ASHLEY A. ROZNOWSKI

BUILDING A PROACTIVE SAFETY CULTURE THROUGH THE USE OF JOB SAFETY ANALYSIS AND JOB SAFETY ANALYSIS AUDITS

ABSTRACT

Striving to be an industry leader in developing safety performance and accountability in 2005, Great Lakes Dredge & Dock (GLDD) began their Incident and Injury Free (IIF) culture journey. Since then, incident and injury rates have significantly been reduced throughout all divisions of the company. The use of safety tools such as the Job Safety Analysis (JSA) and Job Safety Analysis Audit (JSA Audit) have been major contributors in the reduction of workplace incidents and injuries. The idea of allowing employees to take extra time to complete a quality JSA before every task was a great stride forward, showing the company's commitment to their employees' safety by putting safety before production, emphasising the IIF safety culture.

Continuing to develop and teach proper JSA procedures to all employees of the company led to the development of JSA Audits. This article looks at developing a proactive safety culture, the process of creating quality JSAs and how auditing JSAs across divisions can benefit JSA development and strategies. Furthermore, an example of cross-division JSA and JSA Audit is broken down and discussed. The article originally appeared in the *Proceedings of the Western Dredging Association and Texas A&M University Center for Dredging Studies*' "*Dredging Summit and Expo 2015*", Houston, Texas, USA, June 22-25, 2015 and appears here in a revised form with permission.

INTRODUCTION

Safety in dredging operations has taken on a new impetus in the 21st century. As seen in Figure 1 in a photo of three men working in 1918 without Personal Protective Equipment (PPE), safety has not always been a crucial part of GLDD's daily operations. Throughout the company's history, everyone accepted that the marine construction industry is particularly hazardous owing to the hostile and often unpredictable nature of the work environment both offshore and in busy ports and harbours. Suggesting that the company has grown to be where it is today without taking risks and compromising safety is a gross understatement. The proactive safety culture surrounding operations has not always been what it is today. Having employees injured at work was previously an expected event where going just one week without an injury was deemed as something that should be celebrated.

Above: In the past everyone accepted that the marine construction industry is particularly hazardous owing to the hostile, often unpredictable nature of the work both offshore and in busy ports. Nowadays that has drastically changed. Safety is priority number one.

Today the company has made great strides in making safety something personal, relevant and important across all divisions of the company and that attitude has changed. As stated in the company's safety commitment statement: "All GLDD employees are committed to an incident and injury free work environment, in which we return safely to our families".

In 2005 work began on a project where the client held GLDD accountable for its safety performance. The client's safety professionals continually monitored the dredging company's safety performance and held it to the highest level of accountability. If GLDD did not meet the high safety expectations of the client, the project would be terminated. The GLDD's President at the time, Douglas Mackie, made a decision that would change the company's values and the way day-to-day operations were run. He chose to elevate safe operations to be the company's highest priority. "Not on my watch," he pronounced. "Going forward, we are not going to hurt people who are working for us".

The company has spent the past nine years

Figure 1. Then: working without PPE on the Chicago River in 1918.

Figure 2. Now: in 2015 working with PPE is always an absolute given.

driving toward an uncompromising "Incident and Injury Free" culture, implementing a wide variety of safety improvement strategies to do so. Elevating the safety of employees to the highest priority was the first step in transforming the safety culture surrounding dredging operations (Figure 2).

SAFETY CULTURE

A positive safety culture is not something that can be purchased or simply acquired; it is something that needs to be developed and grown from within an organisation. It can be witnessed that culturally, the marine construction industry remains a trade where employees feel that taking risks is part of their job and often times may worry about what their peers think about those who do take extra precautions. Building a safe workplace and a proactive safety culture requires constant attention and development and starts at the top. Transforming the safety culture and mindset of employees in the marine construction industry is challenging; it takes strong leaders, persistence and a personal and relevant safety programme to accomplish such a task.

Transformation

In 2005, the decision was made to change how daily operations were run. GLDD teamed up with consultants at JMJ Associates which introduced the concept of IIF (Incident and Injury Free). This introduction began the transformation of an improvident safety culture into a proactive safety culture and the company started to break away from the enforcement mentality, where employees are punished for breaking the rules and safety officers are responsible for "making work safe." IIF introduced a personal side of safety, reminding employees of their personal relationships which could be affected by taking risks at work that result in injury.

The involvement of upper management with the IIF launch helped transform the safety culture surrounding dredging operations, reinforcing the personal side of safety. With the IIF launch came Job Safety Analysis (JSA), a safety tool regularly used in daily operations that will be explained further below. Quantitatively, the Total Recordable Incident Rate (TRIR) fell 36% one year after the IIF launch, nearly halved from the incident rate three years prior. Recognising that incidents and injuries were preventable and unacceptable was the large stride towards the continuing transformation of the safety culture at GLDD.

In 2007, incident rates reached a plateau, increasing 3% from 2006. After the drastic decrease in incident rates previously, the company was motivated to continue to evolve the safety culture. The IIF launch worked, fewer employees were getting injured but there were still injuries happening in daily operations. To further the progress of developing a proactive safety culture, the company teamed with consultants at the Hile Group.

The efforts shifted even more to the personal side of safety and embedded safety practices further into daily operations. All employees became involved in the safety programme, including non-operations employees and more involvement was shown from upper management. More focus was applied to awareness and training, shifting further from the rules and enforcement approach. Since teaming with the Hile Group and using safety

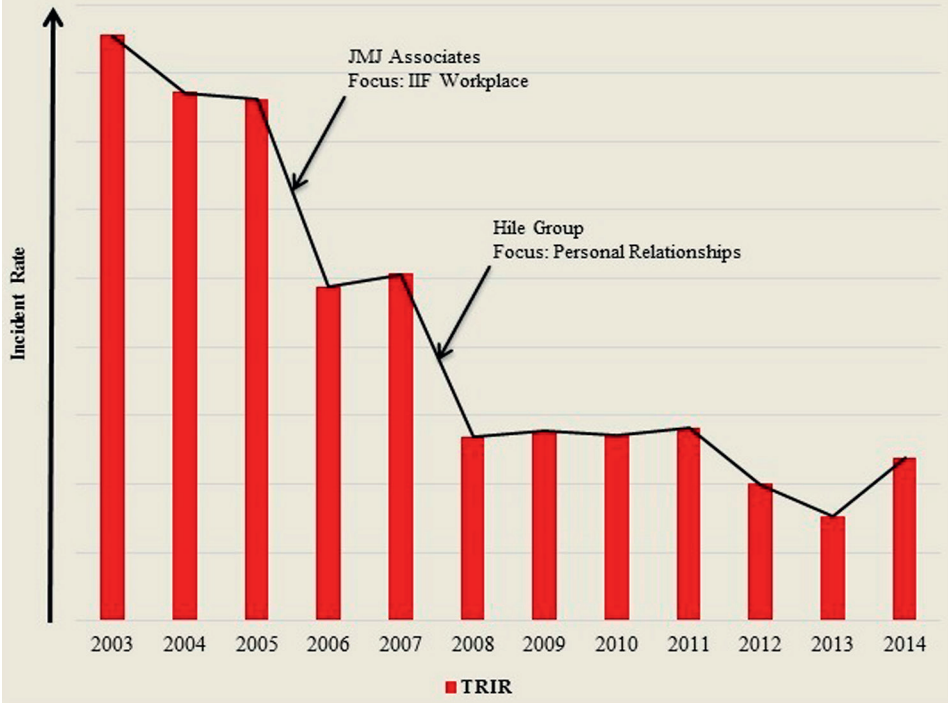

Figure 3. Total Recordable Incident Rate at GLDD from 2003 to 2014.

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obtained her Bachelor of Science in Environmental Engineering with a minor in Ecology at Michigan Technological University in 2011. From 2012 through 2014 she worked for Great Lakes Dredge & Dock Company as a Site Engineer on various Hopper Dredging projects and most recently as Project Engineer on the Miami Harbor Deepening Phase III project. In 2015 she joined the Great Lakes Dredge & Dock Production Estimating Department as a Production Estimator. She is also an active member of the GLDD Site Engineering Safety Leadership Team.

tools such as the ones described here, the TRIR fell 70% to an all-time low in 2013. The TRIR trend is provided in Figure 3.

In 2014 another plateau was reached quantitatively, but qualitatively the safety culture of GLDD has made a large turnaround. Using tools such as the JSA and JSA Audit along with a strong accountability policy will ensure further development of a proactive and positive safety culture and in turn, reduce the TRIR making the company completely IIF.

SAFETY TOOLS

There are four main components that help develop a proactive safety culture:

1. Good communication, goals and follow up actions.
2. Providing effective safety tools which allow employees to be proactive in their daily work.
3. Having effective training initiatives that teach employees how to use safety tools to their full extent.
4. Supporting safety initiatives with a strong accountability programme.

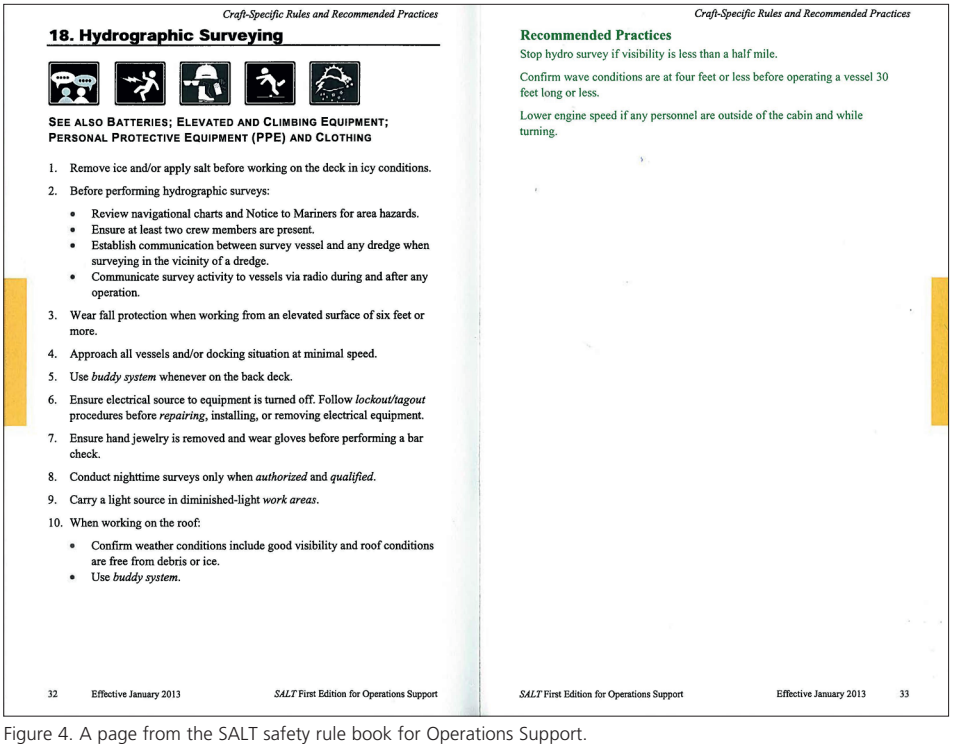
Communication between managers and employees is a large part of creating a safe work environment. Open communication allows for all employees to be made aware of the goals and expectations of safety efforts and is key to a safety programme's success. However, studies have shown that open communication alone is not sufficient enough to ensure a low injury rate. In a study by Michael, Guo, Wiedenback and Ray (2006), a questionnaire was used to study the 'communication atmosphere' in supervisor-worker safety exchanges. They found that safety-related communication between supervisors and subordinates had little direct effect on workers' safety-related events or in predicting reported injuries. Their conclusion was that safety communication in itself is not sufficient to ensure a low injury rate and that employees may see increased safety communication simply as 'lip service' with little commitment from managers.

A study by Meliá and Sesé (2007) distinguished between a supervisor's 'lip service' and behaviour in describing two facets of supervisory safety responses to workers. The first was a supervisor's self-applied safety response regarding the supervisor's own safety behaviour (i.e., modelling – what the workers see), and the second was a supervisor's safety response towards workers (i.e., what the workers hear, such as safety information, instructions as well as feedback toward worker's safe and unsafe behaviour).

A similar distinction, labeled as Behavioral Integrity was made by Simons (2002), referring to the congruence between espoused and enacted values or between words and actions, 'walk the talk.' These behavioural studies suggest that safety communication is part of a larger picture including organisational safety culture, leadership and group climate (Kines et al., 2010).

Open communication is clearly part of a larger safety picture. Continued development of safety tools, along with open communication about safety between front line managers and employees is necessary to ensure the continued reduction in the incident rates in the marine construction industry. Creating an environment in which employees want to participate in and communicate about the safety programmes is a challenge, particularly in a workplace that has many resistant employees that are comfortable with the way things have always been.

When the company initially began rolling out safety initiatives, they gave their word that anyone can pull a "stop card" anywhere and anytime if they feel like it is necessary to take a time out or step back for safety, without repercussion. In a work environment that has typically been rushed and full of risks, this was a large step towards giving employees the



Craft-Specific Rules and Recommended Practices

18. Hydrographic Surveying

SEE ALSO BATTERIES; ELEVATED AND CLIMBING EQUIPMENT; PERSONAL PROTECTIVE EQUIPMENT (PPE) AND CLOTHING

1. Remove ice and/or apply salt before working on the deck in icy conditions.
2. Before performing hydrographic surveys:
   - Review navigational charts and Notice to Mariners for area hazards.
   - Ensure at least two crew members are present.
   - Establish communication between survey vessel and any dredge when surveying in the vicinity of a dredge.
   - Communicate survey activity to vessels via radio during and after any operation.
3. Wear fall protection when working from an elevated surface of six feet or more.
4. Approach all vessels and/or docking situation at minimal speed.
5. Use *buddy system* whenever on the back deck.
6. Ensure electrical source to equipment is turned off. Follow *lockout/tagout* procedures before *repairing*, installing, or removing electrical equipment.
7. Ensure hand jewelry is removed and wear gloves before performing a bar check.
8. Conduct nighttime surveys only when *authorized* and *qualified*.
9. Carry a light source in diminished-light *work areas*.
10. When working on the roof:
    - Confirm weather conditions include good visibility and roof conditions are free from debris or ice.
    - Use *buddy system*.

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Craft-Specific Rules and Recommended Practices

Recommended Practices

Stop hydro survey if visibility is less than a half mile.

Confirm wave conditions are at four feet or less before operating a vessel 30 feet long or less.

Lower engine speed if any personnel are outside of the cabin and while turning.

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Figure 4. A page from the SALT safety rule book for Operations Support.

backing to slow down and use tools such as JSAs and JSA Audits to make the workplace safer.

SAVE A LIFE TODAY

An internally developed tool that is used in daily operations across divisions is Save A Life Today (SALT). SALT is a programme that was created by various departmental managers and field employees geared for six different departments within GLDD. Books were created for employees working in the Engine Room, Tugs and Crew Boats, Dredge and Deck, Shore and Yard, Operations Support and Office Non-Operations that provide mandatory and recommended practices (Figure 4). The SALT safety rule books coordinate the Safety Management System with JSAs and safety videos. Their creation was meant to guide employees clearly and easily in daily tasks and increase consistency from project to project. SALT is a strong tool for employees to use along with JSAs and JSA audits. Since SALT was created primarily from employee input, it is a safety tool that works and provides realistic expectations of how operations should be conducted.

JOB SAFETY ANALYSIS

What is a Job Safety Analysis (JSA)? A JSA is a procedure for a given task that integrates all known and potential hazards associated with each step of the task. JSAs also involve a meeting of all employees involved in the task where personnel review the JSA before the task is started. JSAs are also commonly referred to as job hazard analysis or job hazard breakdowns. JSAs are used for analysis of a specific task such as disassembling an engine and are not meant for something broad such as overhauling an engine or as narrow as removing head nuts and washers.

There are four basic steps to conducting a JSA:

1. Recognise the task to be analysed and those employees that will be involved.
2. Break down the task into a sequence of steps.
3. Identify known and potential hazards associated with every step.
4. Determine preventative measures for each potential hazard associated with every step.

When creating a JSA it is important to include all workers that will be involved in the task, including someone with previous experience if possible. Including a variety of employees helps to ensure that the JSA will be complete and allows for the incorporation of multiple perspectives, which reduces the risk of an element being overlooked.

Recognising and breaking down the task into steps is crucial to identifying the potential hazards associated with each step of the task. Identifying the potential hazards can sometimes be less than straightforward. To assist employees with recognising hazards, GLDD created the "6Ts," which are described

JOB SAFETY ANALYSIS

	JOB TITLE: Calibrate the Ladder	**Date:** 03/08/2014 **PAGE: 1 OF 1**	**JSA NO.:** 1 **REV:** 1 **Written By:** A. Roznowski
	LOCATION of JOB **Dredge Texas Cutter Service Platform**(A. Roznowski, C. Lawler, J. Worden)/**Leverroom**(E.Corey, R. Lambert, D. Lopez)	**Tools to Be Used:** ☐ Rigging ☐ Electrical Tools ☐ Torches ☐ Air Tools ■ Hand tools ☐ Welding ☐ Hyd. Tools ■ *Other **Tool safety and inspection was covered in the JSA briefing** *Other tools used included a tape measure, pressure transducer and zip ties	
REQUIRED AND/OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT: ■ Hardhat ■ Personal Floatation Device ■ Safety Glasses ■ Steel Toed Boots ■ Gloves Type High Vis ☐ Hearing Protection ☐ High visibility vest ■ Other: VHF Radio			**JSA REVIEWED BY:** A. Roznowski Supervisor's Signature

MAJOR JOB STEPS	POTENTIAL HAZARDS & CONSEQUENCES	RECOMMENDATIONS TO ELIMINATE OR REDUCE HAZARDS
Acquire Proper PPE and Tools	Improper Housekeeping	Replace tools to original proper location
Notify crew not involved in JSA of calibration efforts	Lack of communication can lead to injury	Notify Captain and other crew in working area of plans for calibration of the ladder and what to be aware of. Communication for the calibration will be performed with VHF Radio, Channel 8
Review JSA with all personnel involved and designate assignments for location of personnel (who will be in leverroom/cutter service platform)	A potentially dangerous situation may have been overlooked.	Involving more personnel in the JSA including the leverman, Captain, and an auditor(Chief) allows for other suggestions to arise which could help to eliminate potential hazards that may have been overlooked.
Transfer to and inspect path to the service platform, ladder and service platform using buddy system	Debris removed from cutter, cutter teeth and other items are often on the service platform causing a potential for slips, trips and falls. A slip or trip could cause personnel to fall into the water, onto the cutter head or on the stairs.	Have all personnel participate in inspection of the ladder and stairs. Distribute tools needed for the job evenly so everyone can maintain three points of contact on the stairs. Once on platform, assign everyone's position and re-check tripping hazards. Use buddy system to prevent falling into the water.
Attach tape measure/pressure sensor to cutter head using zip ties	Falling into the water when leaning over	Use buddy system when leaning over to attach sensors to ensure no one falls into the water or onto the cutter. Use localized controls(LOTO) for cutter rotation on cutter service platform to bring the teeth to you so leaning over is minimized.
Perform calibration to 20', 30', 40', 50' & back up to 30'	Mis-communication could lead to ladder moving before reading is taken. Unexpected movement of cutter service platform due to traffic.	Keep constant communication between leverroom(D. Lopez, E.Corey, R. Lambert) and cutter service platform(Ashley/Charlie/J. Worden) throughout entire task. Make sure all parties know when task is completed.
Remove tape measure/pressure sensor from cutter head using snips to remove zip ties	Falling into the water when leaning over, improper use of snips could lead to injury.	Use buddy system when leaning over to attach sensors to ensure no one falls into the water or onto the cutter. Use localized controls(LOTO) for cutter rotation on cutter service platform to bring the teeth to you so leaning over is minimized. Use snips properly to cut zip ties and remove equipment from cutter head.
ALL WORK MUST STOP IF YOU DEVIATE FROM THE JSA PLAN		

JOB TITLE: Calibrate the ladder	Date: 03/08/14 Page 2 of 2	JSA NO: 1 REV: 1 Written By: A. Roznowski
MAJOR JOB STEPS	**POTENTIAL HAZARDS & CONSEQUENCES**	**RECOMMENDATIONS TO ELIMINATE OR REDUCE HAZARDS**
End task and return tools to their proper homes	Improper housekeeping	Place tools in their proper locations for the next person that needs to use them
ALL WORK MUST STOP IF YOU DEVIATE FROM THE JSA PLAN		

Figure 5. Job Safety Analysis, Ladder Calibration.

and broken down in detail below in the "Hazard Control and Recognition" section.

Hazard Control and Recognition

The Occupational Safety and Health Administration (OSHA) breaks hazard control methods into three categories. The precedence and effectiveness are as follows, although a combination of all three is likely to be used when hazards cannot be entirely mitigated (OSHA 3071, 2002):

1. Engineering Controls which eliminate or mitigate the hazard through design or isolation, i.e., an enclosed cab, machine guards, exhaust ventilation, and such.
2. Administrative Controls which are written operating procedures, work permits and safe work practices, i.e., alarms, signs and warnings, training, buddy system, and such.
3. Personal Protective Equipment (PPE) which minimises exposure to serious workplace injuries and illnesses, i.e., hard hat, respirator, hearing protection and other personal equipment.

To assist employees with recognising and mitigating potential and existing hazards, the company developed the 6Ts – Today, Task, Tools, Tidy Up, Time Out and Transition – which was created in addition to SALT, JSAs and JSA Audit efforts. Addressing the 6Ts in each JSA has become a standard practice in daily safety operations.

The 6Ts used to identify hazards during the JSA process are:

Today

- Assemble the team and ensure everyone is paying attention.
- Meet at the task area to ensure specific hazard awareness of the task area is known.
- Inspect access ways to and from all of the work areas that will be visited in the task. This includes transferring to and from equipment.
- Consider the environmental aspects of the day including temperature, wind, seas, current, precipitation, deck conditions, lighting…

Task

- Review the task in steps. If the task is large, consider breaking the task down into several tasks and doing a JSA for each.
- Consult SALT for applicable rules and recommended practices for the task.
- Ensure each crewmember involved knows his/her role in the task.
- Recognise, analyse and mitigate the hazards of each step in the task. Be specific in the identification of hazards, and identify if the task requires permitting such as "lock out tag out", confined space entry….
- Establish lines of communication amongst all crew members and designate signalers if necessary.
- Emphasise "hand checks," if a tool or piece of equipment is in motion.
- Confirm how all communications will flow from beginning to the end of the job task, including how deviations from the JSA will be handled as the job proceeds.

Tools

- Identify, gather and inspect the tools required for each step of the task. Ask if the crew members are authorised and qualified and/or require certification to use the tools or equipment needed for this task.
- Identify, gather and inspect required PPE.

Tidy Up

- Clean up after the task and properly stow all tools and equipment used.

Time Out

- Make sure everyone agrees with the plan. If anyone doesn't understand the task, his/her role in the task or is uncomfortable with the task, then call for a "Time Out," and address the uncertainties.
- A time out should be called during the task if there is a change in conditions, or in crew members participating in the task or tools needed to complete the task.
- Open communication should be promoted during the JSA revision after the time out is called to ensure all workers involved in the task understand the changes to the JSA.

Transition

- Identify the end of the task and identify the next task and its JSA if applicable.

Including the 6Ts in every JSA has helped reduce communication hurdles amongst employees involved in tasks and has aided employees in identifying hazards through a structured format. To assist employees with understanding the importance of JSAs and the 6Ts, the process is sometimes described as something relatable, like a playbook in football. For a play to work you have to have all the players, with the proper equipment and designated responsibilities anticipating what will happen; the same is true for completing a task safely.

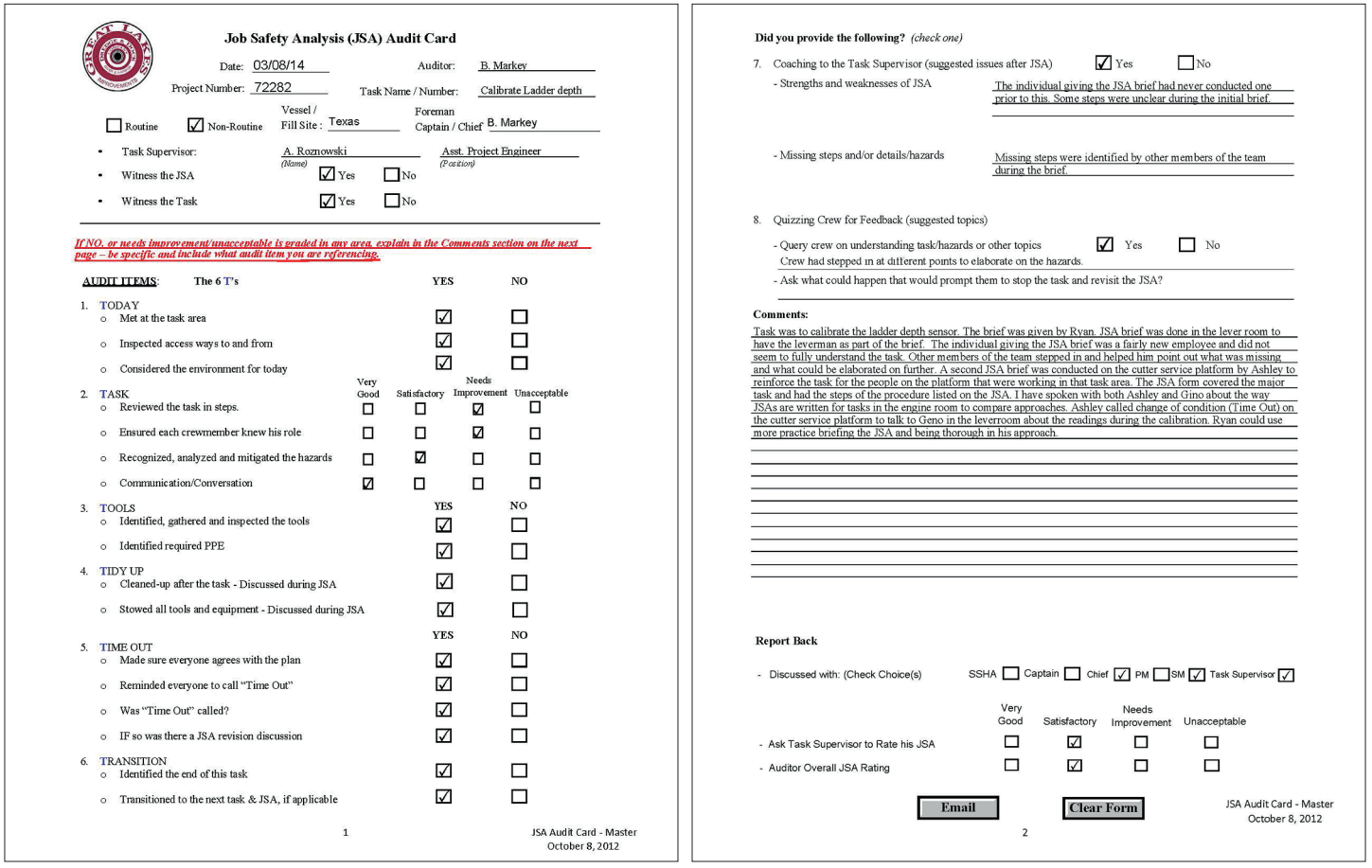
One of the least recognised aspects of creating JSAs is proper training and coaching. Without these, conducting an effective JSA is difficult. In addition to SALT, JSAs and the 6Ts, the company also uses an additional coaching resource, JSA Audits.

JOB SAFETY ANALYSIS AUDIT

The goal of having an auditing programme that goes along with JSAs is to allow for continued development of hazard recognition and prevention. Acting as an evaluation and coaching tool for JSAs, JSA Audits provide qualitative feedback and ensure JSAs remain a viable and effective safety tool in field operations. JSAs are assessed for both verbal and audible completeness with use of JSA Audits.

To complete a JSA audit successfully, the auditor must follow a general set of guidelines:

1. *Observe.* The auditor should remain just a quiet spectator and avoid participating in the task in any way. Ideally, the task leader and JSA members wouldn't know the observer was there so it is best for the auditor to avoid taking excessive notes and limit actions. Too much interaction by the auditor may give the impression of silent judgment before the JSA is completed, which may interfere with quality of the JSA being performed.
2. *Evaluate and rate the JSA.* The auditor should complete the JSA Audit form once the JSA and task are complete, taking care to remember how each step went and if the 6Ts were recognised and used in the JSA. The 6Ts are outlined on the JSA Audit form, so noting the particulars of each, whether they are positive or negative, are important for giving feedback.
3. *Provide coaching and feedback to the JSA leader.* It is important for the auditor to give feedback without ridiculing the JSA leader. Schedule a meeting with the JSA leader to discuss the audit as soon as possible after completion of the task. Coaching should be



Job Safety Analysis (JSA) Audit Card

Date: 03/08/14 Auditor: B. Markey
Project Number: 72282 Task Name / Number: Calibrate Ladder depth
☐ Routine ☑ Non-Routine Vessel / Fill Site: Texas Foreman / Captain / Chief: B. Markey
- Task Supervisor: A. Roznowski (Name) Asst. Project Engineer (Position)
- Witness the JSA ☑ Yes ☐ No
- Witness the Task ☑ Yes ☐ No

If NO, or needs improvement/unacceptable is graded in any area, explain in the Comments section on the next page – be specific and include what audit item you are referencing.

AUDIT ITEMS: The 6 T's	YES	NO
1. TODAY		
○ Met at the task area	☑	☐
○ Inspected access ways to and from	☑	☐
○ Considered the environment for today	☑	☐

2. TASK	Very Good	Satisfactory	Needs Improvement	Unacceptable
○ Reviewed the task in steps.	☐	☐	☑	☐
○ Ensured each crewmember knew his role	☐	☐	☑	☐
○ Recognized, analyzed and mitigated the hazards	☐	☑	☐	☐
○ Communication/Conversation	☑	☐	☐	☐

3. TOOLS	YES	NO
○ Identified, gathered and inspected the tools	☑	☐
○ Identified required PPE	☑	☐
4. TIDY UP		
○ Cleaned-up after the task - Discussed during JSA	☑	☐
○ Stowed all tools and equipment - Discussed during JSA	☑	☐

	YES	NO
5. TIME OUT		
○ Made sure everyone agrees with the plan	☑	☐
○ Reminded everyone to call "Time Out"	☑	☐
○ Was "Time Out" called?	☑	☐
○ IF so was there a JSA revision discussion	☑	☐
6. TRANSITION		
○ Identified the end of this task	☑	☐
○ Transitioned to the next task & JSA, if applicable	☑	☐

1 JSA Audit Card - Master October 8, 2012

Did you provide the following? *(check one)*

7. Coaching to the Task Supervisor (suggested issues after JSA) ☑ Yes ☐ No
- Strengths and weaknesses of JSA: The individual giving the JSA brief had never conducted one prior to this. Some steps were unclear during the initial brief.
- Missing steps and/or details/hazards: Missing steps were identified by other members of the team during the brief.

8. Quizzing Crew for Feedback (suggested topics)
- Query crew on understanding task/hazards or other topics ☑ Yes ☐ No
  Crew had stepped in at different points to elaborate on the hazards.
- Ask what could happen that would prompt them to stop the task and revisit the JSA?

Comments:
Task was to calibrate the ladder depth sensor. The brief was given by Ryan. JSA brief was done in the lever room to have the leverman as part of the brief. The individual giving the JSA brief was a fairly new employee and did not seem to fully understand the task. Other members of the team stepped in and helped him point out what was missing and what could be elaborated on further. A second JSA brief was conducted on the cutter service platform by Ashley to reinforce the task for the people on the platform that were working in that task area. The JSA form covered the major task and had the steps of the procedure listed on the JSA. I have spoken with both Ashley and Gino about the way JSAs are written for tasks in the engine room to compare approaches. Ashley called change of condition (Time Out) on the cutter service platform to talk to Geno in the leverroom about the readings during the calibration. Ryan could use more practice briefing the JSA and being thorough in his approach.

Report Back

- Discussed with: (Check Choice(s)) SSHA ☐ Captain ☐ Chief ☑ PM ☐ SM ☑ Task Supervisor ☑

	Very Good	Satisfactory	Needs Improvement	Unacceptable
- Ask Task Supervisor to Rate his JSA	☐	☑	☐	☐
- Auditor Overall JSA Rating	☐	☑	☐	☐

Email Clear Form

2 JSA Audit Card - Master October 8, 2012

Figure 6. Job Safety Analysis Audit, with the 6Ts, Ladder Calibration.

constructive, not destructive. As such the auditor should portray both the strengths and weaknesses in a positive manner.

4. *Provide feedback to the on-site management team and divisional safety managers.* Both the strengths and weaknesses of the JSA should be presented and the audit conversation between the auditor and JSA leader should be discussed additionally.

Most importantly the auditor should remain neutral when performing an audit. If the auditor is auditing a coworker that is also a friend, it may be difficult to give an unsatisfactory JSA rating. For the JSA Audit programme to work to its fullest capability, auditors have to give honest feedback, regardless of emotions that may be involved. Reminding employees that the programme is meant to make the workplace safer and that there will be no reprimand for an unsatisfactory JSA, is essential for transforming the quality of JSAs and to the success of the JSA Audit programme.

The JSA Audit tool is fairly versatile in that it can be used within or across divisions. JSA Audits can be conducted within small groups, i.e., on a dredge for a dredge-related task where the dredge captain audits the JSA on cross-functionally, i.e., where a member of the engineering team audits a dredge-related task for dredge crew members.

Allowing auditors to audit JSAs not typically encountered in their work day has proved to be beneficial, particularly in hazard recognition. Complacency is something easily acquired when the same employees perform the same task and the same JSA day in and day out. Bringing an auditor in that hasn't performed the task or JSA before allows for a fresh set of eyes to examine the task at hand. This has potential to bring up hazards that a complacent employee may have forgotten about or not recognised.

The JSA Audit programme is something fairly new to GLDD employees and managers. Data is collected for each completed audit and compiled for qualitative analysis. Quantitatively there has been much positive feedback from the programme. As it unfolds further, employees are seeing the benefit to giving honest ratings and feedback and avoiding letting emotions come into play. The accountability policy described below reduces the amount of emotion involved in the JSA Audit ratings. Keeping employees accountable for their actions is a key part of having successful safety initiatives and tools.

SAFETY ACCOUNTABILITY

The final safety tool is safety accountability. All of the safety tools used at GLDD are only successful if employees are being held accountable for their own safety and the safety of their fellow coworkers. To establish a safety accountability policy that encompasses all of the safety tools used in daily operations, the company created 10 Life Saving Absolutes, or LSAs. The LSAs were generated from the SALT programme and are ten rules that must be adhered to by everyone, 100% of the time. Having an accountability policy that directly incorporates the safety tools used every day by employees is important to the success of all safety tools and to the safety of the employees using them. This accountability policy makes the safety tools and workplace

personal, relevant and important to everyone that uses them.

JOB SAFETY ANALYSIS AND AUDIT BREAKDOWN

A breakdown of a JSA form is shown in Figure 5 and a JSA Audit form in Figure 6 completed for the site engineering team to calibrate the ladder of a cutter dredge. Note that this JSA was written before the integration of the 6Ts into the JSA form. The JSA Auditor was the Chief Engineer of the dredge, who brought an outside look into the site engineering JSA allowing for additional hazard recognition.

The engine department does JSAs a bit differently than the site engineering department. This brought to light other ways in which JSAs could be done for both parties. It can be seen in this audit how auditing can assist new employees in developing their JSA skills by exposing both strengths and weaknesses in the JSA briefing and discussion. This example also illustrates how performing cross divisional audits can teach new and seasoned employees different approaches to using safety tools.

The JSA and JSA Audits allowed for collaboration between two groups within dredging operations. The discussion and comments included positive reinforcement of the areas that were proficient and constructive criticism of the areas that could be improved. Ways to improve new employees JSA skills were also part of the verbal discussion between the auditor and JSA leader. These JSA and JSA Audit are just one example of many that have proven beneficial to the development of safety tools.

In the 4th quarter of 2014, 60% of audits submitted companywide were conducted by front line supervisors. This has demonstrated that management continues to be involved in JSA leadership and coaching, one of the key aspects to a successful safety programme. From data analysis, 4% fewer JSAs were given a rating of unsatisfactory or needs improvement. 8% more JSAs were held at the task site and 7% of JSAS saw betterment in reviewing the task in steps. Quantitatively, these are just a few of the improvements that have been accomplished through the use of JSA Audits enriching JSAs being completed in daily operations.

Notable qualitative achievements so far from using the JSA Audit tool include more focus on the core rules included in SALT, particularly with confined space entry, Lock Out Tag Out and qualified operators and tools. Auditors have increased their attention to ensuring the 6Ts are addressed during the JSA and crews completing JSAs are reflecting on past injuries as part of their hazard reviews. The JSA Audits have alerted GLDD to action items that need to be further addressed in JSAs including complacency of JSA discussion for tasks occurring multiple times a day.

CONCLUSIONS

Safety in the marine construction industry, particularly dredging, has developed into a mandatory practice in daily operations. Revealing that employees can go home safely every day has been a challenge, but with an ever developing safety culture influenced by safety tools such as SALT, JSAs and JSA Audits, it will continue to become second nature.

Just as important as the safety tools and positive safety culture, is support from management. Management showing an interest in operations not only gives vital support to the effectiveness of safety tools but also gives reassurance to employees. Giving employees the comfort that it is okay to step back for safety and pull a stop card if they feel like someone is at risk for being injured is not something that was easily acquired after so many years in which production was considered as the top priority.

Progression of the safety culture transformation depends on the continued development new safety tools, open communication between employees and front line management, and continued positive re-enforcement through coaching and an accountability policy. The safety tools described here are just a few of many tools that are used in day-to-day operations at GLDD. Employees using these safety tools effectively has transformed the safety culture at the company from a workplace where employees feel like it is necessary to take risks, to a workplace where employees feel it is necessary to slow down and get the job done safely. Continued coaching efforts and safety tool development will further reduce the total recordable incident rate making the workplace Incident and Injury Free.

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