Handling and Preparation Guidelines
for Dentists and Labs

Lava™
Precision Solutions

Handling & Prep Made Easy

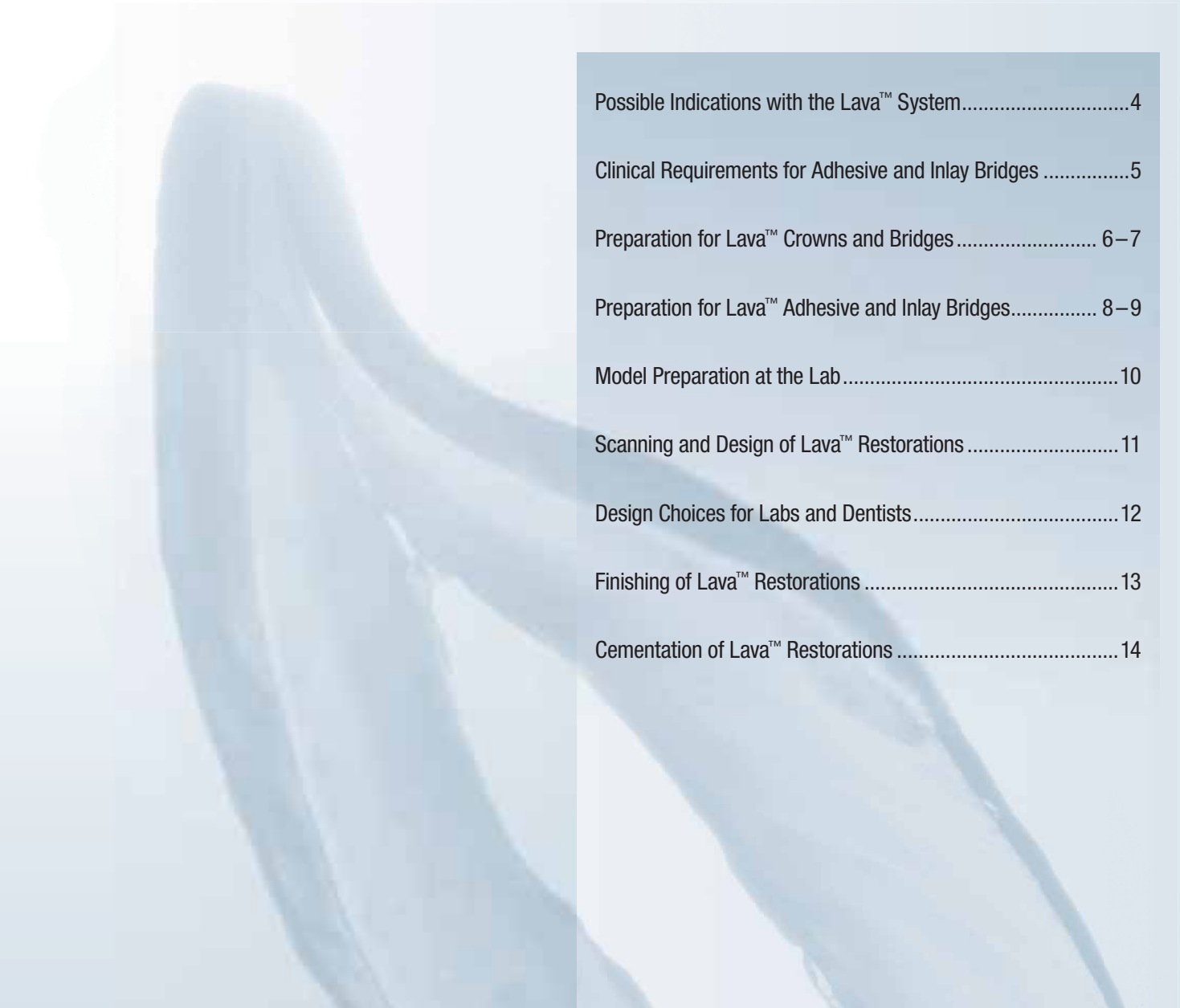
3M ESPE

It's easy to offer 3M™ ESPE™ Lava™ Restorations.

The Lava™ brand integrates digital technology and material science in an intuitive way to help dentists and labs improve productivity while offering excellent oral care.

The Lava system works together in harmony. From the digitization of the model with our Lava scanner to the virtual design with our software and the milling of our specially-formulated zirconia, the system has been designed to produce high-strength restorations with outstanding marginal fit and excellent esthetics.

Our preparation and handling guidelines have been designed for dentists and their dental labs. We are sharing the entire guideline with clinicians and labs so both groups understand the complete process. We hope you both enjoy working with Lava restorations.



Possible Indications with the Lava™ System.

Due to its excellent mechanical and optical characteristics, 3M™ ESPE™ Lava™ zirconia can be used for a wide range of indications.

Figure 1: Single crowns

Figure 2: Splinted Crowns

Figure 3: 3-unit Bridges[1]

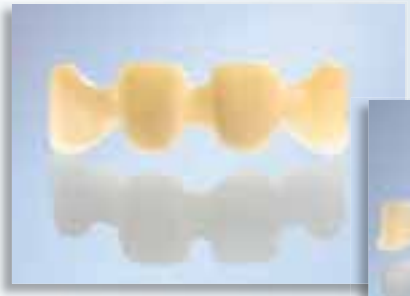


Figure 4: 4-unit Bridges[1]

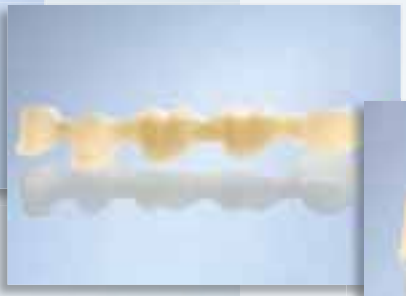


Figure 5: 5-unit Bridges[1]

Figure 6: 6-unit Bridges[1]

Figure 7: Cantilever bridges[2]

Figure 8: Inlay Bridges and Onlay Bridges[3]
(excluded for patients with bruxism)

Figure 9: Maryland Bridges[3]
(excluded for patients with bruxism)

Figure 10: Primary/telescopes

1) 3–6 unit bridges with a maximum of two bridge units next to one another in the posterior area and a maximum of four bridge units next to one another in the anterior area.

2) with a maximum of 1 pendant at the position of a premolar or incisor (cantilever bridges are not approved for use in patients with bruxism)

3) Tests have proven: Lava™ zirconia shows a sufficient strength for this indication. However, this type of indication overall can have a higher failure risk due to de-cementation and secondary caries regardless of manufacturer. Please refer to national and regional dental associations for more information.

Clinical Requirements for Adhesive and Inlay Bridges.

Advantages:

Adhesive and inlay bridges have the advantage of being minimally invasive. Compared to traditional bridge preparation, only three to 30% of healthy tooth structure is lost instead of 63 to 72%. (D. Edelhoff et al. (2002)). This makes these restorations an attractive option for young people with healthy dentition. In addition, adhesive bridges (Maryland bridges) show a lower occurrence of post-operative sensitivity due to the enamel retention of the restoration. However, these restorations are associated with a higher risk of failure in comparison to conventional FPDs (Priest, 1996). Survival rates of these indications are 70 to 80% (4 to 6 years) and are lower than conventional FPDs. Debonding of the restorations and secondary caries are the most prominent failure rate. Undetected debonding of a retainer may lead to plaque accumulation and possibly to subsequent lesions and gingivitis.

Therefore, these indications have to be carefully considered for each clinical situation. For further information also see the recommendations of the national or regional dental associations.

Patient Selection*

The literature recommends diligence in patient selection:

- Vital abutment teeth
- Only moderate sized carious lesions or restorations not exceeding the preparation depth of adhesive bridges
- Good oral hygiene
- Teeth in final occlusion
- No parafunction (e.g. bruxism)
- No periodontal hypermobility of abutment teeth or high difference in abutment teeth mobility
- No heavy occlusal load on the restoration

(St George G. et al. 2002; St George G. et al. 2002; Ketabi 2004; Stokes A. (2002); C.J. Goodacre et al. 2003; Zalkind M. et al. 2003)

*References: please look on the inside back cover for more information.

Preparation for Lava™ Crowns and Bridges.

Many Procedures Remain the Same

With 3M™ ESPE™ Lava™ crowns and bridges, you provide high-quality restorations to your customers. In addition to natural esthetics and durability, Lava crowns and bridges also stand out for their excellent fit. To achieve this, practice and laboratory have to meet just a few basic requirements.

Courtesy Dr. J. Manhart, University of Munich

Zirconium Oxide – the Framework Material of the Future

Unlike traditional all-ceramic restorations, Lava™ restorations are made of zirconium oxide. This strong material does not require a distinct shoulder to support the framework or to enhance the esthetics. In addition, the margins can be thinly tapered. This means the preparation for Lava restorations protects the tooth structure.

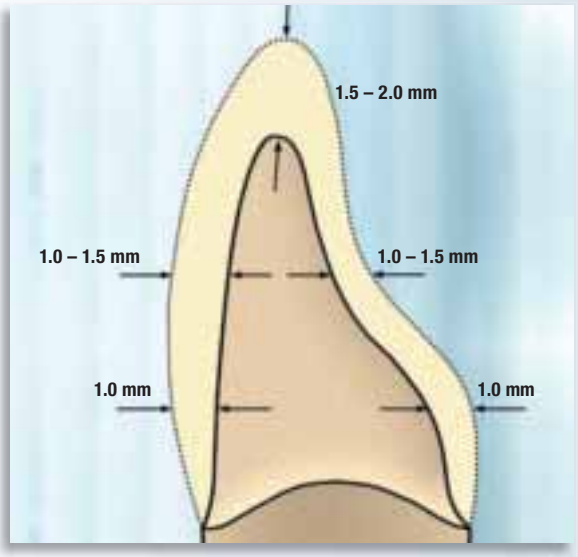
Minimal Reduction

The zirconia used for Lava™ framework is strong enough to allow for thin walls. Space for an opaque layer is not required. Therefore, a reduction of the tooth structure based on the dimensions indicated below is sufficient.

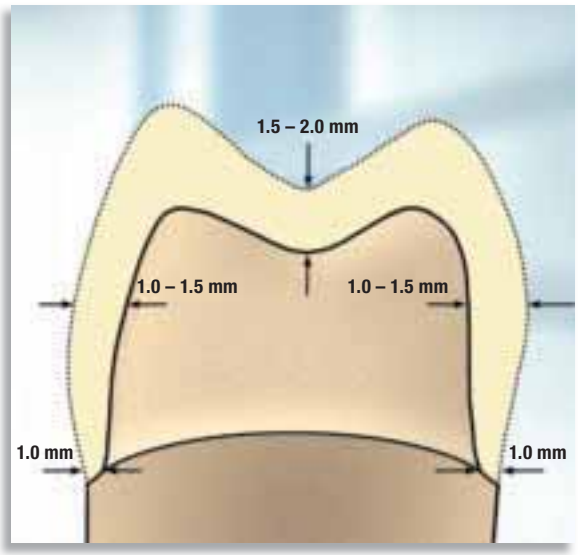
Shoulder or Chamfer to set Precise Limits

Ideally, the preparation includes a circumferential shoulder or chamfer with a horizontal angle of at least 5°. The vertical preparation angle should be at least 4°. The inside angle of the shoulder preparation must be given a rounded contour. All occlusal and incisal edges should also be rounded.

The marginal edge of the preparation needs to be continuous and clearly visible. A bevel should be avoided. For posterior and anterior teeth, a supragingival margin poses no problems. Due to the tooth-colored framework, very aesthetic results can be achieved.



Recommended preparation for anterior teeth.



Recommended preparation for posterior teeth.

Preparation for Lava™ Crowns and Bridges.

Special Preparations

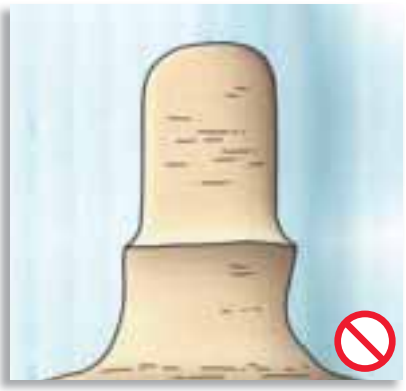
Tangential preparation: Steep tangential preparations may result in extremely thin tapered margins. In principle, this type of preparation is possible, but caution is advised.

Unacceptable Preparations

Gutter Preparation: Margin cannot be detected unambiguously.

90° Shoulder: Margin cannot be detected unambiguously.

Undercuts must be avoided.



Parallel walls: In principle, parallel wall preparations are feasible. However, a cement gap cannot be milled in this case. This may significantly affect the fit.

Sharp incisal-occlusal edges must be avoided. The rounding radius should be > 0.4 mm.

Divergent stumps in the bridge cannot be milled. Due to the restricted path of insertion inclination of the two stumps can not be realized.

Preparation for Lava™ Adhesive and Inlay Bridges.

Preparation:

Tooth preparation has an influence on the survival of the restoration. Especially in the case of Maryland bridges (anterior adhesive bridges) retentive elements should be prepared (e.g. seating groove and pinhole (M. Behr and A. Leibrock, 1998, El Mowafy 2003, Kern (2005), see dental textbooks).

The teeth to be restored by a 3M™ ESPE™ Lava™ zirconia adhesive bridge should be prepared according to the following instructions. In general, rounded edges and clear margins are required for full ceramic restorations.

Preparation Maryland bridges (anterior adhesive bridges):

Preparation depth: up to 0.7 mm; The preparation needs to be in enamel instead of dentin. The enamel depth of a tooth can vary from 0.4 to 1.0 mm (W. Kullmann 1990). Wall thickness of zirconia framework: 0.5 mm minimum to ensure sufficient strength.

Veneering: 0.1 mm (Glazing is necessary to prevent abrasion of antagonist); If the preparation depth can not be realized with the minimum wall thickness of 0.6 mm (zirconia + glazing) due to insufficient enamel thickness, the dentist should re-evaluate this indication. If the zirconia is not glazed, the restoration should not have any occlusal contact. We recommend the use of a preparation matrix before tooth preparation to be able to check the preparation depth.

For the preparations of retentive elements see figure 1 to 3 (e.g. pinholes, seating groove). In general a radius of ≥ 0.4 mm is required for the milling in the Lava system.

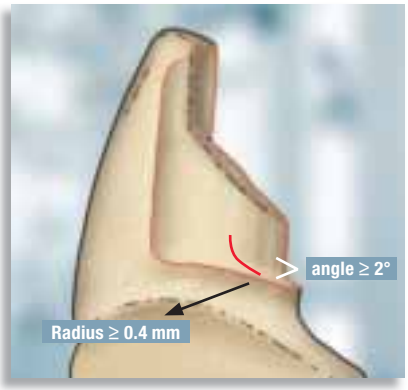


Figure 1: Rounded angles (Radius ≥ 0.4 mm, no sharp edges), clear margin and horizontal angle ≥ 2°.

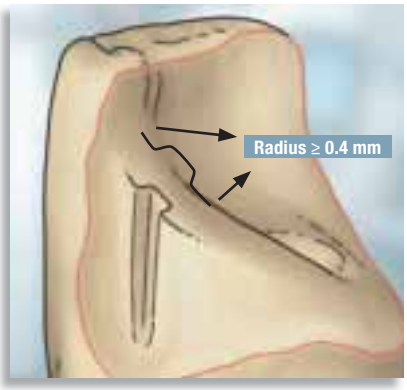


Figure 2: Retentive element: rounded ridge (Radius ≥ 0.4 mm).

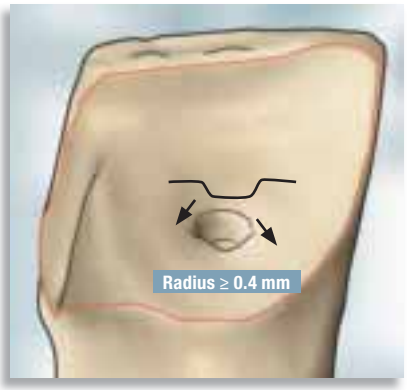


Figure 3: Retentive element: rounded pinhole (no sharp edges, radius ≥ 0.4 mm).

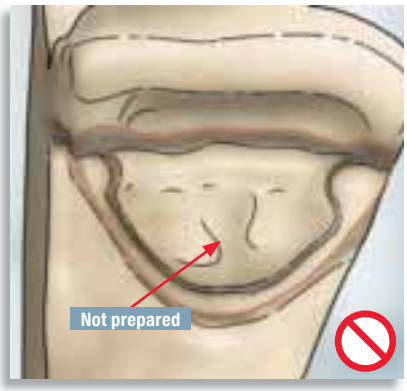


Figure 4: Not possible: circular preparation of the wings, no preparation in the middle, only one preparation margin can be detected by the system.

Remember: Adhesive and inlay bridges are more complex to manufacture. With these restorations, it is even more important than ever to follow the preparation guidelines to avoid inferior marginal adaptation and lengthy manual fitting efforts after milling.

Preparation for Lava™ Adhesive and Inlay Bridges.

In comparison to a 3-unit Maryland bridge, fixed-pontic-fixed, a cantilever 2-unit Maryland bridge, fixed-pontic, design is even more conservative, since only one abutment tooth needs to be prepared. The risk of unnoticed debonding and consecutive secondary caries is low. However, debonding of a single retainer adhesive bridge could directly lead to loss or swallowing/aspiration of the restoration. In general clinical studies show a better survival rate of 2-unit cantilever bridges. When considering adhesive bridges, the recommendations of the national or regional dental association need to be followed where applicable.

Preparation of Inlay Bridge (see Figure 5 and 6):

Preparation depth:
2–4 mm
It is important to have sufficient space for a connector of 9 mm^2.
The preparation should have a taper of ≥ 2° to 3° and have no friction.
The margins must be clearly indicated.
Full ceramic preparation in general requires rounded angles (no sharp edges, minimum radius ≥ 0.4 mm)
Wall thickness of zirconia inlay: ≥ 0.5 mm

Veneering:
Veneering or glazing is necessary to prevent abrasion of antagonist.
Maximal length of pontic: 10 mm

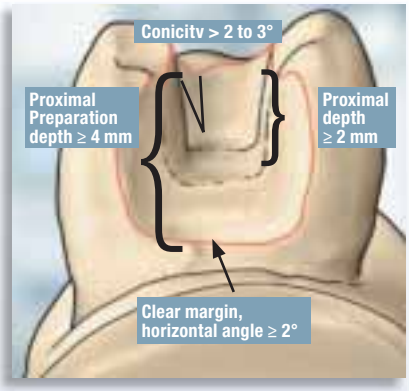


Figure 5: Proximal view inlay preparation.

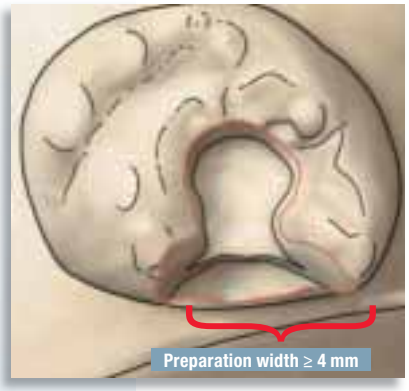


Figure 6: Occlusal view inlay preparation.

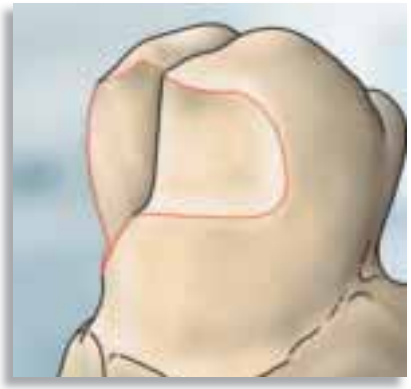


Figure 7a+b: Additional lingual or vestibular wing only with an extension maximally until tooth equator.

In the case of vestibular and lingual/palatinal wings in addition to the inlay cavity, the wings can be prepared by the Lava system maximally until a 90° angle to the inlay preparation (see figure 7a + b).

*References: please turn back for further informations

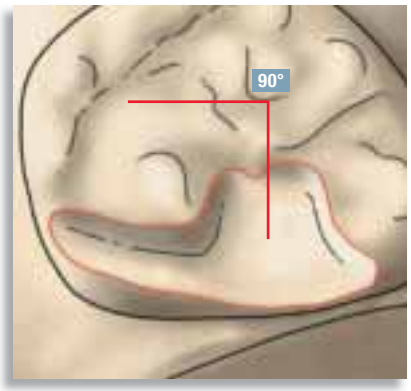


Figure 7b

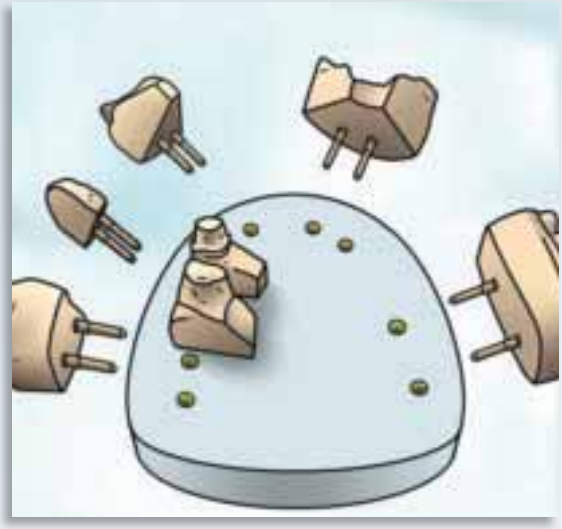
Model Preparation at the Lab.

Model Preparation

A precise model preparation is vital for quality and fit of the restoration. To ensure that all data can be collected, the saw cut model for the scanning process is made of a light-colored, unvarnished gypsum laboratory stone (Class IV) with a dull surface.

All stumps, the alveolar ridge and all other segments need to be removable and need to have a defined seat in the base. For optimal analysis of the situation in the scanned area the maximum height of the model, measured from the bottom of the base to the incisal edge, should not exceed approx. 40 mm.

A magnet split cast system available from SAM (Order 526) is recommended. However, in principle, all systems are feasible, provided that they meet the general requirements. A bite registration in the form of a simple silicon or polyether key serves as an aid in placing the bridge elements.

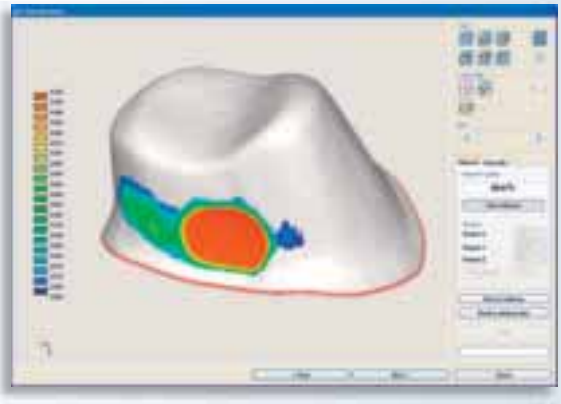


Segmented model: The scanner digitizes the stumps, alveolar ridge, bite registration, and adjacent teeth (optional). They can be visualized on the screen according to the individual needs.

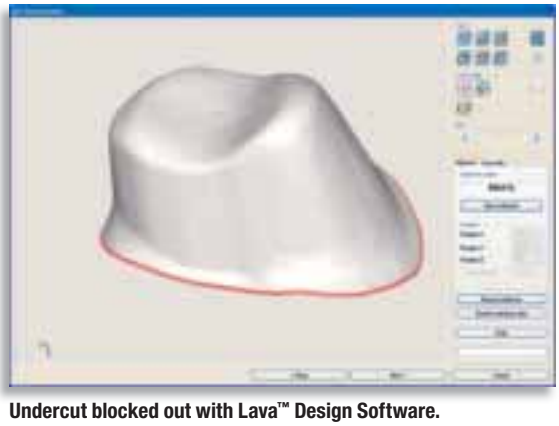
Blocking Out

Dips, cavities and pores can be blocked out in a conventional way with light colored wax or by use of the digital wax knife.

Undercuts are automatically blocked out by the software.

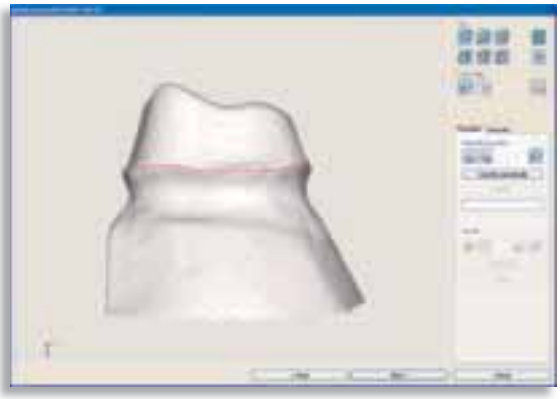


Undercut before being blocked out.



Undercut blocked out with Lava™ Design Software.

Scanning and Design of Lava™ Restorations.



Precise preparation margin.

Coping Preparation

The complete surface of the stump is scanned with a non-contact white light fringe pattern. Approx. 120,000 data points are measured and digitised for each stump. Detection is carried out from incisal/occlusal to the stump.

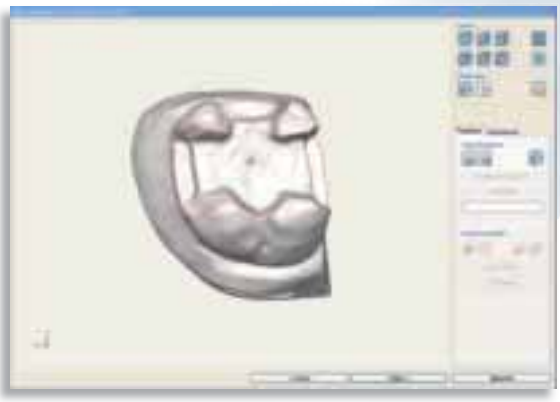
The complete surface must be easily visible under the scanner light. The system automatically defines the overall preparation margin.

Ditching.

Ditching

The prepared margin must be clearly defined on the model; pencil marks are not suitable. The prepared margin can be precisely ditched using a rotary instrument under magnification.

Inadequate ditching may effect the quality of the scan.



Margin detection Inlay bridges.

Inlay and Maryland Wing Preparation

The margin is detected automatically. However, the scan operator can manually refine the margin if desired.

Design Choices for Labs and Dentists.

Framework Coloring

3M™ ESPE™ Lava™ restorations offer the option of coloring the framework in one of seven different shades based on the Vita®* Classic shade guide (plus one shade, i.e. uncolored).

Wall Thickness and connector design

You can determine the thickness of the framework wall to fit your needs. The minimum wall thickness is 0.5 mm for bridges and posterior crowns and 0.3 mm for anterior crowns. The minimum connector cross section highly depends on the bridge position and the amount of pontics.

For special indication, please contact your laboratory or milling center.

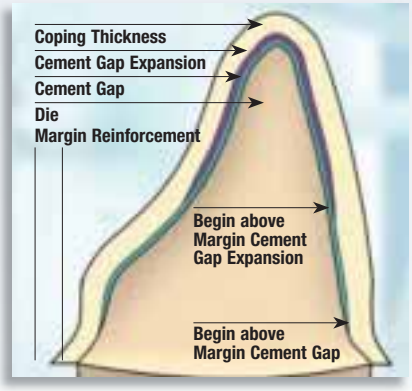
Minimum Connector Cross Section

	Anterior	Posterior
3-unit bridges	7 mm^2	9 mm^2
4-unit bridges	7 mm^2	9/12/9 mm^2

	Wall thickness	Connector
Maryland bridges	0.5 mm	7 mm^2
In-/Onlay bridges	0.5 mm	9 mm^2

Cement Gap

The size of the cement gap can be adjusted using standard values or individually. For certain parts of the framework, for example the top half of a coping, the cement gap may be increased. The cement gap is adjusted by the CAD specialist at the milling center in accordance with the customer and based on each individual situation.

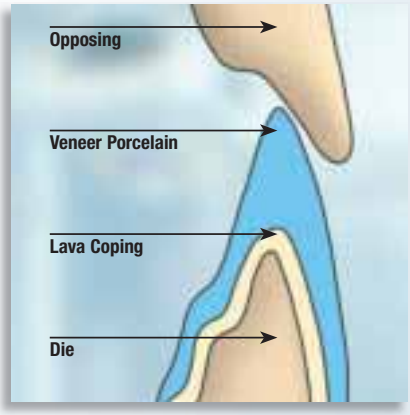


Tangential preparation: Steep tangential preparations may result in extremely thin tapered margins. In principle, this type of preparation is possible, but caution is advised.

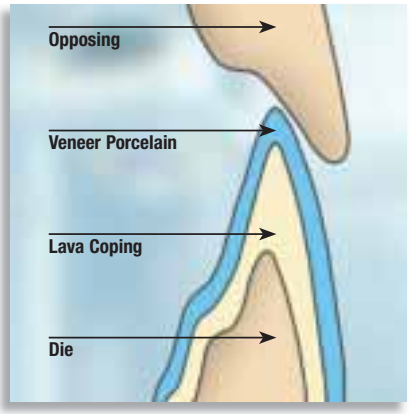
Optimal Framework Design

It is important to optimally support the veneering porcelain. The framework should be designed to leave an even thickness of no more than two millimeters. This can be accomplished by using the digital wax knife. Moreover in addition, it is also possible to directly scan your designed wax up.

In addition to the parameters above, you may discuss other design ideas with your milling/design center.



Inadequate porcelain support.



Optimal framework design with the digital wax knife.

*Registered trademark of Vita Zahnfabrik H. Rauter GmbH & Co. KG, Bad Säckingen, Germany.

Finishing of Lava™ Restorations.

Treatment of Ceramic Materials

When working on the surface of a ceramic restoration, defects can be introduced and may affect the strength of the restoration. Although zirconium oxide is very forgiving for these kinds of defects, it is nevertheless important, to keep this in mind. This is critical in the areas of the restoration, which may be under tension during application. The use of water during finishing is always recommended. Sandblasting should not be used for surfaces, which will be veneered. It can be used for surfaces, which are cemented, using a grain size ≤ 50 µm and 2 bar pressure.

Removal of Marginal Reinforcement and Undesired Contacts

Standard contact sprays or color are suitable markers for the zirconium oxide framework. Diamond instruments with a particle size of ≤ 30 µm (color code: red) are ideal for removing marginal reinforcement and undesired contacts. The use of a turbine and water is recommended. Marginal reinforcement should be removed under magnification to create a precise margin.

Esthetic Advantages of Colored Framework

The esthetics of the colored framework eliminates the need for a fired porcelain shoulder (butt margin). Since an esthetic appearance can be created by using effect and glaze materials, a narrow collar may be left on the coping. A perfectly aesthetic appearance can be achieved by using effect and glaze materials with no additional layers. Lava™ frameworks can be shaded in seven different colors (FS1 – FS7).

No shading **FS1** **FS2** **FS3** **FS4** **FS5** **FS6** **FS7**

Interdental Separation of a Veneered Bridge

A natural look of the interdental area of bridges is achieved by using diamond separation cutters. The framework should not be cut since sharp notches in the interdental area may affect the durability of the restoration. If the framework is inadvertently damaged during separation, the area has to be polished. Rubber polishing disks with diamonds (polishing system for ceramics from Komet No. 4330, series grey) are suitable for this purpose. For better access to the notch, the diamond disk may be sharpened with a conditioning stone.

Trimming of the coping.

Interdental separation with a separation disk.

Cementation of Lava™ Restorations.

Due to the strength of Lava™ zirconia frameworks, adhesive cementation is not necessary. For Maryland and Inlay bridges, see "Cementation of Maryland (adhesive) and Inlay bridges". Restorations can be placed in the mouth in a conventional way by using a glass ionomer cement or by using an adhesive or self-adhesive cement. Before cementation, thoroughly clean the restoration and sandblast the interior surfaces of the crowns with aluminum oxide ≤ 50 µm. For detailed cementation please see always the appropriate Instructions for Use of the respective cements for detailed information.

1. Conventional Cementation

- Use a conventional glass ionomer cement, e.g., Ketac™ Cem, manufactured by 3M ESPE. The use of phosphate cements will not provide the desired esthetic results.

2. Cementation with RelyX™ Unicem Self-Adhesive Universal Resin Cement

- Thoroughly clean the Lava restoration, sandblast the interior surfaces of the crown with aluminum oxide ≤ 50 µm. It is not necessary to pre-treat with 3M™ ESPE™ Rocatec™ or to silanate it, if 3M™ ESPE™ RelyX™ Unicem Cement is used.
- Please refer to the product's instructions for use when using RelyX Unicem Cement.

3. Adhesive Cementation

- Lava zirconia frameworks cannot be etched or silanized with a silane coupling agent. For adhesive cementation with resin cements, the adhesive surfaces must be treated for 15 seconds with Rocatec™ Soft or 3M™ ESPE™ CoJet™ Sand and silanized with ESPE™ Sil.
- If the restoration is to be tried in, it must be done before the treatment described above.
- See the Instructions for use for Rocatec™ System or CoJet Sand for detailed information.
- Place the restoration in the mouth with a resin cement (e.g., RelyX™ ARC) as soon as possible after silanization
- Please follow the Instructions for use of the respective resin cement

Cementation of Maryland (adhesive) and Inlay Bridges*:

- Maryland bridges must be cemented adhesively.
- Cementation is only allowed with a cement clearly indicated for the cementation of these indications made of zirconia. The recommendations of the cement manufacturer need to be followed to ensure optimum bonding. Please consider that the zirconia part of the restoration needs to be pre-treated differently than the veneering part.
- Before cementation Lava restorations should be sandblasted (≤ 50 µm grain size) in order to increase the surface roughness.
- Especially for Maryland bridges the bonding should be mainly to enamel surfaces.
- Sufficient enamel surface are required for an optimal bonding. Some textbooks recommend to have a 1.5 to 2 times larger surface for bonding compared to the palatinal or lingual surface of the pontic (W. Kullmann, 1990). Therefore, the abutment teeth should be characterized by low enamel abrasion.
- The working area needs to be free of contamination. The adhesive cementation has to be performed using a rubber dam isolation.
- Debonding of the Maryland/ Inlay bridges and secondary caries are the most prominent failure reason for these indications. Unnoticed decementation of one of two retainers leads to plaque accumulation and possibly subsequent carious lesions and gingivitis.
- To prevent decementation additional retentive elements should be prepared (see preparation guidelines for Maryland and Inlay bridges).
- Please see also the recommendations of the national and regional dental associations.

*References: please look at the right page

References.

Cementation of Maryland (adhesive) and Inlay Bridges*:

References:

Audenino G et al. (2006) Resin-bonded fixed partial dentures, ten year follow-up; Int J Prosthodont 19, 1, 22–23

Behr M, Leibrock A et al Clin Oral Invest 1998

Boening KW (1996) Clinical Performance of resin-bonded fixed partial dentures, J Prosthet Dent 76, 39–44
Preparation and Handling Guidelines for Dentists and Laboratories

Briggs P, Dunne s, Bishop K 1996, The single unit, single retainer, cantilever resin-bonded bridge,
Restorative Dentistry 181, 373–379

D.Edelhoff et al. (2002) The Journal of Prosthetic Dentistry 87, 5, 503–509

El-Mowafy, Omar (2003) Resin-Bonded fixed partial denture as alternative to conventional fixed treatment,
The Inter J Prosthodontics, 16, 60–70

Goodacre CJ et al. (2003) The journal of Prosthetic Dentistry 90, 1, 31–40

Kern (2005) Einfügelige Adhesivbrücken und Adhäsivattachemnts- Innovation mit Bewährung, ZM 95, 21, 54–60

Kern (2005) Clinical long term survival rate of two retainer and single retainer all-ceramic resin-bonded fixed partial dentures,
Quintessenz International 36, 2, 141–147

Ketabi A.R. et al. (2004) Quintessenz 35, 5, 407–410

Werner Kullmann (1990) Atlas der Zahnerhaltung, Verlag Hanser, p. 379

Priest, 1996, Failure rate of restorations fopr single tooth replacement, Int J Prosthodont 9, 38–45

St George G. et al. 2002 Prim Dent Care 9, 3, 87–91

St George G. et al. 2002 Prim Dent Care 9, 4, 139–144

Stokes A. (2002) N Z Dent J. 98, 434, 107

Van Dalen A, Feilzer AJ, Kleverlaan CJ Int J Prosthodont 2004, 17(3) 281–284

Zalkind M., Ever-Hadani P., Hochman N. (2003) Resin-bonded FPD retention: a retrospective 13 years follow-up,
J Oral Rehabil 30, 10, 971–977

You + 3M ESPE =

A formula for success

Customer Care Center: 1-800-216-9502

Visit www.3MESPE.com/lava for more information

3M ESPE

Dental Products
3M Center
Building 275-2SE-03
St. Paul, MN 55144-1000
USA

3M Canada
Post Office Box 5757
London, Ontario N6A 4T1
Canada
1-888-363-3685

Please recycle. Printed in USA.
© 3M 2007. All rights reserved.

3M, ESPE, CoJet, Ketac, Lava, RelyX and Rocatec are trademarks of 3M or 3M ESPE AG. Used under license in Canada.

Vita is not a trademark of 3M or 3M ESPE AG.

70-2009-3969-5