Argen's Smart Split File Design Guidelines

For Zirconia / Titanium Split File Design

Successful split files have as much to do with milling as they do with design. If you've tried split file design, been curious about split file design, or if this is the first time you're hearing of it, here is some guidance on how to get the best-fitting split files every time.

Step One: Abutment Design

The most important aspect of abutment design is the abutment itself. A poorly designed abutment will cause difficulty getting an accurate fit without adjustments.

Posterior Abutments

For posterior abutments, we recommend using the "robotic abutment" selection in the 3Shape design software. Figure 3 shows the menu that will allow you to change this.

1. **Abutment Taper: 5 degrees** – This increases the passiveness of the unit and prevents it from getting caught up before seating.
2. **Abutment Shoulder Length: 0.3mm – 0.8mm** – This maintains a short chamfer and is ideal for milling.
3. **Shoulder Angle (Approx): 15 degrees** – This controls the angle of the chamfer, distributing the force of the crown along the whole abutment.
4. **Abutment Shoulder Radius: 0.9mm** – This keeps the shoulder from being sharp which maintains millability.
5. **Abutment Top Fillet Radius: 0.5mm** – A softer occlusal edge means less drill compensation. Less drill compensation ensures a more accurate fit.
6. **Abutment Occlusal: Minimal definition** – Less is more. Adding too much geometry on the occlusal increases the areas that your abutment may be undermilled.
7. **Retention Groove: Optional** – Always ensure your retention groove has no sharp edges or tight angles on the inside edges of the retention groove and follows the same path of insertion as the crown. These retention lines can lead to fit issues by either creating areas that a mill will have difficulty reproducing or creating areas with additional drill compensation.

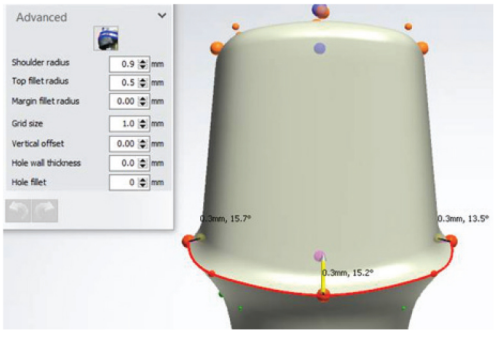

Figure 1
Buccal view of a posterior abutment, with design settings and ideal shoulder size.

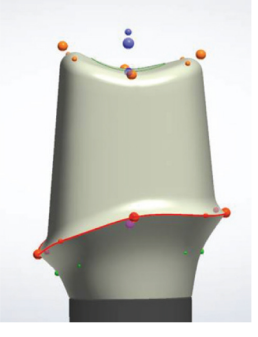

Figure 2
Profile view of a posterior abutment, showing ideal occlusal design.

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Anterior Abutments

Anterior abutment design is more complex than posterior abutments. The concept for anterior abutments remains the same as posterior abutments (5 degree taper, millable shoulders, no hard edges). However, if you're using 3Shape to design your abutment, we recommend using the custom abutment selection instead of the robotic abutment selection (see Figure 3). When using the custom abutment option, the numbers that we used for posterior units will not be selectable. Instead, keep the following in mind.

1. **Abutment Taper: 5 degrees** – To achieve 5 degrees with a custom abutment selection, point your mouse at the blue dots on the side and roll your mouse wheel up and down. This will adjust the taper. We recommend 5-8 wheel clicks per side to achieve ideal taper degree.
2. **Abutment Chamfer: 0.5mm** – This maintains a short chamfer and is ideal for milling.
3. **Margin/Shoulder Design: Smooth** – The custom abutment feature allows you to give too much detail in the margin. Remember, the wavy and sharp angled margins/shoulders will leave areas in which a milling bur cannot fit (See Figure 4). This will lead to fit issues for the crown.
4. **Abutment Shape: Triangular** – This shape allows for a more anatomically correct crown while ensuring that rotation will not be a concern.
5. **Retention Groove: Optional** – Always ensure your retention groove has no sharp edges or tight angles on the inside edges of the retention groove and follows the same path of insertion as the crown. These can all lead to fit issues by either creating areas that a mill will have difficulty reproducing or creating areas with additional drill compensation.

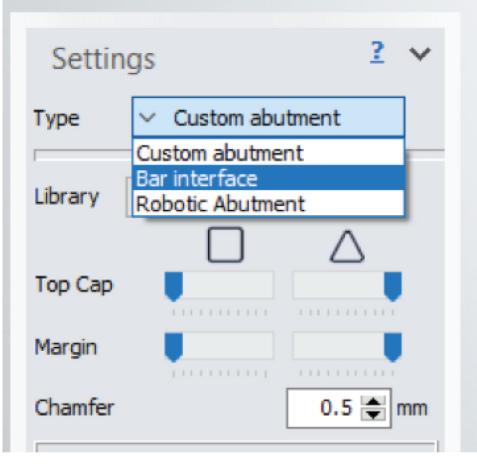

Figure 3
In the "Parametric" step of abutment design, under the settings tab, is the option to select the type of abutment design. For posterior we recommend Robotic Abutment and for anterior we recommend Custom Abutment.

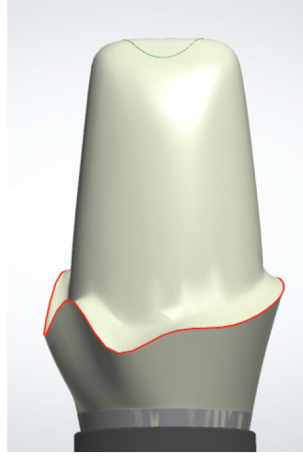

Figure 4
The left side of this abutment would be a potential issue with milling burs. The right side of the abutment is an example of a smoother margin line.

Step Two: Proper Cement Gap Settings

A good abutment design is only 90% of the story. If you only correct your abutment design you will likely manufacture crowns that will fit most of the way down the abutment, but will require 1-5 minutes of adjusting to get to seat the rest of the way. Instead, if you modify the cement gap settings, you will be able to get the crown to drop the last .5mm to seat nearly perfectly.

1. Crown Cement Gap: Posterior = 0.010mm / Anterior = 0.020mm – This setting controls your die spacer closest to the margin. Too high, and your abutments look open. Too low and you risk hydraulic compression or tight fits.
2. Crown Extra Cement Gap: This is the thick, nail polish-like paint you use to put on your dies. It controls your general fit. We recommend keeping these settings at your current defaults for posterior abutments. For anterior abutments we recommend decreasing this slightly. We decreased our extra cement gap setting from our preferred default: 0.065mm to 0.060mm.
3. Crown Dist. to Margin Line: 0.30mm-0.50mm – This controls when your cement gap becomes extra cement gap. A lower setting brings the looser cap closer to the margin, preventing any hang-ups in the shoulder. This number should always be smaller than the length of your shoulder (See Figures 5 and 6).
4. All Other Cement Gap Settings – Leave at default.

Figure 5
This is an example of a Dist. to Margin line setting that is too high. The yellow area represents your cement gap and the orange area represents your extra cement gap. As you can see, the cement gap goes up past the shoulder and onto the walls of the abutment. In addition to being too snug in the shoulder, this creates an undercut on the walls of the crown.

Figure 6
We took the same abutment and decreased the Dist. to Margin line setting. This drops the extra cement gap down past the shoulder allowing for a more passive fit and decreasing the issue of any potential undercuts.

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