



Ministry of  
Forests, Lands and  
Natural Resource Operations

## Clean Energy Projects

### Requirements for Planning, Design and Construction to Protect Forest Roads or Timber Tenures

(Originally Released as Working Draft – July 7, 2005)

Revision 2 – June 10, 2013



Upper Mamquam Waterpower Project, Squamish Forest District  
Penstock Installation Below Mamquam Forest Service Road, September 2004

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## 1.0 INTRODUCTION

This document was prepared by Engineering Branch, Timber Operations, Pricing and First Nations Division of the Ministry of Forests, Lands and Natural Resource Operations (FLNR). It will be of use to Clean Energy Project (CEP) proponents and their consultants for the planning, design and construction of Clean Energy Project (CEP) works proposed within or adjacent to an existing forest road right-of-way. Although this document was originally developed specifically for waterpower projects, there is information contained herein that may be useful for other types of CEPs.

The name of this updated FLNR document has changed from *IPP Waterpower Projects - MFR Design Criteria for Works that may Impact Forest Roads or Timber Tenures (Rev 1)* to *Clean Energy Projects -- Requirements for Planning, Design and Construction to Protect Forest Roads and Timber Tenures (Rev 2)*.

This updated FLNR document contains content from, and replaces, the following two earlier FLNR documents (now both defunct):

- *Waterpower Projects: Guidelines for Works that may Impact Forest Roads or Timber Tenures and Waterpower Projects*, dated May 10, 2005
- *MFR Design Criteria for Works that may Impact Forest Roads or Timber Tenures, Rev 1*, dated August 17, 2010

For CEPs, this updated FLNR document is also referenced in Schedule C of the FLNR Works Permit (FS 103).

### Key documents

The Land Tenures Branch, Tenures, Competitiveness and Innovation Division of FLNR has developed a Clean Energy Guidebook for proponents of Clean Energy Projects. The full title of the document is, *Clean Energy Production in BC: An Inter-agency Guidebook for Proponents*.

The Clean Energy Guidebook provides a step-by-step guide to the Clean Energy application and project review cycle, as well as guidelines, standards, and best practices for the collection, analysis, and presentation of data for proponents' applications and ministry approvals associated with CEPs. The Clean Energy Guidebook is available online at:

[http://www.for.gov.bc.ca/Land\\_Tenures/documents/publications/clean\\_energy\\_guidebook.pdf](http://www.for.gov.bc.ca/Land_Tenures/documents/publications/clean_energy_guidebook.pdf)

Chapter 4 of the Clean Energy Guidebook describes six stages in the application process for project development:

**Stage 1:** Project site identification and application preparation

**Stage 2:** Application submission and acknowledgement

**Stage 3:** Development plan preparation

**Stage 4:** Completion and submission of development plan

**Stage 5:** Development plan review and initial authorizations

**Stage 6:** Final decisions, approvals and authorizations

Clean Energy Project proponents are required to submit comprehensive Development Plans for review by government agencies. The information requirements for Development Plans are detailed in *Clean Energy Project Development Plan Information Requirements*, available online at:

[http://www.for.gov.bc.ca/Land\\_Tenures/documents/publications/DPIR.pdf](http://www.for.gov.bc.ca/Land_Tenures/documents/publications/DPIR.pdf) (as a stand-alone document)

or

[http://www.for.gov.bc.ca/Land\\_Tenures/documents/publications/clean\\_energy\\_guidebook.pdf](http://www.for.gov.bc.ca/Land_Tenures/documents/publications/clean_energy_guidebook.pdf) (as a Supplement to, and contained within, the Clean Energy Guidebook).

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For more information on Clean Energy Projects, refer to the Clean Energy Initiatives website at: <http://www.for.gov.bc.ca/mof/cleanenergy/index.htm>

### Definitions of terms

“**Right-of-way width**” for a Forest Service road is the width of Crown land legally established or reserved, and should not be confused with the clearing width as shown in attached Figure 1;

“**APEGBC**” means Association of Professional Engineers and Geoscientists of the Province of British Columbia;

“**APEGBC professional engineer**” means a professional engineer licensed to practice by APEGBC;

“**APEGBC professional engineer of record**” means the professional engineer with the lowest level of direct professional responsibility for the engineering design work produced for the Clean Energy Project Works authorized for construction within a forest road right-of-way and whose seal appears on the design documents; a test of “direct professional responsibility” is the ability of that professional engineer to alter or revise the engineering content in the master design documents;

“**field reviews**” means the reviews conducted at the site of implementation or construction of the engineering work by an APEGBC professional engineer or his or her subordinate acting under his or her direct supervision, that the APEGBC professional engineer in his or her professional discretion considers necessary to ascertain whether the implementation or construction of the work substantially complies in all material respects with the engineering concepts or intent reflected in the engineering design documents prepared for the project;

The **definitions of other terms** used in this document may be found in the following parts, divisions, and sections of the Forest Planning and Practices Regulation under the *Forest and Range Practices Act* available at: [http://www.bclaws.ca/EPLibraries/bclaws\\_new/document/ID/freeside/14\\_2004](http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/14_2004).

Part 1 Interpretation: Section 1 (Definitions), Section 3 (Damage to the Environment)

Part 2 Forest Stewardship Plans: Sections 4.1 to 10

Part 4 Practice Requirements: Division 1 (Soils), Division 3 (Riparian Areas), Division 4 (Watersheds), Division 5 (Biodiversity), Division 6 (General Wildlife Measures and Resource Features)

Part 5 Roads

“You” or “your” or “proponent” or “CEP proponent” referenced herein means the Clean Energy Project proponent.

## 2.0 ROADS AND PERMITS

### Existing forest roads

If you propose to **construct works** within an existing forest road right-of-way on Crown land for a purpose other than the passage of vehicular or pedestrian traffic, you must obtain a **Works Permit** from FLNR **if the road is a Forest Service road**, or negotiate an **Agreement to Construct Works** with an existing permit holder **if the road is under Road Permit or Special Use Permit**.

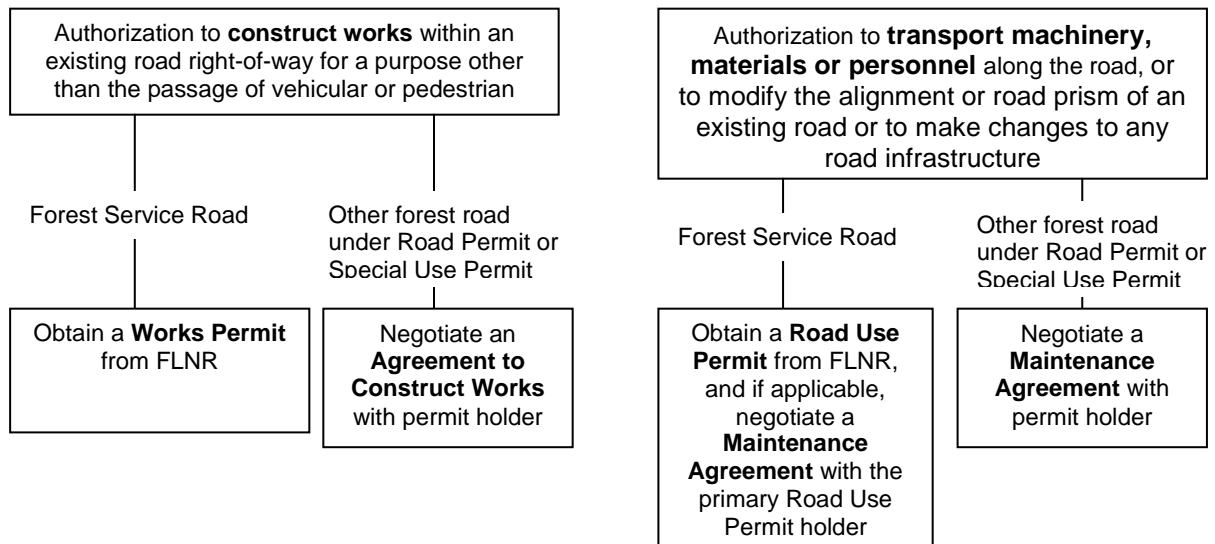
a) **Forest Service road (FSR):**

- (i) The Works Permit will include terms and conditions for planning, design and construction that you must meet.
- (ii) The ministry’s timelines to respond to a request for a Works Permit will vary depending on the complexity of your project and the scope and nature of the potential impacts. It is recommended that you submit your request at least three months in advance of the planned construction start date of the CEP works.
- (iii) Unless authorized by a Road Use Permit, you must not (1) modify the FSR alignment or road prism, or (2) make changes to any FSR infrastructure including bridges and culverts.

- b) **Other forest roads under permit:** For a road under an existing Road Permit or Special Use Permit, negotiate an Agreement to Construct Works with the permit holder. You must negotiate the terms of the agreement whereby you agree to comply with:

- (i) due diligence / best practices requirements to protect the safety of road users;
- (ii) the road and associated infrastructure;
- (iii) the environment, including forest resources and other social and economic values;
- (iv) the legal rights of the permit holder authorized to use the road for harvesting of Crown timber or other industrial purpose; and
- (v) the legal rights of a forest agreement holder's operations as set out in a Forest Stewardship Plan or Forest Development Plan.

#### Permit / Agreement Requirements for Existing Forest Roads



#### Use of existing forest roads to transport machinery, materials or personnel

If you propose to use an existing forest road to **transport machinery, materials or personnel**, or if you propose to modify the alignment or road prism of an existing forest road or to make changes to any road infrastructure, you must obtain a **Road Use Permit** from FLNR **if the road is a Forest Service road**, or negotiate a **Maintenance Agreement** with an existing permit holder **if the road is under Road Permit or Special Use Permit**.

If you propose to use an existing forest road to **transport machinery, materials or personnel**, you will be considered an 'industrial user' as described in Section 22.1(2) of the *Forest and Range Practices Act*.

#### a) **Forest Service road (FSR):**

- (i) Obtain a Road Use Permit from FLNR;
- (ii) If no other industrial users are currently using the Forest Service road, you should expect that the district manager will direct you to carry out all required road maintenance while you are using the road;
- (iii) If another industrial user holds a **Road Use Permit** to use the **Forest Service road** and has been directed by the district manager as the primary to carry out road maintenance, you must **also** negotiate a Maintenance Agreement with the permit holder to pay for your fair share of the road maintenance costs.

- b) **Other forest roads under permit:** For a road under Road Permit or Special Use Permit, notify the permit holder of road use at least five clear days ahead of start up, negotiate a Maintenance Agreement with the permit holder, and pay your fair share of road maintenance as per the agreement.

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## **New road building or use of non-status roads on Crown land**

A new policy has come into effect May 2012 that gives Clean Energy Project (CEP) proponents a choice to apply for authorization to build and maintain new roads, or to use and maintain non-status (untenured) roads, under a *Land Act* Licence of Occupation or a *Forest Practices Code Act* Special Use Permit (SUP), within the Provincial Forest. Clean Energy Project roads authorized under SUP to be built, modified or maintained for accessing CEPs will no longer require Section 9 *Water Act* approval or any authorization for borrow pits adjacent to roads. Additionally, compliance and enforcement of road standards will be simplified for SUP roads as they will be subject to *Forest and Range Practices Act* requirements and administrative remedies.

## **3.0 DEVELOPMENT PLANNING TO MITIGATE IDENTIFIED IMPACTS**

### **Identification of potential impacts**

3.1 Clean Energy Project works have the potential to cause different impacts in a number of ways:

- a) Potential impacts on road user safety, stability and maintenance of the road, and environment from installation of penstock, transmission lines, and other Clean Energy Project works;
- b) Potential impacts on road user safety, stability and maintenance of the road, and environment from modification or realignment of existing roads where authorized by the ministry;
- c) Potential impacts on timber harvesting operations in the immediate vicinity of the works or in the watershed from installation of penstock, transmission lines, and other Clean Energy Project works.

### **Potential impacts on roads and environment**

- 3.2 Works for penstock installation typically involve the use of heavy equipment, and may include the development of spoil sites, gravel pits and quarries, and extensive cut-and-fill operations.
- 3.3 Where the penstock is buried, works may include excavation of side hill cuts and a deep trench, placement of trench backfill, and compaction of backfill materials in the trench. Where the penstock is elevated, works will likely include installation of structures to support the penstock. Other works to protect the structural integrity of the penstock may include retaining walls or concrete apron slabs over a buried penstock that will be subjected to heavy vehicle loads.
- 3.4 Works associated with CEPs may have impacts on the road and on other road users that must be addressed during the engineering design, construction, and operation phases of the project:
  - a) New sources of sediment can be created by excavating cuts, constructing embankments, and by transporting and stockpiling excavation waste materials and imported backfill. Uncontrolled soil erosion and deposition of sediment into streams during or after construction of these works has the potential to harm fish or fish habitat, and to adversely affect the quality of water diverted for human consumption.
  - b) The penstock trench may cause changes to natural drainage patterns by intercepting creek flow or surface and subsurface drainage water flow above the trench alignment. If a penstock is located along the uphill side of a road, captured creek flow or drainage water flow exiting from the penstock corridor may result in altered drainage patterns that are not compatible with the natural surface drainage patterns. Capture and diversion of such flows can increase the size of a drainage area, and may cause landslides or severe erosion within the road prism or clearing width, or on terrain within, above, or below the road right-of-way.

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- c) The works could damage the existing road drainage system and prevent the system from functioning effectively. Failure of the drainage system may initiate a landslide or gully process, and cause loss or damage to elements at risk.
  - d) If not designed for the projected life of the CEP, the works may result in long-term road maintenance problems and higher road maintenance costs.
  - e) Penstock works that are poorly located, designed, constructed or maintained have the potential to affect terrain stability, and to increase the landslide risk to forest resources, residents, property and infrastructure and other elements at risk beyond a level acceptable to the ministry or other road users. Landslides that cause large scale environmental and visual disruption could have negative implications for forest companies operating in the area.
  - f) Temporary stockpiling of excavation waste materials on road surfaces may result in changes to road surface conditions through the mixing of unsuitable soils with existing road surfacing materials. This may cause the road surface to become unusable, and may also increase sediment generation and transport.
  - g) The use and transport of heavy equipment and materials along the road for construction of the penstock and other project components can damage the structural integrity of the road, bridges and other structures.
  - h) Some CEPs may require the mobilization of worker camps adjacent to roads used for logging and other industrial purposes. An increase in traffic may mean more frequent road maintenance is required, and therefore raise road maintenance costs.
- 3.5 Some sections of an existing road possibly may need realignment (requires ministry authorization) to accommodate the penstock, or to avoid excessively long and high cut slopes for installation of the penstock and intake structures.
- 3.6 Affected road users need to be consulted about their access needs to ensure that the new alignment is suitable for use by logging trucks and other industrial vehicles, and does not present an increased risk to user safety. The new alignment may also impact fish and fish habitat, water quality, and other **forest resources**.
- 3.7 Where the penstock crosses a road, unsuitable construction techniques could impact the structural integrity of the road, the load carrying capacity of the running surface, and the control of surface and ground water. At these locations, the works may increase the level of road maintenance required, and decrease the stability of road fill slopes. This may increase the costs of forestry road inspection and maintenance.

### **Potential impacts on timber harvesting operations**

- 3.8 The penstock, transmission line and other components of a CEP project may have a significant impact on forest management in the area. Operable forestland may be lost and forest management objectives for the area may be negatively impacted. Without sufficient vertical clearance above the road, overhead transmission lines have the potential to restrict industrial operations of authorized road users. As well, helicopter-logging operations may be adversely affected because of restrictions placed on flying over transmission lines.
- 3.9 Installation of a transmission line immediately adjacent to a road may make it difficult to carry out routine road maintenance at a safe distance from the lines. As well, transmission line poles may restrict road maintenance and future road modifications.
- 3.10 The installation of a penstock may restrict construction of new roads into proposed cutblocks, or may restrict motor vehicle access at existing road junctions. Difficulties associated with crossing



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these pipes may severely constrain forestry operations (such as ground-based yarding and cable harvesting) or raise timber harvesting costs if additional roads must be built to re-establish lost or restricted access.

### **CEP development plan preparation**

3.11 During the preparation of a Development Plan for a CEP, it is important for the proponent (and forest district office) to be mindful of the impacts described above among others that are specific to the project. If a CEP proponent contemplates implementing or constructing CEP works within an FSR right-of-way, the proponent must liaise with the responsible forest district office to discuss concerns, and to address the forest district's concerns and requests in the Development Plan and Summary Report as described in Chapter 4 of the Clean Energy Guidebook. The proponent must also address the forest district's concerns and requests during the detailed design and construction phases of the project. In summary, the CEP proponent must:

- a) Identify potential impacts on holders of permits and timber tenures
- b) Identify potential impacts on the road and other elements at risk
- c) Evaluate and mitigate the impacts and concerns, and address requests, to the satisfaction of the forest district office and other affected stakeholders.

### **Identify potential impacts on permit and licence holders**

3.12 To avoid infringing upon the rights of authorized road users and those granted the right to harvest Crown timber, CEP works constructed within or adjacent to the road right-of-way **must not**:

- a) cause conditions along the road that are unsafe for other users of the road;
- b) adversely impact vehicle access, or restrict industrial use of the road;
- c) compromise a forest company's timber harvesting operations as set out in a Forest Stewardship Plan or Forest Development Plan.

3.13 For roads affected by the proposed works, the proponent must identify the legal status and type of road and the type of required motor vehicle access. The CEP proponent's Development Plan must identify:

- a) holders of Road Use Permits who use the road for harvesting of Crown timber or other industrial purposes, if the road is an industrial use Forest Service road;
- b) road user groups, if the road is a community or general use Forest Service road;
- c) identify the stakeholders who are currently responsible for road maintenance, and the type of maintenance being carried out on the FSR.

3.14 The proponent must communicate with the forest district manager and permit holders regarding potential impacts from the construction and operation of the project, and seek their advice regarding their interests.

- a) To avoid a potentially significant deletion from the timber harvesting land base, the proponent must seek input from a professional forester and other appropriate qualified registered professionals to determine if the proposed penstock and transmission line will impact current or planned forestry operations anywhere within the watershed, and particularly within a 1 km wide corridor on each side of the penstock and transmission line alignments.

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- b) The effects of the proposed works on non-industrial users must also be considered, particularly in the case where a road provides access to a community, residences, provincial park, or recreation site.
  - c) The forest district manager may advise the proponent that formal advertising of the intent to build works within or adjacent to a Forest Service road right-of-way is required in order to notify road users of proposed changes to road access and to solicit input on those changes.

### **Evaluate the impacts**

3.15 With the assistance of appropriate qualified registered professionals, the proponent must re-evaluate options for road use and general project configuration if:

- a) terrain stability problems along road segments affected by the works cannot be avoided, mitigated or managed to the satisfaction of the ministry or other stakeholders;
- b) the likelihood of being able to resolve significant conflicts with the ministry or other parties is low;
- c) potential impacts on the size of the timber harvesting land base are significant.

### **Development plan referral process**

3.16 The proponents Development Plan in Stage 4 of the application process for Clean Energy Project development is referred to provincial regulatory agencies for review.

## **4.0 DESIGN OF CLEAN ENERGY PROJECT WORKS**

4.1 The *design engineer* retained by the CEP proponent must supervise the preparation of plans showing the design and layout of the project and preparation of plans suitable for the construction. The design of works within a forest road right-of-way, including the modification or realignment of a forest road (subject to approval) to accommodate the general arrangement of the works, must provide for or consider all the following:

- a) the safety of all workers and users of the road;
- b) the topography of the area and the gradient of the road corridor;
- c) the drainage of water in the area including the existing road drainage system;
- d) the stability of terrain in the area including the stability of the road prism and stability of the works within or immediately adjacent to an existing forest road right-of-way;
- e) the effect of the works on the road and associated infrastructure, and on the environment, forest resources, and other social and economic values;
- f) issues of importance or concern to FLNR and industrial road users, and proposed mitigation and compensation measures, as identified in the CEP proponent's Summary Report described in Chapter 4 of the Clean Energy Guidebook;
- g) the results of a terrain stability assessment including any drainage plan prepared for the affected area during that assessment;
- h) operational requirements, including:
  - (i) the short- and long-term maintenance and erosion control of any large scale cut slopes required for installation of the works,

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- (ii) placement of pits, quarries, and waste areas,
  - (iii) the storage of building materials and equipment,
  - (iv) the amount of area required to operate equipment within the clearing width of the road, including equipment turnaround sites,
  - (v) fencing and other ancillary structures.

### **Roads and associated structures**

4.2 Design, construct and operate works within a forest road right-of-way to:

- a) ensure that the road and associated structures (e.g., road surfacing materials, ford crossings, ditches, culverts, bridges, etc.) remain structurally sound;
- b) avoid impacting the stability of road fill and cut slopes;
- c) ensure safe use of the road.

### **Damage to the environment**

4.3 Ensure that the works do not cause damage to the environment, where damage means any of the following that fundamentally and adversely alters an ecosystem:

- a) a landslide;
- b) a gully process;
- c) a fan destabilization;
- d) soil disturbance;
- e) the deposit into a stream, wetland or lake of a petroleum product, a fluid used to service industrial equipment, or any other similar harmful substance;
- f) a landslide that enters a fish stream.

### **Landslides, gully processes, fan destabilization**

4.4 Ensure that the works do not cause a landslide, or an adverse gully process, or fan destabilization that place human life at risk, and that can damage property, infrastructure, and forest resources. Elements at risk of damage or loss must be identified during the planning and design process so that development activities are suitably designed to prevent harmful effects. Forest resources include the following eleven values listed in section 149(1) of the Forest and Range Practices Act (FRPA):

- a) **Biodiversity:** Retain old forest and other age classes consistent with land use objectives established by government in the FRPA for the area under development.
- b) **Cultural heritage resources:** Identify cultural heritage resources and establish appropriate management mechanisms to prevent impacts.
- c) **Fish:** Conserve fish, fish habitat, water quality, quantity, and timing of flow in community watersheds and watersheds that have significant downstream fisheries values.
- d) **Forage and associated plant communities:** Conserve forest cover and forage over an area necessary for winter survival of ungulate species (e.g., deer, elk, moose, and caribou), recognizing regional variance in the ecology of ungulate species.

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- e) **Recreation resources:** Recreation resources are comprised of 2 components: 1) recreation resource management – the identification, protection and management of the Provincial forest recreation resource; 2) recreation use management – the provision of safe, sanitary, socially acceptable and environmentally sound recreation sites and recreation trails for public use.
  - f) **Resource features:** Protect other unique resource features, such as salt deposits or an eagle wintering area.
  - g) **Soils:** Protect soil properties, including the physical, chemical, and biological attributes in addition to the natural drainage patterns of the site.
  - h) **Timber:** Protect timber values.
  - i) **Visual quality:** Achieve visual quality objectives within scenic areas.
  - j) **Water:** Stream channel dynamics, aquatic ecosystems, fish and fish habitat, and the water quality of all streams, lakes, and wetlands, including water quality in community watersheds, will not be harmfully impacted.
  - k) **Wildlife:** Retain ecologically suitable wildlife trees in quantity, quality, and distribution typical of naturally occurring stand structure.

#### **Natural surface drainage patterns**

- 4.5 Maintain natural surface drainage patterns on the area within the road right-of-way and in adjacent or connected areas affected by the works both during and after construction.

#### **Restrictions in a riparian management area**

- 4.6 Do not construct works along a forest road (including relocating a road) within a riparian management area, unless approval has been granted by the forest district manager.
- 4.7 Do not remove gravel or other fill from within a riparian management area in the process of constructing or maintaining the works, unless exempted by the district manager and unless
  - a) the gravel or fill is within a road prism,
  - b) the gravel or fill is at a stream crossing, or
  - c) there is no other practicable option.

#### **Restrictions in a riparian reserve zone**

- 4.8 Do not cut, modify or remove trees in a riparian reserve zone, except for the following purposes:
  - a) felling or modifying a tree that is a safety hazard, if there is no other practicable option for addressing the safety hazard;
  - b) constructing a stream crossing;
  - c) felling or modifying a tree that has been windthrown or has been damaged by fire, insects, disease or other causes, if the felling or modifying will not have a material adverse impact on the riparian reserve zone.
- 4.9 A tree that is felled, topped, pruned, or modified under clause 4.8 can be removed only if the removal will not have a material adverse effect on the riparian reserve zone.

#### **Restrictions in a riparian management zone**

- 4.10 Where authorization is given to cut, modify or remove trees within a riparian management zone for an S4, S5 or S6 stream that has trees that contribute significantly to the maintenance of

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stream bank or channel stability, retain enough trees adjacent to the stream to maintain the stream bank or channel stability, if the stream is:

- a) a direct tributary to an S1, S2 or S3 stream,
- b) flows directly into the ocean, at a point near to or where one or more of the following is located:
  - (i) a herring spawning area;
  - (ii) a shellfish bed;
  - (iii) a saltwater marsh area;
  - (iv) an aquaculture site;
  - (v) a juvenile salmonid rearing area or an adult salmon holding area, or
- c) flows directly into the ocean at a point near to the location of an area referred to in paragraph (b) and failure to maintain stream bank or channel stability will have a material adverse impact on that area.

#### **Temperature sensitive streams**

4.11 Where trees are felled, modified, or removed within a riparian management area adjacent to a temperature sensitive stream, or a stream that is a direct tributary to a temperature sensitive stream, retain either or both of the following in an amount sufficient to prevent the temperature of the temperature sensitive stream from increasing to an extent that would have a material adverse impact on fish:

- a) streamside trees whose crowns provide shade to the stream;
- b) understory vegetation that provides shade to the stream.

#### **Stream crossings**

4.12 Where a stream crossing is built as part of the works, locate, build and use the crossing in a manner that (a) protects the stream channel and stream bank immediately above and below the stream crossing, and (b) mitigates disturbance to the stream channel and stream bank at the crossing.

#### **Fish passage**

4.13 Ensure that activities do not have a material adverse effect on fish passage in a fish stream. However, with approval from the Ministry of Environment and Department of Fisheries and Oceans Canada (migratory fish), the proponent may temporarily have a material adverse effect on fish passage to construct the works, including a stream crossing, if

- a) fish are not migrating or spawning, and
- b) the source of the material adverse effect is removed immediately on completion of the construction.

#### **Protection of fish and fish habitat**

4.14 Unless exempted by the Ministry of Environment (Part 7 of the Water Regulation, pursuant to section 9 of the Water Act) and Department of Fisheries and Oceans Canada (migratory fish), conduct the activities at a time and in a manner that is unlikely to harm fish or destroy, damage or harmfully alter fish habitat.

#### **Watersheds -- protecting water quality**

4.15 Ensure that the activities do not cause material that is harmful to human health to be deposited in, or transported to, water that is diverted for human consumption by a licensed waterworks.

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### **Licensed waterworks and community watersheds**

- 4.16 Ensure that the activities do not damage a licensed waterworks.
- 4.17 Do not cut or remove timber or construct works within a community watershed if these activities occur within a 100 m radius upslope of a licensed waterworks where the water is diverted for human consumption, unless the activities will not increase sediment delivery to the intake.
- 4.18 Do not cut or remove timber or construct works on an area that is within a community watershed, if such activities would cause sediment that would be harmful to human health to enter a stream, wetland or lake from which water is being diverted for human consumption by a licensed waterworks.

### **Buried penstock and other underground utilities**

- 4.19 **Do not** bury penstock or other underground utilities longitudinally along ditch lines or longitudinally within the running width of any forest road.
- 4.20 Apply for permission to place buried penstock or other underground utilities in the vicinity of a road. The proposed location(s) of transverse crossings of buried penstock or other underground utilities across a road requires approval of the forest district office in the case of a Forest Service road, and a permit holder in the case of a road under Road Permit or Special Use Permit. The application should clearly state the type of the facility, method of construction, the legal land description, the name of the road involved, and particulars of the contact person responsible for the application. No construction may be undertaken without appropriate permission. All applicable engineering Code requirements that govern the design and construction of penstock or other underground utilities must be followed.
- 4.21 If approval has been given for burial of penstock across a road, design the penstock to withstand fully loaded off-highway trucks and off-highway equipment, and for a minimum L-165 (off-highway) vehicle loading. Higher design vehicle loading may be required. Always consult with the forest district office and the Bridge Engineer in the regional office in the case of a Forest Service road, and with a permit holder if the road is under a Road Permit or Special Use Permit, to confirm the design vehicle loading and design vehicle configuration. Provide sufficient soil cover over the penstock and ensure proper compaction of backfill materials. Ensure that the works do not restrict or constrict the crossing road width, and ensure that road maintenance / repair activities can be carried out as required without conflict.
- 4.22 Buried penstock designs should incorporate measures to allow required maintenance of the works at least over the life of the project.
- 4.23 Mark the crossing in the field where a buried penstock crosses the road.

### **Design of bridges**

- 4.24 Where a new bridge is built, or an existing bridge is modified or repaired, for the purpose of constructing the works within the forest road right-of-way ensure that the design and fabrication of the bridge:
  - a) meets or exceeds standards applicable to roads at the time the design or fabrication is done, in respect of
    - (i) bridge design, as established by the Canadian Standards Association, Canadian Highway Bridge Design Code, CAN/CSA-S6, and
    - (ii) soil properties, as they apply to bridge piers and abutments, as established by the Canadian Foundation Engineering Manual, and
  - b) takes into account the effect of logging trucks with unbalanced loads and off-centre driving.
- 4.24 For bridges on FSRs, the FLNR is responsible for determining appropriate design and construction specifications, and the proponent must consult with the ministry's Bridge Engineer. The minimum expected administrative processes and specifications for the design, fabrication

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and construction of FSR bridges are provided in the following FLNR standard reference documents:

- FLNR standard drawings
- FLNR Interim Bridge Design Guidelines (IBDG)
- Forest Service Bridge Design and Construction Manual (FSBDCM)
- The standard drawings, IBDG, and FSBDCM are available for downloading at: [http://www.for.gov.bc.ca/hth/engineering/Bridges\\_And\\_Major\\_Culverts.htm](http://www.for.gov.bc.ca/hth/engineering/Bridges_And_Major_Culverts.htm)

4.25 For bridges on permitted roads other than FSRs, consult with the forest district manager **and** the permit holder about design criteria.

#### **Peak flow – bridges and stream culverts**

4.26 If authorized to build / modify/ repair a bridge across a stream or to install a culvert in a stream for the purpose of constructing the works, ensure that the bridge or culvert is designed to pass a stream flow having a 100-year peak flow return period.

4.27 A bridge may be built / modified/ repaired to a lesser peak flow return period provided all the following conditions are met:

- a) the bridge will pass the flow that will occur during the period the bridge remains on the site,
- b) the construction of the bridge occurs during a period of low flow, and
- c) the bridge, or a component of the bridge that is vulnerable to damage by high flow, is removed before any period of high flow begins.

4.28 A stream culvert that will not conform to a 100-year peak flow return period may be installed if all the following conditions are met:

- a) the installation is temporary and the proponent does not expect to subsequently install a replacement culvert at that location,
- b) the stream in which the culvert is being installed is not a fish stream,
- c) the culvert will pass the flow that will occur during the period the culvert remains on the site,
- d) the installation of the culvert occurs during a period of low flow, and
- e) the culvert is removed before any period of high flow begins.

#### **Structural defects**

4.29 If authorized to build/ modify/ repair a bridge on a road for the purpose of constructing the works, ensure that one or more of the following is carried out if a structural defect or deficiency occurs:

- a) correct the defect or deficiency to the extent necessary to protect (i) industrial users of the bridge, and (ii) downstream property, improvements or forest resources that could be affected if the bridge fails;
- b) close, remove or replace the bridge;
- c) restrict traffic loads to a safe level;
- d) place a sign, on each bridge approach, stating the maximum load capacity of the bridge.

#### **Culvert fabrication**

4.30 If authorized to build a culvert on a road for the purpose of constructing the works, fabricate all permanent culvert materials according to:

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- a) culvert fabrication standards, as established by the Canadian Standards Association, Corrugated Steel Pipe Products, CSA G401 and Plastic Nonpressure Pipe Compendium, section B182.8 of the B1800 Series, that are applicable to roads at the time of the fabrication, or
  - b) standards that ensure at least the same strength and durability as the standards referred to in paragraph (a).

### **Construction records**

- 4.31 If authorized to build a bridge or major culvert on a forest road for the purpose of constructing the works, carry out the following:
- a) prepare or obtain (i) pile driving records, (ii) for new materials used to build the bridge or major culvert, mill test certificates, in-plant steel fabrication drawings, and concrete test results, (iii) soil compaction results, and (iv) other relevant field and construction data;
  - b) prepare as-built drawings (i.e., record drawings and documents) of the bridge or major culvert;
  - c) submit all information to the forest district manager in the case of a FSR, and to the permit holder in the case of a road under Road Permit or Special Use Permit.

## **5.0 CONSIDERATIONS FOR TRANSMISSION LINE CROSSINGS OF FOREST ROADS**

### **Timber removal, slash and debris disposal within FSR right-of-way**

- 5.1 If it is necessary to cut, damage or destroy any standing timber within the road right-of-way to facilitate the pole and line installation, request authorization before doing so from the applicable FLNR office. All slash and related debris must be disposed of to the satisfaction of FLNR.

### **General transmission line planning and design considerations**

- 5.2 **Confirmation of land use / normal transportation requirements for transmission line planning and design:** At the transmission line planning and design phases, confirm the land use and normal transportation requirements related to forest operations in an area. Guidance on these aspects is available from the ministry district office and/or through discussion with affected forest companies in the area. It is important for the CEP proponent, utility owners, the ministry and affected stakeholders to partner, communicate, coordinate and cooperate during these phases.
- 5.3 **Alignment of overhead line crossings:** If practicable, the design of overhead line crossings of existing or planned roads must be as near right angle as possible to minimize the distance of the crossing. Multiple line crossings must be avoided and may be unacceptable on some roads.
- 5.4 **Timber harvesting operations:** As applicable, there must be provision in the transmission line route and design to prevent potential negative effects on timber harvesting operations and forest management objectives in the area (e.g., to prevent loss of operable forestland). During planning and design, evaluate and mitigate the following potential impacts on timber harvesting operations:
- a) The potential for isolation of timber harvesting opportunities (e.g., by cable operations) can be an important consideration. For example, transmission lines that are installed parallel to the road right-of-way can prevent or make it more difficult to cable harvest timber on one or both sides of the road;
  - b) Helicopter-logging operations may be adversely affected because of restrictions placed on flying over transmission lines and safety hazards. Discuss the spacing and width of helicopter yarding corridors with the district manager and affected forest agreement holders.



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- 5.5 **Notification requirements for proposed new roads crossing under existing transmission lines:** For existing transmission lines, and to provide assurance that legislative requirements have been met and design expectations for safety have been considered, there must be no new roads constructed to cross the transmission line rights-of-way without the design guidance and approval of the owner of the power system. The process that deals with any application for a road crossing of an existing transmission line must also focus on options to minimize the impact on forest operations and future road access in the area of interest.
- 5.6 **Standards:** Design and construction for transmission line towers, poles, overhead cable and supporting structures (e.g., guy lines) must meet or exceed standards established by the Canadian Standards Association and WorkSafeBC, and / or other regulatory agencies which have authority. Where the ministry has prescribed a more stringent standard than other regulators, the ministry's standard will apply. Similarly where a regulatory authority requires a higher standard than those prescribed by the ministry, the regulator's standard will apply. See **Clause 5.11 (f) and (g)** for specific CSA and WorkSafeBC standards information.

#### Horizontal clearances

- 5.7 Where a project transmission line and its right-of-way pass over forested lands, overhead transmission line crossings may be required over existing FSRs. Design for sufficient horizontal clearance from roadside transmission line towers or poles to accommodate industrial traffic through road curvatures and allow safe trailer tracking for over length log haul trailer loads or equipment. Properly locate above-ground obstacles such as transmission line towers, poles, guy lines and other supporting structures along a road right-of-way to avoid unduly restricting industrial traffic, creating new roadside safety hazards, or interfering with roadside maintenance operations.
- 5.8 Do not locate transmission line crossings across roads at bridge locations without written approval of the forest district manager. Generally, transmission line wires should be located parallel to bridge decks and at a height and distance away from the edge of bridge decks to allow for future unobstructed structure maintenance with no overhead electrical hazard.
- 5.9 **Consider vehicle tracking requirements and road user safety:** In locating towers, poles, guy lines and other structures along an FSR right-of-way, provide for the greatest possible horizontal setback distance from the edge of the road running surface.
- a) Optimally, all transmission line towers, poles, guy lines and other associated structures will be located 3 m horizontal distance away from both the top of road cuts and toe of road fills to maintain the integrity of the road prism. Variations on this optimum horizontal setback distance may be authorized by the ministry on a site specific basis. If the ministry authorizes a lesser horizontal setback distance, the following minimum requirements must be met among other ministry requirements if specified:
- (i) In all circumstances, these structures will be located outside road ditch lines and well clear of all running surfaces of roads to allow off-highway movement of industrial traffic, with a minimum of 3 m horizontal distance away from the edge of the road running surface. For off-highway log haul roads, this distance will be increased to facilitate the turning radius of over length log haul trailer loads (e.g., combined vehicle and load lengths can range between about 27 to 30 metres).
- 5.10 **Avoid interfering with future road maintenance and modifications:** The placement of the transmission line towers, poles, guy lines and other associated structures must be designed considering the requirements for long term road maintenance activities and possible future modifications within the road prism and clearing width of the road. With these considerations in mind, determine the best side of the roadway for a pole line. Minimize the number of poles down the right-of-way (space the poles as far apart as possible). Also, for road user safety, locate poles to minimize the potential to interfere with a driver's line of sight.

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## Vertical clearances

5.11 Carry out the following activities during the design of vertical clearances, among others as required:

- a) **Identify road crossing locations:** All existing, planned, or reasonably predicted road crossing locations must be considered in the transmission line design.
- b) **Identify configuration of forest equipment:** Without sufficient vertical clearance above the road, overhead transmission lines have the potential to restrict industrial operations of authorized road users. Transmission line clearance to the road is not expected to accommodate every possible configuration of forest equipment in use. However, sufficient clearance must permit safe passage of equipment (in a normal transport configuration) that can reasonably be expected to regularly use the FSR (and connecting roads in an area if applicable), now or in the future. Obtain relevant manufacturers' equipment height diagrams. An example grapple yarder equipment height diagram is provided in Appendix 1.
  - (i) Vehicles or equipment may either move unaided along a road, or else be transported on a low bed. During planning and design of transmission lines in a given area of forest operations, determine the governing vehicle load heights or equipment height conditions and normal transportation requirements that apply to each road affected by transmission line crossings.
  - (ii) In design of the vertical clearance on some roads, particularly for coastal forest operations, special consideration may need to be given to transport of specialized over height forestry equipment such as a grapple yarder (swing yarder) or a line loader on an off-highway low bed with the gantry up (i.e., fully assembled), or with the gantry down, as appropriate.
  - (iii) Other information about transporting a grapple yarder is available from WorkSafeBC at:  
[http://www.worksafebc.com/publications/health\\_and\\_safety/by\\_topic/assets/pdf/grapple\\_yarder.pdf](http://www.worksafebc.com/publications/health_and_safety/by_topic/assets/pdf/grapple_yarder.pdf)



**Photos:** Courtesy of Western Forest Products Inc.

- c) **Meet minimum vertical clearances:** Transmission line clearance to the travelled road surfaces will be such that clearance to any part of vehicles or equipment normally expected to be in transit along that road are at or greater than the levels that would compel special involvement of the owner of the power system or encroach on the clearance minimums indicated by WorkSafeBC. The vertical clearance of overhead transmission lines must consider the requirements of the **Canadian Standards Association (CSA)** and the **BC**

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**Occupational Health and Safety (OHS) Regulation** for overhead transmission lines and electrical installations. **Refer to clauses f and g below.**

- d) **Consider opportunities to make transmission lines conspicuous to workers:** Consider opportunities to make transmission line crossings conspicuous to workers moving vehicles or equipment along roads or involved in helicopter yarding operations within areas of forest development. Install adequate advance warning signs of such crossings as appropriate.
- e) **Retain as-built file records:** As-built file records of the equipment type, configuration, height and the designed transmission line to road clearance must be retained by the power project proponent, the ministry district office, and the owners of the power system. This information must be available to present or future forest agreement holders and other industrial users of the roads at their request.
- f) **Meet CSA standards of transmission line design to establish minimum vertical clearance:** The minimum vertical clearance of all overhead transmission line crossings will vary significantly depending on location and design factors. Some of the key design factors include the transmission line voltage level, worker safety, height of equipment for harvesting operations and its related movement and transport and other types of industrial traffic that may reasonably be expected to use the forest road. In designing the transmission lines, the design vertical clearances are to consider the requirements of **CSA Standard C22.3 No. 1** to provide for safe vehicle or equipment passage under the energized transmission lines.
- g) **Meet OHS Regulation section 19.24:** In designing the transmission lines, the design vertical clearances must meet at least the minimum clearance distance established for the situation of a person moving or involved in moving equipment (e.g., logging trucks, or harvesting equipment) under exposed electrical equipment and conductors (e.g., under transmission and distribution lines) and the person is not performing any work other than work related to moving the equipment. For full and current WorkSafeBC guidance, refer to: <http://www2.worksafebc.com/publications/OHSRegulation/Part19.asp#SectionNumber:19.24>
  - (i) **Section 19.24.2 and Table 19-1B of the OHS Regulation:** Minimum vertical clearances of overhead transmission lines (for the above situation) are specified in section 19.24.2 and Table 19-1B of the OHS Regulation for a range of voltage.
  - (ii) **WorkSafeBC interpretive guidance:** WorkSafeBC has prepared interpretive guidance on the application of section 19.24 of the OHS Regulation. This guidance can be obtained from WorkSafeBC's website.

## **6.0 DESIGN DRAWING REQUIREMENTS**

### **Preliminary design drawings**

- 6.1 Preliminary design drawings showing the design and layout of the project and plans suitable for the construction of the project within rights-of-way of forest road corridors must be submitted to the appropriate stakeholders (e.g., FLNR for FSRs) including other government agencies (and affected permit holders as applicable) for review and comment. The CEP proponent must retain a Terrain Stability Professional to review and comment on the preliminary design drawings to ensure that the design and construction specifications for the project have properly addressed the landslide and sedimentation hazards and risks along the road corridor, and in adjacent areas or connected areas to the road corridor, that could be adversely affected by the works.
- 6.2 Design drawings must include detailed notes, and "process-based" and "results-based" specifications, as appropriate, to ensure that the works during or after construction will not result in an adverse effect to elements at risk. Technical specifications for construction should include specifications for material types, subgrade preparation, compaction, drainage, quality control, etc.

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### **Final design drawings and specifications**

- 6.3 The APEGBC professional engineer of record (retained by the CEP proponent) must appropriately address all agency review comments during the preparation of final design drawings and specifications before stamping them "For Construction." All final design drawings and specifications stamped "For Construction" must be signed and sealed by the APEGBC professional engineer of record. Without exception, the APEGBC professional engineer of record must be familiar with forest road construction and maintenance practices where the CEP works will be located within or adjacent to a forest road right-of-way.
- 6.4 Before construction of the works commences, the design engineer may be required to provide a statement in a separate letter that the final design drawings were prepared in overall conformance with the criteria in this document and in accordance with the recommendations of the Terrain Stability Professional.

## **7.0 CONSTRUCTION FIELD REVIEW REQUIREMENTS**

### **Field reviews during construction of the CEP works**

- 7.1 The CEP proponent will retain the APEGBC professional engineer of record (preferably) or another qualified APEGBC professional engineer to carry out field reviews during implementation or construction of the Works within an FSR right-of-way. Upon completion of the Works within the FSR right-of-way, the proponent must submit a Works Assurance Statement signed by the APEGBC professional engineer taking responsibility for the field reviews to confirm that the implementation or construction of the Works substantially complies in all material respects with the engineering concepts or intent reflected in the engineering design drawings and supporting documents.

### **Record drawings**

- 7.2 The CEP proponent must submit record drawings and documents of the completed Works, prepared by the APEGBC professional engineer taking responsibility for the field reviews.
- 7.3 If underground cable is installed within a forest road right-of-way, the record drawings and documents must also indicate the location (GPS coordinates) and average depth of the buried cable. The CEP proponent must post appropriate identification signage marking the location of buried cable within the road right-of-way, including posting of hazard signs at underground cable crossings of the road.

### **Hazard signs**

- 7.4 After construction, the CEP proponent will at its cost provide appropriate signage at CEP transmission line crossings of the forest road that provides road users with the nominal phase to phase voltage and design vertical clearance that governs. The CEP proponent must obtain recommendations for the signage from the APEGBC professional engineer of record. The proponent must erect warning signs in each direction of travel that specifies the overhead height where the power line crosses the road.
- 7.5 After construction of the Works, the CEP proponent at its cost must return the condition of the forest road to pre-construction or better condition ensuring (1) no blockages of road drainage structures (i.e., ditches, culverts etc.) and (2) no damage to bridges, culverts, or road surfacing materials.

### **Revegetation**

- 7.6 To minimize erosion and control siltation, upon completion of works, all exposed mineral soil must be revegetated immediately using a suitable reclamation seed mixture and monitored and revegetated (as necessary) to ensure successful germination within one growing season. The CEP proponent must submit a plan to the person responsible for the road (e.g., District Manager for an FSR) that details the manner in which the cleanup of the Work sites will be managed, including specifics on how the revegetation of disturbed ground within the road right-of-way will be managed and implemented.

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## 8.0 HELPFUL REFERENCES

- 8.1 The reference documents listed below provide helpful information about acceptable forest road practices and technical processes that will assist the proponent to meet the intent of the design criteria in this document. Where design and field services are carried out by a registered professional, that person must choose methods and techniques that best serve the individual project objectives, consistent with the design criteria in this document.

Forest Road Regulation (Transition Version Pre-January 31, 2004) under the Forest Practices Code of BC Act available at  
<http://www.for.gov.bc.ca/tasb/legsregs/archive/fpc/fpcaregs/forroad/froadr.htm>

The following parts, divisions, and sections of the Forest Planning and Practices Regulation under the Forest and Range Practices Act available at:  
[http://www.bclaws.ca/EPLibraries/bclaws\\_new/document/ID/freeside/14\\_2004](http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/14_2004)

- Part 1 – Interpretation: Section 1 (Definitions), Section 3 (Damage to the Environment)
- Part 2 – Forest Stewardship Plans: Sections 4.1 to 10
- Part 4 – Practice Requirements: Division 1 (Soils), Division 3 (Riparian Areas), Division 4 (Watersheds), Division 5 (Biodiversity), Division 6 (General Wildlife Measures and Resource Features)
- Part 5 – Roads

Forest Practices Code of British Columbia Act guidebooks, in particular the Forest Road Engineering Guidebook (June 2002), Gully Assessment Procedures Guidebook, Mapping and Assessing Terrain Stability Guidebook, Soil Rehabilitation Guidebook, Fish-Stream Crossing Guidebook (March 2002) available at the following ministry website:  
[\[http://www.for.gov.bc.ca/tasb/legsregs/fpc/FPCGUIDE/Guidetoc.htm\]](http://www.for.gov.bc.ca/tasb/legsregs/fpc/FPCGUIDE/Guidetoc.htm)

Forest Road Regulation (Pre-January 31, 2004) of the Forest Practices Code of British Columbia Act available at the following website:  
[\[http://www.for.gov.bc.ca/tasb/legsregs/archive/fpc/fpcaregs/fpcaregs.htm\]](http://www.for.gov.bc.ca/tasb/legsregs/archive/fpc/fpcaregs/fpcaregs.htm)

Best Management Practices Handbook: Hillslope Restoration in British Columbia (November 2001) is available at the following website:  
[\[http://www.for.gov.bc.ca/hfd/pubs/docs/mr/Mr096.htm\]](http://www.for.gov.bc.ca/hfd/pubs/docs/mr/Mr096.htm)

References listed on the Division of Engineers and Geoscientists in the Resource Sector website:  
<http://www.degifs.com/announcements.php3?category=newannouncements&item=189>

Wise M.P., Moore, G.D. and VanDine, D.F (eds), 2004. Landslide risk case studies in forest development planning and operations. British Columbia Ministry of Forests, Research Branch, Victoria, BC, Land Management Handbook No 56, 199p, also on the internet at:  
<http://www.for.gov.bc.ca/hfd/pubs/Docs/Lmh/Lmh56.htm>

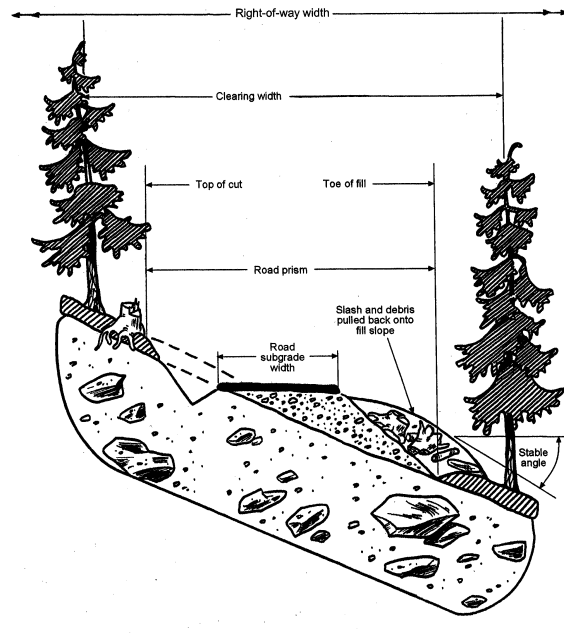
Association of Professional Engineers and Geoscientists of British Columbia (APEGBC). Revised 2010. Guidelines for Professional Services in the Forest Sector - Terrain Stability Assessments Burnaby, B.C. August 2010.  
[http://www.apeg.bc.ca/ppractice/documents/ppguidelines/TSA\\_Guidelines.pdf](http://www.apeg.bc.ca/ppractice/documents/ppguidelines/TSA_Guidelines.pdf)

Association of Professional Engineers and Geoscientists of British Columbia (APEGBC). Revised 2008. Guidelines for Professional Services in the Forest Sector - Crossings. Burnaby, B.C. September 2008.  
<http://www.apeg.bc.ca/ppractice/documents/ppguidelines/guidelinesforestcrossings.pdf>

**9.0****LIST OF REVISIONS**

<b>Rev. #</b>	<b>Date</b>	<b>Comments / Changes to Standards</b>
<b>0</b>	July 7, 2005	Original release version – working draft
<b>1</b>	August 17, 2010	<b>List of revisions:</b> <ul style="list-style-type: none"><li>• Deleted original clauses 1.32 to 1.37 under “Transmission line”, and replaced them with new clauses 1.32 to 1.40 under a new section title called, “Considerations for transmission line crossings of forest roads.”</li><li>• Original clauses 1.38 - 1.41 renumbered to 1.41 - 1.44.</li><li>• Updated web links and references, and deleted mention of the former LWBC.</li></ul>
<b>2</b>	June 10, 2013	<b>List of revisions:</b> <ul style="list-style-type: none"><li>• The name of this FLNR document has changed from <i>IPP Waterpower Projects - MFR Design Criteria for Works that may Impact Forest Roads or Timber Tenures (Rev 1)</i> to <i>Clean Energy Projects -- Requirements for Planning, Design and Construction to Protect Forest Roads and Timber Tenures (Rev 2)</i>.</li><li>• This version contains content from, and replaces, the following two earlier documents (now both defunct):<ul style="list-style-type: none"><li>○ “<i>Waterpower Projects: Guidelines for Works that may Impact Forest Roads or Timber Tenures</i>”, dated May 10, 2005;</li><li>○ “<i>IPP Waterpower Projects – MFR Design Criteria for Works that may Impact Forest Roads or Timber Tenures (Rev 1)</i>”, dated August 17, 2010.</li></ul></li><li>• Revised the Introduction.</li><li>• Added a new section 2.0 called “Roads and permits.”</li><li>• Added a new section 3.0 called “Development planning to identify and mitigate possible impacts.”</li><li>• Revised entire section called “Considerations for transmission line crossings of forest roads” (contains modified and new clauses 5.1 to 5.11).</li><li>• Revised the text in the sections now titled “Design drawing requirements” and “Construction field review requirements.”</li><li>• Added Figure 1 and Appendix 1.</li></ul>

**Figure 1: Typical forest road cross-section and definition of terms**



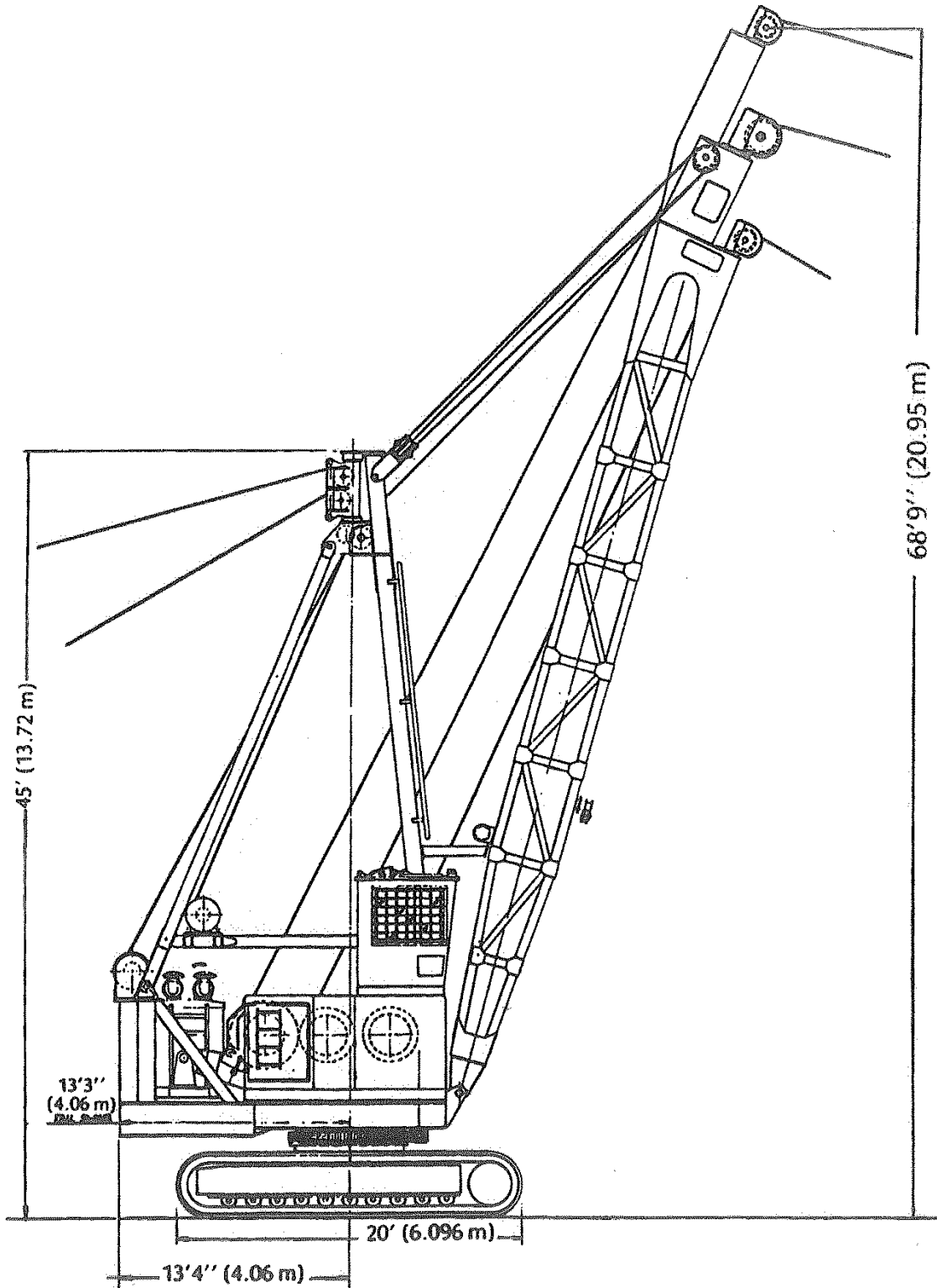
**Road prism** width is the width between the top of the road cut slope and toe of the road fill slope.

**Clearing width** is the width that is cleared of standing trees for the purpose of constructing or maintaining a road, and is typically wider than the road prism width. The clearing width, located within the road right-of-way, is the minimum width required to accommodate the: road prism; user safety; subgrade drainage; subgrade stability; areas for placement of slash, debris and other waste; operation of equipment; snow removal; fencing and other structures that are ancillary to the road; pits or quarries; and landings.

**Road right-of-way:**

- Right-of-way width for a Forest Service road is the width of Crown land legally established or reserved.
- Right-of-way width for a Road Permit or Special Use Permit road is the width of Crown land established by the permit, for the purpose of constructing, maintaining or operating the road and carrying out other ancillary activities.
- A road right-of-way width is typically much wider than the clearing width. The width of a road right-of-way is very likely to be at least 30 m and likely up to 75 m (in the case of a Forest Service road), depending on local conditions. As well, policy on this matter is continually evolving. Contact the relevant FLNR district office to obtain detailed information on the location and width of a Forest Service road right-of-way.

Appendix 1  
Example Grapple Yarder Equipment Height Diagram



Madill 143 Interlock Swing Yarder