

Hand Structure Guidelines

Article for the Master Skier by Ian Harvey

Stonegrinding is definitely the most effective method for applying structure to a ski base for almost any given condition. However, sometimes we do not have the appropriately grinded ski available at an event. In this case, we need to be able to react by applying structure by hand.

I will refer to two main types of hand structure: linear and broken. A linear structure looks like this (Figure 1) and can be fine or coarse which refers to the width. It can also be deep or shallow. Linear structure can be applied using a Swix riller or Toko Structurite tool using the linear bits. Broken structure is a term that refers to a structure involving vertical structure lines that are broken up (Figure 2). It can be applied using the Toko Structurite tool using the non-linear bits (which come with the tool).

There are two main factors which determine which structure is required: water content of the snow and crystal type. I refer to approximate snow temperatures below, but please keep in mind that snow temperature is just one indicator of moisture content. Similar snow temperatures in New England and in the Rockies will normally yield very different types of snow which is why we also measure relative humidity. An effective way of evaluating moisture content of the snow is to look at it carefully. Pick it up and throw it up in the air. Blow on it to see how fluffy and dry it is. Evaluate it. It is also important to realize that classic tracks will have more moisture and possibly be more transformed than the snow outside of the classic tracks because it gets skied in. For this reason, classic skis normally require more structure than skating skis given the same conditions.

A safe generalization to make is that in new snow, a quick way to have slow skis in all conditions except for wet new snow is to have too much structure. It is safe to err on the conservative side. Very wet (saturated) new snow requires the heaviest structure though. In transformed snow, even in the coldest conditions, a medium linear structure is a safe bet.

In very cold powder snow (snow temperatures of 9F and below), very little structure is desired. Ideally, the ski base would be almost glass smooth with just a little linear structure. In these conditions, no structure should be added to the ski.

In cold powder snow (snow temperatures of 19F and below), there is still very little moisture in the snow. A fine linear structure (.5 to .75 mm) is best in these conditions.

Powder snow with snow temperatures in the 20s contains significantly more moisture. In these conditions, a fine broken structure (2 passes of Toko Structurite with fine non-linear) works to break up surface tension that starts to exist with the increased water film between the ski and the snow. I should add that a broken stonegrind, generally referred to as an offset or “wet” grind is not recommended in these conditions. This is the classic “straight cross” or “cross hatch” stonegrind condition.

Wet powder snow conditions can be challenging. With too fine a structure, these can be the slowest conditions to ski in. New snow does not drain water like transformed snow usually does. For this reason, wet new snow conditions usually require the most aggressive structure of all. Aggressive deep and wide linear structures work best in very wet new snow. The Swix super riller with the 2 or 3 mm bit is necessary for those without a coarse linear stonegrind for those who want to have good skis. One important thing to note is that once this deep and aggressive structure is in, it's not coming out! Your skis will remain skis for very wet conditions until they are stoneground or scraped flat.

Transformed snow is really different from new snow. In some ways, transformed snow acts "warmer": usually we need a warmer and stickier kick wax and a warmer and softer glide wax also usually works well compared to new snow in the same temperature range). However, in other ways it acts "colder". Transformed snow locks up moisture, in the form of ice, and also allows free moisture to drain. For this reason, suction is not much of an issue unless the temperatures get so warm that the crystals start to break down which releases water and keeps it on the surface of the snow.

Transformed cold snow (in the 20s and colder) requires a medium linear structure (.75 to 1 mm). The linear structure seems to match up well with the round crystals creating a "bearings on rails" type effect where the skis handle better and also glide faster. The smaller the crystals, the finer the structure required and visa versa.

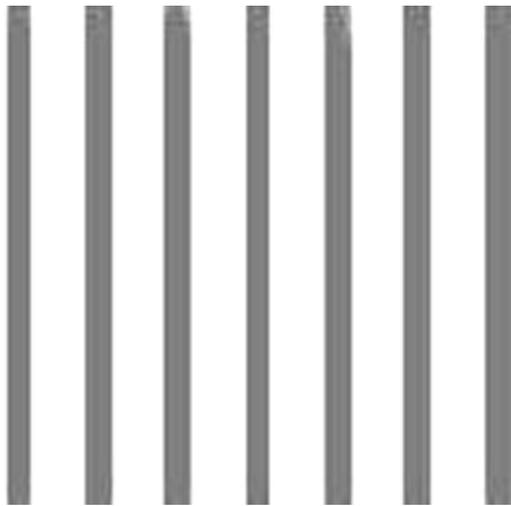
Transformed wet snow (air temperatures warmer than freezing and snowball can be easily made) that is not breaking down is fast and fun to ski on. As the water drains so easily, generally so long as the tracks stay hard (set up) and the crystals are not breaking down, a linear structure with a broken structure over it is very effective.

Wet transformed snow that is breaking down because it is raining and/or it is very warm becomes somewhat similar to very wet powder snow. A very aggressive linear structure is required (2 to 3 mm).

Transformed wet snow and very wet snow usually involve dirt. When snow melts, the dirt accumulates on the surface of the snow. The dirtier the snow is, the more we need to concern ourselves with keeping our skis clean. One very common mistake is to use aggressive structure in dirty snow. This is a mistake because aggressive structure offers more surface area for the dirt to stick to and it also involves deep grooves for the dirt to accumulate in. When the aggressive structure gets clogged up with dirt, then the structure is rendered ineffective against breaking suction and there will be significant friction between the snow and the dirt on the ski base. The key in very dirty snow is to use shallower structure that is linear covered by broken (1 mm followed by 2 passes of Toko Structurite on coarse non-linear). This helps break surface tension and suction, but will not allow such opportunities for the collection of dirt on the base that a deep structure will.

There are two main hand structure tools on the market: the Toko Structurite and the Swix Riller. They each have their advantages and both are necessary for the serious ski racer. The Toko tool presses the structure in. Pressing is advantageous in that the structure is only temporary. The ski will return to its original form after a couple of wax jobs. This is especially important when considering how many pair of skis are available and if they are “all around” skis or skis just for wet snow. The Toko tool also has the capability of pressing in both linear and broken structure. The Swix tool is less versatile, but when conditions are wet and a truly coarse structure is required, it is the tool for the job. The Swix Riller is capable of cutting in a much deeper linear structure (when desired) than the Toko tool is. This structure will also last for a long time which can be good and bad.

When hand structuring with any tool, it is very important to press down with all of the pressure that can be given while moving the tool down the ski from tip to tail. This must be done while the ski is on a form bench.



Linear Structure

Broken Structure