



Recommended Practice 10.0

INSPECTION OF DRAWWORKS

BRAKE LOAD PATH COMPONENTS

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

Developed by the Canadian Association of Energy Contractors
Engineering & Technical Committee

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This edition supersedes all prior
editions of this recommended practice

Purpose

This document contains practical recommended operating practices for drawworks brake load path components used in the Canadian land-based drilling and well servicing industry.

Disclaimer

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 defined by the OEM. If the OEM stipulates levels of inspection or accelerated inspection/certification cycles beyond those outlined in this recommended practice, the contractor must follow the OEM guidelines unless granted approval to follow this CAOEC recommended practice by a professional engineer.

The CAOEC produced this recommended practice based on industry experience. However, this document should be considered in conjunction with requirements of the local jurisdictional regulator.

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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Revisions

CAOEC recommended practices are reviewed and revised, reaffirmed or withdrawn at least every three years.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@caoec.ca. Edition history can be found in Appendix 1.

Range of Obligation

Throughout this recommended practice the terms 'must', 'shall', 'should', 'may' and 'can' are used as follows:

- **Must** A specific or general regulatory and/or legal requirement that must be followed.
- **Shall** An accepted industry practice or provision that the reader is obliged to satisfy to comply with this recommended practice.
- **Should** A recommendation or action that is advised.
- **May** An option or action that is permissible within the limits of the recommended practice.
- **Can** Possibility or capability.

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1. Scope

This recommended practice (RP) describes the inspection schedule for drawworks brake load path (DBLP) components currently used in the Canadian land-based drilling and well servicing industry and is intended to ensure safe and reliable operation by emphasizing training, inspection, handling and repairs.

2. Equipment

For purposes of this RP, the drawworks brake load path is considered to be all mechanical components, including the brake handle and all brake linkages of the mechanical brake towards the drawworks drum. The DBLP components for drilling and/or service rigs include the following:

- Brake bands
- Brake handle
- Brake handle locking mechanism
- Brake linkage components
- Auxiliary brake (or equivalent)
- Any other load bearing mechanical brake

The following figures identify the components and show their location on the drilling or servicing rig.

Figure 1. Location of DBLP Components on a Drilling Rig

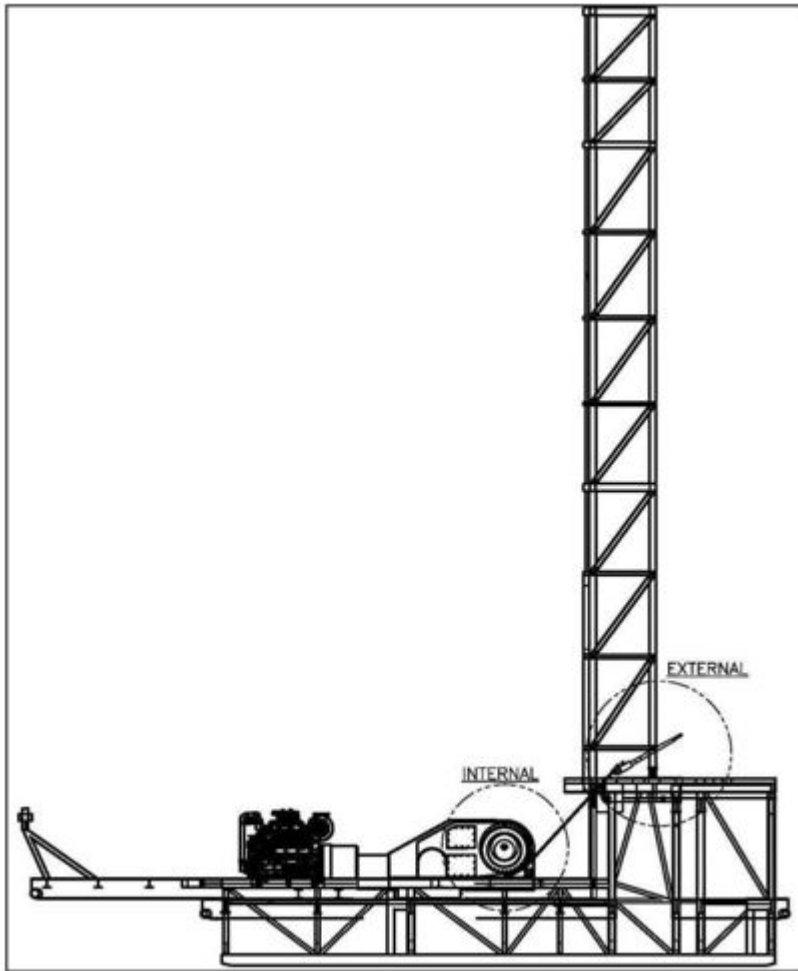


Figure 2. Location of DBLP Components on a Service Rig

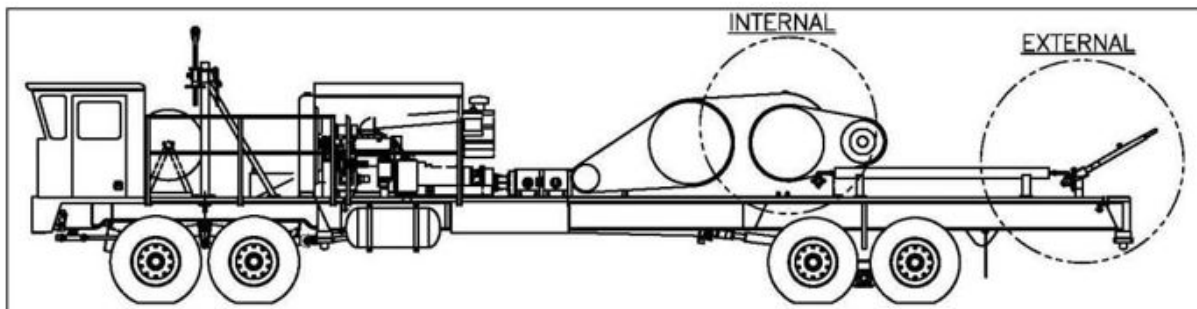


Figure 3. External Components – Main Drum Brake Linkage

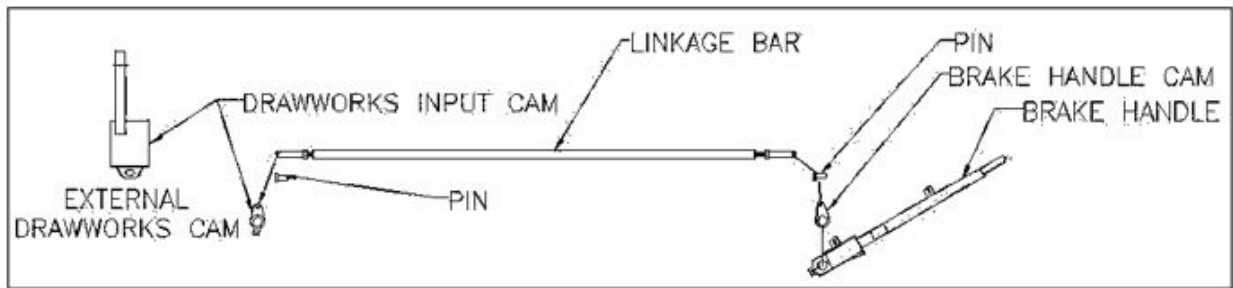
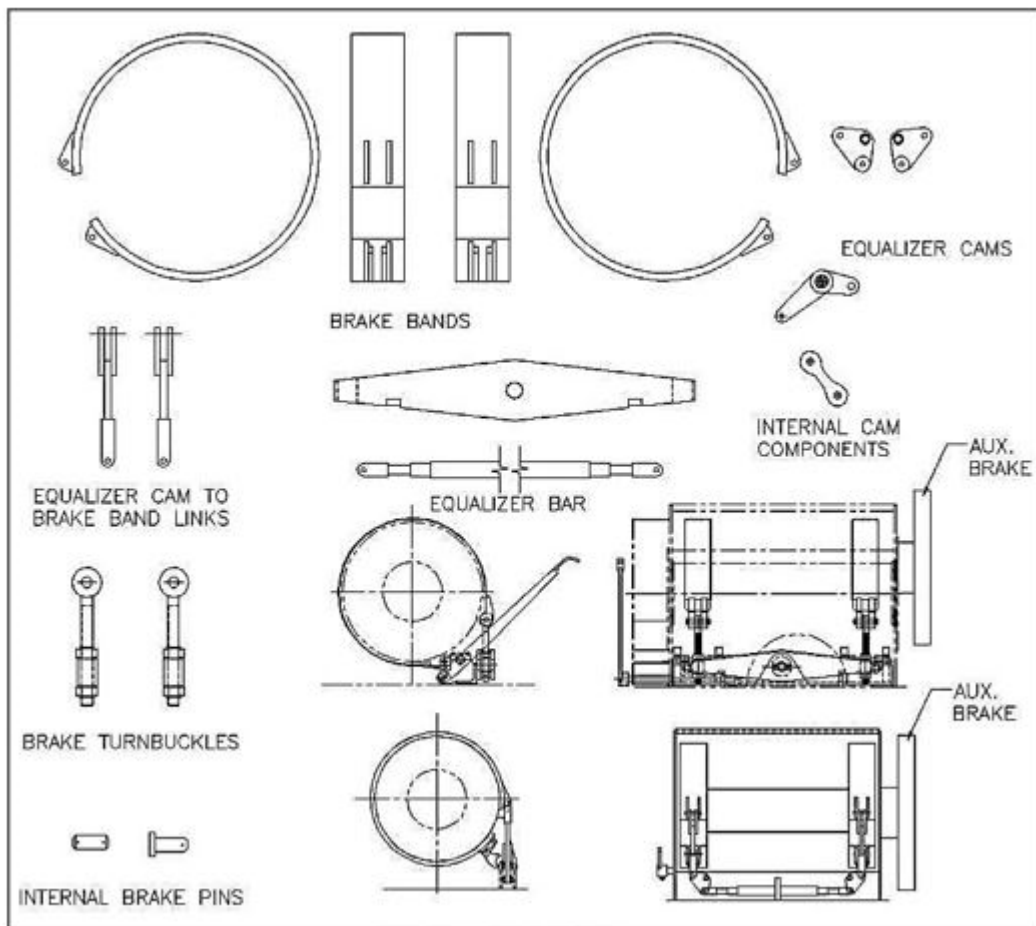


Figure 4. Internal Components – Main Drum Brake Linkage



3. Personnel Descriptions and Training

It is the responsibility of equipment owners to ensure that individuals involved in the inspection, repair and certification of DBLP components are properly qualified, trained and competent in their respective roles based on documented education, training or experience. The personnel referenced in this RP are defined below.

3.1 Professional Engineers

Professional engineers (P. Eng) 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

3.2 OEM and OEM Agent

The original equipment manufacturer (OEM) is the company who built the piece of equipment to be inspected.

An OEM agent is a designate of the OEM that has practical working knowledge of the specific equipment to be inspected.

3.3 Inspection Personnel

Inspection personnel are designated by the company and typically have:

- Knowledge of working principles of the equipment referenced in this RP
- Mechanical competency in the disassembly and reassembly of the equipment type and model
- Experience and knowledge in drilling and/or service rig maintenance

Examples of inspection personnel include:

- Professional engineers
- Journeymen heavy duty mechanics and/or millwrights (for service rigs)
- OEM agents
- Mechanical and/or maintenance managers
- Senior operations personnel such as:
 - Rig managers
 - Field superintendents
 - Technologists
 - Rig-up superintendents
 - Shop foremen
 - Operations managers

3.4 Operating Personnel

Operating personnel are typically members of the rig crew and have:

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

3.5 NDT Technicians

At a minimum, non-destructive testing (NDT) technicians must have Level II Canadian Government Standards Board (CGSB) certification or other approved certification/training at the discretion of the inspecting party.

3.6 Welders

Welders must hold a valid Journeyman Welder certificate and have experience in drilling and/or service rig maintenance.

3.7 Training

Inspection and operating personnel shall be adequately trained to conduct inspections (including visual inspections) in accordance with this RP in order to satisfy provincial regulations and ensure that equipment will operate in the manner for which it was designed.

At a minimum, training should outline the inspection criteria for all components outlined in this RP.

Companies shall have a process in place to document and retain all training administered to company designated personnel referenced in this RP. Documentation should include the date of training and the attendees.

4. Inspection Types

All DBLP components used during drilling and well servicing should be subject to an inspection and certification program to ensure all equipment is properly maintained and operable. Four levels of inspection should be performed:

- Level I inspection
- Level II inspection
- Level III inspection
- Level IV inspection

When scheduling an inspection, the inspecting party should be contacted to ensure any related safety or product bulletins are included in the scope of work.

All repairs shall be performed following the requirements outlined in section 6 – Repairs, Maintenance and Documentation.

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4.1 Inspection Frequency

At minimum, the inspection frequency for DBLP components on drilling rigs shall be in accordance with the schedule in Table 1 below.

At minimum, the inspection frequency for DBLP components on service rigs shall be in accordance with the schedule in Table 2 below.

Inspections may be conducted more frequently if deemed necessary (e.g., by the OEM or site/personnel specific experience).

Table 1. Drilling Rig DBLP Component Inspection Frequency

Equipment	Documentation	Inspection Frequency							
		Daily	Weekly	250 Days	500 Days	625 Days	750 Days	1000 Days	1250 Days
Mechanical Brake bands	Tour Sheet	I	II						
	Mast and Overhead Equipment Log Book			III	III	IV	III	III	IV
Mechanical Brake handle	Tour Sheet	I	II			II			
	Mast and Overhead Equipment Log Book			III	III		III	III	IV
Mechanical Brake handle locking mechanism	Tour Sheet	I	II			II			
	Mast and Overhead Equipment Log Book			III	III		III	III	IV
Mechanical Brake linkage components	Tour Sheet	I	II			II			
	Mast and Overhead Equipment Log Book			III	III		III	III	IV
Mechanical Auxiliary brake (or equivalent)	Tour Sheet	I	II			II			
	Mast and Overhead Equipment Log Book			III	III		III	III	III
Any other load bearing mechanical brake	Tour Sheet	I	II			II			
	Mast and Overhead Equipment Log Book			III	III		III	III	IV
AC Load Components/NDT	Tour Sheet	I	II						
	Mast and Overhead Equipment Log Book			III – As per OEM Requirements					IV
AC Function Test/Visual	Tour Sheet	I	II						
	Mast and Overhead Equipment Log Book			III – As per OEM Requirements					IV
AC Component Specific Measurements	Tour Sheet	I	II						
	Mast and Overhead Equipment Log Book			III – As per OEM Requirements					IV

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Note: For drilling rigs, one operating day = 24 accumulated operating hours from spud to rig release.

Note: For brake bands, the actual brake band change-out requirements may be more frequent than the Level IV inspection period depending on inspection results and pad wear. Include regular checks of OEM specified assembly and wear limits on rims and brake pads during Level III inspections or when removing guards.

Table 2. Service Rig DBLP Component Inspection Frequency

Equipment	Documentation	Inspection Frequency			
		Daily	Weekly	Annual	24,000 Operating Hours
Brake bands	Tour Sheet	I	II		
	Mast and Overhead Equipment Log Book			III	IV
Brake handle	Tour Sheet	I	II		
	Mast and Overhead Equipment Log Book			III	IV
Brake handle locking mechanism	Tour Sheet	I	II		
	Mast and Overhead Equipment Log Book			III	IV
Brake linkage components	Tour Sheet	I	II		
	Mast and Overhead Equipment Log Book			III	IV
Auxiliary brake (or equivalent)	Tour Sheet	I	II		
	Mast and Overhead Equipment Log Book			III	III
Any other load bearing mechanical brake	Tour Sheet	I	II		
	Mast and Overhead Equipment Log Book			III	IV

Note: For service rigs, one operating day = 24 accumulated operating hours consisting of time over the well, mast standing, crew active and transportation time (the same as a billable hour).

4.2 Level I Inspections

A Level I inspection is a visual observation of the equipment before operations begin, during operations or during routine maintenance. This should include, but is not limited to, inspection for mechanical defects and proper operating condition of:

- All pinned connections to ensure cotter pins have been installed correctly and are a sufficient size

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- All welded linkage components to ensure proper function and allowable wear tolerances
- All keyed connections to ensure key ways and associated parts are not loose or worn
- All brake handles to ensure a securement device in place

Level I inspections shall be performed by operating personnel and should be included as part of the daily rig walk around carried out by the driller/operator or rig manager.

Level I inspections shall be recorded on the tour sheet.

4.3 Level II Inspections

A Level II inspection is a Level I inspection with a more thorough inspection of the equipment for:

- Proper lubrication
- Obvious external cracks or paint chips
- Damage, distortion and/or premature wear or deterioration (including bushings, cables and chains)
- Missing parts or guards (e.g., cotter pins, fasteners, guards)
- Proper function

A Level II inspection shall include a two-person review of moving mechanical parts (i.e., one person performs a visual review of the moving mechanical parts while the other function tests the brakes). Excessive wear, or improper function must trigger a more intensive inspection.

Note: Observe linkage movement to ensure rods are not cracked, broken or bent and no excessive play at pin connections,

Level II inspections should be performed by the driller/operator or rig manager.

Level II inspections shall be recorded on the tour sheet.

4.4 Level III Inspections

A Level III inspection is a thorough check of the equipment to determine operability. It is performed in the field. This may, at the discretion of the inspector, include or require:

- NDT techniques on critical areas and load bearing components
- Some minor disassembly of guards
- Outside technical assistance

Level III inspections should be performed by inspection personnel.

Level III inspections must be documented in the CAOEC Mast and Overhead Equipment Log Book (or suitable equivalent).

There are primary differences between mechanical and AC braking systems. Contact your manufacturer for details. Reference *Table 1. Drilling Rig DBLP Component Inspection Frequency* on page 9 of this document.

4.4.1 Drilling Rigs

The following procedure shall, at minimum, be followed for Level III inspections:

- A visual inspection of
 - All brake linkage and brake assembly components
 - The brake linkage mounting points
- A function test of the auxiliary braking system

For brake bands, the actual brake band change-out requirements may be more frequent than the Level IV inspection period depending on inspection results and pad wear. Include regular checks of OEM specified assembly and wear limits on rims and brake pads during Level III inspections or when removing guards.

4.4.2 Service Rigs

The following procedure shall, at minimum, be followed for Level III inspections:

- A visual inspection of
 - All brake linkage and brake assembly components
 - The brake linkage bar, including removal of the guard to allow for proper inspection
 - The brake linkage mounting points
- A function test of the auxiliary braking system

4.5 Level IV Inspections

A Level IV inspection is a complete inspection of the equipment. Disassembly may be required. NDT of all critical load bearing components shall be included and as per the American Society for Testing and Materials (ASTM) standards A902: Standard Terminology Relating to Metallic Coated Steel Products and E709: Standard Guide for Magnetic Particle Testing (or equivalent standards).

The following procedure shall, at minimum, be followed for Level IV Inspections:

- Check that all braking pin connections have cotter pins
- Perform NDT of brake linkages
- Perform NDT of brake bands
- Check brake band drum thickness
- Perform NDT of equalizer bar and all associated components
- Visually inspect bearing and mounting of pillow blocks for damage

All repairs required should be done in accordance with section 6 – Repairs, Maintenance and Documentation.

Level IV inspections shall be performed under supervision of a professional engineer or an OEM Agent.

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There are primary differences between mechanical and AC braking systems. Contact your manufacturer for details. Reference *Table 1. Drilling Rig DBLP Component Inspection Frequency* on page 9 of this document.

Inspection documentation is to be provided by the inspecting party and should include the following:

- Document author
- Date of inspection
- Drawworks serial number (if available)
- Name of manufacturer (if available)
- Date of manufacture (if available)
- Results of the Level IV inspection
- Description of the repair and where on the equipment the repair took place
- Location where repairs were completed (e.g., facility, on site, shop).

Level IV inspections must be documented in the CAOEC Mast and Overhead Equipment Log Book (or suitable equivalent) and signed by the inspecting party.

5. Equipment Transportation

It is important to prevent damage to equipment during transportation. To prevent damage during transportation:

- Proper handling procedures must be observed.
- Affected personnel must be trained accordingly.
- A pre-move safety meeting must take place that includes discussion about any handling issues unique to the drawworks brake load path components.

6. Repairs, Maintenance and Documentation

Repairs and/or maintenance may be required after any Level III or Level IV inspection to retain the operating integrity of the equipment.

6.1 Repair Category

Any damage that requires repair shall be categorized as minor or major.

A professional engineer or an OEM agent must be consulted if there is any question as to whether the damage is minor or major.

All major damage must be repaired.

6.2 Repairs for Minor Damage

Repairs for minor damage include repairs to correct:

- Damage or distortion to the following equipment:
 - Chasing threads
 - Setting of brakes
- Damage that requires repair of guards
- Damage that requires replacement of:
 - Worn pins/bushings in the linkage assembly
 - Linkage bars
 - Drive shafts
 - Brake bands
 - Auxiliary brake pads
 - Pillow block bearings on linkage

The rig manager (or higher authority) can determine the personnel to complete minor repairs.

Minor repairs do not require repair certification.

6.3 Repairs for Major Damage

Repairs for major damage include:

- Weld repairs to any load path components, on the band or any linkage components
- Modifications to any load bearing equipment (e.g., oversizing or under-sizing pin fits)

NDT inspection must be performed after the repair of major damage.

Repairs may be completed in a field environment provided they can be performed adequately and are accessible for NDT inspection.

Major repairs shall be overseen and certified by a professional engineer or an OEM agent.

6.4 Repair and Maintenance Documentation

All repairs and maintenance shall be documented in the CAOEC Mast and Overhead Equipment Log Book (or a suitable equivalent) and include the following information:

- Date of repairs and/or maintenance
- Description of repairs and/or maintenance completed
- For minor repairs, the personnel that completed the repair and/or maintenance and signoff by the repair supervisor
- For major repairs, the name and signature of the professional engineer or OEM agent who supervised the repair.

Appendix 1: Revision History

Table 2. RP 10.0 Revision History

Edition	Date	Revision Details
5	May 2023	Revised <ul style="list-style-type: none"> • Updated Table 1. Drilling Rig DBLP Component Inspection Frequency • Revised wording in sections 4.2, 4.3, 4.4 and 6.2
4	March 2022	Revised <ul style="list-style-type: none"> • For reformat to new style
3	October 2021	Revised <ul style="list-style-type: none"> • For logo and name change • Removal of 100-day extension. • Update drilling inspection frequencies
2	August 2019	Revised <ul style="list-style-type: none"> • Operating day definition, revised (see CAOEC Technical Information Bulletin T-19-04 for more information)
1	March 2016	New RP sanctioned All content relevant to drawworks was removed from RP 3.0A Inspection and Certification of Substructures, Drawworks, and Carriers and the practices of this new RP were adopted. The rationale for this decision was the lack of inspection standards specific to drawworks brake load path components.