ENERGY SAFETY CANADA

Hazard Identification, Assessment, and Control

Dangerous Trees

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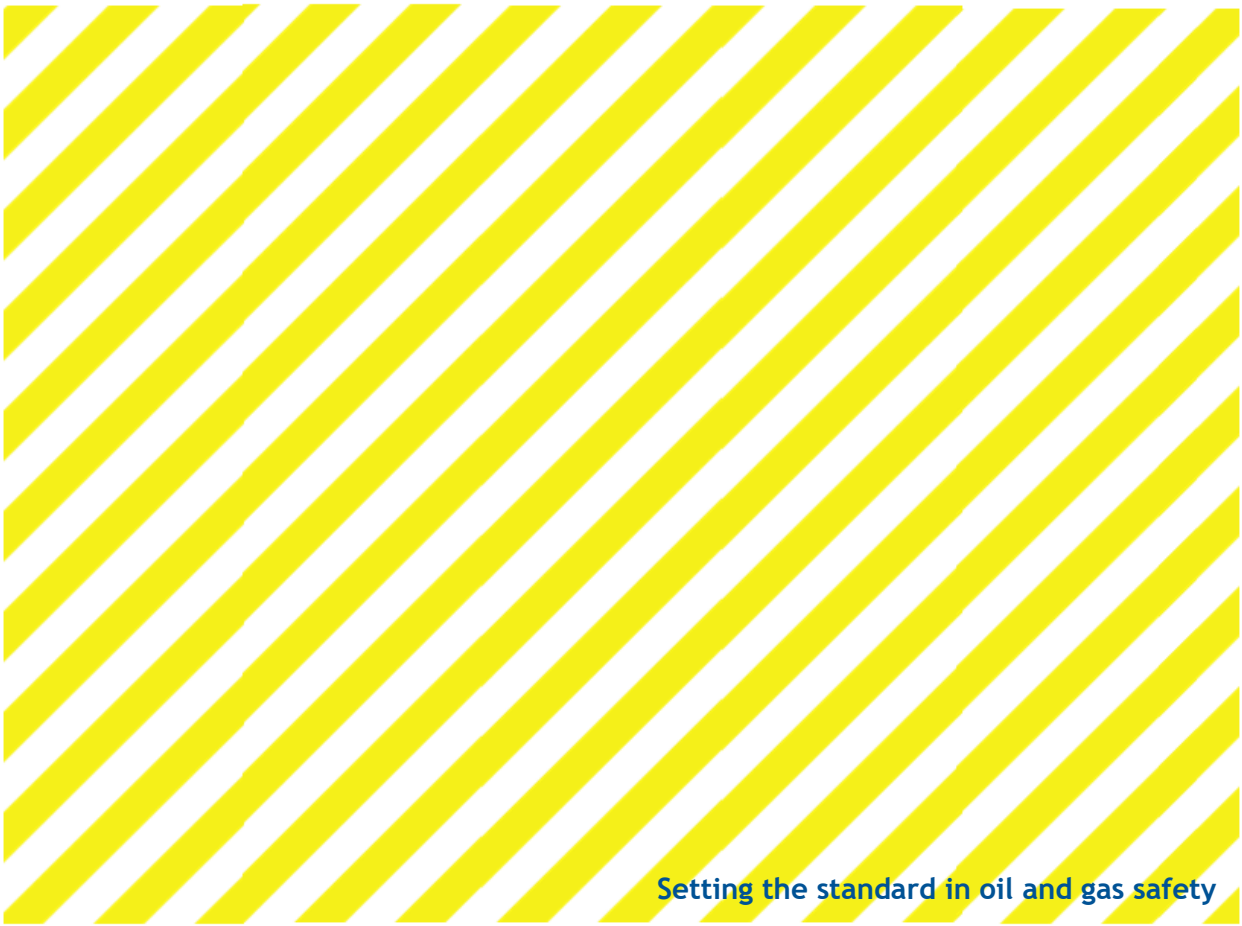

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This document as well as future revisions and additions, is available from:
Energy Safety Canada
150 - 2 Smed Lane SE
Calgary, Alberta T2C 4T5
Phone: 403 516 8000
Toll Free: 1 800 667 5557
Fax: 403 516 8166
EnergySafetyCanada.com

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DISCLAIMER

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PREFACE

HOW TO USE THIS GUIDELINE

The purpose of this document is to provide a framework to aid in ensuring safe working conditions exist for workers conducting upstream oil and gas activities where workers may be at risk of being exposed to dangerous trees. As well, 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: camp sites, facilities, pipeline, roads, line of sigh/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.

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1.0 Hazard Considerations

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

1.1 Wind

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

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

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, light weight flags extend.	None (normal work)
20 km/h or more	Moderate breeze; small branches move, raises dust, leaves and paper.	Work ceases within one and one half (1½) tree lengths of trees exempted under Sections 2.4.1, 2.4.2 and 2.4.3.
40 km/h or more	Large tree branches move, 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.

Working in Windy Conditions

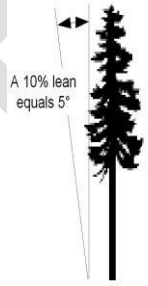
< 40 km/h CAUTION	40-65 km/h ALARM	65+ km/h ALERT
Workers need to review the stability of any potentially dangerous trees in the area. Should the stability of dangerous trees appear suspect, remove the tree or workers.	Activities may significantly impact the stability of dangerous trees in the work area. 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.

1.2 Slope

There is a greater risk to workers when felling on slopes. 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.

1.3 Leaning Trees

Any tree within one and one half (1½) tree lengths, or 60 metres, whichever is greater, of the work area that has a weakness or disturbance to the base that is leaning more than 10 percent towards the work area should be evaluated as a hazard.



A 10% lean is approximately 5˚

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

1.4 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 one and one half (1½) tree lengths of the work area which has had 20 percent or more of its trunk scored by mechanized equipment, or which has had more than 50 percent of its root system damaged by mechanized equipment.
- Any tree within one and one half (1½) 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 percent of the tree's trunk circumference, disease or root rot (where more than 50 percent of the lateral roots are decayed), wind, animals or 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].

1.5 Level of Disturbance (LOD) Table

Level of Disturbance* †	Example Types of Work Activities in Seismic Project
Very Low Risk (No DT Assessment)	• Walking • Surveying • safety egress • General light vehicle travel (pickups, ATV/UTV, snow sleds)
1 WIND: <40km/hour	• Placing/retrieving recording equipment (e.g., geophones) • Power tool brushing/slashing • Bucking logs (any size), or downed trees <15cm dbh • Seismic blasting <4kg charges • Seismic line rehabilitation (manual works, light duty machinery) • Road travel with heavy vehicles (>5500 kg GVWR) on constructed & maintained resource roads
2 WIND: <40km/hour	• Road travel with heavy vehicles (>5500 kg GVWR; e.g., LIS Drills, Vibes) on seismic line or overgrown road • Light duty equipment (e.g., LIS drills, small cats) • Bucking downed trees >15cm dbh (e.g., wind thrown trees with full root wad attachment) • Seismic line construction (stems <15cm dbh) with chainsaws*** • Seismic blasting >4kg charges • Road maintenance activities without excavations (e.g., brushing, ditch clearing)
3 WIND: 40-65km/hour	• Hand falling (stems >15cm dbh)*** • Mechanical harvesting and ground skidding • Use of light and intermediate helicopters where workers are exposed to rotor wash • Land clearing & site preparation/deactivation with heavy machinery

	• Road maintenance or construction activities with heavy equipment
4 WIND: >65km/hour	• Use of medium and heavy lift helicopters where workers are exposed to rotor wash • Surface blasting (e.g., road construction)

*A dangerous tree assessment is only valid for the lowest level of disturbance at which the assessment has been done.
**If trees CANNOT be safely felled and yarded away from adjacent standing timber (i.e., there is a chance that felled or yarded timber will strike adjacent standing "leave timber"), then default to Level 4 disturbance.
***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 Handbook for Reference Hazard Tables.

2.0 Hazard Control Considerations

A competent worker trained in the assessment and control of dangerous trees must take into account a number of factors in determining 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 one and one half (1½) tree lengths or 60 metres, whichever is greater, of the work area must be felled. If a tree is deemed safe by qualified workers, no action with respect to tree removal is required. However, there are additional considerations in the application of this control principle.

2.1 Exceptions to Dangerous Tree Removal, re: Forest Configuration

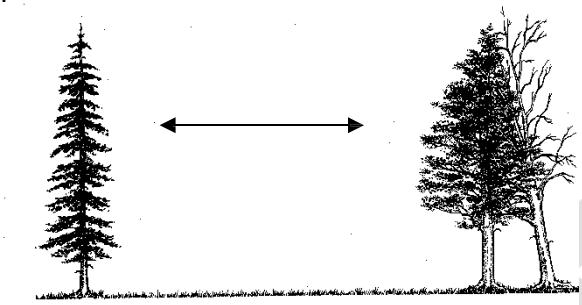
A tree falling into the category of a dangerous tree may not need to be removed based on the nature of the tree and its location and configuration vis-à-vis other surrounding trees.

2.1.1 Leaning away from work area

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

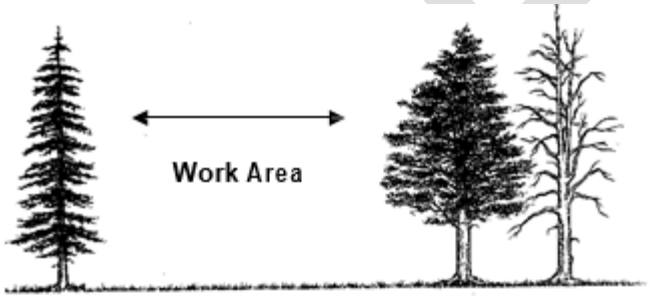
2.1.2 Limb-tied tree

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



2.1.3 Buffered by green standing timber

No further action is required if the tree is buffered by green standing timber similar in height that would prevent 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:

- It is not within the work area right-of-way,
- It is not in the debris/wood berm adjacent to the work area,
- The tree has definitely not been touched by another tree,
- It is not leaning toward the work area; regardless of the angle,
- No work is permitted within one and one half (1½) tree lengths of that tree when the wind exceeds 20 km/h (see Section 3.1), and
- Adequate safe work procedures are developed for deploying equipment with helicopters.

2.1.5 Adjusted work area

The work area extends a distance of one and one half [1½] tree lengths, or 60 metres whichever is greater. Where slopes are in excess of 30 percent,

the distance must be sufficiently increased to minimize the risk.

2.2 Wildlife Trees

Alternative actions to minimize risk can be used if the tree is a significant wildlife tree (i.e. contains a raptor's nest, bear den, etc.) and must be preserved.

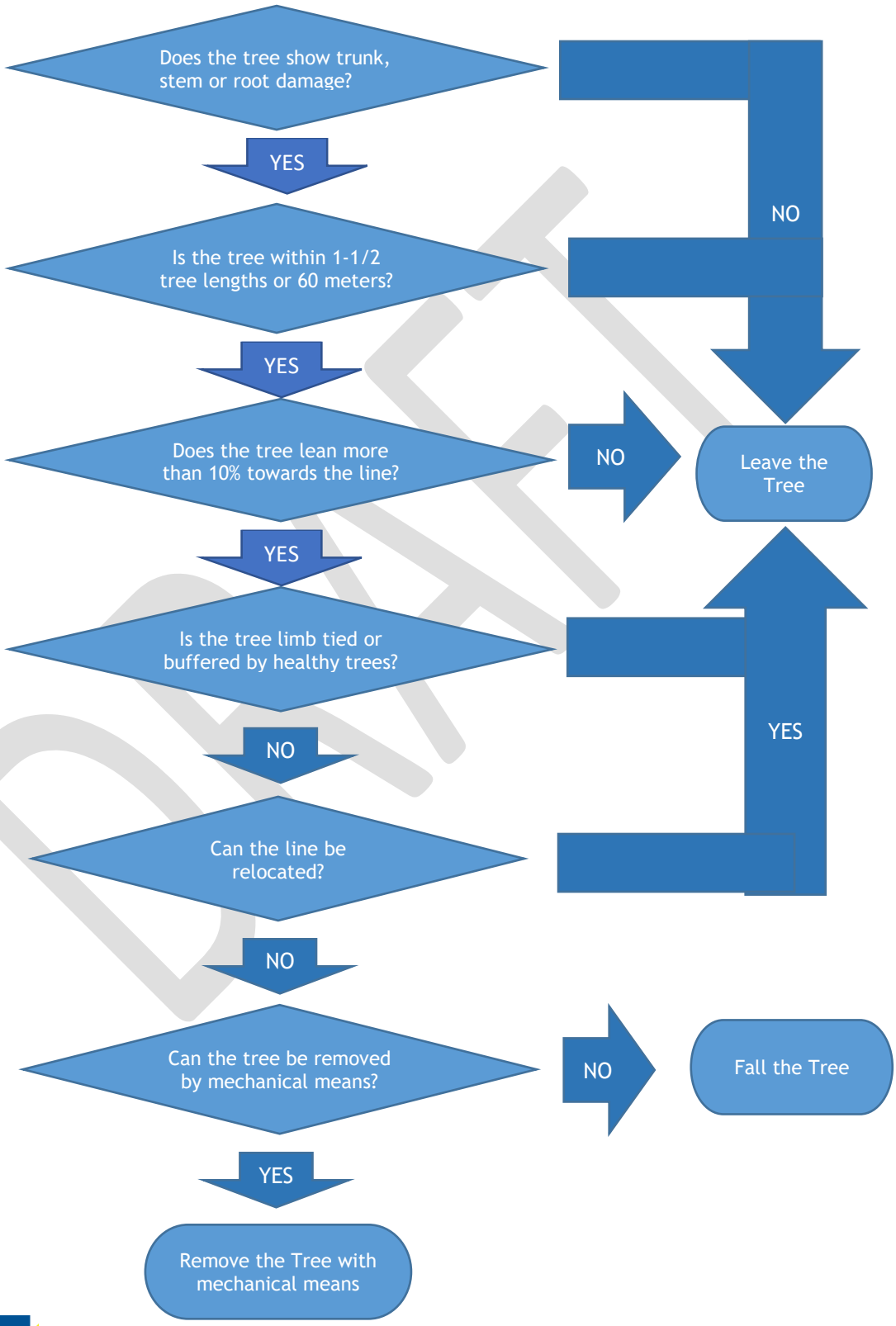
2.3 Alternate Actions to Dangerous Tree Removal

If falling a tree poses unacceptable risk, alternative actions to minimize risk can be used.

Alternate actions to falling dangerous trees include restricting activity/access within one and one half (1½) 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.

3.0 Tree Removal Flow Chart



CALGARY
T 403 516 8000 150 - 2 Smed Lane SE
F 403 516 8166 Calgary, AB T2C 4T5

NISKU
T 780 955 7770 1803 11 Street
F 780 955 2454 Nisku, AB T9E 1A8

FORT MCMURRAY
T 780 791 4944 Box 13 – 8115 Franklin Avenue
F 780 715 3945 Fort McMurray, AB T9H 2H7

BRITISH COLUMBIA
T 250 784 0100 2060 – 9600 93 Avenue
F 250 785 6013 Fort St. John, BC V1J 5Z2

SASKATCHEWAN
T 306 842 9822 208 – 117 3 Street
F 306 337 9610 Weyburn, SK S4H 0W3

Info@EnergySafetyCanada.com
Enrolment Services and Certificate of Recognition:
1 800 667 5557

EnergySafetyCanada.com