3.4 Survey Procedures

3.4.1 Survey Level 1

Where a geometric road design is not required (e.g., where a proposed road will not cross areas with a moderate or high likelihood of landslides as determined by a terrain stability field assessment), carry out the following as part of a field traverse:

1. Clearly identify the beginning and end of the road.
2. Clearly flag the proposed centreline of the road.
3. Using an appropriate method (such as aluminum plaques and tree blazes), mark and record control points, noting the control point number, station, bearing, and horizontal distance from the proposed centreline.
4. Measure the bearing, slope gradient, and distance between the TPs and mark the cumulative changes and/or point number in the field.
5. Geo-reference the end points by double occupying the stations.
6. Record notes describing forest cover, vegetative types, soil types, rock, groundwater seepage, streams, and other related factors.

3.4.2 Survey Level 2 & 3

Carry out the following where a geometric road design is required:

1. Clearly identify the beginning and end of the road.
2. Establish intervisible stations (called turning points [TPs] if done with a compass, or traverse hubs [THs] if done with a transit) along the preliminary centreline (P-line). Use manufactured stakes or local material (blazed saplings) driven into the ground.
3. Measure the bearing, slope gradient, and distance between TPs and mark the cumulative chainages and/or point number in the field. Take both foreshots and backshots to verify the readings and to protect against booking errors.
4. Measure the slope gradient and distance to additional grade breaks between TPs as intermediate fore shots to facilitate taking cross-sections at those locations.
5. Using an appropriate method (such as aluminum plaques and tree blazes), mark and record control points, reference points, and benchmarks. Note the number, station, bearing, and horizontal distance from the P-line.
6. Geo-reference the end points by double occupying the stations.
7. Record notes describing forest cover, vegetative types, soil types, rock, groundwater seepage, streams, and other related factors that were not identified on the reconnaissance report.
8. Obtain enough information to ensure that road junctions can be designed and constructed. This includes capturing a minimum of 50 m of the existing road in the traverse (horizontal and vertical alignments and

side slopes) to ensure that the road junction is adequately designed. Switchbacks located on steep slopes also require detailed data for proper design and construction.

9. The final design road location centreline (L-line) should be close to the P-line and generally within 3 m of the P-line if the road will cross areas with a moderate to high likelihood of landslides as determined by a terrain stability field assessment, or if bedrock is present, or switchbacks are encountered.

Expand All | Collapse All

Cross-sections

Carry out the following:

1. Take cross-sections at all TPs and intermediate foreshots perpendicular to the back tangent or bisecting the interior angle of two tangents. Ensure that the recorded information is compatible with computer design software requirements.
2. Ensure that cross-sections are not more than 15m apart in rock or 30m apart in other material. A longer spacing will not provide sufficient cross-sections for the accurate earth volume calculations required for geometric design. Exceptions to this guideline may be considered for Level 2 surveys conducted in uniform terrain.
3. Extend cross-sections at least 15m horizontally on either side of the location line or farther to accommodate the road prism and in areas considered for waste disposal.
4. Measure and record slope breaks (over 10%) on the cross-section profile to the nearest 0.1m in distance and nearest 1% in slope gradient.
5. Take additional cross-sections to record features that may affect the road prism on each side of the proposed centreline. Examples of such features are rock outcrops, flat topography (benches), lakeshores, fences, streams, back channels, and existing roads.

Referencing and benchmarks

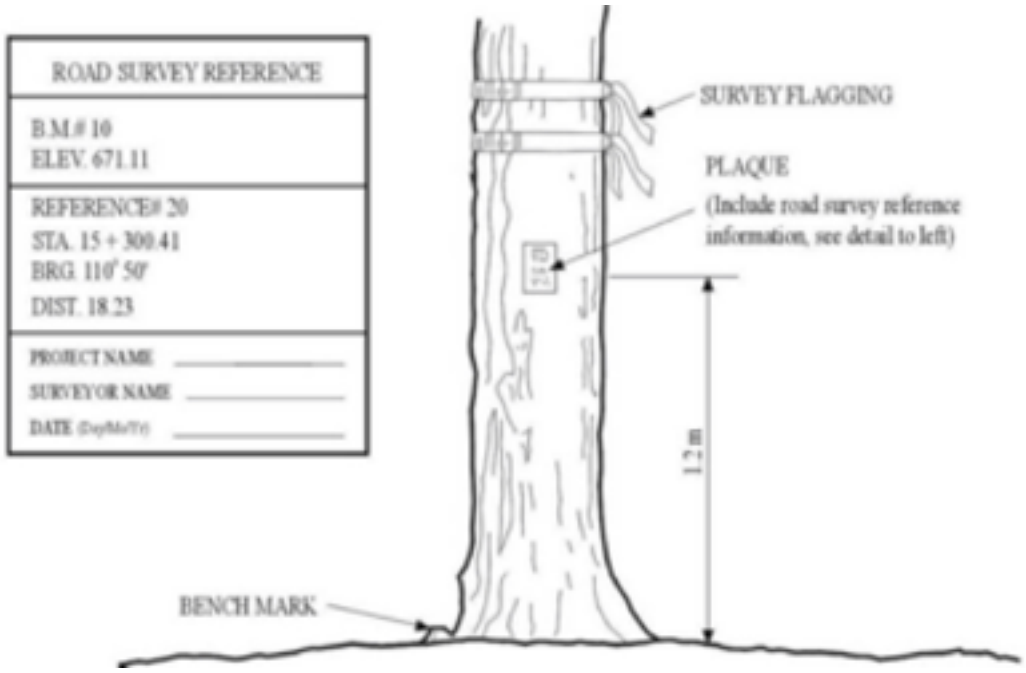
Use a reference tree or other fixed object (e.g., bedrock outcrop) for the horizontal control, and use a benchmark for the vertical control of the road traverse. Both are important for re-establishing the designed location line (L-line), as well as for construction surveys and those surveys necessary to complete as-built documentation.

Carry out the following:

1. Reference the beginning and end of the location line traverse. When switching from one survey level to another, reference this point in accordance with the higher survey level accuracy.
2. Establish references at least every 300m and at control points established during the field traverse.
3. Use two trees to establish references outside the proposed upslope clearing limit. Set the angle from the TP to the two reference trees between 60° and 120° from the centreline tangent. Make horizontal measurements to the centre of the reference marker (plaque). (The use of two reference trees improves the accuracy of relocating the traverse station and provides for a back-up if one tree is destroyed.) Use the same level of survey accuracy to establish references and benchmarks.
4. Record the diameter at breast height (dbh) and species of the reference trees so that they can easily be found.
5. Establish benchmarks outside the clearing width no more than 1km apart, at major structures and at

existing references for control points established during the field traverse.

Figure 3-1 Typical benchmarks and road survey reference information (source: Forest Road Engineering Guidebook)



3.4.3 Survey Level 4 (For High-Order Survey Requirements)

As noted earlier, this high-order survey is also suitable for alienated lands such as private property (Note: coordinate this with FLNR Forest Land Acquisitions, Victoria).

Carry out the following:

1. Before starting work on alienated lands, contact the owners and explain the nature of the work. The owner may be able to provide the location of corner pins and other useful information.
2. When working on alienated lands, keep the clearing (tree falling, line slashing, etc.) and marking of lines to a minimum.
3. Record the following information and tie it to the location line traverse:

- all existing legal markers;
- improvements and utilities that may be affected by the right-of-way;
- fences and buildings; and
- parts of the existing road, if applicable, including the top of cut, toe of fill, grade, and ditchline.

4. If possible, close traverses onto at least two legal posts to ensure accuracy and to establish correct orientation of the survey with respect to the legal lot or lots.
5. Geo-reference the end points by double occupying the stations.

Expand All | Collapse All

Survey on private property, Crown leases, and mineral and placer claims and leases

For such road location surveys, carry out the following:

- Notify, in writing, owners of private property and holders of leases and claims before conducting

survey work.

- Carry out a P-line survey to a relative precision of 1:5,000 horizontally and a vertical accuracy of +0.3m per 1km of traverse.
- Keep the clearing and marking of lines to a minimum.
- Locate all existing legal markers and tie them into the traverse.
- Tie in to the P-line, including those for buildings, fences, and existing roads.

Ties to existing property boundaries

Traverse tie the location survey to existing property markers or other evidence of legal boundaries that may be near the location survey. Complete sufficient investigations to establish the location of the property line and determine whether the road right-of-way will encroach on the property line. If possible, relocate the centreline and right-of-way if there is an encroachment.

Site survey for stream crossings

A sketch is generally sufficient for non-fish and non-major stream culverts, showing the culvert and the foundation locations with enough detail so the locations can be accurately re-established in the field. Basic Drainage Site Report Requirements describes works and standards for data collection, site planning, and plan details.

To establish site survey specifications for all bridges and for the planned installation of any culvert 2,000mm or greater in diameter, or with peak flow greater than 6 m3/s. (see Chapter 4: Design & Construction of Bridges & Major Culverts).