



# **RP 1.0A: INSPECTION AND CERTIFICATION OF SUBSTRUCTURES**

A Recommended Practice (RP) for the  
Canadian Land-Based Drilling and Well  
Servicing Industry

**CANADIAN ASSOCIATION OF OILWELL DRILLING CONTRACTORS  
RECOMMENDED PRACTICE 1.0A  
INSPECTION AND CERTIFICATION OF SUBSTRUCTURES (DR/SR)**

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## **INTRODUCTION**

The Canadian Association of Oilwell Drilling Contractors (CAODC) Engineering & Technical (E&T) Committee has developed a Recommended Practice (RP) for substructures. This document dated October 2016 supersedes all prior editions of this Recommended Practice.

The information contained herein is a recommendation only of certification schedules for substructures currently utilized in the Canadian drilling and well servicing industry. An attempt has been made to establish some practical recommended operating practices for substructures equipment in the Canadian drilling and well servicing industry.

The recommendations contained in this document should be considered in conjunction with the requirements of the original equipment manufacturers (OEM). Companies should operate and maintain the equipment within the operating limitations, such as load ratings, as designed by the OEM.

If the OEM stipulates increased levels of inspection or accelerated inspection/certification cycles, the contractors must follow the OEM guidelines unless granted approval to follow this CAODC Recommended Practice by a Professional Engineer (P. Eng).

CAODC has produced this Recommended Practice based on industry experience. However, this document should be considered in conjunction with all relevant legislation and the requirements of provincial regulatory authorities. This document should not be construed as a legal opinion, and users are advised to seek legal counsel to address their specific facts and circumstances.

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## **HISTORY**

At the request of the Engineering & Technical and Safety & Technical Committees, CAODC Recommended Practice 3.0A section on substructures was deleted and the RP 1.0A practices adopted. This was because of the extremely small number of substructures in Canada used on service rigs.

## REVIEW PROCESS

CAODC Recommended Practices are reviewed and revised, reaffirmed, or withdrawn at least every three years. A one-time extension of up to two years may be added to this review cycle. Email any comments or items of concern to [rpfeedback@caodc.ca](mailto:rpfeedback@caodc.ca).

## RP REVISION SCHEDULE

Revision Date	Revision Details
October 2014	Introduction revised to standardize all RP's.
October 2016	Content standardized for alignment and reformatted into new RP template.

## 1. **SCOPE – LOAD BEARING ATTACHMENT POINTS**

- Any new load bearing attachment points must be certified by a Professional Engineer or an OEM Agent (as described in [Section 5.1 - Personnel Qualifications](#)) and identified with a capacity rating;
- The application of loads to members within the substructure, not considered in the original design, must be approved and certified by a Professional Engineer or an OEM Agent (as described in [Section 5.1 - Personnel Qualifications](#)).

## 2. **INSPECTION TYPES**

To ensure that substructures are properly maintained and serviceable, four levels of inspection are recommended:

### 2.1 **LEVEL I INSPECTION**

A Level I inspection is a visual observation of the equipment prior to, and/or during operation, and/or during routine maintenance.

#### 2.2.1 **LEVEL I INSPECTION PERSONNEL**

Level I inspections are performed by the rig crew and should also be included as part of the daily rig walkaround carried out by the Driller or Rig Manager.

#### 2.2.2 **LEVEL I INSPECTION DOCUMENTATION**

Level I inspections shall be recorded in the tour sheet.

### 2.3 **LEVEL II INSPECTION**

A Level II inspection is a Level I inspection that includes a more thorough inspection of, but not limited to, load areas and sheaves that includes checking for:

- Proper lubrication;
- Obvious external cracks;
- Damage and/or premature wear or deterioration;
- Missing parts or guards.

#### 2.3.1 **LEVEL II INSPECTION PERSONNEL**

Level II inspections should be carried out by the Driller or Rig Manager.

### **2.3.2 LEVEL II INSPECTION DOCUMENTATION**

Level II inspections shall be recorded in the tour sheet.

### **2.1 LEVEL III INSPECTION**

A Level III inspection requires rig equipment to be thoroughly checked in the field to determine serviceability. This may, at the certifying party's discretion, include Non Destructive Testing (NDT) techniques, and may require some minor disassembly of guards.

Upon reaching the required number of operating days, as outlined in [Section 3 - Inspection Frequency](#), substructures shall be Level III inspected. At a minimum, a thorough visual inspection of the following critical components is required:

- Mast pinning stools;
- Rotary table beams;
- Racking floor beams;
- Main beams supporting stools;
- BOP handling system;
- All other components deemed critical by the certifying party.

Any repairs required should be done in accordance with [Section 5 - Repairs, Maintenance and Documentation](#).

#### **2.1.1 LEVEL III INSPECTION PERSONNEL**

Personnel qualified to supervise and/or provide technical assistance> for a Level III inspection include:

- Inspection Personnel as described in [Section 5.1.1](#);
- NDT Technicians as described in [Section 5.1.3](#);
- Professional Engineer's as described in [Section 5.1.4](#);
- OEM Agents as described in [Section 5.1.6](#).

#### **2.1.2 LEVEL III INSPECTION DOCUMENTATION**

Level III inspections shall be documented in the CAODC Mast and Overhead Equipment Log Book, or suitable equivalent.

## 2.2 **LEVEL IV INSPECTION AND CERTIFICATION**

A Level IV inspection requires the equipment to be disassembled as required to do a complete inspection and may, at the certifying party's discretion, include NDT of all critical load bearing components.

Upon reaching the required number of operating days, as outlined in [Section 3 - Inspection Frequency](#), the entire substructure shall be Level IV inspected. At a minimum, the following procedure is required:

- Clean substructure as directed or required by the certifying party;
- Inspect the following critical components of the substructure:
  - Mast pinning stools;
  - Rotary table beams;
  - Racking floor beams;
  - Main beams supporting stools;
  - BOP handling system;
  - All other components deemed critical by the certifying party.

**Note:** *actual inspection requirements will be at the discretion of the certifying party.*

Any repairs required should be done as described in [Section 4 – Repairs, Maintenance and Documentation](#).

### 2.2.1 **(IF APPLICABLE) ONE-TIME EXTENSION PROVISION**

Prior to the 1000<sup>th</sup> operating day, a one-time extension of 100 operating days may be granted providing a Professional Engineer (as described in [Section 6.1.4](#)) performs a complete visual inspection of the entire substructure.

**Note:** *a well spudded prior to the expiry of the original 1000 operating days may be completed.*

### 2.2.2 **LEVEL IV INSPECTION AND CERTIFICATION PERSONNEL**

Personnel qualified to perform a Level IV inspection typically include:

- Professional Engineers as described in [Section 5.1.4](#);

- OEM Agents as described in [Section 5.1.6](#).

### **2.2.3 LEVEL IV INSPECTION AND CERTIFICATION DOCUMENTATION**

A certification document will be provided by the certifying party and should include the following:

- Document author;
- Date and period of certification;
- Substructure serial number (if available);
- Name of manufacturer (if available);
- Date of manufacture (if available);
- Manufacturer or Professional Engineer rating (if applicable);
- Load rating of the BOP handling system;
- Results of the Level IV inspection;
- Location of repairs (if applicable).

Additionally, Level IV inspections shall be documented in the CAODC Mast and Overhead Equipment Log Book, or suitable equivalent, and signed by the certifying party.



## Sample - Substructure Certification

for

### ABC DRILLING COMPANY

RIG 1

GEE BEE One Piece Substructure

Date: March 1, 2012

The Substructure Specifications and Ratings are as follows:

Serial No: XX-XXX

Floor Height: XX'-X" Ft / X.XX Meters

Casing Capacity XXX,XXX lbs / XXX,XXX daN

Setback Capacity XXX,XXX lbs / XXX,XXX daN

**Caution:** Utilizing unitized drawworks skid requires table to be supported properly to transmit casing loads to substructure

During February 2012 the ABC Drilling Rig 1 substructure was refurbished in ABC's yard in Nisku, Alberta. Repairs to defects as identified by XYZ Engineering's P.Eng and MPI Company (file no. xxxx) were repaired by the DEF Welding Company (Work Order no. xxxx). The Substructure was sandblasted and painted.

Based on these repairs and inspections, it is my opinion that the substructure is safe to operate within its rated capacity when used in accordance with manufacturers specifications and/or industry standards provided that the owner performs routine inspections as/per the CAODC RP1.0A Guidelines. This certification is valid for **1000 Operating Days** or until such time that the substructure is structurally damaged by operations, handling, or transportation.

XYZ Engineering Ltd.

Engineer's Stamp  
with Appropriate  
Jurisdiction

John Smith, P.Eng  
123 Avenue Street  
Edmonton, Alberta, XXX-XXX  
Phone: (XXX) XXX-XXXX  
Fax: (XXX) XXX-XXXX  
File No: XXXX

Permit to Practice Stamp  
or Permit Number

**3. INSPECTION FREQUENCY**

At a minimum, the inspection frequency for substructures shall be conducted in accordance with the schedule below.

**Note:** *should circumstances, OEM recommendations or individual experience dictate otherwise, CAODC member companies may conduct these inspections at greater frequencies.*

DOCUMENTATION	DAILY	RAISE & LOWER	250 DAYS	500 DAYS	750 DAYS	1000 DAYS
TOUR SHEET	I	II				
MAST AND OVERHEAD EQUIPMENT LOG BOOK			III	III	III	IV

**Note:** *one operating day = 24 accumulated operating hours from spud to rig release.*

**4. REPAIRS, MAINTENANCE AND DOCUMENTATION**

Occasionally repairs and/or maintenance following a Level III or IV inspection may be required to retain the operating integrity of the equipment. Any damage that requires repair will be categorized as minor or major as follows:

**4.1 MINOR DAMAGE**

Minor damage includes damage to:

- Ladders;
- Skids;
- Stairs;
- Non-structural cosmetic shells;
- Walking platforms on subs (fold down wings).

**4.1.1 MINOR DAMAGE REPAIR PERSONNEL**

Minor repairs may be completed by Operating Personnel, as described in [Section 5.1.2](#), at the discretion of the Rig Manager or higher authority, and do not require certification.

If there is any question as to whether the damage is minor or major, either a Professional Engineer or OEM Agent as described in [Section 5.1 - Personnel Qualifications](#) must be consulted.

#### **4.2 MAJOR DAMAGE**

Major damage includes the following:

- Repairs to:
  - Rotary table beams that require welding or replacement;
  - Setback area beams that require welding or replacement;
  - Lifting structure and raising load points;
  - Mast saddles;
  - Locking assemblies on telescopic subs;
- Repairs or replacement to the main substructure frame.

All major damage must be repaired and requires an inspection as specified by the certifying party. Repairs may be completed in a field environment provided they can be performed adequately and are accessible for NDT inspection.

##### **4.2.1 MAJOR DAMAGE REPAIR PERSONNEL**

Personnel qualified to complete major repairs include:

- Professional Engineers as described in [Section 5.1.4](#);
- OEM Agents as described in [Section 5.1.6](#).

#### **4.3 REPAIR AND MAINTENANCE DOCUMENTATION**

All repairs and maintenance performed shall be documented in the CAODC Mast and Overhead Equipment Log Book, or suitable alternative, and include the following information:

- Date repairs and/or maintenance was conducted;
- Description of repairs and/or maintenance that was completed;
- For minor repairs:

- Operating Personnel (as described in [Section 5.1.2](#)) that completed the repair and/or maintenance;
- For major repairs:
  - Certifying party of the repair, including signature.

#### **4.3.1 MAJOR REPAIR DOCUMENTATION (RECERTIFICATION)**

The certifying party will provide a certification document for the equipment requiring major repairs.

Repair certification is issued for the repair of actual damage and is intended to maintain Level IV certification. It does not extend the Level IV certification requirements unless a complete Level IV inspection is conducted in accordance with [Section 2.2 - Level IV Inspection and Certification](#).

### **5. PERSONNEL QUALIFICATION, TRAINING AND DOCUMENTATION**

#### **5.1 PERSONNEL QUALIFICATIONS**

##### **5.1.1 INSPECTION PERSONNEL**

Typical Inspection Personnel are considered to be senior operations personnel designated by the company that have:

- Knowledge of working principles of the equipment referenced in this RP;
- Mechanical competency in the disassembly of the equipment type and model;
- Experience and knowledge in drilling and/or service rig maintenance (as applicable).

Examples of senior operations personnel include: Field Superintendents, Technologists, Rig-up Superintendents, Shop Foremen, and Operations Managers.

### **5.1.2 OPERATING PERSONNEL**

Typical Operating Personnel are considered to be members of the rig crew that have:

- Knowledge of working principles of the equipment referenced in this RP;
- Experience and knowledge in drilling and/or service rig maintenance (as applicable).

### **5.1.3 NDT TECHNICIANS**

At a minimum, NDT Technicians are required to have Level II, Canadian Government Standards Board (CGSB) certification or other approved certification at the discretion of the owner/inspector.

### **5.1.4 PROFESSIONAL ENGINEERS**

Professional Engineer's shall have:

- Previous experience and training in structural and/or mechanical analysis;
- A practical working knowledge of equipment referenced in this RP;
- Previous experience and training in the repair of the equipment referenced in this RP;
- Experience with general quality control standards;
- Professional status in Canada.

### **5.1.5 ORIGINAL EQUIPMENT MANUFACTURERS (OEM)**

The company who built the original piece of equipment under inspection.

### **5.1.6 ORIGINAL EQUIPMENT MANUFACTURER AGENT**

A designate of the OEM that has a practical working knowledge of the specific equipment under inspection.

### **5.1.7 WELDERS**

Welders must hold a Journeyman Welder certificate and have previous experience in drilling and/or service rig maintenance (as applicable).

## **5.2 PERSONNEL TRAINING**

To satisfy provincial regulations and ensure that equipment will operate in the manner for which it was designed, Inspection and Operating Personnel (as described in [Section 5 - Personnel Qualification, Training and Documentation](#)) shall be adequately trained to conduct inspections (including visual) in accordance with this Recommended Practice. At a minimum, training should outline the inspection criteria for all critical components outlined in this Recommended Practice.

## **5.3 PERSONNEL DOCUMENTATION**

Companies shall have a process in place that documents and retains all training administered to company personnel referenced in this Recommended Practice and should include:

- Date training took place;
- Who was in attendance.