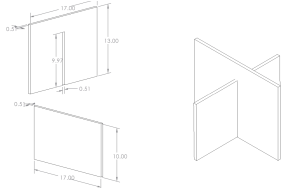
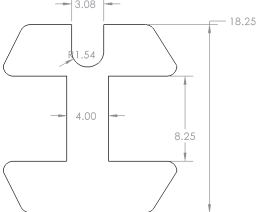
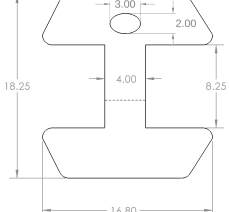


Design Matrix

Design Criteria:	Design 1: S-Design		Design 2: Half-Oval		Design 3: Perforation	
						
Filling Quality (25)	4/5	20	2/5	10	5/5	25
Ease of Removal (25)	3/5	15	5/5	25	4/5	20
Ease of Use (20)	3/5	12	4/5	16	5/5	20
Ease of Fabrication (10)	5/5	10	4/5	8	3/5	6
Safety (5)	4/5	4	5/5	5	5/5	5
Cost (5)	4/5	4	5/5	5	5/5	5
Total (100)	65		69		81	

Category Definitions:

Filling Quality: Expected filling quality describes the ability of the device to replicate the natural tooth shape. To successfully replicate the natural tooth shape and protect the gums, there must be proper interproximal contact and wedging. Proper interproximal contact prevents food packing, which can lead to gingivitis, tartar, and tooth decay. Adequate wedging prevents gingival margin leakage, protecting the gums.

Ease of removal: Ease of removal is integral to the success of the project because the device aims to be as efficient as possible. Less time removing the device results in the overall restoration time decreasing. The objective of the device is to reduce procedure time. If the dentist must take extra time to remove the matrix, there will be no time saving effect and dentists will continue using two matrices back to back.

Ease of Use: It is crucial that the design is easy for the dentist to use. The design aims to replace the standard of interproximal cavity restorations, and to do this, the design must be user-friendly. A design that is only one piece will be easiest to use because the oral cavity is small and accounting for several pieces would require the dentist to take more steps. Furthermore, the device will arrive flat, and the dentist will fold it into the butterfly shape. It will be more difficult to contour the matrix band if it is made of more than one piece.

Ease of Fabrication: A design that is easy to fabricate will consistently produce accurate dimensions, which is crucial to device functionality. Easier fabrication also reduces the time and cost needed to produce the device. A quick, easy manufacturing process allows the team to spend more time on quality checking, smoothing edges, and testing performance. Together, these benefits make the matrix more practical for dentists to use.

Safety: Safety is of the utmost importance to ensure patient comfort during and following the restoration. Thin metal bands can easily slice gingival tissue, so it is important to choose a design that fits snug to the contour of the tooth without needing to force it into the gumline. Additionally, the metal needs to be burnished carefully to avoid sharp edges or burrs which can also cut the soft tissue during placement or removal. Removing the device in the least amount of pieces possible will also ensure no metal components are left in the oral cavity.

Cost: The cost is imperative as the design requires functionality but also must remain at a competitive price relative to competitors in order to sell. Despite this importance, it does not take precedence over other categories as the primary function of the device is to save time and not money.

Ranking Explanations:

Filling Quality: Expected filling quality is weighted 25 because filling quality is integral to the device. This is because the purpose of the device is to reduce restoration times by performing two restorations at once. The device must produce a quality filling otherwise it will not replace current devices. The Perforation design is ranked 5/5 for quality because it provides good tooth contact with a tooth-like shape while allowing for proper wedging. The S-design is ranked 4/5 because it allows for mostly good contact and wedging; however, its use would not result in a tooth-like shape. The Half-Oval design is ranked 2/5 because although its contact on the upper part of the tooth is good, the opening on the bottom will result in the composite resin leaking into the gum area and onto the wedge.

Ease of Removal: Ease of removal is weighted 25 because the client indicated removal difficulties as the largest issue with previous design iterations. The Half-Oval design earned a score of 5/5 because there is no bottom to the circle, allowing the matrix to slide straight up and out of between the teeth. It also has a tab. The Perforation design is ranked 4/5 because breaking the matrix into two pieces should allow the dentist to remove one side after the other. However, the side with the circle cutout could still get stuck on filling. The S-Design is ranked 3/5 because there could be a gap between the two metal sheets either causing a lip or one filling to connect to another which would make it difficult to remove. It also has no tab to grab.

Ease of Use: Ease of use is weighted 20 because the device must be easy to shape, otherwise dentists will likely not adopt its use. The Perforation design is the easiest to use because the dentist can simply fold the piece in half to create the butterfly shape, which is why it has a score of 5/5. The wings are also easy to mold because they are connected throughout the bottom. The Half-Oval design is similar to the Perforation design in that the user can simply fold it to create the butterfly shape. However, the Half-Oval design will be more difficult to contour than the Perforation design because the bottom is not connected on one side. So, it earned a score of 4/5. The S-Design is more difficult to use compared to the others because it is made of two pieces, rather than one. This requires more assembly. Additionally, it will be more difficult to contour because it does not taper in towards the gums, resulting in an ease of use score of 3/5.

Ease of Fabrication: Ease of fabrication is weighted 10 because easier fabrication reduces production time and cost, which in turn reduces device cost. A cheaper device is more desirable to dental offices. The Perforation design is rated a 3/5 for ease of fabrication because there are several small pieces that must be cut out and be smoothed. Similarly, the Half-Oval design has several small cut-outs; however, there is no perforation which means fabrication will be easier. So, it is rated a 4/5. The S-Design only requires one slit to be extruded and a chamfering of

edges, which is why it is rated a 5/5 for ease of fabrication.

Safety: Safety is weighted 5 because the patient's health and safety is our first priority and as such all designs that are on the matrix are already highly safe. The perforation design was ranked 5/5 for safety because the perforated section allows for a lower risk of tearing into 3 or more pieces, which reduces the likelihood of metal being swallowed by the patient. The half oval design is also 5/5 because there is no lower lip for the matrix to get caught on, so there is minimal tearing likely. The S-design is ranked slightly lower than the others because the 2 pieces sliding together in the middle could pose a higher risk of accidentally cutting the gums.

Cost: The Perforation and the Half Oval designs were rated 5/5 as their material and fabrication costs are relatively low as they are composed of a single piece of metal. For the S-Design however, it is rated a 4/5 because it is composed of two separate pieces and would require more cutting and material costs compared to the other two designs.