Hazard Identification, Assessment, and Control

Dangerous Trees

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ENFORM The Safety Association for Canada's Upstream Oil and Gas Industry

By industry, for industry

ENDORSEMENT

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- Canadian Association of Geophysical Contractors (CAGC)
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- Canadian Association of Petroleum Producers (CAPP)
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1.0 Hazardous Conditions

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 Speed

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.

1.2 Table 1: 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.	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.

1.3 Table 2: 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 potential 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.

1.4 Disturbances

In addition to wind, disturbances that have taken place in the worksite can impact the level of risk presented by dangerous trees. Various types of disturbances that may increase the risk presented by potentially dangerous trees are outlined and classified in Table 3 of this document, according to the equivalent risk presented by wind. As noted above, the cumulative effect of both wind and disturbance should be considered when identifying, assessing, and controlling danger tree hazards.

If the worksite has been impacted by any of the activities noted in Table 3, site management and workers must recognize that the risk profile has changed, and adjust their behaviours accordingly. Supervisors and workers involved in dangerous tree control activities must consider any additional risks when disturbances have taken place and adjust operations accordingly.

Helicopter operations can generate excess wind speeds that cause additional hazards that must be mitigated through the prime contractors' risk assessment and control process.

1.5 Table 3: Disturbances Affecting Dangerous Tress Risk Classified by Wind Equivalency

Disturbances equivalent to < 40 km/h CAUTION	Disturbances equivalent to 40-65 km/h ALARM	Disturbances equivalent to 65+ km/h ALERT
• surveying and flagging • cable/geophone layout and pick-up • chain saw cutting of limbs <20 cm dbh • use of light-duty machinery (e.g., weed whips, brush saws) • road travel with heavy vehicles (>5500 kg GVWR) on ballasted and compacted roads • road travel with heavy vehicles (>5500 kg GVWR) on non-ballasted, non-compacted roads • maintenance or construction activities without heavy equipment (e.g., small machines such as “bobcats” or enviro drill rigs • limbing of stems >20 cm dbh • slashing stems <15 cm dbh) • tree bucking • fire control with hand tools and/or water hoses	• tree falling (any tree >15 cm dbh) • tree clearing using bulldozing equipment/mulchers • ground skidding • mechanical harvesting and forwarding • helicopters (lift <2200 kg) with workers exposed to rotor wash • use of light and intermediate helicopters where workers are exposed to rotor wash (e.g., helipads / drop zones) • mechanical site preparation with heavy machinery (leases, lease roads, pipelines) • maintenance or construction activities with heavy equipment	• tree clearing operations using chain saws, mulchers or bulldozers in structurally damaged stands (e.g. wildlife burns) • blasting • helicopters (lift >2200 kg) with workers exposed to rotor wash • use of medium and heavy helicopters where workers are exposed to rotor wash

***** Adapted from the Wildlife Dangerous Tree Assessors Handbook. See original versions in course guides available at http://www.for.gov.bc.ca/hfp/values/wildlife/WLT/Training.htm

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.

Key considerations in the application and execution of controls to dangerous tree hazards include:

- Slope
- Leaning Trees
- Damaged or Weakened Trees
- Exceptions to Tree Removal
- Wildlife Trees
- Alternate Actions to Tree Removal

2.1 Slope

2.1.1 Addressing Felling Risk

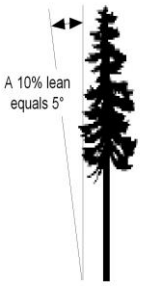
There is a greater risk to workers when felling on slopes. Felling on slopes that are slippery, wet, or have icy conditions, pose a greater risk to workers than when felling on dry slopes. Trees felled in slippery, wet, or icy conditions may slide faster and further than expected.

2.1.2 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 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 must be felled.



A 10 % lean is approximately 5°

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

2.3 Damaged or Weakened Trees

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

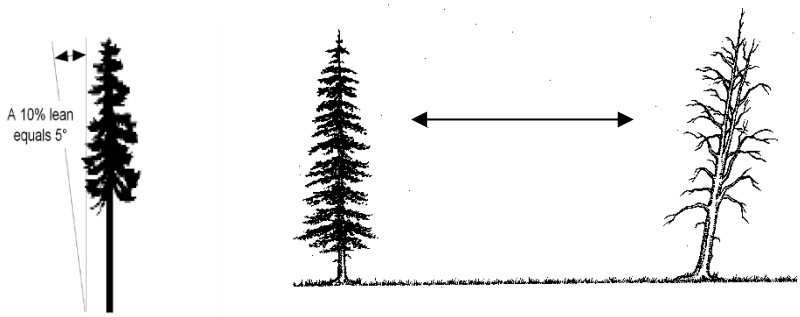
- Any tree within one and one half (1½) tree lengths of the work area which has had 20 percent or more of its trunk scored by mechanized equipment, or which has had more than 50 percent of its root system damaged by mechanized equipment.
- Any tree within one and one half (1½) tree lengths of the work 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 unions where those tops or branches could fall into the work area.
- Any tree affected by beetle kill.
- Any tree affected by fire [burn].

2.4 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.

2.4.1 Leaning away from work area

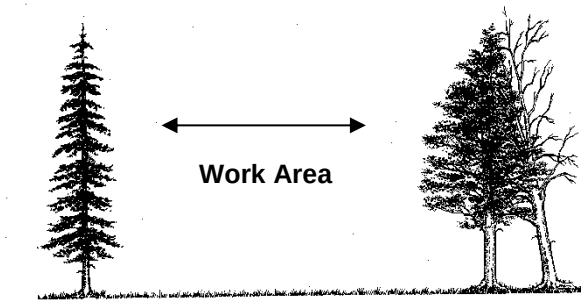
No further action is required if the tree is leaning more than 10 percent away from the work area.



A 10% lean is the same as 5°

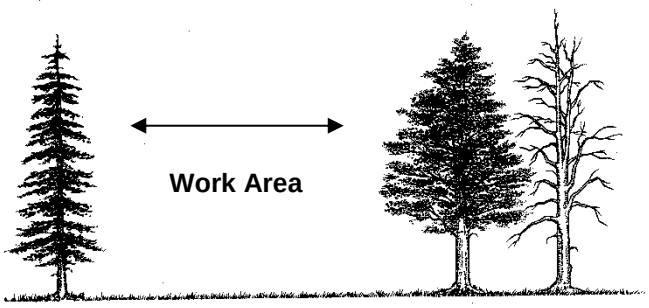
2.4.2 Limb-tied tree

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.



2.4.3 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.



2.4.4 Trees less than 10 cm in diameter

No further action is required if the tree is less than 10 centimetres in diameter at the base of the tree, and:

- It is not in the work area,
- It is not in the debris/wood berm adjacent to the work area,
- It is not overhanging the work area, and
- There is no risk of significant injury to workers passing within one tree length of it.

2.4.5 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.

2.5 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.

2.6 Alternate Actions to Dangerous Tree Removal

Alternative actions to minimize risk can be used if it is deemed to pose an unacceptable level of risk if falling is attempted.

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, and
- Other actions as deemed appropriate by qualified workers.

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