

**CONSTRUCTION OWNERS ASSOCIATION
OF ALBERTA
BEST PRACTICE FOR
MOBILE CRANES AND HOISTING**

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<u>SECTION 1: Scope:</u>	

The Mandate for the Cranes and Hoisting Best Practice Committee was as follows:

Under the direction of the Construction Owners Association of Alberta (COAA), collaboratively develop a Best Practice that significantly improves crane safety and reduces incidents, through the development and application of standardized, consistent practices to be used by industry within Alberta.

The committee's focus was on all mobile crane and hoisting equipment with a capacity of **5 tons or greater** (including boom trucks). The committee did not address overhead/indoor hoists and cranes.

Included in this Best Practice are those common practices and standards that the committee believes will move the crane and hoisting operations within the Construction Industry toward a more consistent standard of excellence in the areas identified in the Introduction section.

Note: This Best Practice does not in any way supersede the applicable Codes, Acts and Regulations and is intended to supplement these Standards. Users of this Best Practice should ensure their practices continue to comply with or exceed all applicable Legislation.

Introduction

Data from incident and injury analysis trends up to and including 1999 indicated that there were too many significant crane incidents occurring in Alberta. The outcome of these incidents often resulted in the loss of life for the Crane Operator or another member of the work crew. The COAA Safety Committee took the stand that this was unacceptable and therefore established the Crane and Hoisting Best Practice Sub-Committee to review this area of concern.

The Cranes and Hoisting Best Practice Committee identified several key areas of focus with the following goals to create better consistency in the construction industry:

1. Develop and implement a standard set of Roles and Responsibilities for those involved in lifting operations.
2. Develop and implement Training and Competency standards that are clearly defined for the industry.
3. Develop and implement minimum standards and skill sets for key personnel involved in lifting operations.
4. Develop and implement acceptable standards for routine crane maintenance and inspections that will ensure the integrity and performance of cranes in the industry.
5. Develop and implement acceptable standards and procedures for "lift planning".

The Committee was made up of and represented by the following organizations;

Owners – Syncrude Canada Ltd., Suncor Energy Inc. Oil Sands, Dow Chemical Canada Inc., Nova Chemicals Ltd.,

Contractors - North American Construction Group, Fluor Constructors Canada Ltd., PCL Industrial Constructors Inc., Inland Construction Limited, AMECO Services

Labour Providers – International Union of Operating Engineers Local #955, Boilermakers #146, Ironworkers, Edmonton Pipe Trades

Government - Alberta Human Resources and Employment (formerly Alberta Labour)

Crane Owners Association - Sterling Crane, Lampson Canada Ltd., Northern Crane Service, Etarco Mammoet

Education Providers - Provincial Apprenticeship Committee, Apprenticeship & Industry Training – Alberta Learning

Other Associations - Alberta Road Builders and Heavy Construction Association

Other groups updated on progress – Construction Labour Relations – Alberta, Alberta Mine Safety Association, Petroleum Institute Training/Canadian Association of Petroleum Producers, Construction Owners Association of Alberta Board of Directors,

Summary of Findings and Recommendations:

During the review of industry practices and the development of this Best Practice Document, the Committee identified several Key Findings and made suggested recommendations to address these. The following list includes several of the recommendations contained in the document and some that will require further developmental work by key stakeholder groups to see them implemented.

1. Roles and responsibilities need to be consistent within the industry so that actions taken during a lift have a standard practice associated with them.
2. Training and Competency requirements need to be clearly defined and on-going development in place within the industry.
3. Critical personnel involved in lifting operations need a minimum standard of skill and knowledge to perform operations in a safe and efficient manner.
4. Acceptable standards for routine crane maintenance and inspections will ensure the integrity and performance of cranes within the industry.
5. Acceptable standards, procedures, and guidelines regarding “lift planning” will help provide consistency within the industry.
6. Implementation of the Crane Operator Log Books to record the Operators work experience. This record will provide employers with a quick indication of the Operators capabilities in regard equipment used.

7. Preference should be given to Crane Operators who have received the Inter-Provincial “Red Seal” designation. Since this designation generally indicates a higher standard of demonstrated skill and knowledge than the pre-1991 Provincial Designation.
8. Drug and Alcohol testing pre-employment has been recommended for “Safety Sensitive” positions or roles associated with lifting operations.
9. The development and implementation of a continuing education program that will, on a regular basis, provide Crane Operators and Riggers with additional advanced or refresher training in critical or new skill and knowledge areas.
10. Proof of Safety program requirements should be included in the Contracting Bid process.
11. Availability of pertinent crane history, maintenance and repair records as well as relevant and up to date inspections sheets and logs should become common and consistent.

12. Medical examinations:

In the construction industry today there are many Skilled Trades or Craft groups that due to the nature of their work may be exposed to hazardous conditions. In fact, during the normal execution of their work, they may be involved in potentially high-risk actions and activities. With this in mind the Cranes and Hoisting Best Practice Committee has included the following suggestion for Employers and other Stakeholders to consider in their work practices and standards.

Periodic medical examinations similar to the Class One (1) Drivers License should become a requirement for key positions associated with crane and hoisting operations. In this way the employer and the worker will be assured that all of the critical physical and medical requirements to safely perform the work are maintained (i.e. eyesight, depth perception, etc.)

13. Lift Coordinator:

The Cranes and Hoisting Best Practice Committee has discussed and endorses the concept of a “Lift Coordinator” designation for Certified Trades personnel. This additional skill and knowledge designation has been deemed as an important next step towards a higher level of competency for those personnel that oversee and coordinate or supervise critical lifts. The Committee believes that all appropriate trade group stakeholders must be involved in the further development and implementation of this concept. Further development of this concept will be done under the direction of the Western Apprenticeship Coordinators Association (WACA).

14. A standardized and common skill training process should be developed to ensure all workers who perform rigging activities are consistently trained to a level of competency which ensures safe hoisting activities. This initiative is currently being worked on by WACA of the Building Trades Council.

SECTION 2

Roles and Responsibilities:

Roles and responsibilities have been identified and defined for all personnel associated with hoisting and crane activities. For each role listed below, a definition has been provided and a detailed list of specific recommended responsibilities relative to Cranes and Hoisting has been documented.

It is important to note here that the following roles and responsibilities are intended to define the work to be done and not to prescribe specific “jobs or positions”. In many cases it is very likely that one individual may be held responsible for multiple roles during a lifting operation. However, although these roles and responsibilities are assigned at the job site, it is critical that these roles and responsibilities are clear and understood by all involved.

Safety Sensitive Positions:

Given the high-risk nature of crane and lifting operations, it is suggested that all persons directly involved in lifting operations be considered as “Safety Sensitive”. With this in mind it is recommended that these positions be required to pass a pre-employment Alcohol and Drug test and should notify their employer of any known medical conditions which may affect their capability to safely perform their work.

Crane Operator:

Definition:

A competent worker in control of the crane who, for mobile cranes at 15 tons (boom trucks 5 tons) or greater lifting capacity, must be,

a) Certified to Alberta Apprenticeship standards,

Or,

b) An indentured apprentice working under the direction of a certified journeyman crane operator

Crane Operator Responsibilities:

- Operate the crane in a safe, controlled and smooth manner
- Maintain the following crane and lifting information:
 - Crane log book – equipment log book
 - Crane Operators Log Book – record of Operators work experience
- Confirm the load and rigging weight
- Select the appropriate boom, jib and crane configuration to meet lift requirements and determine the net lifting capacity of this configuration.
- Determine the number of parts of line required.
- Have a thorough understanding of the information in the crane’s operating manual and to understand the crane’s limitations.
- Know, understand and properly use the crane’s load charts.

- Inspect the crane daily and perform daily maintenance as prescribed by manufacturer and crane owner. Confirm operating aids and safety devices are operational (i.e.: load moment indicator, etc.)
 - Check that the site is adequately prepared for the crane.
 - Check that all hazards have been identified, e.g., power-lines, underground pipe-ways, culverts, etc.
 - Assemble, set up, rig and operate the crane properly in accordance with manufacturer's specifications
 - Inform site supervision of any dangerous conditions observed before or during crane operations.
 - Move the crane around the work-site either with or without a suspended load.
 - Assess weather conditions at time of lift to confirm lift can safely proceed.
 - Shut down and secure the machine properly when it is unattended
 - Complete a "Hoisting Information Planning Sheet" for each lift (refer to Appendix 1 for a sample sheet)
 - Cease operations if an unsafe situation or condition is present
-

Crane Owner/End User:

Definition: Has "Operational control" of the crane. This can also be defined as the Organization paying for the crane service. Example: The Operator and his/her employer. End User is the contractor when they "dry rent" a crane. Crane Owner is the company that provides a crane complete with operator.

Crane Owner/End User Responsibilities:

- Assign appropriately sized equipment and appropriately trained people to do the job.
- Maintain equipment according to manufacturer's recommendations and specifications.
- Provide cranes in a safe, operable condition in compliance with manufacturer's requirements and all applicable regulations.
- Establish and follow comprehensive preventative maintenance and inspection programs.
- Empower the crane operator to refuse to make a lift for safety reasons without fear of reprisal.
- Provide crane operators who are well trained, competent, certified and capable of performing the required work.
- Provide crane operators who fully understand how to use the load chart.
- Ensure crane operators are kept thoroughly oriented to all pertinent operating conditions and hazards including the crane and rigging configurations.
- Provide support system to the operator for consultation regarding safety issues prior to and during the lift.

- Inform crane operator of known hazards or requirements, e.g., high voltage power lines or underground cavities.
 - Provide competent personnel to maintain, repair, transport, assemble and erect the lift equipment.
 - Provide ongoing high quality training and upgrading programs to all personnel.
 - Inform site owner of site owner's responsibilities relating to crane use.
 - Maintain, for examination, the most recent inspection and/or certification record for each crane.
 - Inform operator that safety features may not be bypassed, defeated, disabled or tampered with.
 - Request and verify Crane Operator work experience and competency by reviewing the Crane Operators Log Book.
-

Facility/Site Owner:

Definition: Person in legal possession of the work site or the person with an ownership interest in the work-site who requests that the work be done.

Reference OH&S Act 1(i.01)

Facility/Site Owner Responsibilities:

- Clearly define requirements, expectations, and specifications in contract documents
 - Confirm Crane Owner/End User has been qualified to work on the site
 - Require and confirm that third parties providing cranes and/or operators are in compliance with applicable laws and regulations, including facility owner's standards.
 - Require and confirm that key personnel (crane operator, rigger, lift coordinator) know and understand their roles and responsibilities including facility owner's standards and carry them out.
 - Consult with crane owner/end user to determine if any site preparation is required.
 - Determine level of supervision to be supplied by the crane owner.
 - Ensure roles and responsibilities of the crane owner/end user, crane operator and site supervision are clearly defined and understood.
 - Confirm all lifts have been assessed.
 - Confirm all lifts have been appropriately planned
 - Confirm all permits for crane activities are issued as appropriate.
 - Work with Lift Coordinator to develop assessment including emergency action plans
-

Lift Coordination Role:

Definition: The person at the lift site who has responsibility for the safe and effective coordination of the lift.

Lift Coordination Responsibilities:

- Assess lift specifics to determine what classification of lift applies.
- Employ a lift plan appropriate for the classification of lift.
- Participate in the development of lift plans for all Serious and Critical lifts.
- Ensure appropriate personnel review lift plans.
- Ensure that the ground beneath the crane can support the loads imposed by the crane.
- Ensure that adequate space is provided to safely assemble, erect, and operate the crane, as well as materials such as timber mats, cribbing and blocks.
- Ensure cranes are placed in the optimum locations for capacity and clearance from obstacles.
- Ensure cranes are currently certified with all known deficiencies corrected.
- Inform the crane operator of any hazardous site conditions, e.g., water lines, sewers, overhead power-lines, etc.
- Ensure that the load weight, center of gravity and maximum radius required for the lift have been accurately determined.
- Check the crane charts to ensure the machines are rigged in the optimum configuration.
- Confirm initial pick and final set locations and orientations of the object are correct and the best possible.
- Communicate the load weight to the crane operator.
- Ensure pre-lift meetings to discuss all hazards in detail to minimize risks and ensure and that the workers all have an opportunity to input and participate and that everyone is aware and ready for the work to be performed.
- Verify that the Crane Operator is properly certified and competent to safely perform the lift and use the equipment designated.
- Verify only competent rigging personnel to work with the crane.
- Ensure the lift procedure and plan are followed explicitly and that any required changes to the plan are reviewed with the Lift Engineer/Rigging Specialist prior to implementing the change. If the lift can not be carried out as per the Engineered plan, then the lift must be stopped until a formal review has been conducted and all parties understand the revised plan.
- Work with the site owner to develop an emergency action plan and communicate it to all personnel involved with the lift.
- Designate a competent signal person and identify this person to the crane operator. Radio communications may be necessary if a direct line of sight is not possible.

- Ensure that each load is properly rigged for lifting. Determine that the load is secure and balanced before lifting more than a few centimeters above the support.
- Assess weather conditions at time of lift to confirm lift can proceed safely.

Lift Engineer/Rigging Specialist:

Definition:

A person who is,

- a) A Professional Engineer as defined by the General Safety Regulations [GSR 1(1)(+ t)]

And/Or

- b) Deemed by the employer to be appropriately trained in the preparation and development of lifting studies.

Lift Engineer/Rigging Specialist Responsibilities:

The requirement for using the expertise of a Lift Engineer/ Rigging Specialist will be determined by the Facility and Crane owners based on the specifics of the lift to be done.

Primary Duty

- The primary duty of the Lift Engineer/Rigging Specialist with respect to lift studies is, as with all engineering functions, to ensure the protection of life, limb and property, of both the companies and personnel involved and the public, through the sound application of knowledge, training and experience.
- The Lift Engineer/Rigging Specialist will provide technical support and resources for the planned lift.

General Duties

Investigate and understand the nature of the lift.

- What is to be lifted, size, weight, center of gravity, special conditions, etc.?
- What is the initial and final position, orientation, elevation, etc. of the load to be lifted?
- Are there any special weather/climate conditions or concerns?
- Are there any special ground or area conditions or concerns? Soil compaction, matting requirements to ensure stable ground conditions for the crane.
- Has the equipment been pre-determined and what is available?

Design the Lift (plan how to make the lift)

- Identify the optimum location for the cranes for capacity and clearance from obstacles.
- Will the crane(s) have to travel or swing?
- Size the crane(s) to suit the requirements, both primary and secondary as may be required. Crane capacity must be calculated through each phase of the lift.

- Calculate the point loading on all cranes involved in the lift, i.e. tracks and outriggers.
- Size, design and/or detail the rigging hardware to suit the lift.
- Prepare drawings, plans and specifications as required.

Communicate the lift

- Issue drawings, plans and specifications to the people who will make the lift.
- Review, discuss and revise as required with the people who will make the lift.

Planning

- Review drawings and/or site information to verify access, clearances, identify obstructions and eliminate interferences with respect to the lift.
- Verify lift lug information, both head and tail if required.
- Verify crane charts, boom length, and accessories required.

Design

- Plan how the crane(s) will physically make the lift.
- Specify the rigging, sling diameter, length and quantity.
- Select shackle size, clearance and quantity.
- Select and detail any new items required.
- Prepare sketches/drawings.

Workers who performs rigging duties (rigger):

Definition: A competent worker designated as the rigger.

Note: The degree of competency and responsibilities for the rigger must meet and be consistent with the requirements of the lift to be performed.

Responsibilities for workers who perform rigging duties:

- Must be competent to perform rigging activities
- Rig loads and equipment to the Manufacturers recommendations
- Interpret the sling charts and lift plans
- Identify appropriate rigging components for the load to be lifted
- Visually inspect rigging components on a regular basis and prior to each lift to ensure compliance with appropriate Standards, Codes, Specifications and Procedures (see CSA Z-150-98)
- Know and understand the operating parameters of cranes.
- Be capable of identifying different rigging components and to be knowledgeable in their proper application.
- Be capable of performing inspections of applicable rigging components to ensure they are in an adequate condition to perform the lifting tasks.
- Wire rope inspections should be performed to manufacturer's specifications and/or to the wire rope specifications established in the Rigging Manual produced by the Construction Safety Association of Ontario.
- Be able to produce documentation showing hours of training accomplished in understanding and applying principles and components.

- Be capable of reading Wire Rope/Synthetic Sling capacity charts.
 - Be knowledgeable of the different sling configurations available and know which to use on different load applications.
 - Be knowledgeable of the weight of the load to be lifted.
 - Be knowledgeable and capable of using the hand signal chart for hoisting and moving loads.
 - Give all signals in a slow, smooth and decisive manner.
 - Be aware of overhead hazards and obstructions.
 - Be aware that the swing path must be kept clear of vehicular and pedestrian traffic.
 - Be aware that the load should never be brought over the top of people.
 - Communicate with the crane operator throughout all stages of the rigging process.
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Crane Mechanic:

Definition:

A worker who is,

a) (i) Certified to Alberta Apprenticeship Standards as a “Heavy Equipment Technician”,

Or

(ii) An indentured Apprentice working under the direction of a Certified Journeyman Heavy Equipment Technician;

And

b) Deemed by the employer to be appropriately trained in the maintenance of crane and hoisting equipment.

Crane Mechanic Responsibilities:

- Maintain cranes to Manufacturer specifications
- Perform routine mechanical inspections of major operational components
- Record maintenance repair history
- Understand and apply manufacturers specifications and procedures
- Maintain crane logbook of repairs/inspections and adjustments completed.

SECTION 3

Training, Competency and Certifications:

In approximately 1989 many of the existing crane operators in Alberta were “Grand Fathered” into the Trade and received their Provincial Trade Certification. Training and testing for load chart reading was minimal until Apprenticeship Training commenced in 1991. The Inter-Provincial examination (RED SEAL) was implemented in 1995. This exam also included questions to verify operators knowledge for reading load charts. As a result, a competency gap may exist with some operators who have not completed Apprenticeship Training and/or successfully passed the Inter-Provincial (RED SEAL) Exam.

For this reason, it is recommended that companies should give preference to crane operators that have completed the Inter-Provincial Test (Red Seal) or have completed the Alberta Apprenticeship Training and received the Alberta Crane Operators Certificate after 1991, for all work performed by that company. A further preference should be given to operators with up-to-date operator logbooks, with verifiable history maintained for at least the past 24 months.

Crane Operators from out of Province (travel cards) are only permitted to operate cranes in Alberta if they have a valid Inter-Provincial Certificate as per the Alberta Apprenticeship and Industry Training Act.

Continuing Education and Safety Training:

Due to the rapid expansion and development of crane technology and use over the past few years, and the diversity and wide variety of cranes employed, it is recommended that Crane Operators in Alberta participate in an on-going education and development program. A “Continuing Education” program will ensure Crane Operators maintain a high degree of competency and are kept up to date with changes and advancements in the trade.

As an on-going action, development and implementation of a Continuing Education program will need to be done by the key industry stakeholder groups.

Typical topics to be included in a “Continuing Education” program could include the following suggestions;

- Safe Operating Practices
- Rules & Responsibilities
- Chart Reading
- Wire Ropes
- Load Rigging Practices
- Rigging Hardware
- Chains
- Inspection and Maintenance
- Multiple Crane lifts
- Reading and understanding Lift Plans

Minimum Competencies:

Lift Engineers/Rigging Specialist:

- Knowledge of hardware and equipment (cranes, rigging, slings, wire ropes, load charts, etc.)
- Experience with lift procedures
- Working knowledge of American Institute of Steel Construction (AISC) and other relevant standards, codes and practices.
- Ability to prepare and interpret site and lift plans and drawings
- Drafting and/or auto-cad experience

Lift Coordinators:

- Ability to read and understand Lift Plans and drawings
- Sound working knowledge and understanding of the use of hardware and equipment (cranes, rigging, slings, wire ropes, load charts, etc.)
- Task leadership abilities
- Communication skills
- Ability to work under stressful conditions
- Ability to make critical decisions
- Previous experience with lift execution and familiarity with the type of lifts being conducted
- Ability to identify hazards and risks associated within the lift area

Crane Operators:

- Provincial or Inter-Provincial Certification or an Indentured Apprentice
- Sound working knowledge and understanding of the hardware and equipment (cranes, rigging, slings, wire ropes, load charts, etc.)
- Ability to read, understand and implement lift plans, lift studies and drawings
- Ability to recognize hazards and risks within the lift area
- Clear understanding of lift dynamics
- Previous experience or familiarity with the type of lift to be performed

SECTION 4

Standards for Inspections and Performance Monitoring:

Inspections and Performance Monitoring has been broken out into two broad categories, 1) the physical crane itself, and 2) the related equipment commonly used in lifting operations.

1) Crane Inspection and Monitoring:

- a) Crane Log book (equipment log)
- b) Current Crane History (2-5 years) (i.e. material hoisting, duty cycle work, claming, drag line work, etc.)
- c) Maintenance Records and Reports
- d) Inspection Reports (Engineered, Quality assurance Inspections)
- e) Physical Conditions Inspections (Pre/Post Lease)

When documents # b-e listed above are compiled into one package they will constitute the complete “pedigree” for the crane and will be available to interested parties including the Operator.

2) Hoisting & Lifting Inspections and Monitoring:

- a) Hazard Assessments
- b) Personnel Lifting Devices
- c) Rigging Equipment

1) Minimum Critical Specifications for Crane Inspections and Monitoring:

Crane Log book: (See Appendix 2 for an example)

Pre-use checklists must be filled out daily and must include the following;

- Mechanical inspection
- Structural condition
- Time, Date, Weather conditions
- Modifications
- Hour Meter reading
- Damages
- Running repairs
- All incidents involving the crane
- “Shock loading” incidents

Current Crane History (2-5 years):

For large jobs the history is usually asked for in Contract bid documents, this is not always the case for smaller jobs. The crane history should be asked for on all lifts regardless of size. The extent of history required may vary based on the classification of the lift. The crane history will include the following:

- Equipment serial numbers
- What type of crane it is

- What type of lifts the crane has performed (size and weights involved).
- When and where the lifts were performed
- All incidents and any shock loading events involving the crane.
- Material hoisting
- Duty cycle work
- Claming, drag line work, etc.

Crane Maintenance Records and Reports:

The crane maintenance records will include, but not be limited to the following items:

Preventative maintenance (PM's) program:

- Checklists – what was checked
- Frequency of Preventative Maintenance checks
- Date of last Preventative Maintenance check
- Any repairs made during the Preventative Maintenance check
- Whether the Preventative Maintenance program comply with the Manufacturers specifications.

Any incidents or shock loading events involving the crane

- What happened
- When the incident happened
- Evaluation results for equipment inspection post incident

Inspection Reports:

The types of Inspection Reports included in this section are generally prepared by qualified Engineers and will require Engineers stamp of verification on the report.

These inspections are typically performed to re-certify the crane and serve as a Quality Assurance function. Inspection will be performed as per the following:

- At a frequency indicated by the Manufacturer specifications
or
- At least annually
or
- After any incident involving the crane
- The Inspection report must include the specifics of what was looked at and what was found during the inspection.

NOTE: All repairs for any damage must be documented to record that proper, repair procedures have been followed, Quality Assurance inspections have been performed and crane re-certification has been completed.

Physical Conditions Inspections:

Physical Condition Inspections are typically performed prior to issuing the crane through a lease agreement, as well as when the crane is returned from a lease. The purpose of the inspection is to verify the physical condition of the equipment before turning it over to, or returning it from, operation.

Other types of Physical Conditions Inspection are those conducted on a Daily, Weekly and Monthly basis. These are typically considered equipment Pre-use checklists used by Crane Operators and Lift Coordinators on a regular basis.

2) Hoisting & Lifting Inspections and Monitoring:

Hazard Assessments:

Hazard Assessments must be conducted prior to any hoisting or lifting operation. These assessments may vary dependent on the site specifics and location as well as the classification of the lift. Hazard Assessment review teams should include all key parties involved in the lift as well as members of the local Operating Units (if applicable). In some situations an independent third party review may be deemed appropriate.

Each Hazard Assessment will be:

- Site and job specific
- Accounted for in the lift plan
- Include hazard and risk mitigation actions
- Include contingency and emergency response plans

Typical Hazard Assessments will consider but not be limited to the following issues:

- Percent of crane capacity
- Changes or transition of critical personnel associated with the lift
- Ground conditions
- Compaction
- Overheads – lines, obstructions, etc.
- Underground equipment or hazards
- Trajectory of load if dropped (which way will it fall)
- Electrical equipment – conductors
- Weather conditions
- Outrigger and track loading
- Matting
- Process operations – local process hazards
- Area personnel
- Multi-lift plans
- Etc.

Inspections of Personnel Lifting Devices:

Inspections required for Personnel Lifting Devices are well documented in the OH&S Legislation. Compliance to this Legislation is mandatory.
(CSA – Z 150 - 98).

The design, assembly and use of personnel lifting devices must comply with all applicable Codes, Legislation and Industry Standards.

Man Baskets should be properly certified and maintained in accordance with applicable Standards.

See appendix 3 for a typical example of a Personnel Hoisting Permit.

Inspections of Rigging Equipment

Records for Rigging Inspection will include, Visual daily inspections, maintenance and history.

All Rigging must be inspected and used according to OH&S Regulation, Manufacturer specifications and in some cases, site specific rules.

See Appendix 4 for a sample Rigging component inspection form.

SECTION 5

Lift Assessments and Planning:

The minimum Standards and Critical Specifications for Lift Assessments and Planning will include the following:

- 1) Lift Assessment Processes
- 2) Lift Planning Processes – knowing the load
- 3) Classifications of Lifts – terminology, standards, controls (Standard, Serious, Critical)
- 4) Engineered Lifts / Non-Engineered Lifts
- 5) Crane lift capability and selection matched to load
- 6) Operator skills and competencies selection matched to lift requirements
- 7) Lift Controls
- 8) Supervision of Lifts (ensuring compliance to lift requirements and plans)
- 9) Permits
- 10) Meetings of all types – planning meetings, pre-lift meetings, hazard assessment meetings, etc)
- 11) Communications – pre-lift, during the lift, post-lift, etc.
- 12) Emergency planning and procedures
- 13) Incident response
- 14) Lift Procedures – standardized checklist review process, depth dependant on lift criteria and classification

Multi-Crane Lift Planning Summary:

“SIMPLE COMMON SENSE” refers to the “rules” for planning, engineering and executing crane lifts. Some of these “rules” are legal requirements, while others may be site specific requirements.

Cranes that are going to be involved in the lift can be selected and rigged to carry anticipated loads with a suitably large reserve capacity to handle those effects that can't be quantified accurately.

One key to the success of a multi-crane lift is to understand how the weight of the lifted load will be distributed as the lift proceeds. The other key is planning, planning, planning...

Because of the complexity of multi-crane lifts, it is not possible to list all of the planning requirements. The following list represents a solid groundwork for lift planning;

- 1) If possible, use one crane. Often the extra money spent to bring in one crane large enough for the job, also brings extra safety out of proportion to the actual cost.
- 2) Know the exact weight and center of gravity location of the item to be lifted.
- 3) Develop a formal lift plan, which should consider;
 - Boom clearances to the load, rigging, site obstacles and each other.
 - A step by step lift plan with the load changes considered.

- Operations and engineering should develop this plan together, in order to draw from each other's experiences.
- 4) Use only very experienced people; engineers, operators, riggers, foremen, supervisors, and signalmen should all be well seasoned in this type of lift.
 - 5) Use cranes that have adequate excess capacity:
 - A rule of thumb is that all cranes in a multi-crane lift should be limited to not lifting in excess of 75% of their chart capacity. This may be safely exceeded on a single main lift crane with proper planning by experienced engineering and operations personnel. The 75% rule should never be exceeded on the tail crane, due to overloads that can occur during the lift due to signaling.
 - De-rating of all components is just good practice.
 - 6) Use proper ground preparation and matting; the travel path must be properly designed and prepared.
 - 7) Designate signalmen; usually one person is the rule, but if more are required, (ground crew and an erection crew), two-way radios with a dedicated frequency are recommended.
 - 8) Monitor the load lines for out of plumb conditions, and correct as the lift proceeds.
 - 9) Try to use cranes equipped with properly functioning (accurate and calibrated) load moment indicators.
 - 10) Check everything before the lift begins: All those involved in the lift should take part. This check should also include wind and temperature.
 - 11) Hold a pre-lift meeting. Any and all hazards should be discussed in detail, as this is to minimize risks. Ensure everyone is aware.
 - 12) Follow the lift plan; if conditions change and you must vary from the plan, **stop** the lift and discuss what will be changed. **CONSIDER THE IMPACT OF CHANGE.**
 - 13) Perform only one crane function at a time.
 - 14) Coordinate the cranes; if two cranes are hoisting in tandem, make sure the load stays **LEVEL** and the two load blocks move as one.
 - 15) Be prepared to stop; if anyone involved in the lift feels, at any time during the lift, that something isn't right – **STOP IMMEDIATELY!!**
 - 16) Stay calm and cool; if you are not the type of person that can do this, have your lift responsibilities designated to someone else.
 - Many major crane accidents can be traced back to someone who made a wrong decision because they got excited or could not think clearly under pressure.
 - Your next decision doesn't have to be quick, but it does have to be the right decision.
 - Know what you are doing; if you don't understand lever "A" then "leave her be".
 - 17) Watch for signs of stress and pressure on the crew members;
 - Yelling and shouting are often an indicator of someone who doesn't know what they are doing or that they can't handle pressure.
 - If there have been any disagreements, take a break before making the lift and make sure they are settled.

18) Make sure the lift area is cleared of all non-essential personnel. Only those directly involved with the lift, need to be there.

REMEMBER – COMMON SENSE ISN'T COMMON AT ALL

Classification of Lifts: The personnel involved in the Lift will apply the appropriate controls and coordination to ensure the safe and effective execution of the Lift (see following sections for recommended controls).

Many types of lifts are possible, however to ensure common terminology and consistency, all lifts will be defined using the following classifications;

- 1) Critical Lift
- 2) Serious Lift
- 3) Standard Lift

Critical Lift Criteria:

Any lift that meets any of the conditions listed below will be classified as a Critical Lift.

Electrical:

- Any load lifted over or near energized electrical equipment such as power lines, transformers, and switchgear (refer to Alberta General Safety Regulation, Section 26).

Buildings / Structures / Processes

- Any lift in a confined space or restricted area where the load or any part of the crane structure could come within 24 inches (600 mm) of any existing structure or building.
- Failure of the lift could endanger existing facilities or one-of-a-kind equipment or processes.

Single Crane Lifts:

- The load will be greater than 90% of the Manufacturer's rating chart.

Tandem Lifts (multi-crane lifts):

- Any crane lift involving two or more cranes lifting the same load simultaneously, where the load may exceed more than 75% of any one crane's lifting capacity as measured on the lifting chart.

Special Considerations:

- Any load where special lifting or rigging equipment configurations is used.

General:

- Any crane lift where the crane is setup over manholes, catch basins, sewers, sinkholes or other known surface or sub-surface interference's such as firewater lines etc.

Serious Lift Criteria:

- Any lift between 80% and 90% of rated crane capacity.
- Any crane lift where personnel are being hoisted in a personnel basket. Any lift requiring the use of a Man-basket (as per GSR Section 160 and CSA – Z150 - 98)
- Any crane lift where the load or any part of the crane could come within the approach limits of Power lines or transformers.
- Any crane lift where the actual weight of the load is unknown

Lift Controls:

Standard Lifts – Control of a Standard lift is typically done through the Operators Log Entry. This will include records of weight, radius and percentage of chart for each lift. In some circumstances a Lift Planning sheet may also be used (see Appendix #1).

Serious Lifts – Typically Serious Lifts will be controlled by completing a simple lift evaluation and documenting this (see Appendix 1 – Sample Hoisting Information Planning Sheet). The information recorded will include weight, radius, crane type, percentage of chart, rigging components, their capacities and also the signatures of those involved in the review.

Additional controls may be required given the exact nature of the lift to be performed. For example a Personnel Hoisting Permit (Appendix 3 – Sample Permit for Hoisting of Personnel) and/or a Power line Approach Permit may be required.

Critical Lifts – The minimum control for all Critical Lifts is an Engineered Lift Plan that includes all details of the lift including scale drawings showing configurations and clearances. This plan MUST be signed and approved by a qualified Lift Engineer or Rigging Specialist.

Section 6

Incident Reporting:

In general ALL crane incidents are to be reported and investigated to determine the root cause of the incident. Typical examples of incidents that must be reported are as follows:

- Shock loading
- Boom Contact
- Boom side loading
- Personal injuries
- Equipment damage
- Rigging damage
- Load shifting or Dropping
- Engineered lifts that do not work as planned
- Near misses
- Environmental incidents
- Equipment Upset (Crane tipping over)

Section 7

Basic Crane Safety Rules:

1. Know the equipment you are working with
2. Know your load and the radius
3. Understand and interpret load charts
4. Always use proper rigging practices
5. Inspect and monitor all critical equipment regularly
6. **Look up** and **LIVE**
7. Be aware of all surrounding area hazards and obstructions
8. Never walk under a raised load
9. Secure and restrict access to the lift area
10. If you are unsure or don't know – **STOP** and **ASK**
11. Ensure all personnel associated with lifting operations are competent and qualified to perform their work.

Section 8

Reference Materials, Resources and Training Programs:

- Exxon Crane Guide – Lifting Safety Management System
Published by:
Specialized Carriers & Rigging Association
2750 Prosperity Avenue, Suite 620
Fairfax, Virginia 22031-4312
Phone (703) 698-0291
- CSA Z150-98 - Safety Code on Mobile Cranes
- Occupational Health and Safety Act, General Safety Regulation, Part 7 and 8
- Rigging Manual – Construction Safety Association of Ontario (1996)
- OH&S – Serious Accident Reporting
- ASME B30.5-2000 - Mobile and Locomotive Cranes (revision of ASME B30.5-1994)

WEB LINKS:

www.wtc.ab.ca/scrane <<http://www.wtc.ab.ca/scrane>>

Schram Crane & Rigging Ltd. - Consultants is a firm that specializes in full lift planning and engineering services and offers a complete line of custom tailored safety training courses from "Critical Lift Management" to "Basic Rigging Safety".
e-mail: scrane@incentre.net <<mailto:scrane@incentre.net>>

www.cranesafety.com

Crane Safety is a Sherwood Park company dedicated to training operators, supervisors and riggers in the safe operation of hoisting equipment.

www.ccohs.ca/oshanswers/safety_haz/Materials_handling/hitches.html

Information and diagrams on a variety of hitches.

www.liftlink.com

Articles on safety and technical information for cranes, including rigging, personnel lifting and material-handling equipment. Look at the "Technical Library" and "Today's Notes" sections.

www.osha-slc.gov/SLTC/cranehoistsafety/index.html

A site from OSHA, U.S. Department of Labor, that contains information on crane and hoist safety for many different industrial applications.

ALBERTA HUMAN RESOURCES AND EMPLOYMENT LIBRARY:

Books:

"Safety in Crane Operations"
Toronto, ON: Industrial Accident Prevention Association
(TJ 1363 S23 1993)

Videos:

Making Your Move: The Safe Use of Overhead Cranes
(VC0300)

High Impact Crane Safety
(VC 0307)

Cranes, Slings and Hoist Safety
(VC 0254)
Crane Safety
(VC 0116)

Hand Operated Hoists
(VC 0083)

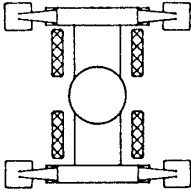
Power Operated Hoists
(VC 0084)

Rigging Equipment Over the Floor
(VC 0085)

Rigging Wire Rope Slings
(VC 0086)

Appendix 1 – Sample Hoisting Information and Planning Sheet

APPENDIX III

- HOISTING INFORMATION AND PLANNING SHEET -	
JOB DESCRIPTION:	DATE :
AREA CONTACT:	S.W.P. # :
LOCATION:	J.T. # :
OPERATOR NAME:	CRANE SIZE:
WEIGHT OF LOAD INFORMATION PROVIDED BY:	
- LIFT INFORMATION -	- LIFT DIAGRAM -
<p>WEIGHT OF LOAD: _____ LBS</p> <p>ALLOWANCE FOR EXTRA WEIGHT: _____ LBS (Scale, Sludge, Internals, Liquid etc.)</p> <p>WEIGHT OF RIGGING: _____ LBS</p> <p>WEIGHT OF BLOCK OR BALL: _____ LBS</p> <p>WEIGHT OF ATTACHMENTS: _____ LBS</p> <p>TOTAL WEIGHT TO BE LIFTED : _____ LBS</p> <p>MAX. RADIUS TO BE USED: _____</p> <p>BOOM LENGTH: _____</p> <p>BOOM ANGLE: _____</p> <p>CAPACITY FROM CHART: _____ LBS</p> <p>% OF CAPACITY: _____ (See example below)</p> <p>EST. CLEARANCE BETWEEN BOOM AND SURROUNDING FACILITIES: _____</p>	
<p>EXAMPLE:</p> <p>TOTAL WEIGHT TO BE LIFTED: 8,695 LBS</p> <p style="text-align: center;">DIVIDED BY</p> <p>CAPACITY FROM CHART: 15,500 LBS</p> <p>X 100 = % OF CAPACITY: 56.1%</p>	
<p>IS THIS A CRITICAL LIFT <input type="checkbox"/> Y <input type="checkbox"/> N <input type="checkbox"/> - IF YES, FS-34 CRITICAL LIFT CHECKLIST MUST BE COMPLETED</p>	

Appendix 2 - Sample of Crane Daily Operation Log book

WEEK ENDING:

SATURDAY _____, 19 ____

UNIT # _____

MODEL # _____

OPERATOR

<table border="1" style="width: 100%; height: 20px; border-collapse: collapse;"> <tr> <td style="text-align: center;">HOUR METER READING</td> </tr> </table>								HOUR METER READING
HOUR METER READING								

	S	M	T	W	T	F	S	OPERATOR COMMENTS
1 OIL LEVELS - ENGINE, TRANSMISSION, HYDRAULIC								
2 ANTIFREEZE (COOLANT), FAN BELTS								
3 HEADLIGHTS, TAILLIGHTS, CLEARANCE/MARKER LIGHTS								
4 BRAKELIGHTS, REVOLVING BEACON LIGHT								
5 BACKUP ALARM, HORN, WINDSHEILD WIPERS								
6 ALL GLASS CLEAR/GOOD CONDITION								
7 SWING BRAKE, HOUSE LOCK								
8 BOOM ANGLE INDICATOR								
9 WEIGHT LOAD INDICATOR								
10 ANTI TWO BLOCK DEVICE								
11 ALL INSTRUMENT GAUGES								
12 AIR PRESSURE, LOW AIR PRESSURE WARNING DEVICE								
13 AIR TANKS DRAINED								
14 PARKING BRAKE, FOOT BRAKES								
15 ALL CONTROLS FOR PROPER FUNCTION								
16 OUTRIGGER PADS, LATCHES, OUTRIGGER FLOAT PADS								
17 TIRE CONDITION/PRESSURE, WHEEL STUDS, (OR TRACKS)								
18 HOISTS (LOAD, WHIP OR BOOM)								
19 BOOM AND ATTACHMENTS								
20 HOOKS, LOAD BLOCK, HEADACHE BALL								
21 FUEL								
22 FIRE EXTINGUISHER								
23 OPERATOR MANUAL								
24 WALK AROUND INSPECTION FOR:								
LOOSE/MISSING BOLTS, PINS/COTTER PINS								
LEAKING FLUIDS, CROACKED/DAMAGED HOSES								
CRACKED WELDS, DENTS/DAMAGE,								
FRAYED/DAMAGED WIRE ROPE								
PROTECTIVE GUARDS/SHEILDS IN PLACE								

COMMENTS: _____

Appendix 3 – Sample Permit for Hoisting of Personnel

PERMIT FOR HOISTING OF PERSONNEL UTILIZING A MAN BASKET, SWING STAGE, BOSUN CHAIR		
1. Area Safe Work Permit is a prerequisite for Permit for Hoisting of Personnel 2. Hot Work Permit is required to move Hoist into Unit Area 3. No work is allowed except that shown on this Permit.	PERMIT NUMBER 93803	
Department _____ Date _____ Time _____ Unit Building or Area _____ Equipment to be Used _____ _____ Description of Work _____ _____ _____ _____ Number of Persons Being Hoisted _____		
	YES	NO
1. Has Facility Owner/ Supervisor been informed?		
2. For Hoist:		
A. Could other methods be used to do this work? Describe _____		
B. If Yes, state reasons for using Hoist _____		
C. Has Hoist Operator checked the following:		
(a) Hoist Cables Condition and Type		
(b) Hoist Brake		
(c) Condition of Man basket / Swing Stage / Boson Chair		
(d) Cable Blocks		
(e) Is a personnel hoisting tigger being used?		
(f) Have the operators / users been trained in the use of this equipment?		
(g) Positive Pin Latch or latch moused		
D. Who will operate the Hoist?		
• Operator		
• Helper		
E. Will a tag line be attached; if NO, explain why _____		
F. Will the Hoist location change during this operation? To what extent? _____		
G. Are the persons to be hoisted thoroughly familiar with hand signals?		
3. Has all personnel safety equipment been checked?		
4. Has wind velocity and direction been checked?		
5. Has the "Trail Lift" been completed?		
6. Can all locations of work be reached within 50% of the cranes rated load capacity?		
AGREEMENT I have checked the Permit and the Job. I understand the nature and extent of work and the precautions to be followed in completing the work.		
SIGNATURE		
Issued and Approved by Job Supervisor _____ Reviewed by Area Field Safety Specialist / Shift Supervisor _____ Hoist Operator (Receiver) _____ Work Completed Yes _____ No _____ Time _____ Hoist Operator Signature (Sign Off) _____		

WHEN IN DOUBT...LOOK ABOUT

Appendix 4 – Sample Rigging Component Inspection Data Sheet

Wire Rope Slings

	<u>No</u>	<u>Yes</u>	<u>Other</u>
• Broken wires	<input type="checkbox"/>	<input type="checkbox"/>	Amount _____
• Worn and abraded wires	<input type="checkbox"/>	<input type="checkbox"/>	Amount _____
• Fatigue fracture	<input type="checkbox"/>	<input type="checkbox"/>	
• Reduction in rope diameter	<input type="checkbox"/>	<input type="checkbox"/>	Amount _____
• Stretch	<input type="checkbox"/>	<input type="checkbox"/>	
• Corrosion	<input type="checkbox"/>	<input type="checkbox"/>	
• Insufficient lubrication	<input type="checkbox"/>	<input type="checkbox"/>	
• Damaged or inadequate splices	<input type="checkbox"/>	<input type="checkbox"/>	
• Corroded, cracked, bent, worn And improperly applied connections	<input type="checkbox"/>	<input type="checkbox"/>	Specify _____ _____ _____
• Kinks	<input type="checkbox"/>	<input type="checkbox"/>	
• Heat damage	<input type="checkbox"/>	<input type="checkbox"/>	
• Electric arc	<input type="checkbox"/>	<input type="checkbox"/>	
• Replace?	<input type="checkbox"/>	<input type="checkbox"/>	

Synthetic Web Slings, Round slings, Twinpath slings

	<u>No</u>	<u>Yes</u>	<u>Other</u>
• Worn or distorted fittings	<input type="checkbox"/>	<input type="checkbox"/>	
• Cuts	<input type="checkbox"/>	<input type="checkbox"/>	
• Holes	<input type="checkbox"/>	<input type="checkbox"/>	
• Punches	<input type="checkbox"/>	<input type="checkbox"/>	
• Tears	<input type="checkbox"/>	<input type="checkbox"/>	
• Frayed material	<input type="checkbox"/>	<input type="checkbox"/>	
• Broken stitching	<input type="checkbox"/>	<input type="checkbox"/>	
• Acid, caustic or heat burns	<input type="checkbox"/>	<input type="checkbox"/>	
• Replace? replacements	<input type="checkbox"/>	<input type="checkbox"/>	If Yes, identify _____ _____ _____

Appendix 5 - Sample Crane Inspection Report



NEIL F. LAMPSON, INC.
CRANE INSPECTION REPORT

PAGE 1 OF 2

MAKE: _____ MODEL: _____ SERIAL NO.: _____ EQUIP. NO.: _____

DATE: _____ LOCATION: _____ LESSEE: _____

PROJECT PERSONNEL: Name _____ Phone No. _____

1. GENERAL: Appearance _____ Paint _____
 Cab _____ Glass _____ Boom _____ Ladder _____
 Fire Extinguisher _____ Capacity Charts Posted _____
 Operator's Manual _____ Note any Grease/Oil Leaks _____
 Parts Book _____
 Remarks: _____

2. POWERPLANTS:
 2a. Upper Powerplant: Make _____ HOURMETER READING _____
 Operating Condition _____ Air Cleaner _____
 Remarks: _____

2b. Lower Powerplant (Truck Crane Only): Make _____
 HOURMETER READING _____ Operating Condition _____
 Remarks: _____

3. COOLING SYSTEM: Hoses _____ Anti Freeze _____ Flushed _____
 Water Condition _____ Radiator Core _____
 Remarks: _____

4. ELECTRICAL: Battery Condition _____ Water _____ Alternator _____
 Posts & Connections _____ Voltage Regulator _____
 Engine Instruments _____ Alarm System _____
 Remarks: _____

5. AIR SYSTEM: Compressor _____ V-Belts _____ Sump Drained _____
 Watts Line Oiler-Vicon Only _____ Oil Reservoir Full _____
 Remarks: _____

6. CONTROLS: Air _____ Manual _____
 Remarks: _____

7. DRAWWORKS: Boom Hoist _____ Boom Hoist Brake _____
 Cuno Filter _____ Sump Drained _____ Main Shaft Bushings _____
 Clutches _____ Ind. Swing Shaft Bushings _____ Clutches _____
 Drum Shaft Bearings _____ Clutches _____ Brakes _____
 "Y" Line Circ. _____
 Remarks: _____

8. a. TRACKS: Chains _____ Rails _____ Sprockets _____
 Idlers _____ Pins _____ Track Adj. _____
 Roller Path _____ Cutting Dogs _____ Travel Cases _____
 Remarks: _____

b. TRUCK CRANE CARRIER: Tires _____ Planataries _____
 Transmissions _____
 Remarks: _____

9. BOOM SUSPENSION: Gantry Sheaves _____ Lubed _____ Equalizer _____
 Backhitch _____ Intermediate Suspension Cables _____
 Gantry Lifting Device _____ Electric _____ Hydraulic _____
 Remarks: _____

10. BOOM INVENTORY (State Quantities Each Item or Length Feet as Noted).
 Check all Boom & Jib in Machine and/or in Storage.

(Quantity)	(Feet)	Basic Butt & Pt. No. (Type)	Pt. Sheaves	Basic Pendants
_____	_____	Split Taper Inserts	_____ Pendants	_____ Boom Pins/Bolts
_____	_____	10' Inserts	_____ "	_____ " "
_____	_____	20' Inserts	_____ "	_____ " "
_____	_____	30' Inserts	_____ "	_____ " "
_____	_____	40' Inserts	_____ "	_____ " "
_____	_____	(Total Ft.)	_____ "	_____ " "

State any required replacement lacings. List insert length, number, and lacing.

11. PENDANTS LUBED _____ CONDITION _____

12. SPREADER BAR _____ CABLE GUIDE ASSEMBLIES _____

13. JIB ASSEMBLY: Total Length _____ ' Jib No. _____ Basic Length _____ '
 plus _____ Quantity _____ ' Inserts. Pendants _____ (Quantity)
 Pendant Pins _____ (Quantity) Lubed _____ Condition _____

List any required replacement lacings below.

14. LOAD BLOCK: Make _____ Capacity _____ S/N _____
 Safety Latch _____

15. WEIGHT BALL: Make _____ Capacity _____ Safety Latch _____
 Swivel Hook _____ Top _____ Bottom _____

Remarks: _____

16. CABLES: Note any kinks, broken strands, gauged diameters all wire rope. Any abuse?
 Boom Hoist _____ ' _____ " Dia. Type _____ Core _____ Condition _____
 Load Line _____ ' _____ " Dia. Type _____ Core _____ Condition _____
 Whip Line _____ ' _____ " Dia. Type _____ Core _____ Condition _____

Remarks: _____

17. COUNTERWEIGHT: Bolts/Pins _____ (Quantity) Removing Devices _____ (Qty.)

18. TOOLS: List all tools w/crane _____

19. GREASE GUN _____ Oil Can _____ Track Jack _____
 Ratchet Jacks _____ Hydraulic Extenders _____

Additional Remarks: (Recommended Repairs or Servicing. Repairs or Servicing done.)

Parts Required:(Including Lacings) If parts have already been ordered by you or office put check mark next to each such part.

All Equipment is accepted in good servicable condition as noted:

REPORT FOR: (Check)

Lessee (Company) _____ Delivery & Assembly _____

By _____ Title _____ General Inspection _____

LAMPSON INSPECTOR _____ Disassembly & Loadout _____

Repair Work _____