PROCEDURE

Hazard Identification, Risk Assessment and Risk Management

REVISION HISTORY

Revision No.	Issue Date	Amendment Description	Date Effective	Date to be Revalidated
00	28-Mar-2004	First Issue.	28-Mar-2004	30-Dec-2007
01	30-Dec-2007	Revised (introduced new logo and name).	30-Dec-2007	30-Dec-2010
	30-Dec-2010	Checked and found OK.	30-Dec-2010	26-May-2013
02	26-May-2013	As per OSHA procedure name changed from 'Evaluation and Control of Safety and Occupational Health Risks' to 'Hazard Identification, Risk Assessment and Determining Controls'.	26-May-2013	25-May-2016
03	12-Jun-2016	Complete review. Hazard identification, control measures according to hierarchy/types of hazard, revised HIRA register with document number, revision number, next revision date, area in charge having emergency preparedness.	12-June-2016	11-Jun-2019
04	16-Feb-2018	Extensive review to produce an integrated Hazard Identification, Risk Assessment and Risk Management procedure including HIRA, MMI and JSA.	16-Jan-2018	15-Jan-2021
05	15-Apr-2020	Template updated. Extensive review. JSA format updated.	15-Apr-2020	14-Apr-2023

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1. INTERNAL CONTROLS

1.1 REVIEW of PROCEDURES

To assure Managements, Shareholders and External agencies confidence in the company's policies & practices, QATAR STEEL Internal Audit may verify compliance with this procedure. [Department Owner] shall review this procedure every three years to ensure that it continues to serve the purpose intended.

1.2 EMPLOYEE RESPONSIBILITIES

All employees of the company are required to observe and abide by this procedure.

1.3 APPROVAL

This procedure and any amendments made thereto require the following approvals.

AUTHORITY	DATE
Approved By: **Mohammed Nasser Al-Hajri** Managing Director & Chief Executive Officer (MD&CEO)	2/4/2020
Checked By: **Alexander Stramrood** Manager – HSE Department	31-03-2020
Drafted by: **Adnan Akram** HSE Engineer – HSE Department	31-MAR-2020

This document has been reviewed by Document Controller. It complies with the requirements of policy 1.12.0.1.01.01 and it is considered ready for issue.

Signed by _____ **Date** 28 MAR 2020

2. PURPOSE

The purpose of this procedure is to:

1. Ensure that risk management is embedded in Qatar Steel Company's culture and practices;
2. Ensure a systematic approach to risk management;
3. Ensure that hazards are identified, risks are evaluated and appropriate control measures are implemented and monitored;
4. Describe specific risk assessment methodologies that can be applied and against which compliance can be measured.

3. SCOPE

This procedure shall apply to all workplace hazards and risks, and all activities are undertaken by Qatar Steel and include:

1. The routine, and non-routine, activities of all persons having access to the workplace;
2. Hazards associated with plant, machinery, and equipment;
3. Hazards associated with substances and materials in the workplace;
4. Hazards originating outside of the workplace that could adversely affect the work environment;
5. Hazards associated with inclement weather or emergency situations;
6. The complete lifecycle of facilities from specification through to decommissioning and disposal.

4. PROCEDURE

4.1. Abbreviations

ALARP:	As Low As Reasonably Practicable
FRA:	Fire Risk Assessment
HAC:	Hazardous Area Classification
HAZOP:	Hazard and Operability Study
HIRA:	Hazard Identification and Risk Assessment
JSA:	Job Safety Analysis
HSE:	Health, Safety and Environment
MAWP:	Maximum Allowable Working Pressure
MMI:	Man-Machine Interface
MSDS:	Material Safety Data Sheet
OEM:	Original Equipment Manufacturer
O&M:	Operations and Maintenance
PDF:	Portable Document Format
P&ID:	Piping and Instrumentation Diagram

PFD:	Process Flow Diagram
PPE:	Personal Protective Equipment
RACI:	Responsible, Accountable, Consulted, Informed
SOP:	Standard Operating Procedure
QSC:	The Qatar Steel Company

Definitions;

Routine Activity:	Routine works are jobs and tasks done at certain defined intervals, to facilitate the normal operation of the plant.
Non-Routine Activity:	Non-routine work are jobs and tasks that are performed irregularly or being performed for the first time. Since these tasks and jobs are not performed regularly, it can be difficult to understand all of the hazards associated with the job. Non-routine work includes jobs or tasks that are, (but not limited to): • Performed infrequently • Outside of normal duties • Do not have a documented procedure • Performed in a different way from the documented procedure • Have never been performed before • Routine tasks that carry a high level of risk
Hazard:	A hazard is any agent that can cause harm or damage to people, property and/or the environment.
Probability:	Probability is the likelihood or chance of an event occurring
Risk:	Risk is defined as the probability that exposure to a hazard will lead to a negative consequence.
Residual risk:	Residual risk is the risk remaining, associated with a job or an activity after the precautions are taken.
Severity:	Severity describes the highest level of damage possible when an accident occurs from a particular hazard.
Risk Ranking:	The numerical value is given to the level of risk based on the risk matrix.
Controls:	Precautions put in place to reduce the risk.

The risk management process can be divided into five steps:

1. Identify the hazards.
2. Identify who is at risk or what can be damaged and how.
3. Evaluate the risk and identify any additional control measures necessary to reduce the risk to As Low as Reasonably Practicable (ALARP).
4. Implement control measures in the workplace.
5. Monitor and review the effectiveness of the control measures.

The aim should be to eliminate the hazard or risk wherever practicable. Where it is not possible to eliminate the risk then a hierarchy of controls can be applied ranging from substitution (i.e. the use of less hazardous substances, materials, equipment or processes), through to the application of engineering or administrative controls, and finally the use of personal protective equipment (PPE).

Qatar Steel employs the use of three interrelated processes for the assessment and control of workplace risks:

1. Hazard Identification and Risk assessment (HIRA);
2. Man-Machine Interface (MMI);
3. Job Safety Analysis (JSA).

At the highest level in the risk assessment hierarchy is the HIRA. This is used to evaluate the hazards, risks, and controls associated with QATAR STEEL facilities and jobs. The MMI and JSA processes shall be used to provide another level of detail.

Where the HIRA process identifies risks associated with the operation and maintenance of machinery then the MMI process shall be applied. This process is defined to specifically address the hazards, risks, and controls associated with operating and maintaining machinery. For the purposes of this procedure machinery shall include:

1. Moving equipment (rotating and reciprocating);
2. Pressure vessels with an internal diameter more than 152 mm and a maximum allowable working pressure (MAWP) more than 15 psig;
3. Static equipment with a surface temperature of more than 7000C.

Where the HIRA process identifies non-routine jobs, or jobs that have the potential for high severity consequences, then the JSA process shall be applied. This process breaks jobs up into a series of sequential activities and is used to assess the hazards, risks, and controls associated with each activity.

An overall, high-level flow diagram for the risk management process is given in Figure 1.

4.2. Hazard Identification and Risk Assessment (HIRA)

The objective of the HIRA process is to provide a systematic basis for the identification of hazards, risks, and controls associated with Qatar Steel facilities and activities and to ensure that all risks are maintained ALARP. It is intended to be a working document that Qatar Steel personnel can use to help them understand the workplace risks and manage them effectively. The identification, implementation and, maintenance of effective controls is key to ensuring that all workplace risks are appropriately managed. Employee and contractor participation, consultation and communication are key to a successful outcome.

4.2.1. Applicability

The HIRA process shall address:

1. Routine, and non-routine, activities;
2. Hazards associated with plant, machinery, and equipment;
3. Hazards associated with substances and materials in the workplace;
4. Hazards originating outside of the workplace that could adversely affect the work environment;
5. Hazards associated with inclement weather or emergency situations;
6. The complete lifecycle of facilities from specification through to decommissioning.

4.2.2. Methodology

A flow diagram for the HIRA process is given in Figure 2. The worksheet given in Appendix 1 shall be used to record the results of the analysis. A team member shall be nominated to facilitate the HIRA sessions and another to compile the worksheet as the analysis progresses. The role of the facilitator is to: lead the team; prompt the brainstorming effort; manage the discussion without compromising creativity; identify the key issues; and ensure that the worksheet accurately reflects the points discussed.

The HIRA process can be broken down into the following basic steps:

1. Select the job which is to be considered.
2. Describe the job which is to be carried out.
3. Brainstorm all the potential hazards and risks associated with the job.
4. For each credible risk define the worst-case outcome and the existing controls.
5. Assess the probability, severity, and level of risk with the existing controls in place.
6. Agree on any remedial actions or additional controls required.
7. Assess the residual risk following the implementation of the proposed actions or controls.
8. Select the next area of the plant or the next job until the HIRA is complete.

The checklist of potential hazards and controls given in Appendix 2 can be used by HIRA assessment teams. This checklist is only intended to be prompt and is not a substitute for

the effective implementation of the HIRA process by knowledgeable and experienced personnel. The teams should have access to any supporting information or documentation that might add value to the assessment such as details of previous incidents, Process Flow Diagrams (PFDs), Piping and Instrumentation Diagrams (P&IDs), Material Safety Data Sheets (MSDS) plant layouts, etc.

The Qatar Steel qualitative risk matrix shown in Figure 3 shall be used to assess the probability of occurrence and potential severity of the scenarios considered, which will, in turn, define the level of risk (i.e. no risk, low risk, medium risk or high risk). The risk is assessed based on the potential impact on people, assets, the environment, and company reputation. The risk level recorded in the HIRA worksheet is taken to be the highest observed for these four categories. Further guidance on how to assess the severity of the consequences is given in Appendix 3.

Where the HIRA process identifies risks associated with the operation of machinery then the MMI process shall be applied as detailed in Section 5.2 of this procedure. Where the HIRA process identifies non-routine, or high-risk jobs (i.e. with potential severity 3, 4 or 5 consequences as per the Qatar Steel risk matrix) then the JSA process shall be applied as detailed in Section 5.3 of this procedure.

4.2.3. Risk Acceptance

Based on the risk level, as derived from the Qatar Steel risk matrix (Figure 3) and assigned during the HIRA assessment, the following actions shall be taken to ensure effective risk management.

High Risk
If the residual risk is high, then the operation or activity shall be stopped until additional controls can be implemented or an alternative process or activity can be found that will reduce the risk to an acceptable level.

Medium Risk
If the residual risk is medium, then the assessment team needs to be satisfied that the identified controls are implemented and effective and that no additional controls can be identified to further reduce the risk (i.e. the risk is ALARP).

Low Risk
If the residual risk is low, it is still important to make sure that the identified controls are implemented and effective and to be aware of further opportunities for improvement.

4.2.4. Deliverables

The deliverable from the HIRA process shall be a fully completed worksheet that has been

reviewed by the relevant Engineer or Section Head and approved by the Department Manager. A PDF copy of the approved HIRA shall be added to the HIRA database located on the Qatar Steel computer network.

4.2.5. The Assessment Team

The selection of the assessment team has a direct effect on the usefulness and quality of the HIRA process. The assessment team shall consist of personnel that are knowledgeable about the plant being considered, its operation and maintenance, the materials used and the activities to be undertaken. The team can be relatively small but it should contain sufficient knowledge and expertise to be able to identify all the hazards and the risks associated with the plant and the activities.

As a minimum, the assessment team should include: the equipment plant supervisor/equipment engineer or the process plant supervisor/process engineer for the plant; operations representatives (supervisor, senior operator); maintenance representatives (supervisor, senior technician) and an HSE representative. The HSE representative shall ensure consistency of approach and provide input on the hazards, risks and the potential severity of the consequences. It is expected that each team member will have at least 8 years' relevant experience. Where specialist knowledge is required to address specific hazards or risks then additional team members can be temporarily included as necessary.

4.2.6. Roles and Responsibilities

A RACI chart for the HIRA process shown in Figure 2 is given in Table 1. The RACI chart defines who is responsible and accountable for each step in the process and who needs to be consulted or informed.

4.2.7. Timing of Assessments

HIRAs shall be reviewed and updated when:

1. There is a change to the existing plant or new facilities are added;
2. There is a change to the hazards, operational environment or working conditions;
3. There is a change to the activities undertaken or new activities are proposed;
4. There has been an incident or high potential near-miss.

Any changes in the HIRA shall be circulated to all concerned agencies and all the changes must be documented.
The Department manager must review and sign at least every 3 months when there have been any changes in the HIRA.
Each HIRA shall be subject to review at least every three years from the date of the last revision if there have been no changes.

4.2.8. Verification of Controls

After completion of the HIRA, it is the responsibility of the line management of the concerned department to:

1. Disseminate the key findings from the HIRA and specifically highlight any medium or high risks and their associated controls;
2. To check that the identified controls have been implemented and are being complied with in the field.

Checking the effectiveness of controls can be achieved through the inspection of documentation such as SOPs, method statements, work permits, inspection and maintenance records, training records, and direct observation.

4.2.9. Audit and Review

Quarterly audits shall be carried out by the HSE department to check that HIRAs are being carried out in accordance with this procedure and that the associated controls are being implemented in the field. Any non-conformances and corrective actions shall be fully documented and brought to the attention of the relevant Department Manager for action and resolution.

4.3. Man-Machine Interface (MMI)

Whenever personnel interface with machinery there is always the potential for severe injuries and, in the worst case, fatalities. To address these specific concerns Qatar Steel has introduced the MMI process. To avoid confusion and ensure consistency this has been aligned to the HIRA methodology. Hazards, risks, and controls are identified in the same way for both the HIRA and MMI processes and the Qatar Steel risk matrix is used in both cases to assess the probability of occurrence, the severity of consequences and risk levels.

Where the MMI process differs is that it requires some basic information on the machine, its condition and operation to be provided prior to starting the assessment sessions. This should be based on the information given in the Qatar Steel Enterprise Asset Management (EAM) system and include:

1. Manufacturer’s details;
2. Machine type, model number, serial number;
3. Machine description;
4. Energy sources;
5. Safety features;
6. Utilization;
7. Modification history;
8. Availability of operating and maintenance (O&M) manuals;
9. Training records for O&M personnel.

In addition, a more detailed hazard checklist, for use by MMI assessment teams, covering the physical hazards, hazardous tasks, and hazardous events associated with machinery is given in Appendix 6. Irrespective of these detailed differences the objectives of the HIRA and MMI processes are the same; to systematically identify all the applicable hazards, risks, and controls and ensure that all risks are maintained ALARP.

4.3.1 Applicability

The MMI process shall be applied where the HIRA identifies hazards and risks associated with the operation and maintenance of machinery. It shall be applicable to all machinery either owned, operated or maintained by Qatar Steel and shall address both operation and maintenance activities.

4.3.2 Methodology

A flow diagram for the MMI process is given in Figure 4. The worksheet given in Appendix 5 shall be used to record the results of the analysis. Each machine shall have a separate worksheet. The basic information on the machine (sheet 1 of 2, of the worksheet) should be compiled before the MMI session.

A team member shall be nominated to facilitate the MMI sessions and another to compile the worksheet as the analysis progresses. The role of the facilitator is to: lead the team; prompt the brainstorming effort; manage the discussion without compromising creativity; identify the key issues; and ensure that the worksheet accurately reflects the points discussed.

The MMI process can be broken down into the following basic steps:

1. Select the system or subsystem of the machine which is to be considered.
2. Describe the function of the system or subsystem.
3. Brainstorm all the potential hazards and risks associated with the system or subsystem.
4. For each credible risk define the worst-case outcome and the existing controls.
5. Assess the probability, severity, and level of risk with the existing controls in place.
6. Agree on any remedial actions or additional controls required.
7. Assess the residual risk following the implementation of the proposed actions or controls.
8. Select the next system or subsystem until the MMI is complete.

The checklist of potential hazards given in Appendix 6 shall be used by the MMI assessment teams. This checklist is only intended to be prompt and is not a substitute for the effective implementation of the MMI process by knowledgeable and experienced personnel. The teams should have access to any supporting information or documentation

that might add value to the assessment such as details of previous incidents, Operating and Maintenance Manuals, Process Flow Diagrams (PFDs), Piping and Instrumentation Diagrams (P&IDs), Material Safety Data Sheets (MSDS) plant layouts, etc.

The Qatar Steel qualitative risk matrix shown in Figure 3 shall be used to assess the probability of occurrence and potential severity of the scenarios considered, which will, in turn, define the level of risk (i.e. no risk, low risk, medium risk or high risk). The risk is assessed based on the potential impact on people, assets, the environment, and company reputation. The risk level recorded in the MMI worksheet is taken to be the highest observed for these four categories. Further guidance on how to assess the severity of the consequences is given in Appendix 3.

4.3.3 Risk Acceptance

Based on the risk level, as derived from the Qatar Steel risk matrix (Figure 3) and assigned during the MMI assessment, the following actions shall be taken to ensure effective risk management.

High Risk
If the residual risk is high, then the operation or activity shall be stopped until additional controls can be implemented or an alternative process or activity can be found that will reduce the risk to an acceptable level.

Medium Risk
If the residual risk is medium, then the assessment team needs to be satisfied that the identified controls are implemented and effective and that no additional controls can be identified to further reduce the risk (i.e. the risk is ALARP).

Low Risk
If the residual risk is low, it is still important to make sure that the identified controls are implemented and effective and to be aware of further opportunities for improvement.

4.3.4 Deliverables

The deliverable from the MMI process shall be a fully completed worksheet that has been reviewed by the relevant Engineer or Section Head and approved by the Department Manager. A PDF copy of the approved MMI shall be added to the MMI database located on the Qatar Steel computer network.

4.3.5 The Assessment Team

The assessment team shall consist of personnel that are knowledgeable about the machine being considered, its operation and maintenance, the materials used and the activities to be undertaken. The team can be relatively small but it should contain sufficient knowledge

and expertise to be able to identify all the hazards and the risks associated with the plant and the activities.

As a minimum, the assessment team should include the equipment plant supervisor/equipment engineer that has responsibility for the machine; operations representatives (supervisor, senior operator); maintenance representatives (supervisor, senior technician) and an HSE representative. The HSE representative shall ensure consistency of approach and provide input on the hazards, risks and the potential severity of the consequences. It is expected that each team member will have at least 8 years' relevant experience. Where specialist knowledge is required to address specific hazards or risks then additional team members can be temporarily included as necessary. For more complex machines it may be necessary to involve a representative from the original equipment manufacturer (OEM).

4.3.6 Roles and Responsibilities

A RACI chart for the MMI process shown in Figure 4 is given in Table 2. The RACI chart defines who is responsible and accountable for each step in the process and who needs to be consulted or informed.

4.3.7 Timing of Assessments

MMI assessments shall be carried out as the need arises from the HIRA. MMI assessments shall be reviewed and updated whenever there is a significant change to the machine or its function, or if a high potential near-miss or accident occurs that is directly related to the machine. Details of new machines should be entered in the EAM, and an MMI assessment carried out prior to starting operations. Each MMI assessment shall be subject to review at least every three years from the date of the last revision.

4.3.8 Verification of Controls

After completion of the MMI assessment, it is the responsibility of the line management of the concerned department to:

1. Disseminate the key findings of the assessment and specifically highlight any medium or high risks and their associated controls;
2. To check that the identified controls have been implemented and are being complied with in the field.

Checking the effectiveness of controls can be achieved through the inspection of documentation such as SOPs, method statements, work permits, inspection and maintenance records, training records; and direct observation.

4.3.9 Audit and Review

Quarterly audits shall be carried out by the HSE department to check that MMI assessments are being carried out in accordance with this procedure and that the associated controls are being implemented in the field. Any non-conformances and corrective actions shall be fully documented and brought to the attention of the relevant Department Manager for action and resolution.

4.4. Job Safety Analysis (JSA)

Job Safety Analysis is an important tool that is used to identify hazards and risks before a job is performed and before they can result in injuries or damage. The aim is to eliminate them or put controls in place to minimize them. Jobs are broken down into a series of steps or tasks. The hazards, risks, and controls associated with each task are then identified. The JSA is used to provide input into the preparation of:

1. Standard Operating Procedures (SOPs);
2. Maintenance procedures;
3. Method statements;
4. Work permits;
5. Toolbox talks;
6. Training materials for new employees;
7. Refresher training for established employees.

4.4.1 Applicability

A JSA shall be carried out:

1. For non-routine jobs that are not covered in HIRA.
2. For any job requiring vessel entry;
3. For jobs with potential severity 3, 4 or 5 consequences as per the Qatar Steel risk matrix;
4. Where there has been a history of previous incidents or injuries.
5. For all contractor activities.

4.4.2 Methodology

A flow diagram for the JSA process is given in Figure 5. The worksheet given in Appendix 7 shall be used to record the results of the analysis. A team member shall be nominated to facilitate the sessions and compile the worksheet as the analysis progresses.

The job is broken down into tasks each with recognizable starting and endpoints. If a job contains more than 15 tasks then consideration should be given to splitting the job up into discrete phases (e.g. preparation, execution, and close-out).

The tasks are listed in the worksheet and then the analysis proceeds task by task until all the tasks have been considered. Following review and discussion by the team the following information is added to the worksheet for each task:

1. The potential safety issue, hazard or risk;
2. The potential causes that could lead to the realization of the hazard or risk;
3. The potential severity of the consequences as per the Qatar Steel risk matrix;
4. The controls that need to be implemented;
5. The party is responsible for implementing the controls.

The checklist of the list of potential hazards (Appendix 2) and controls (Appendix 3) can be used by JSA assessment teams. This checklist is only intended to be prompt and is not a substitute for the effective implementation of the JSA process by knowledgeable and experienced personnel. Where there are potential chemical hazards references should always be made to the relevant MSDS.

4.4.3 Deliverables

The deliverable from the JSA process shall be a fully completed worksheet that has been reviewed by the relevant Engineer or Section Head and HSE representative.
For Contractors, the JSA process shall be a fully completed worksheet done by the contractor and then be reviewed by the relevant engineer under whom the contractor is working and will then be approved by the HSE representative.

4.4.4 The Assessment Team

The JSA team shall include at least three members. The area supervisor, at least one senior operator or technician, depending on the nature of the job, and an HSE representative. The HSE representative shall ensure consistency of approach and provide input on the hazards, risks and the potential severity of the consequences. To ensure that the JSA is both realistic and practical, it is essential that those that will be carrying out the work are responsible for its preparation. Where a job requires specialist knowledge then additional team members should be included as appropriate.

4.4.5 Roles and Responsibilities

A RACI chart for the JSA process shown in Figure 5 is given in Table 3. The RACI chart defines who is responsible and accountable for each step in the process and who needs to be consulted or informed.

4.4.6 Timing of Assessments

JSAs shall be carried out as the need arises. A JSA shall be reviewed and updated whenever there is a significant change to the job or if a high potential near-miss or accident occurs

related to the execution of the job.

4.4.7 Verification of Controls

After completion of the JSA, it is the responsibility of the line management of the concerned department to check that the identified controls have been implemented, and are being complied with, in the field. This can be achieved through the inspection of documentation such as SOPs, method statements, work permits, training records, and direct observation of jobs.

4.4.8 Audit and Review

Quarterly audits shall be carried out by the HSE department to check that JSAs are being carried out in accordance with this procedure and that the associated controls are being implemented in the field. Any non-conformances and corrective actions shall be fully documented and brought to the attention of the relevant Department Manager for action and resolution.

4.5. Associated Studies

There are a number of associated studies that are outside the scope of this procedure that can nevertheless provide useful input into the identification of risks and controls.

4.5.1 Hazard Operability Study (HAZOP)

A HAZOP is a structured and systematic assessment of processes or operations to identify and evaluate problems that may represent risks to personnel or equipment by examining the impact of deviations from normal operations.

4.5.2 Hazardous Area Classification (HAC)

A HAC assessment involves the evaluation of a manufacturing or process facility to identify areas where potentially flammable atmospheres can occur, to enable the selection of equipment that will minimize the chances of ignition.

4.5.3 Fire Risk Assessment (FRA)

An FRA is used to identify what needs to be done to prevent fires and protect personnel. It is a structured process for identifying fire hazards, the personnel at risk and what can be done to eliminate or reduce the risks.

4.6. Communication and Dissemination

For the risk assessment and management practices described in this procedure to be effective Qatar Steel personnel must be made aware of the workplace risks and the

associated controls. The identification, implementation and, maintenance of effective controls is key to ensuring that all workplace risks are appropriately managed. Employee participation, consultation, and communication are essential to a successful outcome.

4.6.1 Qatar Steel Company

This latest version of this procedure shall be made available to all Qatar Steel employees through the Qatar Steel computer network. It is a line management responsibility to ensure that the hazards, risks, and controls identified through the application of this procedure are effectively communicated to supervisors and shop floor workers. A wide range of mechanisms is available to achieve this goal, including training, coaching and toolbox talks, etc.

4.6.2 Contractors

Qatar Steel has a responsibility to ensure that its contractors are made aware of the hazards, risks and associated controls that can affect them while working for QSC. It is the responsibility of the Qatar Steel contract supervisor to ensure that these are effectively communicated to contractors prior to the starting work on Qatar Steel facilities.

4.7. Related Procedures

Document Number

2.32.1.1.06.01 Emergency Plan
2.32.1.1.06.02 Emergency Plan for Radiation Exposure
2.32.2.1.01.01 HSE Regulations
2.32.2.1.02.01 Incident Reporting, Investigation and Handling of Safety Suggestions
2.32.2.1.02.01 Personal Protective Equipment
2.32.2.1.02.01 Work Permit System
2.32.2.1.11.01 Working at Height
2.32.2.1.12.01 Excavation Procedure
2.32.2.1.13.01 Confined Space Procedure

4.8. Sources of Information

Relevant sources of information include:

1. Operation and maintenance manuals;
2. PFDs and P&IDs;
3. Plant layouts;
4. Chemical inventories
5. MSDS;
6. Incident investigation reports;

7. Standard operating procedures;
8. Work permit audit reports;
9. External party audits and technical reports.

4.9. Audit and Review

Annual audits shall be carried out by the HSE department to check that risk assessment and risk management activities are being carried out in accordance with this procedure. Any non-conformances and corrective actions shall be fully documented and brought to the attention of the HSE Manager for action and resolution. This procedure shall be subject to review when an opportunity arises to make a significant improvement or to address a concern, but the review date shall not exceed three years from the date of the last revision.

4.10. Management of Change (MOC)

No changes shall be made to this procedure without approval from the Qatar Steel HSE Manager. Any suggestions or recommendations for updates or improvements to this procedure should be submitted in writing to the HSE Manager. Each submission should give details of the proposed amendment and the reason why it is considered necessary.

The HSE Manager will keep a log of all change requests, prioritize them for action and, subject to his approval, schedule them for inclusion in the next relevant update of the document. The latest version of this procedure shall be made available via the Qatar Steel computer network. Earlier versions shall be retained for a minimum of three years in accordance with the Qatar Steel document management system.

4.11. References

4.11.1 Table 1: RACI Chart for the HIRA Process

Process Step	Department Manager	Engineer/Section Head	Assessment Team
Define the scope of the assessment	A	R	I
Form the assessment team	A	R	I
Select area, process or job	A		R
Identify the hazards	A		R
Identify the present controls	A		R
Assign probability and severity	A		R
Determine the current risk	A		R
Identify remedial actions/controls	A	C	R
Identify the responsible party	A	C	R
Determine the residual risk	A		R
Review the HIRA for accuracy and completeness	A	R	C
Add HIRA to database	A	I	R
Verify controls are implemented	A	C	R

Legend
R: Responsible for Carrying out the Activity
A: Accountable for the Outcome of the Activity
C: Must be Consulted
I: Must be Informed

4.11.2 Table 2: RACI Chart for the MMI Process

Process Step	Department Manager	Engineer/Section Head	Assessment Team
Define the scope of the assessment, provide basic information	A	R	I
Form the assessment team	A	R	I
Select a system or a subsystem	A		R
Identify the hazards	A		R
Identify the present controls	A		R
Assign probability and severity	A		R
Determine the current risk	A		R
Identify remedial actions/controls	A	C	R
Identify the responsible party	A	C	R
Determine the residual risk	A		R
Review the MMI for accuracy and completeness	A	R	C
Add MMI to database	A	I	R
Verify controls are implemented	A	C	R

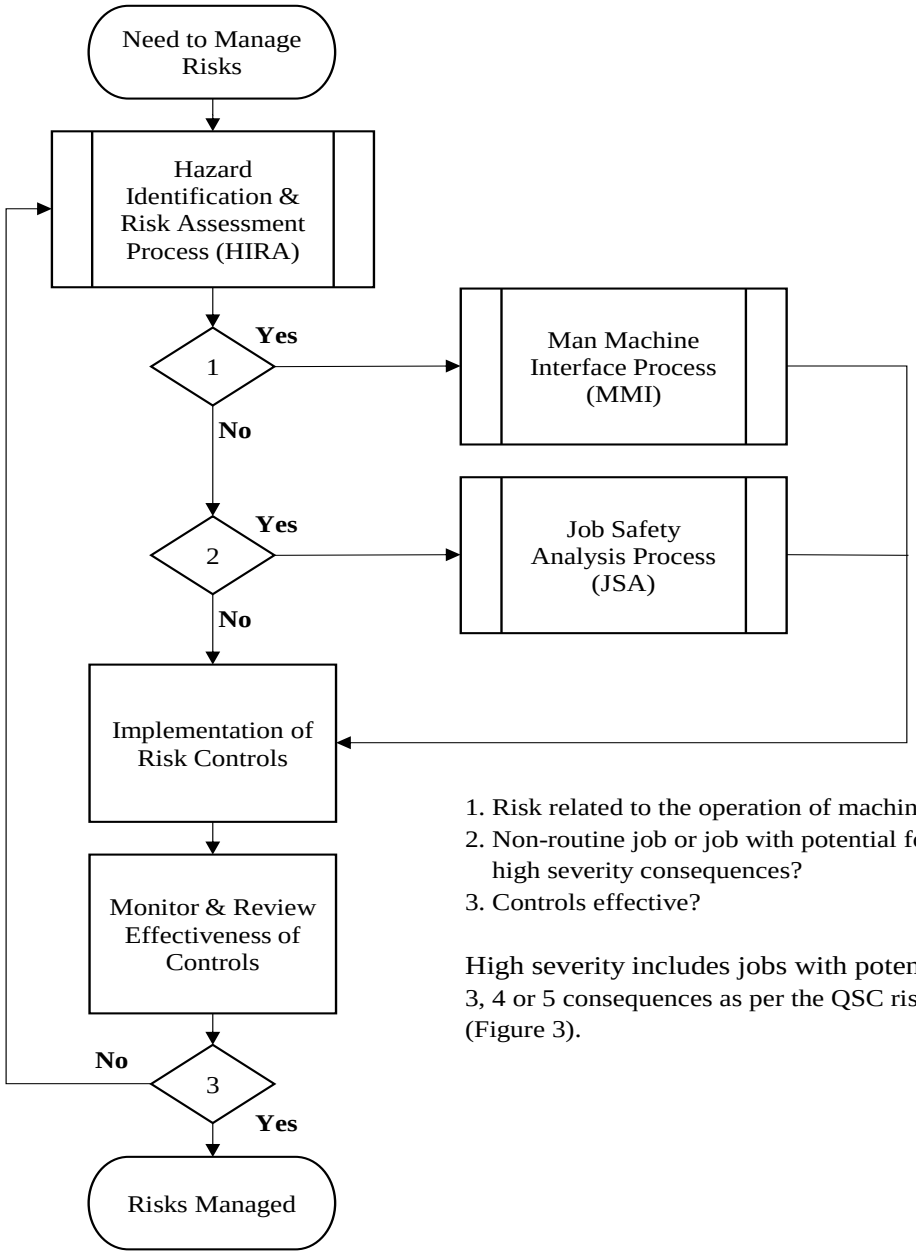
Legend
R: Responsible for Carrying out the Activity
A: Accountable for the Outcome of the Activity
C: Must be Consulted
I: Must be Informed

4.11.3 Table 3: RACI Chart for the JSA Process

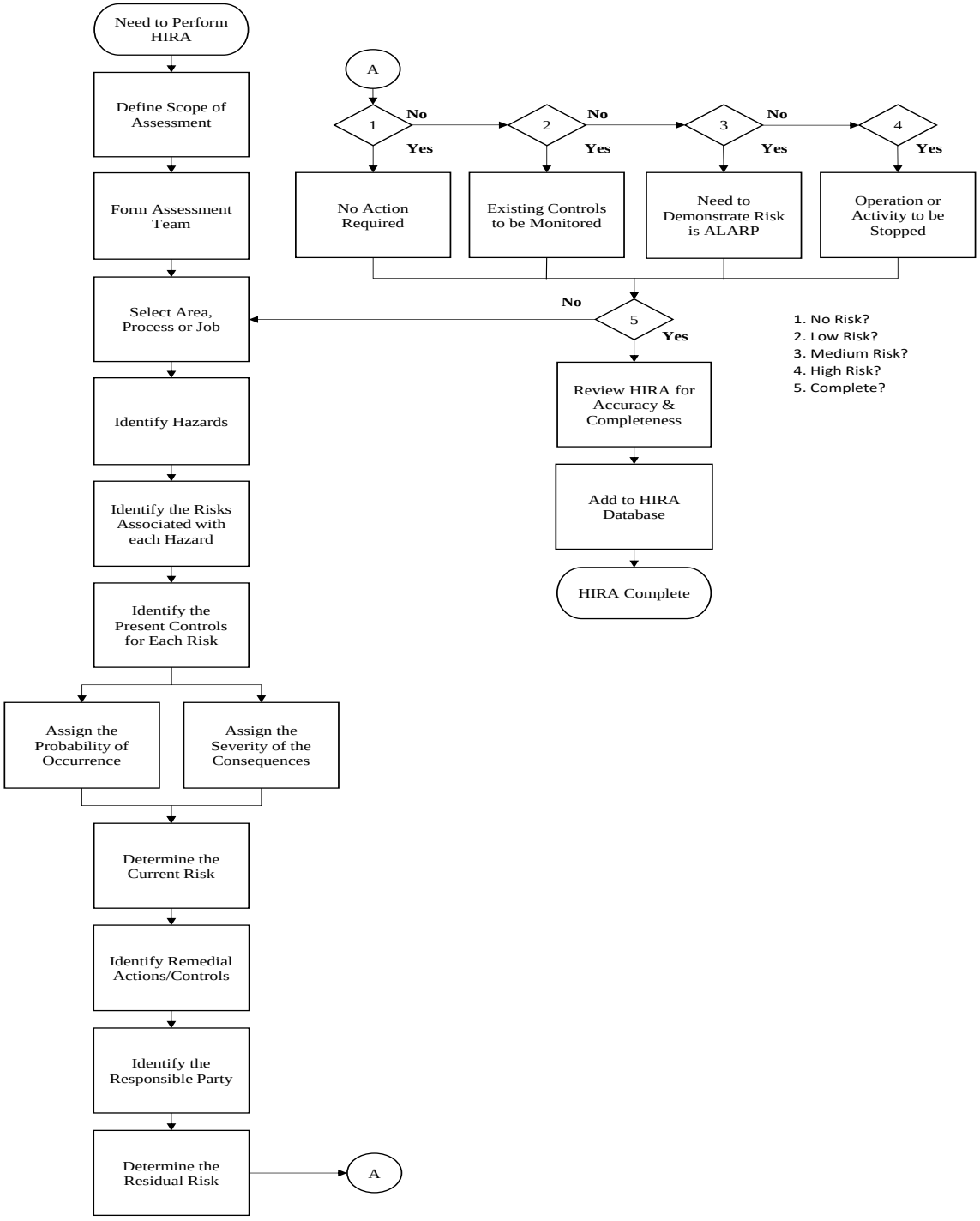
Process Step	Department Manager	Engineer/Section Head	Assessment Team
Select the job to be analyzed	A	R	I
Form the analysis team	A	R	I
List the job steps	A		R
Select a job step	A		R
List the potential hazards, risks, and causes	A		R
Identify the controls and actions	A	C	R
Identify the responsible party	A	C	R
Review the JSA for accuracy and completeness	A	R	C
Add JSA to database	A	I	R
Verify controls are implemented	A	C	R

Legend
R: Responsible for Carrying out the Activity
A: Accountable for the Outcome of the Activity
C: Must be Consulted
I: Must be Informed

4.11.4 Figure 1: Overall Risk Management Process



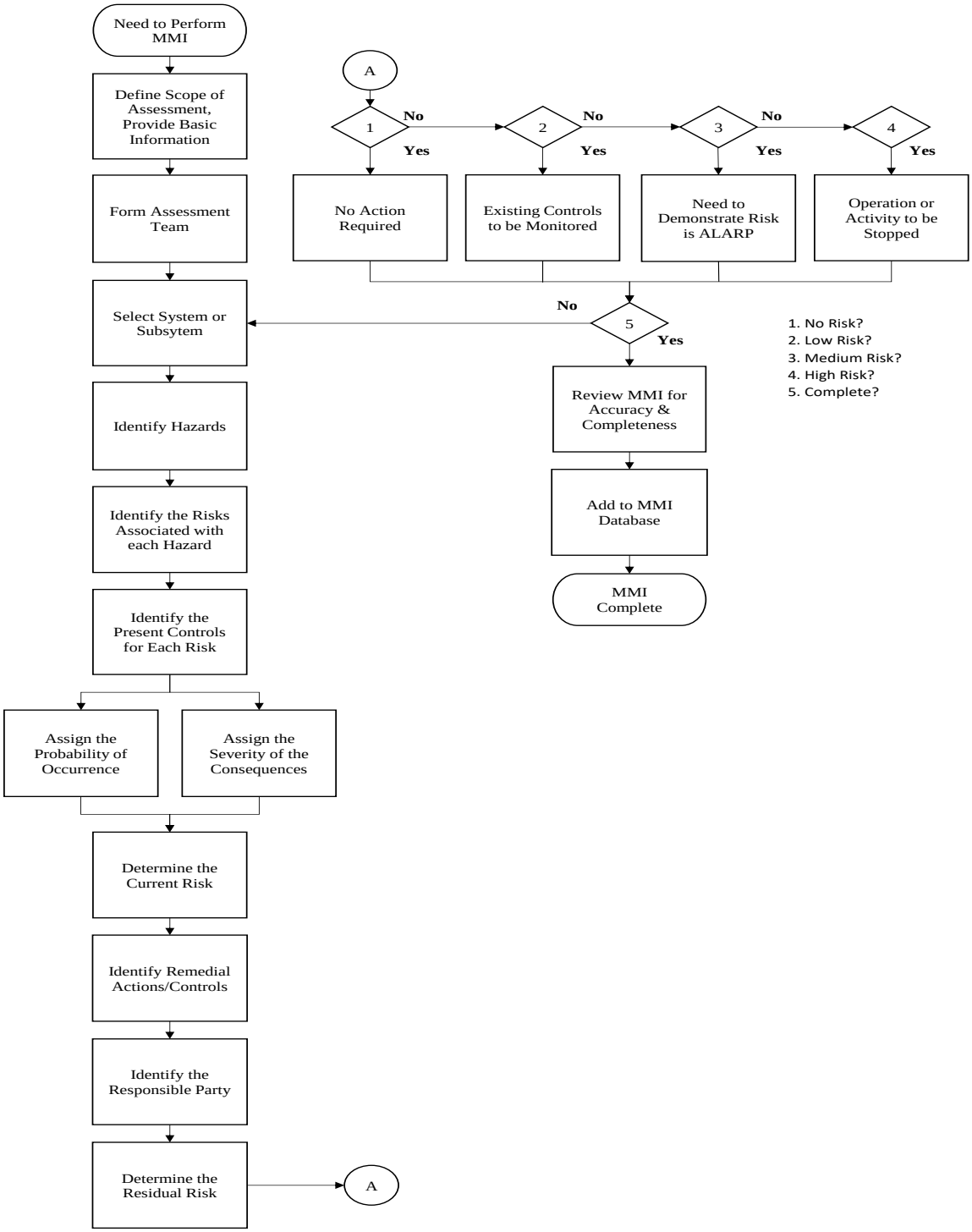
4.11.5 Figure 2: HIRA Process Flow Diagram



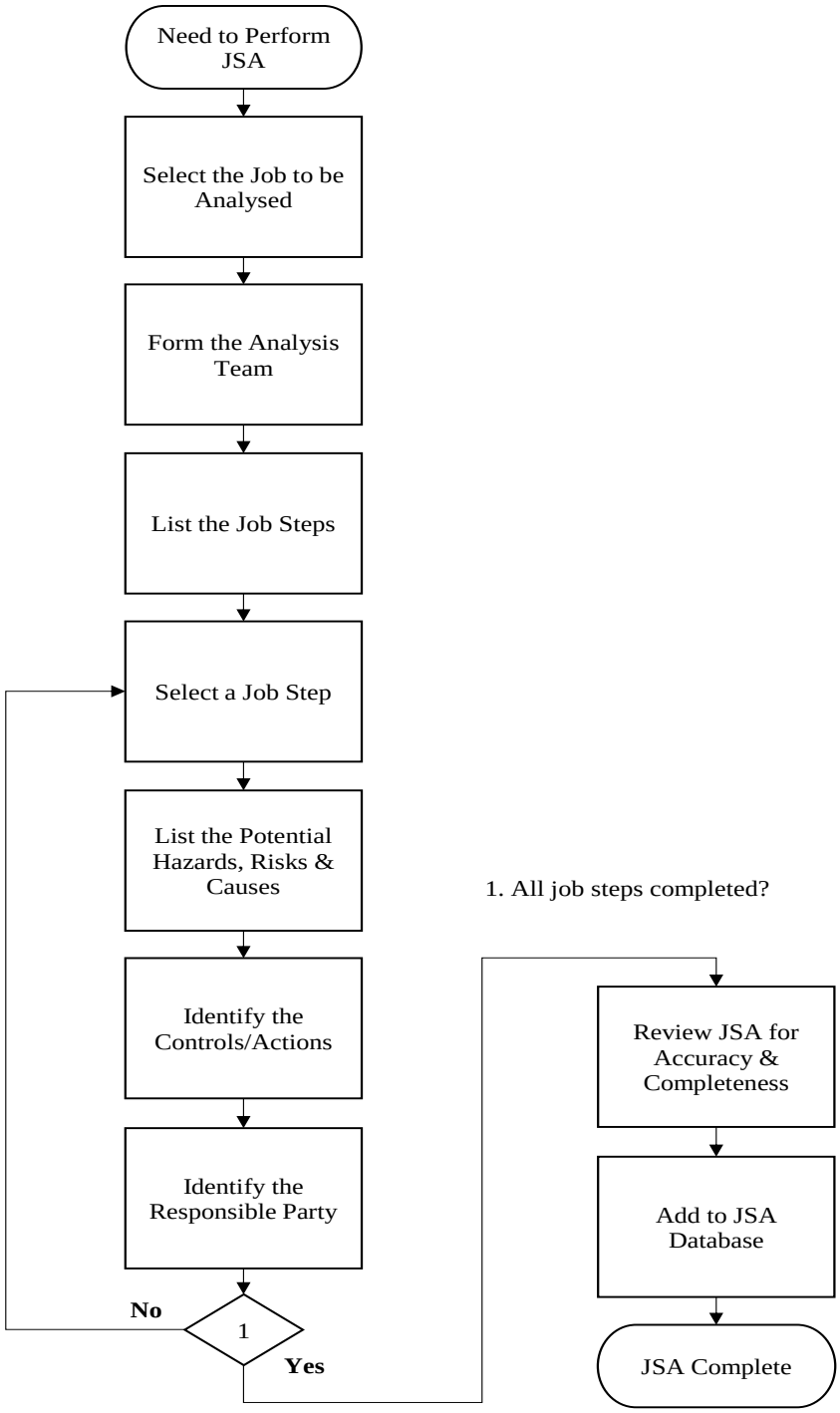
4.11.6 Figure 3: The Qatar Steel Risk Matrix

		Consequences				Increasing Probability →				
Increasing Severity ↓	Potential Severity	People	Assets and Production	Environment	Reputation	A	B	C	D	E
						Remote Never heard of in the Steel Industry	Unlikely Has occurred in the Steel Industry	Occasional Has occurred in Qatar Steel	Likely Occurs several times a year in Qatar Steel	Frequent Occurs several times a year in a Department
	0	No injury	No damage	No effect	No impact	No Risk				
	1	Slight injury or health effect	Slight damage, (< QAR 50,000)	Slight effect	Slight impact	Low Risk				
	2	Minor injury or health effect	Minor damage (QAR 50,000 to 500,000)	Minor effect	Limited impact					
	3	Major injury or health effect	Local damage (QAR 0.5M to 5,000,000)	Local effect	National impact			Medium Risk		
	4	Single Fatality or permanent total disability	Major damage (QAR 5M to 25,000,000)	Major effect	Regional impact				High Risk	
	5	Multiple fatalities	Extensive damage (>QAR 25,000,000)	Massive effect	International impact					

4.11.7 Figure 4: Flow Diagram for MMI Process



4.11.8 Figure 5: Flow Diagram for JSA Process



4.11.9 Appendix 1 - HIRA Worksheet

HIRA WORKSHEET

Department: _____ HIRA Conducted by: _____
Area: _____
HIRA Reference: _____
Date of Issue: _____ Supervisor: _____
Section Head: _____
Department Manager: _____

#	Area or Activity	Hazard What has the potential to cause harm to people, assets or the environment?	Risk What could go wrong and what might happen as a result?	Consequences What is the worst case credible outcome?	Existing Controls What can be done to prevent or reduce the impact of the incident?	Current Risk						Remedial Actions Define the additional actions to be implemented to reduce the risk	Responsible Party Assign responsibility to ensure that actions are implemented	Target Date	Status	Residual Risk						Comments Any additional information to be noted
						Probability	Severity: People	Severity: Assets	Severity: Environment	Severity: Reputation	Risk Ranking					Probability	Severity: People	Severity: Assets	Severity: Environment	Severity: Reputation	Risk Ranking	
1	Road network	Driving	A collision involving one or more vehicles, structures or equipment	Multiple fatalities	All drivers must have a valid Qatar license. Speed on site limited to 30 km/h. Use of mobile phones while driving is forbidden. All occupants must wear seatbelts.	B	5	2	0	0	M	Provide barricading at sensitive locations to prevent vehicle impacts. Provide speed bumps to calm the traffic.	Engineering	30-Nov-17	Open	B	1	1	0	0	L	

Drafted By: | Assessed By | Reviewed by: | Approved By:

4.11.10Appendix 2 - Checklist of Potential Hazards

Safety Hazards	• Slipping and tripping hazards (e.g. poorly maintained floors) • Moving parts of machinery (e.g. belts, flywheels, pinch points) • Working at height (e.g. on roofs, from elevated platforms) • Pressurized systems (e.g. piping, vessels, boilers) • Vehicles (e.g. forklifts, loaders, trailers, cranes) • Electricity (e.g. poor wiring, worn cords) • Suspended loads • Inadequate lighting • Confined spaces
Occupational Health Hazards	• Noise Exposure (e.g. hand-held tools, compressors, engines) • Respiratory Exposure (e.g. dust, fumes, mists, vapors) • Ergonomics (e.g. repetition, forceful exertions, awkward postures, vibration, lifting and handling loads) • Ionizing radiation (e.g. x-rays, radioactive materials) • Extreme temperatures • Biological Exposure (e.g. molds, bodily fluids, bacteria, viruses)
Chemical Hazards	• Inhalation • Skin Contact • Absorption • Injection • Ingestion
Fire Hazards	• Fire/Explosion • Hot Work (e.g. grinding, cutting, welding, brazing)
Weather Hazards	• Heat • Flood • Wind

4.11.11Appendix 3 - Hierarchy of Controls

Elimination	• Task elimination • Hazard elimination
Substitution	• Safer substances • Safer equipment • Safer work processes
Engineering Controls	• Guards • Barricades • Interlocks • Isolation • Automation • Redesign
Administrative Controls	• Standard operating procedures • Safe working practices • Training • Supervision • Warning signs and signals • Job rotation
PPE	• Safety glasses, goggles, visors • Gloves • Hard hats • Safety shoes, boots • Aluminized Jackets • Dust masks • Respirators • Ear protection • Safety harnesses
Emergency Response	• Escape routes • Rescue equipment • Firefighting equipment • Medical support • Emergency communications

4.11.12Appendix 4 -Consequence Category Definitions

Potential Severity	People	Description
0	No injury	No injury or health effect.
1	Slight injury or health effect	First Aid cases or minor discomfort cases e.g. Headache, dust/fumes/gases having irritation in the nose when inhaled - a person can return back to work after a rest.
2	Minor injury or health effect	Reversible injuries or illnesses requiring Medical Treatment (MTC) or Restricted Workday Cases (RWC) for 5 days or but not LTI's. E.g. loss of consciousness from medical reasons only (e.g. diabetes, epilepsy, narcolepsy, etc.), needle stick injuries and cuts from sharp objects.
3	Major injury or health effect	Reversible injuries or illnesses resulting in RWCs for more than 5 days or LTIs e.g. Punctured eardrums, fractured ribs or toes, chronic back injuries, loss of consciousness from work-related activities e.g. blow to the head, heat-induced.
4	Single Fatality or permanent total disability	Single fatality, permanent disability or irreversible illness such as corrosive burns, amputation.
5	Multiple fatalities	Multiple fatalities or multiple irreversible illnesses. A near miss with potential for multiple fatalities.

Potential Severity	Assets and Production	Description
0	No damage	No financial impact.
1	Slight damage, (< QAR 50,000)	No disruption to the operation estimated cost less than QAR 50,000.
2	Minor damage (QAR 50,000 to 500,000)	Brief disruption to the operation estimated cost of QAR 50,000 to 500,000
3	Local damage (QAR 0.5M to 5,000,000)	Partial shutdown of the operation estimated cost of QAR 500,000 to 5,000,000.
4	Major damage (QAR 5M to 25,000,000)	Partial loss of the operation estimated cost between QAR 5M to 25,000,000.
5	Extensive damage (>QAR 25,000,000)	Substantial or total loss of operation with an estimated cost in excess of QAR 25,000,000.

Potential Severity	Environmental	Description
0	No effect	No impact to the environment.
1	Slight effect	No lasting effect. Low-level impacts on the biological or physical environment, local environmental risk within the fence and within the system. Clean up within days.
2	Minor effect	Minor short-medium term damage to a small area of limited significance. Single exceeding of statutory or prescribed limits; single complaint; no permanent effect on the environment. Clean up within weeks.
3	Local effect	Moderate short-medium term widespread impacts, repeated exceeding of statutory or prescribed limits and beyond fence or neighborhood. Clean up within months.
4	Major effect	Severe environmental damage; Qatar Steel is required to take extensive measures to restore the contaminated environment to its original state; extended exceeding of statutory or prescribed limits. Clean up within months – years.
5	Massive effect	Persistent severe environmental damage or severe nuisance extending over a large area; in terms of commercial or recreational use or nature conservancy, a major economic loss for Qatar Steel; constant high exceeding of statutory or prescribed limits. Long term clean up required.

Potential Severity	Reputation	Description
0	No impact	No reputational impact.
1	Slight impact	Public awareness may exist but there is no public concern.
2	Limited impact	Some local public concern; some local media or local political attention with potentially adverse aspects for Qatar Steel operations.
3	National impact	National public concern; extensive adverse attention in the national media. Significant difficulties in gaining approvals.
4	Regional impact	Extensive adverse attention in the regional media; regional public and political concern. May lose consent to operate or not gain approval. Management credentials are significantly tarnished.
5	International impact	Extensive adverse attention in international media; international public attention. Consent to operate threatened. Reputation severely tarnished.

4.11.13Appendix 5 - MMI Worksheet

MMI Worksheet (1 of 2)

Machine Tag Number:		Number of Operatives:	
Type of Machine:		Number of Shifts per Week:	
Machine Location:		Usage (hours per month):	
Machine Description:		Maintenance Manual Reference:	
Machine Manufacturer:		Operating Manual Reference:	
Machine Model:		Standard Operating Procedure:	
Machine Serial Number:		Warning Signs Posted:	
List Modifications from As-Supplied:		Raw Materials:	
Energy Sources:		Maintenance Training Records Available:	
Energy Source Ratings:		Operators Training Records Available:	
Safety Features:		Inspection and Maintenance Records Available:	

MMI WORKSHEET (2 of 2)

Department: _____ MMI Conducted by: _____

Area: _____

HIRA Reference: _____

MMI Reference: _____ Supervisor: _____

Date of Issue: _____ Section Head: _____

Department Manager: _____

						Current Risk										Residual Risk						
#	System or Subsystem	Hazard What has the potential to cause harm to people, assets or the environment?	Risk What could go wrong and what might happen as a result?	Consequences What is the worst case credible outcome?	Existing Controls What can be done to prevent or reduce the impact of the incident?	Probability	People	Assets	Environment	Reputation	Risk Ranking	Remedial Actions Define the additional actions to be implemented to reduce the risk	Responsible Party Assign responsibility to ensure that actions are implemented	Target Date	Status	Probability	People	Assets	Environment	Reputation	Risk Ranking	Comments Any additional information to be noted
							Severity										Severity					
1	Distribution conveyor	Moving belts and rollers	Entrapment while cleaning spillage from around the conveyor	Fatality	Emergency cable switch runs alongside conveyor. The majority of the conveyor has covers fitted. Covers fitted at head and tail of conveyor.	B	4	0	0	2	M	Extend covers to completely protect conveyor. Restrict access to conveyor area to essential personnel.	Engineering to provide covers. Operations to restrict access.	11/30/2017 30/09/2017	Open	A	4	0	0	2	L	

Drafted By:	Assessed By	Reviewed by:	Approved By:

4.11.14Appendix 6 – Guidelines to check for Potential Hazards for MMI

Physical Hazards

Hazard Type	Potential Consequences
Mechanical	
1. Acceleration/deceleration	Struck against
2. Kinetic energy	Crushing
3. Angular parts	Cutting or severing
4. Approach of a moving element to a fixed part	Drawing-in or trapping
5. Cutting parts	Entanglement
6. Elastic elements	Friction or abrasion
7. Falling objects	Impact/ Struck by.
8. Gravity	Injection
9. Stored energy	Shearing
10. Height from the ground	Slipping, tripping or falling
11. High pressure	Stabbing or puncturing
12. Machinery mobility	Suffocation
13. Moving elements	Being run over
14. Rotating elements	
15. Surface finish (rough or slippery)	
16. Sharp edges	
17. Instability	
18. Vacuum	
Electrical	
1. Arc	Chemical effects
2. Electromagnetic phenomena	Effects on medical implants
3. Electrostatic phenomena	Electrocution
4. Live parts	Falling or Struck against
5. Insufficient distance from live parts under high voltage	Fire
6. Overload	Struck by Projection of molten particles
7. Parts becoming live under fault conditions	Shock
8. Short-circuit	Burn
9. Thermal radiation	
Thermal	
1. Explosion	Burn
2. Flame	Dehydration

3. Objects or materials with a high or low temperature 4. Radiation from heat sources	Discomfort Frostbite Injuries from radiated heat Scald
Noise	
1. Cavitation phenomena 2. Exhaust system 3. High-speed gas leak 4. Manufacturing process (e.g. stamping, pressing, grinding) 5. Moving parts 6. Scraping surfaces 7. Unbalanced rotating parts 8. Whistling pneumatics 9. Worn parts	Discomfort Loss of awareness Loss of balance Permanent hearing loss Stress Tinnitus Tiredness
Vibration	
1. Cavitation phenomena 2. Misalignment of moving parts 3. Mobile equipment 4. Scraping surfaces 5. Unbalanced rotating parts 6. Vibrating equipment 7. Worn parts	Discomfort Low-back disease Neurological disorder Osteoarticular disorder Trauma of the spine Vascular disorder
Radiation	
1. Ionizing radiation source 2. Low-frequency electromagnetic radiation 3. Optical radiation (IR, visible, UV), including laser 4. Radiofrequency electromagnetic radiation	Burn Damage to eyes and skin Effects on reproductive capability Genetic mutation Headache, insomnia, etc.
Materials/Substances	
1. Aerosol 2. Biological and microbiological (viral or bacterial) agent 3. Combustible 4. Dust 5. Explosive 6. Fiber	Breathing difficulties, suffocation Cancer Corrosion Effects on reproductive capability Explosion Fire

7. Flammable 8. Fluid 9. Fume 10. Gas 11. Mist 12. Oxidizer	Infection Mutation Poisoning Sensitization

Hazardous Tasks

Transport 1. Lifting 2. Loading 3. Packing 4. Transportation 5. Unloading 6. Unpacking
Assembly, Installation and Commissioning 1. Preparations for installation (e.g. foundations, vibration isolators) 2. Assembly of the machine 3. Fixing, anchoring 4. Connection to energy supplies (e.g. electricity, compressed air) 5. Connecting to the disposal system (e.g. for exhaust gases, wastewater) 6. Adjustment of the machine and its components 7. Fencing 8. Feeding, filling, loading of ancillary fluids (e.g. lubricants, adhesives) 9. Testing 10. Running the machine without load 11. Trials with load or maximum load 12. Demonstration
Setting, Teaching, Programming and/or Process Changeover 1. Mounting or changing tools, tool-setting 2. Adjustment and setting of protective devices and other components 3. Adjustment and setting functional parameters (e.g. speed, pressure, force, travel limits) 4. Clamping/fastening the workpiece 5. Feeding, filling, loading of raw material 6. Program verification 7. Functional test, trials 8. Verification of the final product

Operation

1. Clamping/fastening the workpiece
2. Feeding, filling, loading of raw material
3. Manual loading/unloading
4. Operating manual controls
5. Driving the machine
6. Minor adjustments and setting of functional parameters (e.g. speed, pressure, force, travel limits)
7. Minor interventions during operation (e.g. removing waste material, eliminating jams)
8. Restarting the machine after stopping/interruption
9. Unclamping/unfastening the workpiece
10. Control/inspection
11. Supervision
12. Verification of the final product

Cleaning and maintenance

1. Adjustments
2. Cleaning, disinfection
3. Dismantling/removal of parts, components, devices of the machine
4. Housekeeping
5. Isolation and energy dissipation
6. Lubrication
7. Replacement of tools
8. Replacement of worn or damaged parts
9. Resetting
10. Removal and disposal of spent fluids
11. Restoring fluid levels
12. Verification of parts, components, devices of the machine

Fault-finding/trouble-shooting

1. Adjustments
2. Dismantling/removal of parts, components, devices of the machine
3. Fault-finding
4. Isolation and energy dissipation
5. Recovering from control and protective devices failure
6. Recovering from jam
7. Repairing
8. Replacement of parts, components, devices of the machine
9. Rescue of trapped persons
10. Resetting

11. Verification of parts, components, devices of the machine
Dismantling and disabling 1. Disconnection and energy dissipation 2. Dismantling 3. Removal and disposal of spent fluids 4. Lifting 5. Loading 6. Packing 7. Transportation 8. Unloading

Ergonomic	
1. Access	Discomfort
2. Design or location of indicators and visual display units	Fatigue
3. Design, location or identification of control devices	Musculoskeletal disorder
4. Effort	Stress
5. Flicker, dazzling, shadow, stroboscopic effect	
6. Local lighting	
7. Mental overload or underload	
8. Posture	
9. Repetitive activity	
10. Visibility	
Environmental	
1. Dust and fog	Burn
2. Electromagnetic disturbance	Slight disease
3. Lighting	Slipping or falling
4. Moisture	Suffocation
5. Pollution	
6. Snow	
7. Temperature	
8. Water	
9. Wind	
10. Lack of oxygen	

Hazardous Events

Shape or Finishing of Accessible Machine Parts
1. Contact with rough surfaces

2. Contact with sharp edges and corners, protruding parts
Moving Machine Parts 1. Contact with moving parts 2. Contact with rotating open ends
Kinetic or Potential Energy of the Machine Falling or ejection of objects
Stability of the Machine 1. Loss of stability
Mechanical Stiffness/Strength of the Machine 1. Deflection or break-up during operation
Pneumatic and Hydraulic Equipment 1. Displacement of moving elements 2. Projection of high-pressure fluids 3. Uncontrolled movements
Electrical Equipment 1. Direct contact 2. Disruptive discharge 3. Electric arc 4. Fire 5. Indirect contact 6. Short-circuit
Control system 1. Dropping or ejection of moving parts of the machine or of a workpiece 2. Failure to stop moving parts 3. Machine action resulting from inhibition of protective devices 4. Uncontrolled movements (including speed changes) 5. Unintended/unexpected start-up 6. Other hazardous events due to failure(s) or poor design of the control system
Materials and Substances or Physical Factors 1. Contact with objects with high or low temperature 2. Emission of a substance that can be hazardous 3. Emission of a level of noise that can be hazardous 4. Emission of a level of noise that can interfere with speech communication or acoustic signals 5. Emission of a level of vibration that can be hazardous 6. Emission of radiation fields that can be hazardous 7. Harsh environmental conditions
Workstation or Work Process Design

1. Excessive effort
2. Human errors/misbehavior (unintentional and/or deliberately induced by the design)
3. Loss of direct visibility of the working area
4. Painful and/or tiring postures
5. Repetitive handling at high frequency

4.11.16Appendix 7 - JSA Worksheet

Qatar Steel:

QATAR STEEL

JSA WORKSHEET

COR/HSE/SE/F029-01

Job:		JSA Conducted by(Team members):	
Department:			
Area:		Reviewed by:	
HIRA Reference no: (High Risk activities)		Approved by::	
Date of Issue:			

#	TASK STEP	SAFETY ISSUE/HAZARD/RISK	CAUSES	POTENTIAL INJURY/DAMAGE	Risk Ranking: Probability	People	Assets	Environment	Reputation	Risk Ranking	CONTROLS	RESPONSIBILITY
	Breakdown the job into a sequence of steps/tasks. Describe what is done not how it is done. Include preparation, execution, testing and wrap-up.	For each step define the safety hazards, risks and concerns. Consider process hazards, materials, conditions, ergonomics, skills etc.	For each hazard or risk define the potential causes.	For each hazard or risk define the worst case, credible scenario that could occur. Refer to QSC risk matrix for guidance on severity.		Severity					For each hazard or risk, define the protective measures to be taken.	Assign responsibility to ensure that the safe procedures, actions are implemented.
1	Position vehicle and prepare to change tyre.	Getting hit by a passing vehicle.	Vehicle not positioned far enough from traffic lane.	Possible fatality.	B	4	2	0	0	M	Stop as far away from the traffic lane as practicable.	Driver.
		Vehicle falls of jack.	Ground beneath jack is soft or not level.	Possible major injury.	A	3	2	0	0	L	Find firm footing for the jack. Raise in steps to confirm stability.	Driver.
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Drafted By:	Reviewed by:	Approved By:

Contractor:

Contractor Logo	JSA WORKSHEET		
Job:		JSA Conducted by(Team members):	
Department:			
Area:		Reviewed by (QS):	(Department Engineer, on who's request the contractor is working)
High Risk activities	HIRA Reference no:	Approved by(QS):	(HSE representative)
Date of Issue:			

#	TASK STEP	SAFETY ISSUE/HAZARD/RISK	CAUSES	POTENTIAL INJURY/DAMAGE	Risk Ranking						CONTROLS	RESPONSIBILITY
					Probability	People	Assets	Environment	Reputation	Risk Ranking		
	Breakdown the job into a sequence of steps/tasks. Describe what is done not how it is done. Include preparation, execution, testing and wrap-up.	For each step define the safety hazards, risks and concerns. Consider process hazards, materials, conditions, ergonomics, skills etc.	For each hazard or risk define the potential causes.	For each hazard or risk define the worst case, credible scenario that could occur. Refer to QSC risk matrix for guidance on severity.		Severity					For each hazard or risk, define the protective measures to be taken.	Assign responsibility to ensure that the safe procedures, actions are implemented.
1	Position vehicle and prepare to change tyre.	Getting hit by a passing vehicle.	Vehicle not positioned far enough from traffic lane.	Possible fatality.	B	4	2	0	0	M	Stop as far away from the traffic lane as practicable.	Driver.
		Vehicle falls of jack.	Ground beneath jack is soft or not level.	Possible major injury.	A	3	2	0	0	L	Find firm footing for the jack. Raise in steps to confirm stability.	Driver.
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