</i>		
Pressure	Rupture of bottled gases under pressure Leaks from high-pressure equipment Line rupture as a result of water hammer	Tank collapse as a result of vacuum Impact from objects to pressure vessel Entry into a high-pressure testing area
Electrical	Current/Voltage Unexpected energization of system Damaged insulation/tools Damaged wiring on hand tools Overloaded outlets	Removal of electrical safety interlocks Exposed energized electrical parts Faulty electrical equipment Overheating of electrical equipment Contact with bare conductors
Static Electricity	Splash filling a vessel with hydrocarbons Fueling operations Painting Bulk movement of grain	Transfer of liquids Conductive tools Clothing Low humidity conditions
Inadvertent startup of equipment	Safety devices removed for maintenance	Isolation not provided
Fire/Explosion	Volatile hydrocarbons or chemicals in heated spaces causing them to gas more rapidly Hazardous cargo breaking free Hydrocarbons under pressure (i.e., aerosols) Spontaneous combustion from oily rag or cargo	Void spaces with trapped gasses Leaking adjacent tanks with flammable chemicals Stowage of chemical cargo/hazardous substances/ munitions in vehicles Welding
UV, IRA, visible light radiation	Sun Exposure Arc welding Curing of paints	UV light from machinery (e.g., water purification, disinfecting equipment) Plasma cutting
Electromagnetic fields (non-ionizing radiation)	High-voltage power lines Radar	Proximity to welding equipment Contact with welding cables
Ionizing (gamma) radiation	Non-destructive examination of marine components	X-Rays
<i>Physical Hazards</i>		
Moving, Falling or Overhead material/equipment	Low bulkhead Dropped objects from overhead work Others working aloft	Swinging loads Pipes run at low level Violent ship motion leading to uncontained cargo
Slips and trips	Slippery surfaces Working on deck during inclement weather Deck openings Uneven surfaces	Line/wire handling Ice on deck Debris on deck/poor housekeeping Spills of chemicals and oil
Falls	Open holes Work overhead – rigging, scaffolding, container lashing	Changing lights using a ladder Unguarded deck openings and edges
Pinch points, crushing and cuts	Line/wire operations – lifting, throwing, splicing, etc. Working near rigging or equipment	Personnel moving around machinery Inadvertent startup of machinery
Excessive strain/posture	Lifting heavy objects during operations such as line/wire handling Use of power tools	Working at awkward angles (line/ wire handling, pulling, pushing, turning, twisting, etc.) Repetitive movements or sustained posture

TABLE 4 (continued)
Checklist of Hazard Types and Potential Causes (Non-Exhaustive)

<i>Work Environment</i>		
Noise	High pressure fluids Machinery operation Propeller action	Use of power tools Construction Working on oil rig drilling floor
Vibration	Installation motion due to various sea states Wave slamming High-speed rotating machinery	Equipment imbalance Machinery striking metal Use of power hand tools
Lighting	Inadequate lighting (insufficient, poorly distributed) Glare (too much light)	Flickering lights Hours of darkness
Extreme Heat	Hot weather Working near heat-generating machines Poorly maintained ventilation systems	Steam and water leaks Deteriorated/missing insulation on piping, valves
Extreme Cold	Excessive exposure to cold weather Working in refrigerated spaces	Contact with cold surfaces
Dangerous Atmosphere/ Asphyxiation	Chemicals in the atmosphere Oxygen deficiency	Fogs, smoke and mists Confined space entry
<i>External</i>		
Heavy Seas	Inclement weather	
Heavy Winds	Inclement weather	
Rain/Storm/Lightning	Inclement weather	
Snow Storm/Ice	Inclement weather	

5.9.1 What-If Analysis

Incidents commonly result from deviations from work practices or from deviations in the expected operation of equipment (failures).

This is the reason why some comprehensive JSAs include a “What-If” analysis of what could go wrong in each particular job step, as a technique for hazard identification. A “What-If” analysis will consider failures and deviations that are reasonably possible, and omit the highly unlikely ones.

To illustrate this approach, consider the example of a routine emergency response drill of facility/ship abandonment using the lifeboat. The JSA indicates a step for hoisting the lifeboat with the maneuvering crew onboard the boat. The hoisting winch is to be operated by a control panel located forward of the davit. As part of the *What-if* analysis, the JSA team can wonder “*what-if the hoisting mechanism does not stop in time?*”. The result can be pulling the fall wire past its breaking point during hoisting. This can subsequently lead to breaking the fall line, dropping the manned lifeboat onto the deck or into the water, with potential injury or loss of life. Risk control actions resulting from this *What-If* analysis can be:

- To switch to using the manual winch handle once the lifeboat is near the stowed position to complete the stowing operation.
- If the job requires a reliance on a limit switch to stop hoisting would be to do a functional test of the limit switch prior to hoisting.
- Suggest a permanent change in company procedure so that lifeboats drills be carried out without crew onboard.

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
1. Secure lifeboat with pendants	
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</i> and <i>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>
2. Remove chafed fall cable	
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</i> and <i>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</i> and <i>Struck by.</i> Back strains and foot injuries from carrying/dropping weight.
3. Install new fall cable	
Transport spool to muster location Connect new fall cable to winch Spool new cable onto winch drum Grease fall cable, if required Rewire the davit	<i>Overexertion/strains</i> and <i>Struck by</i> <i>Slips and Trip.</i> Grease on deck. <i>Falls from heights, Drowning</i>
4. Test installation	
Check all fall cable connections Disconnect safety pendants Partially lower boat to test cable	<i>Caught in, under or between</i> <i>Struck by</i> <i>Falls from heights</i>
5. Place lifeboat into readiness status	
Hoist the lifeboat into readiness status, verifying safety pendants are removed. Clean up area and tools before leaving Notify of readiness of equipment	<i>Caught in, under or between.</i> Winch does not stop after lifeboat reaching stowing position, potentially exceeding the fall cable breaking strength. <i>Slips and trips</i> if area is not cleared

5.11 Formal JSA Step 4. Identify Existing Control Measures for Each Hazard

Controls are methods, actions, or equipment used to eliminate or control the hazard. The objective of this step is to identify existing adequate risk mitigation controls for *each* identified hazard. Existing controls refer to normal and available controls generically associated with the task by procedure, company policy, common practice, etc. For example, an existing control associated with work in heights is likely to be a body harness. There are four types of controls that can be implemented to reduce risks, listed in the preferred order of implementation: