

**DEPARTMENT:** Construction Owners Association of Alberta

**SUBJECT:** Implementation of a Hazard Identification/Analysis Prior to the Start of a Project - Leading Indicator - Best Practice

## **1. PURPOSE**

To communicate to COAA members a best practice for the implementation of a Hazard Identification / Analysis process prior to the start of an industrial construction project.

### **1.1 SCOPE**

#### **Leading Indicator**

The completion of a Hazard Identification / Analysis process prior to the start of a construction project on industrial construction sites is identified as one of the top ten (10) Leading Indicators developed through the Construction Owner's Association of Alberta.

Leading indicators/activities are pro-active measurements associated with environmental, health and safety management system activities that are identifiable and are regarded as "best in class" performance measurements of construction environmental, health and safety management systems.

Traditional EHS measured indicators are lagging indicators reflecting the past performance of a project. The COAA top ten leading indicators are measurable activities that reflect positively on construction project EHS performance.

#### **Increase Knowledge of the Hazard Identification / Analysis process**

Each COAA member has its own hazard analysis techniques and risk matrix. It is not the intention of this best practice to provide a specific, or a trademark hazard identification / analysis program. It is assumed that the hazard identification / analysis processes utilized by COAA members have the same general result of identifying and controlling hazards.

In addition it is not the intention of this best practice to suggest a risk level matrix. Each COAA member needs to determine a risk matrix based on the member's own acceptability of risk.

The project Hazard Identification / Analysis processes continually evolves from the conception of the project and engineering phase, through construction, the commissioning of the unit, and the operating and maintaining of the unit.

Owners tend to concentrate on operate maintain aspects of the hazard assessment process. These types of hazard identification / analysis processes include but are not limited to:

- FEMA – Failure Modes and Effects Analysis
- LOPA – Layer of Protection Analysis
- PSM – Process Safety Management Analysis
- SIL – Safety Integrity Level Analysis
- HazOps – Hazard and Operability Analysis
- EIA – Environmental Impact Assessment

“Hands On” Contractors concentrate on the construction aspects of the hazard assessment process. These types of hazard identification / Analysis processes include but are not limited to:

- JHA – Job Hazard Analysis (task specific)
- Permits – Operations specific task requirements
- FLHA – Field Level Hazard Analysis – task assigned workers conducting a formalized task location assessment prior to starting work or after conditional change in the site environment.

Typically, a disconnect exists between the owner hazard identification / analysis process and the contractor’s process. The intention of this best practice is to provide a tool that compliments both processes to increase the performance of the hazard identification / analysis process to lower the likelihood of incidents occurring.

### **Hazard Identification / Analysis Template**

This best practice includes a straw model Hazard Identification / analysis process that provides a generalized template to be implemented prior to the “pre-mobilization” phase of a project.

### **Hazard identification / Analysis process**

The hazard assessment process spans the life span of the project from the project Scoping phase to the completion and turnover of the project to the client. This best practice generates a flow chart to provide a visual checklist, and to demonstrate the need to integrate the pre-award Hazard Identification / Analysis process with other Environment, Health, and Safety (EHS) management systems (Site Specific EHS Plans), and typical Hazard Analysis systems (FEMA, LOPA, SIL, PSM, two week look ahead EHS integration assessments, JHA’s, HazOps, Permits, and Field Level Hazard Assessment). The flowchart models the utilization of the Hazard Identification / Analysis Process with other EHS Management systems.

### **Correlation between reducing incidents by utilizing leading indicators.**

The COAA best practices subcommittee has developed a list of 300 best practices that are considered leading indicators for the EHS performance of a project. The top ten leading indicators have the greatest impact on reducing incidents. Ultimately, the intent of this best practice is to provide a tool that reduces incidents on industrial construction work sites. It is to be applied appropriately by all COAA members.

## **1.2 Responsibilities**

COAA members are responsible for the implementation of this best practice within their project management systems. The development of hazard identification / analysis processes at each phase of design/construction from DBM through to pre-mobilization. If the COAA member retains the Prime Contractor responsibility then the COAA member is responsible to audit the hazard identification / analysis process for currency, accuracy, and integration during the projects life span.

Engineering houses are responsible for the implementation of this Standard within their project management systems. The development and implementation of hazard identification / analysis processes at each phase of design from the Scoping study phase through DBM, and EDS phases.

The “Prime Contractor” is responsible for the implementation of this Standard within their project management systems. The development and implementation of hazard identification / analysis processes at each phase of construction from the identification and acceptance of the “Prime

Contractor” role, through the contractor selection and pre-bid meetings, during the construction phase and concluding at the contract completion. The Prime Contractor is responsible to audit the “hands on” contractor and their hazard identification / analysis process for currency, accuracy, and integration during the projects life span.

“Hands On” contractors are responsible for the implementation of this Best practice within their project management systems, and the development and implementation of hazard identification / analysis processes at each phase of construction from the pre-bid meeting through to turn-over to the client.

### **1.3 Definitions**

#### **DBM**

Design Basis Memorandum

#### **EDS**

Engineering Design Specification

#### **Hazard Identification / Analysis**

The objective of any hazard identification / Analysis process is to introduce hazard identification and controls early in the project by identifying risks associated with the project.

#### **Hazard Assessment**

A formal process used to identify hazards that may create losses to people, equipment, materials, property or the environment.

#### **HAZOP**

A Hazard and Operability (HAZOP) study is a structured process which is intended to identify all possible deviations from the way a design is intended to work and all of the hazards or operational difficulties associated with those deviations.

#### **Job Hazard Analysis (JHA)**

During the hazard assessment process certain tasks will be identified that present additional risk. These tasks will require additional review and assessment and a specific safe work procedure developed for the task.

#### **Procedures**

Procedures refer to step-by-step task descriptions associated with project.

#### **Risk**

Probability that during a period of activity a hazard will result in an incident with definable consequence

#### **Risk Management**

Reduction of the consequence and probability of risk or risks to an acceptable level to ensure a zero injury workforce

## **2. BEST PRACTICE**

A majority of the hazards associated with a project can be and are identified early in the design and development phase through the use of formalized hazard analysis techniques.

Typically, the engineering and the owner representatives will conduct a macro hazard identification / analysis and correct and control identified hazards in the design and engineering phases of the project. This is prior to the “hands on” contractor selection phase.

It is recommended that the result of the hazard identification / analysis process are incorporated at the various design reviews, and contractor assessment meetings (DBM, EDS, pre-bid meeting, contract award meeting, and pre-mobilization meeting- see hazard identification / Analysis process flow chart). A copy of all hazard identification / analysis (“macro analysis”) must be part of the owner’s deliverables, at the pre-bid meeting, to the “hands on” contractors bidding the work.

Hazard identification, analysis, and reporting do not terminate at the pre-bid meeting. The hazard identification / analysis process, like the entire EHS process must be an on-going active “evergreen” process if it is to affect the EHS performance of the project.

The macro analysis provided to the “hands on” contractors should be a summary of all of the hazard identification / analysis completed prior to the “pre-bid” meeting. It should provide a background to the contractor on the scope of the project, and the limitations of the assessment (see Appendix 1A.).

The analysis should then describe in general the hazards associated with the location of the project (see Appendix 1A.).

Health and hygiene hazards need to be considered, based on the scope of the project, and current controls for these hazards are to be outlined with any suggested controls for the length of the project. Applicable owner, or prime contractor procedures, practices, standards, and policies should be referenced for the contractor’s use (see Appendix 1A.).

Safety hazards need to be considered, based on the scope of the project, and current controls for these hazards need to be outlined with suggested controls for the length of the project. A comparison of the possible tasks during the project to the legislated Occupational Health and Safety requirements is suggested. Applicable owner, or prime contractor procedures, practices, standards, and policies should be referenced for the contractor’s use (see Appendix 1A.).

Environmental hazards need to be considered, based on the scope of the project, and current controls for these hazards need to be outlined with suggested controls for the length of the project. A comparison of the possible tasks during the project to the owner or site environmental requirements is suggested. Applicable owner, or prime contractor procedures, practices, standards, and policies should be referenced for the contractor’s use (see Appendix 1A.).

Security concerns need to be considered, based on the scope of the project, and current controls for these hazards need to be outlined with suggested controls for the length of the project. A comparison of the possible concerns during the project to the owner or site security requirements is suggested. Applicable owner, or prime contractor procedures, practices, standards, and policies should be referenced for the contractor’s use (see Appendix 1A.).

After delivery of the macro analysis to the contractor; the contractor is then expected to take the owner’s macro analysis and make it contract specific. The contractor will integrate this macro

analysis, and develop their site specific EHS plan based on their micro (task specific) hazard id / analysis.

The contractor's EHS plan should be submitted to the owner, or Prime Contractor, at the contract submission stage for review as part of their contract submission. COAA members should incorporate this into their contract requirements, and review the submission for completeness and project competency. This then becomes a due diligence document for the owner and prime contractor.

Through the life of the program, the hazard identification / analysis must constantly be reviewed for currency and accuracy. It is an "evergreen" document that is the basis for the integration of EHS systems in the project scheduling and planning process. It is then the responsibility of the owner, or prime contractor, to audit the hazard identification / analysis process for currency, accuracy, and integration during the projects life span.

### **3. IMPLEMENTATION**

Implementation by COAA members requires integration of this best practice in COAA member's Engineering and Design, Contractor Management, and Hazard Analysis standards, practices and procedures.

#### **Engineering and Design**

In the engineering and design phase; hazard assessments, of any type need to be conducted with the results documented and carried forward to the next stage of design to ensure consistency in the development of the hazard assessment and control process through out the life of the project. These assessments (including environmental impact assessments) are the foundation of the macro assessment.

#### **Contractor Management**

The contractor management phase requires the creation of a macro assessment – Hazard Identification / Analysis Process – to be in place prior to the start of the project.

To ensure that this measurement is met for all industrial projects it is necessary for COAA members to review their contractor management program from the qualification and pre-bid phase through to commissioning and turnover of the project. Resources are required to complete the Owner's portion of the hazard identification / analysis process as well the evaluation of the contractor's EHS plan based on the hazard identification / analysis and the contract specific task analysis. In addition resources are necessary for the auditing function to ensure that the hazard identification process utilized by the contractor is current and accurate.

#### **Hazard Identification Analysis**

Hazard analysis requires COAA members to implement a hazard identification tool that meets the general template provided, and to ensure competent individuals facilitate this process.

#### **Implementation**

Leadership within each COAA member is responsible to carry out the implementation of this and other COAA endorsed best practices within the framework of their organizations.

### **4. INTERPRETATION AND UPDATING**

The Safety Chairperson of the Construction Owners Association of Alberta, Safety Committee shall ensure interpretation and updating of this best practice.

**5. APPROVED BY**

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Peter Dunfield  
Safety Chairperson  
Construction Safety Association of Alberta (COAA)

**Attachment 1A.**

**Known and Potential  
Health, Safety, Environment and Security**

**Pre-Bid Hazard Identification / Analysis**

**Contract Number:** \_\_\_\_\_

**Project Name:** \_\_\_\_\_

**Location:** \_\_\_\_\_

**Background:**

- Describe the scope of the project.
- Establish the limitations of the analysis.
- Establish which hazard assessments have been completed to date and attach these assessments (provided there are not intellectual property issues) to the appendix.

**Location:**

- Define the specific location of the project.
- Include any hazards directly the result of location (examples may include):
  - traffic hazards, and access to the site
  - congestion due to the plot plan,
  - environmental considerations due to water runoff
  - weather
  - process considerations
  - known or unknown underground utilities
  - soil compaction with regards to trenching/excavations
  - emergency response concerns
- Include suggested controls for the identified hazards
- Include a reference to any studies or hazard assessments that assessed the location previous to this document (add documents to the Appendix).

**Health:**

- Define the specific health, and hygiene issues related to the project or site.
- Include any health, and hygiene hazards directly the result of project (examples may include):
  - A list of possible chemical and biological exposures (MSDS requirement) as a result of the location of the project, or the materials to be used in the construction phase (generally).
  - Determination of substances and processes requiring a code of practice
  - Occupational exposure limits for possible chemical or biological substances
  - Noise exposure (add documents to the Appendix).
  - Current, and past industrial hygiene studies, and determination of adequacy of the in-place program for the project (add documents to the Appendix).

- Suggestions for improvement of the monitoring of exposures over the life of the project
- Occupational Health Service needs based on the expected manpower requirements (include a construction manpower chart over the life of the project), and the regulatory requirements.
- Include suggested controls for the health, and hygiene hazards
- Include a reference to any studies or health/hazard assessments that determined the possible health hazards prior to this document (add documents to the Appendix).
- Include a reference to related owner, or prime contractor procedures, practices, standards, or policies.

**Safety:**

- Define the specific safety issues related to the project or site.
- Include any safety hazards directly the result of the project (examples may include):
  - Excavations/trenching
  - Working at elevations
  - Engineered, critical lifts
  - Hot Work
  - Confined Space
  - Lockouts
  - Tie-ins, hot taps
  - Personal Protective Equipment requirements
  - Permitting

Include a determination of the applicability of the Alberta Legislated Hazard Assessment requirements versus the scope of the project

- 52(1) Confined spaces
- 165(1) Explosive atmosphere
- 210 Manual lifting
- 221(1) Noise
- 228(1) PPE
- 233(2) Footwear
- 241(1) Life jackets
- 242 Limb/body protection
- 244(1) RPE (airborne contaminants)
- 270(3) ROPS
- 272(1) FOPS
- 291 Radiation
- 310(2) Machine guards
- 317 Machine failure
- 319 Cutting machines
- 362 Machine contact
- 389 Violence
- 393 Working alone
- Include a determination of the applicability of the Alberta Legislated Safety related code of practice requirements versus the scope of the project.
  - Confined Space
  - Respiratory Protective Equipment
  - Fall Protection Plan
  - Emergency Response

- Include suggested controls for these safety hazards
- Include a reference to any studies safety hazard assessments that assessed the possible safety hazards prior to this document (add documents to the Appendix).
- Include a reference to related owner, or prime contractor procedures, practices, standards, or policies.

#### **Environment:**

- Define the specific environmental issues related to the project or site.
- Include any environmental hazards directly the result of the project (examples may include):
  - Soil contamination
  - Air quality plan
  - Process upsets as a result of a construction incident
  - Waste handling
  - Hazardous waste
  - Recycle plan
  - Water management plan
  - Spill control
  - Emissions control
  - Discovery of unexpected conditions
  - Controlled products plan (Workplace Hazardous Information Management System)
- Include a determination of the applicability of the Alberta Legislated Environmental requirements versus the scope of the project (examples may include):
  - Alberta Environmental Protection and Enhancement Act
  - Operating Approvals (Limits of release)
  - Transportation of Dangerous Goods
  - Alberta Energy and Utilities Board Guide 55: Storage Requirements for the Upstream Petroleum Industry
  - Alberta Fire Code – Hazardous Waste Storage Guidelines
- Include suggested controls for these environmental hazards
- Include a reference to any studies or environmental impact assessments that determined the possible impact of the project prior to this document (add documents to the Appendix).
- Include a reference to related owner, or prime contractor procedures, practices, standards, or policies.

#### **Security:**

- Define the specific security issues related to the project or site.
- Include any security concerns directly the result of the project (examples may include):
  - Travel and site access
  - Defined site boundaries
  - Identification badges
  - Vehicle permits
  - Pre-Access Drug and Alcohol Testing
- Include suggested controls for these security concerns
- Include a reference to any studies or security assessments that determined the possible security implications of the project prior to this document (add documents to the Appendix).

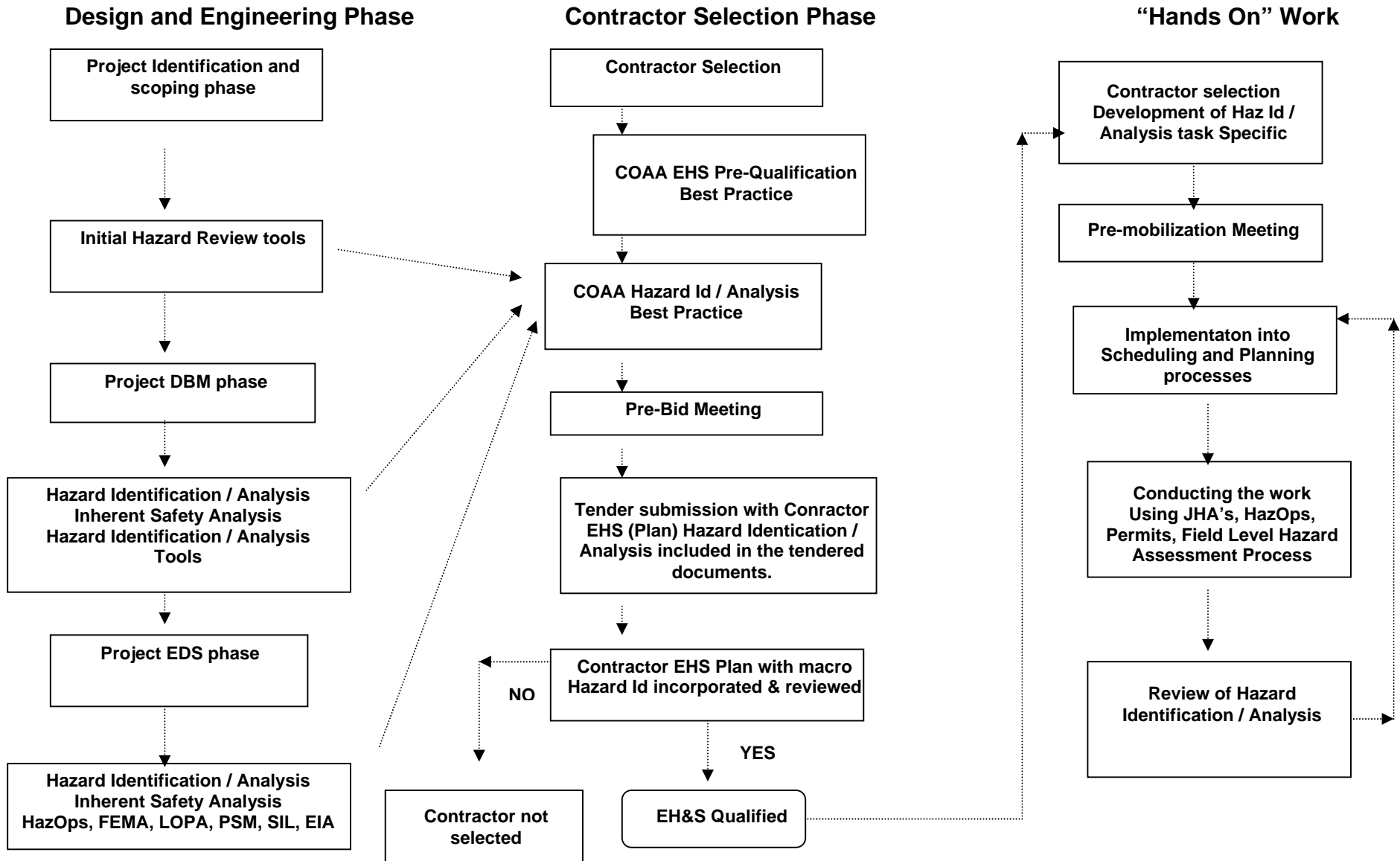
- Include a reference to related owner, or prime contractor procedures, practices, standards, or policies.

**Appendix:**

- Any document referenced in the Hazard Identification / Analysis

# Hazard Identification / Analysis Process Flow Chart

Attachment 1B.



## **COAA Vision for Safety**

***“No one gets hurt in heavy industrial construction”***

### **Safety Committee Mandate:**

***Work collaboratively to improve overall safety culture and performance in the construction industry - identify/develop/support Best Practices***

**COAA**  
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Association of Alberta**

