

**E N E R G Y
S A F E T Y
C A N A D A**

Hazard Identification, Assessment and Control

Dangerous Trees

National Safety Association
for Canada's Energy Industry

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Preface

Purpose

The purpose of this document is to provide a framework to ensure safe working conditions exist for workers engaged in upstream oil and gas activities, particularly where there is a risk of exposure to dangerous trees.

This document will provide strategies and alternatives to exposing workers to the risk of felling dangerous trees while in the workplace. After identifying dangerous trees, either eliminating or controlling them is appropriate for any upstream oil and gas worksite where there are free-standing trees at the boundaries of the worksite, including but not limited to: campsites, facilities, pipelines, roads, line of sight/seismic lines, aircraft landing. This document is intended for application in Canadian petroleum industry activities, where dangerous trees may pose a risk to workers, zones and well sites.

Project Scope And Limitations

This document contains guidance notes to assist employers, prime contractors, and owners in developing programs that properly identify dangerous trees, and minimize the risks associated with such trees.

The information contained herein is intended for use by a full cross-section of workers in the petroleum industry.

Table Of Contents

1.0 Hazard Considerations	6
1.1 Level of Disturbance	6
1.2 Wind	7
1.3 Slope	8
1.4 Leaning Trees	8
1.5 Damaged or Weakened Trees	9
2.0 Hazard Control Considerations	9
2.1 Exceptions to Dangerous Tree Removal, Re: Forest Configuration	9
2.2 Wildlife Trees	11
3.0 Tree Removal Decision Tree (Based On Lod)	12

1.0 Hazard Considerations

In general terms, the following sections outline conditions under which there is heightened risk from dangerous trees for all workers in the vicinity of dangerous trees and heightened risk for workers assigned the task of felling dangerous trees.

1.1 Level of Disturbance

Table 1: Level of Disturbance (LOD) for Seismic Activity

Level of Disturbance ^{1/*}	Example Types of Work Activities in Seismic Project
Very Low Risk ² (No DT Assessment)	<ul style="list-style-type: none"> • Walking • Surveying • Safety egress (i.e. heads-up work) • General light vehicle travel (e.g. pickups, ATV/UTV, snow sleds)
1.0 WIND: <40km/hour	<ul style="list-style-type: none"> • Placing/retrieving recording equipment (e.g., geophones) • Power tool brushing/slashing • Bucking logs (any size), or downed trees <6in or <15cm dbh** • Seismic blasting <4kg charges (properly placed) • Seismic line rehabilitation (manual work, light duty machinery) • Road travel with heavy vehicles (>5500 kg GVWR) on constructed and maintained resource roads
2.0 WIND: <40km/hour	<ul style="list-style-type: none"> • Road travel with heavy vehicles (>5500 kg GVWR; e.g., LIS Drills, Vibes) on seismic lines or overgrown road • Light duty equipment (e.g., LIS drills, small cats) • Bucking downed trees >6in or >15cm dbh** (e.g., wind thrown trees with full root wad attachment) • Seismic line construction (stems <6in or <15cm dbh**) with chainsaws ³ • Seismic blasting >4kg charges (properly placed) • Road maintenance activities without excavations (e.g., brushing, ditch clearing)

3.0 ³**WIND: 40-65km/
hour**

- Hand falling (stems >6in or >15cm dbh^{**}) ⁴
- Mechanical harvesting and ground skidding
- Use of light and intermediate helicopters where workers are exposed to rotor wash (e.g., slinging geophones)
- Land clearing & site preparation/deactivation with heavy machinery
- Road maintenance or construction activities with heavy equipment

4.0**WIND: >65km/hour**

- Use of medium and heavy lift helicopters where workers are exposed to rotor wash (e.g., slinging heli-seismic)
- Surface blasting (e.g., road construction)

¹A dangerous tree assessment is only valid for the lowest level of disturbance at which the assessment has been done.

²Very Low Risk (VLR) activities are based upon the expectation that workers have been trained and mentored how to be situationally aware of the hazards expected

³ If trees CANNOT be safely felled and removed from adjacent standing timber (i.e., there is a chance that felled or timber will strike adjacent standing timber, then default to Level 4 disturbance.

⁴ Does not include danger tree falling and/or line slashing for fallen tree hazard mitigation. Falling of dangerous trees does not require reassessment to LOD3; the falling process must be in accordance with the BC Faller Training Standard and adherence to safe falling practices. Slashing and bucking to remove fallen hazards after mulcher line clearing does not require reassessment to LOD2.

* Refer to the Danger Tree Assessor Course Forest Activities (most current version) Handbook for Reference Hazard Tables.

**AB: 4in or 10cm DBH/ BC: 6in or 15cm DBH

1.2 Wind

Windy conditions are a critical factor when determining the level of risk presented by potentially dangerous trees. Wind speed must be considered when determining if dangerous tree control operations will proceed. Table 1 includes the Beaufort Scale description of various wind speed levels which allow any worker to estimate wind speed. Table 1 also offers a description of the typical or expected impact on operations and dangerous tree control operations. Table 2 is a guide to responding to especially high winds in excess of 40 km/h.

It should be noted in both Table 1 and Table 2, wind conditions are one factor among others that need to be considered when assessing the hazard created by dangerous trees.

Table 2: Assessing Wind Speed and Typical Impact

Wind Speed (Km/H)	Beaufort Scale Description	Typical Impact On Operations *
Less than 20 km/h	Gentle breeze; leaves and small twigs move, lightweight flags extend	None (normal work)
20 km/h or more	Moderate breeze; small branches move, raising dust, leaves and paper	Work ceases within two (2) tree lengths of trees exempted under Sections 2.1.1, 2.1.2 and 2.1.3
40 km/h or more	Large tree branches move and telephone wires begin to “whistle”	All hand felling of timber ceases and dangerous tree assessment ceases

* Note that other factors such as ground disturbance must be considered when determining the impact of a particular wind speed on general operations or specifically felling operations on a given site.

Table 3: Working in Windy Conditions

<40 KM/H Caution	40-65 KM/H Alarm	65+ KM/H Alert
Workers must review the stability of any potentially dangerous trees in the area. Should the stability of dangerous trees appear suspect, remove the tree or workers.	Activities may significantly impact the stability of dangerous trees in the work area. Workers must reassess the stability of any dangerous tree adjacent to work areas.	Use extreme caution. Activities should be stopped or suspended until conditions moderate.

1.3 Slope

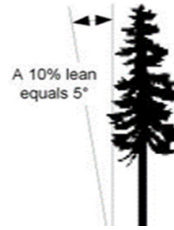
There is a greater risk to workers when felling on slopes. Do not fall trees if workers are in the area below. Felling on slopes that are slippery, wet, or have icy conditions, pose a greater risk to workers than when felling on dry slopes. Trees felled in slippery, wet or icy conditions may slide faster and further than expected.

1.4 Leaning Trees

Any tree within two (2) tree lengths, or 60 metres (whichever is greater), of the work area that has a weakness or disturbance to the base leaning more than 10 per cent toward the work area should be evaluated as a hazard.

A 10 per cent lean is approximately 5°.

For more information on felling on slopes, please refer to the CAGC Terrain Assessment Guideline.



1.5 Damaged or Weakened Trees

Any trees with one or more of the following characteristics should be considered dangerous and felled, or otherwise controlled accordingly:

- Any tree within two (2) tree lengths of the work area with 20 per cent or more of its trunk scored by mechanized equipment, or has more than 50 per cent of its root system damaged by mechanized equipment
- Any tree within two (2) tree lengths of the work area that has been significantly weakened by:
 - » Lightning
 - » Deep cracks into the stem
 - » Areas of sunken or missing bark (cankers) affecting more than 50 per cent of the tree's trunk circumference
 - » Disease or root rot (where more than 50 per cent of the lateral roots are decayed)
 - » Wind
 - » Animals
 - » Multiple defects
- Any tree with a dead top, dead branches or weak branch union where those tops or branches could fall into the work area
- Any tree affected by beetle kill
- Any tree affected by fire (burn)

2.0 Hazard Control Considerations

A competent worker trained in the assessment and control of dangerous trees must consider several factors to determine which trees present a risk to site workers, and the safest means of felling or otherwise controlling the hazard presented by a dangerous tree.

The general principle is that any dangerous tree within two (2) tree lengths or 60 metres, whichever is greater, of the work area must be felled or avoided by relocating the work area. If a tree is deemed safe by qualified workers, no action is required.

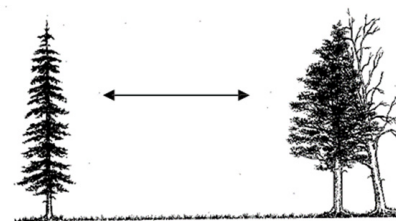
However, there are additional considerations in the application of this control principle.

2.1 Exceptions to Dangerous Tree Removal, Re: Forest Configuration

A tree falling into the category of a dangerous tree may not need to be removed based on the nature of the tree and its location and configuration vis-à-vis other surrounding trees.

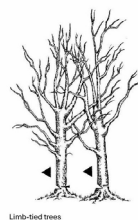
2.1.1 Leaning Away from Work Area

No further action is required if the tree is leaning more than 10 per cent away from the work area.



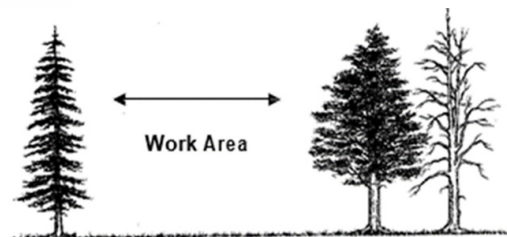
2.1.2 Limb-Tied Tree

No further action is required if the tree is limb-tied in a manner that prevents the fall of the tree into the work area.



2.1.3 Buffered by Green Standing

No further action is required if the tree is buffered by green standing timber similar in height, preventing the clear fall of the tree into the work area.



2.1.4 Additional Considerations for Trees Adjacent to Work Area

No further action is required if the tree is adjacent to the work area, and:

- Not within the work area right-of-way.
- Not in the debris/wood berm adjacent to the work area.
- The tree has not been touched by another tree.
- Not leaning toward the work area; regardless of the angle.
- No work is permitted within two (2) tree lengths of that tree when the wind exceeds 20 km/h (see Section 3.1).
- Adequate safe work procedures are developed for deploying equipment with helicopters.

2.1.5 Adjusted Work Area

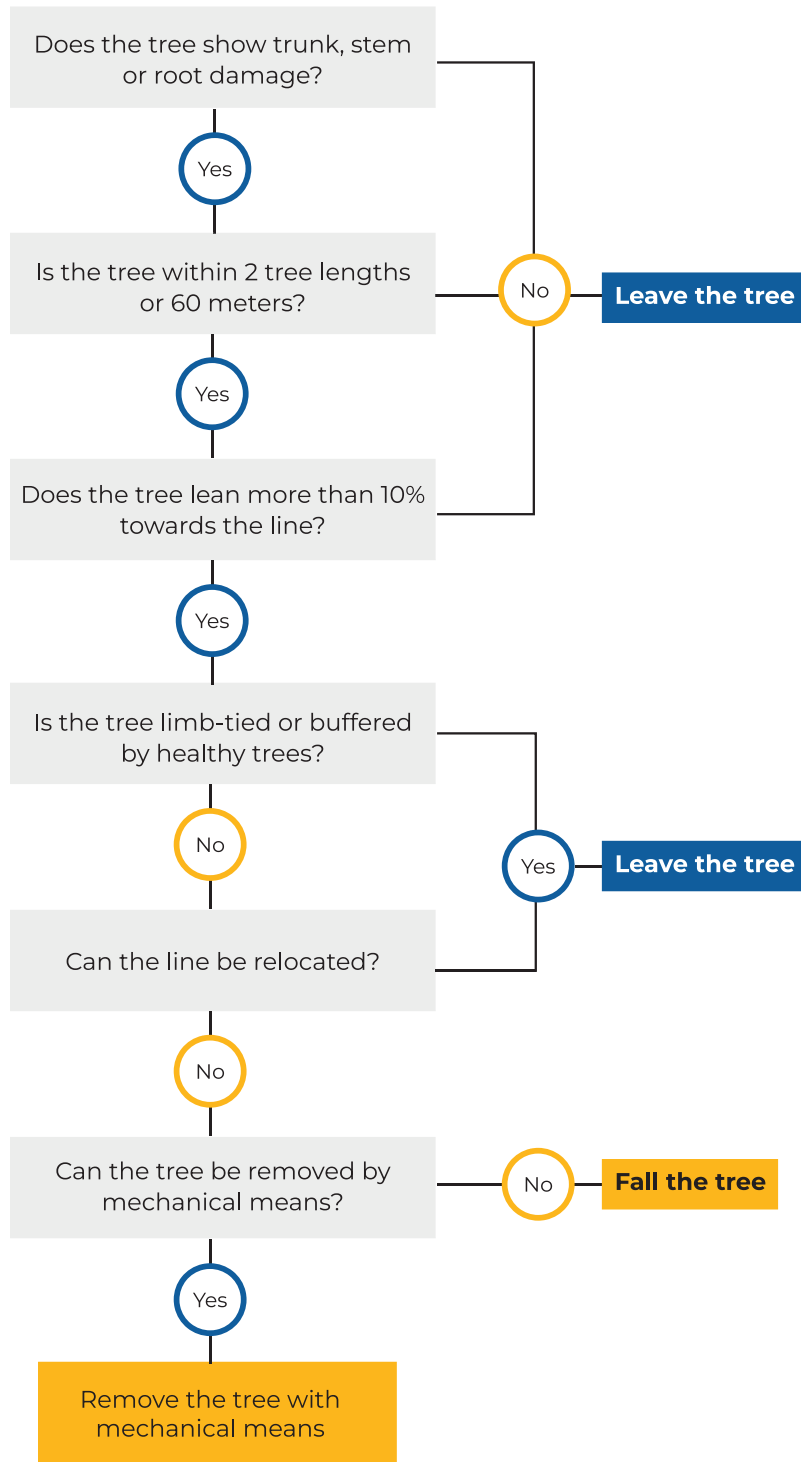
The work area extends a distance of two (2) tree lengths, or 60 metres—whichever is greater. Where slopes exceed 30 per cent, the distance must be sufficiently increased to minimize the risk.

2.2 Wildlife Trees

If falling the tree is not possible due to an unacceptable risk to the faller, proximity to an identified archaeological site or restrictions on private land, the following alternative actions to minimize risk may be considered:

- Restricting activity/access within two (2) tree lengths of the dangerous tree by:
 - » Relocating the work area.
 - » Modifying the work area by clearly identifying the hazardous area via flagging, signage or other means.
- Use mechanical assistance to remove dangerous trees (Mulchers or other suitably-guarded alternative machinery).
- Use of explosives by suitably trained, certified and competent workers.

3.0 Tree Removal Decision Tree (Based on LOD)





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