



Bonding System Technique Protocols

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There are three primary bonding techniques with direct restorations:

I. Total etching

II. Self-etching

III. Selective etching

Before getting into the protocols used with each technique, there are several precautions that should be taken regardless of technique.

- It's essential to not start the technique until you've ensured that the tooth is well protected from saliva, blood and other contaminants with a rubber dam, cotton rolls, saliva ejectors, or whatever means of isolation works best for you. If the tooth comes into contact with any contaminants during the process, you'll need restart the technique again.
- If you're using an air/water syringe to dry a tooth, it's important to first test it occasionally by aiming it at some litmus paper or the floor and hitting the air button a few times to make sure it isn't putting out any water. You want nothing but air coming out of that syringe; if any water is also present, it could compromise the ultimate quality of the bond. Of course, if you're using a dedicated air-only line for drying, this won't be an issue. These dedicated devices also usually have the advantage of gently blowing slightly warmer air, which can make the drying process a little easier.
- Regularly test your curing light to make sure it's performing as specified. And remember that it's better to over-cure than to under-cure.
- Whichever bonding system you use, make sure to follow the manufacturer's instructions closely.

With that said, here are my recommended protocols for each of the three primary bonding techniques.



I. Total Etching

If you're employing a total etching technique, you're most likely using one of these two bonding systems:

- A **3-step etch-and-rinse bonding system** (sometimes referred to as “4th Generation” bonding systems) – like DMG's LuxaBond Total Etch – uses an etchant, primer, and an adhesive.
- A **2-step etch-and-rinse system** (sometimes referred to as “5th Generation” bonding systems) that uses an etchant and a primer/adhesive combination

Here's my recommended total etching protocol:

1. Etch the tooth with a phosphoric acid solution (using whatever percent concentration and whatever etching time is recommended by the bonding system manufacturer).
2. Rinse the etchant and dry the tooth.
 - *Note:* It's prudent to err on the side of over-rinsing, as no harm can come from that. However, drying is a much more sensitive step. If the tooth is too wet, the resin can become diluted and won't penetrate as well as it should. If the tooth is too dry, the collagen fibers that help hold the resin to the tooth can collapse. If you've over-dried the tooth, you may want to re-hydrate it or make it less sensitive by using substituted materials like desensitizers or cavity cleansers. (However, this isn't necessary if your technique is sound.)



Conditioning of the cavity and canal (enamel: 20 to 60 seconds, dentin: max. 15 seconds).



Cleaning and drying.



Applying the Pre-Bond with a specially shaped endobrush.



Mixing Bond A and Bond B.



Bonding the cavity with the mixture of components Bond A and Bond B.



3. The next steps depend on which bonding system you're using:

- If you're using a **3-step** bonding system:
 - Apply the primer lightly.
 - Air-dry*.
 - Lightly apply multiple coats of the adhesive, being careful to get thorough penetration without damaging the collagen fibers.
 - Air-dry*.
 - Light cure.
- If you're using a **2-step** bonding system:
 - Apply the primer/adhesive combination, being careful to get thorough penetration without damaging the collagen fibers.
 - Air-dry*.
 - Light cure.

**The challenge with air-drying is to be able to thin the adhesive down to create a Saran Wrap-like layer on the tooth. If the air is blowing too hard, you can create tiny air voids that displace the adhesive. It requires a good technique to be able to manage the fine line between under-drying and over-drying.*

Keep in mind that while you'll save some procedural time due to the one less step involved with the 2-step system, these systems generally involve a trade-off in the form of reduced bond strength.

II. Self-Etching

Please note that if you're using a self-etching technique, any enamel present should typically be etched following manufacturer protocols.

Here are the three bonding systems you're most likely to use if you're employing a self-etching technique:

- **2-step self-etch** bonding systems (sometimes referred to as "6th Generation" bonding systems) that use an acidic primer and an adhesive.



- **1-step self-etch** bonding systems (sometimes referred to as “7th Generation” bonding systems) that use a no-mix acidic primer/adhesive combination. These systems are inherently acidic and tend to have a significant amount of water in their formulations, which can lead to hydrolysis and chemical breakdown. Furthermore, once placed and polymerized, 1-step self-etch systems are generally more hydrophilic than 2-step self-etch systems, making them more prone to water sorption, lower depth of resin infiltration into the tooth, and the risk of some voids.
- **1-step universal self-etch** bonding systems (sometimes referred to as “8th Generation” bonding systems) – such as DMG’s Ecosite Bond – that use a no-mix acid/primer/adhesive combination, are compatible with direct resin systems but in most cases, are not compatible with all dual cure resins and cements without adding another bottle. Importantly, these bonding systems can be used not only with a self-etch technique, but with total-etch and selective-etch techniques as well. This reduces the amount of product inventory you’ll need to purchase and maintain.

Here’s my recommended 2-step self-etch protocol assuming no enamel is present:

1. Apply the acidic primer to achieve full coverage and penetration*.
 - Note: Some manufacturers may also instruct you to scrub the tooth with a micro-brush after applying the acidic primer.
2. Air-dry.
3. Apply the adhesive thoroughly.
4. Air-dry.
5. Light cure.

**It’s essential to make sure you have adequate coverage of the primer, which will probably meaning applying several layers of the liquid. The reason: Being acidic, the primer will neutralize when it comes into contact with the tooth. For best results, multiple coatings are recommended.*

Here’s my recommended protocol for both 1-step self-etch and 1-step universal self-etch systems assuming no enamel is present:

1. Apply the no-mix acid/primer/adhesive combination to achieve full coverage and penetration.



2. Close the bottle lid immediately with 1-step self-etch to prevent evaporation that could change the material's physical properties prior to the next use.
3. Scrub using a micro-brush to help the liquid penetrate the tooth since there was no separate etching or priming step.
4. Dip back into the well of liquid and scrub again.
 - Note: Be sure to follow the manufacturer's protocol regarding how long you should scrub, as it may be as long as 20 seconds each time.
5. Air-dry.
 - Note: Again, be sure to follow the manufacturer's protocol regarding how long you should air-dry, as it may be as short as 5 seconds.
6. Light cure.

As mentioned above, one of the many advantages of using a **1-step universal self-etch** system is that it can be used with selective etching.

III. Selective Etching

For all their advantages, self-etch systems don't always etch enamel well. As a result, if you're using a self-etch bonding system on enamel, you'll probably want to add an etching step. This is called selective etching, and it's pretty straightforward. In the early years, there were some problems with the etchant being runny and difficult to control. Fortunately, manufacturers then developed thicker etchants that make it possible to etch just the enamel and have it stay where you want it.

Here's my recommended protocol for 1-step universal self-etch protocol when doing selective etching:

1. Etch the enamel with a phosphoric acid solution.
2. Air-dry.
3. Apply the no-mix acid/primer/adhesive combination to achieve full coverage and penetration.
4. Using a micro-brush, gently apply to enamel. Scrub when on the dentin to help the liquid penetrate the tooth since there was no separate etching or priming step.



5. Dip back into the liquid well and apply to the enamel and dentin again.
 - Be sure to follow the manufacturer's protocol regarding how long you should scrub, as this can vary by manufacturer.
6. Air-dry.
 - Again, be sure to follow the manufacturer's protocol regarding how long you should air-dry, as it may be as short as 5 seconds.
7. Light cure.

Additional Thoughts

While 2-step bonding systems save a step relative to 3-step systems, the 2-step systems could provide weaker bond strength than 3-stage systems. Thus, their time savings advantage may be outweighed by their bond strength disadvantage.

However, it doesn't necessarily follow that you have to give up even more bond strength when transitioning from a 3-step or 2-step system to a 1-step universal system. In fact, some 1-step universal systems offer even higher bond strengths than 3-step systems.