



Figure 1 A & B. Permanent winter roads in northern Alberta are closed to resource extraction during non-frozen periods.

## Stump Shearing During Winter Road Building: Techniques and Benefits

**USING STUMP SHEARING WHEN BUILDING** winter roads can leave the majority of the forest floor intact with minimal disturbance (Figure 1). As resource-extraction operations move towards a lighter footprint on the environment, the technique of stump removal during winter road building may be an aspect which can be reduced in favour of soil/forest floor preservation.

However, the art of stump shearing, cutting trees off at their base while using crawler tractors during winter road building, is not as simple as one would think. The old-timers who did more of this in the past simply had the knowledge and technique down pat. But as the old-timers retire, they are taking their knowledge with them.

There are shared and separate benefits around stump shearing in-block temporary roads and on-going permanent winter haul roads. Both temporary and permanent winter roads usually gain bearing capacity from properly sheared stumps.

- Stump shearing in-block temporary roads allows for suckering regeneration which would be reduced or lost if the stump was removed. This is especially true if the trees

involved are a species such as aspen which suckers readily.

- Stump shearing permanent winter roads usually creates less forest floor disturbance because there is no void left by the removed stump to be filled. Voids would typically be filled by a crawler tractor pushing forest floor and top soil along with snow into the void. (Snow alone is not enough fill.) During the following spring and summer, it would be evident where the scalping of material to fill the voids had taken place.

Whether the road is temporary or permanent, stump shearing can have structural and environmental benefits.

### Seasonal Timing

Temperatures need to be in the range of -25 to -35 °C to shear stumps with a crawler tractor (Figure 2). There is more success at shearing and less inadvertent stump removal once temperatures approached the -20 to -25 °C range for a period of a week. Others suggest even colder temperatures of -30 to -40 °C are needed to accomplish effective shearing. Warmer temperatures make shearing more difficult because stumps will lift and pivot



Figure 2 A & B. Crawler tractor with a Rome KG blade used for stump shearing. An in-block winter access road built using stump shearing.

from the soil when they are not frozen securely in the ground. Once they lift out of the soil, they leave a void that needs to be filled.

### Machines

Relatively large crawler tractors are used during stump shearing operations. One northern Albertan operation uses a D85 Komatsu. A smaller machine may not accomplish the task as well as a larger machine with additional weight, traction and horsepower. A D85 is similar to a Caterpillar D7; the weight and horsepower for these two machines are shown in Table 1.

	Komatsu D85E crawler	Caterpillar D7E crawler
Operating weight	28 100 kg / 61 950 lb	25 705 kg / 56 669 lb
Flywheel horsepower	197 kW / 264 HP	175 kW / 235 HP

Table 1. Comparison of weight and horsepower for two crawler tractors.

### Species

FPIInnovations research has found there's not much of a difference between shearing conifer and deciduous trees. Although spruce is a particularly shallow rooted species, operations in mixed wood stands did not notice a difference, providing the temperature and length of frozen period was adequate.

One parameter that did affect shearing success was the size or diameter of the stump. In some operations, larger diameter stumps were removed and there was no attempt to shear them. Stump shearing large sized stumps may not be practical even when using larger sized crawler tractors.

### Technique

The blade of the crawler tractor is positioned parallel and low to the ground as it approaches a stump, attempting to shear at the root collar, the area where the roots join the main stem or trunk, or lower. One stump is sheared at a time. If needed, the blade can be dragged across the stump by turning the machine. However, when the temperature conditions are met often no alteration to the blade edge is required. While there are purpose-built stump shearing blades (Figure 3), a basic straight or three-way blade will do the job.



Figure 3. A Fleco serrated-edge blade.

Note that this shearing technique differs from the approach used when purposefully removing a stump, which is to approach the top of a stump with the blade and lift the blade while pushing on it.

### Finished Road Grade

The finished winter road grade can be smoothed by a skidder pulling a couple of skidder tires, also known as a 'tire drag.' Other types of drag equipment can also be used (Figure 4). These devices smooth the road and fill-in minor differences between the running surface and the tops of sheared stumps. The technique also removes freshly fallen snow and any insulating effect it may have therefore allowing frost to penetrate into the road more readily. However, this technique will not sufficiently fill-in voids resulting from removed stumps.

Water trucks can deliver water to the road surface to promote a frozen condition in preparation for hauling. In certain situations, artificial snow is used to supplement local fill material for patching and leveling roads with uneven running surfaces. Artificial snow is typically denser and packs well for road fill applications.

### Spring and Summer Road Condition

A winter road built with sheared stumps will be extremely uneven and likely inaccessible with a 4x4 truck after the spring thaw. Silvicultural or survey workers may need to travel by quads to navigate the road.

If the road was built to be an in-block temporary road, this is the first season where the



Figure 4. Drag equipment used along winter roads includes used excavator tracks and skidder tires.

### Mulching: An Alternative to Consider

Used extensively for seismic line clearing, pipeline right-of-way and well-site construction, mulchers may present an opportunity for forest winter road construction. The additional cost of using a mulcher to eliminate stumps must be weighed against the potential benefits, such as the reduction in crawler tractor, construction time and potentially less environmental site impacts. Weather may also play a role in the sense that if the soil does not get cold enough for long enough, stump shearing may not be an option and mulching may prove more favourable.

benefits of an undisturbed forest floor will be seen. Suckering from the roots and stumps may be evident.

The shearing of stumps with a crawler tractor during winter road building activities is a technique which has numerous benefits when done right. Although temperatures need to be cold enough and for long enough to accomplish this task well, I am sure a few old timers would tell you all you need is a little know how to do it right, which they would be willing to share so you too could have it *down pat*. 🐾

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