METAL CROWN

I. Full Metal Crown

Indications of full metal crown

1. A tooth with extensive destruction due to caries or trauma in order to protect the remaining tooth structure from fracture.
2. A tooth with large amalgam restoration in order to protect the remaining tooth structure and amalgam from fracture.
3. Endodontically treated teeth.
4. When maximum retention and resistance needed as in a tooth with short crown.
5. Recontouring of the tooth as in a tooth receiving a clasp for removable partial denture.
6. As a bridge retainer.
7. Correction of minor inclination.
8. A patient with high caries index.
9. Correction of the occlusal plane.

Contra-indications of full metal crown

1. If high esthetic need is demanded.
2. When less than maximum retention and resistance necessary.
3. When a more conservative crown could be used such as 3/4 crown as in a tooth with intact buccal surface and very short span bridge.
4. When caries index is low.

Advantages of full metal crown

1. Greater retention and strength.
2. High resistance to deformation.
3. Modification of axial tooth contour is possible
4. More conservative than other types of full crown such as porcelain fused to metal and all ceramic crowns.

Disadvantages of full metal crown

1. Extensive tooth structure removal as compared with partial crown such as 3/4crown.
2. Difficulty to test the vitality of the tooth especially by electrical pulp tester.
3. May interfere with taste.
4. Display of metal.

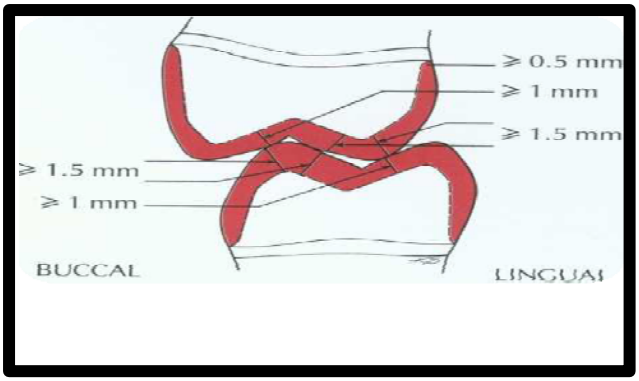
- Preparation steps:

1. Occlusal surface preparation.
2. Buccal surface preparation.
3. Lingual surface preparation.
4. Proximal surfaces preparation.

Depth Orientation grooves (D.O.G) are grooves prepared in the surface of the tooth to act as a guide or reference to determine the amount of tooth structure removed by preparation. If the preparation is done without these grooves, under and over preparation is possible, and more time will be spent by repeated checking of the preparation.

The type of finishing line recommended for full metal crown is chamfer finishing line; therefore, a round end tapered fissure bur is used in the preparation. Knife edge finishing line may also be used.

The recommended tooth reduction for full metal crown is shown in the figure below:



Occlusal surface preparation

The aim of the occlusal surface preparation is to create 1.5mm occlusal clearance over the functional cusps and 1 mm over the non-functional cusps.

Planar occlusal reduction (anatomical reduction) following the geometric inclined planes of the occlusal surface should be done for the following objectives:

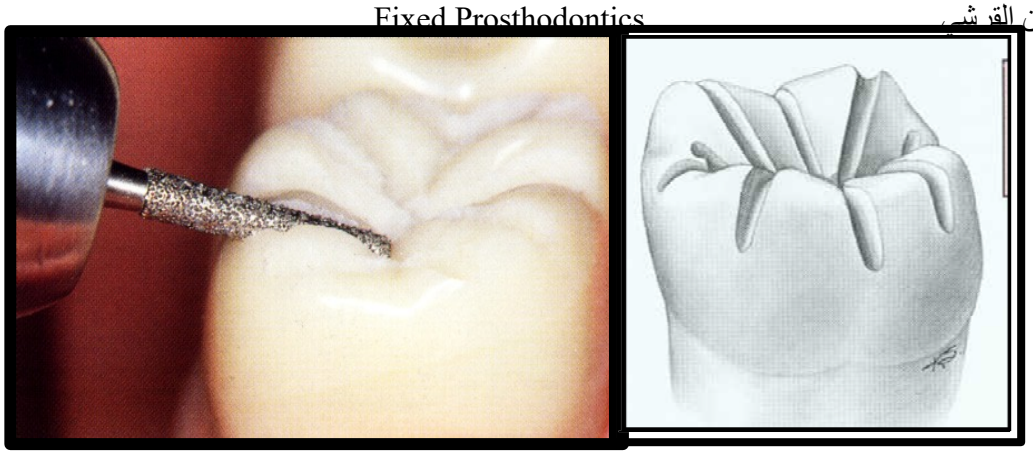
-To provide a restoration with uniform thickness.

-To preserve the tooth structure (axial wall length).

-To improve the retention- resistance features of the preparation.

The sequence of the occlusal surface preparation is as follows:

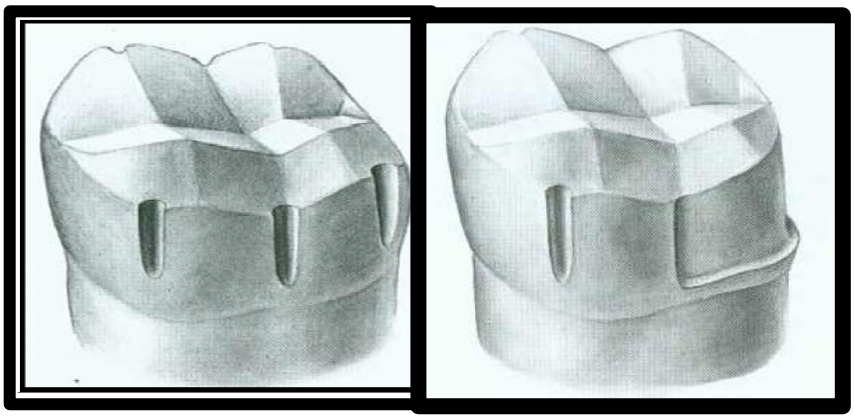
1. Depth orientation grooves (D.O.G) are prepared in the occlusal surface by a fissure bur to follow the inclines of the cusps. A D.O.G is prepared in each cusp extending from the cusp tip to the central groove, which represents the deepest part of the occlusal surface. The depth of each groove corresponds to the diameter of the fissure bur used. i.e. a fissure bur with 1.5 mm diameter is used to prepare D.O.G on the functional cusps, while a fissure bur with 1 mm diameter is used to prepare D.O.G on the non-functional cusps.
2. Any tooth structure between D.O.G should be removed following the normal contour of the cusps.
3. A wide bevel is placed on the functional cusps.
4. The occlusal clearance is then checked in centric & eccentric occlucal relations.



Buccal surface preparation

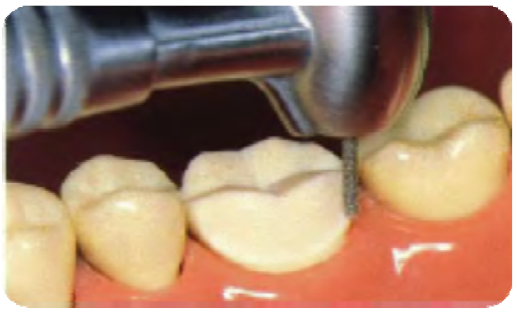
1. Three D.O.G with 1 mm depth are prepared in the buccal surface of the tooth, one placed in the center of the wall and one in each medial and distal transitional line angles. These grooves are prepared parallel to the long axis of the tooth or to the proposed path of insertion of the restoration.

2. Move the bur mesially and distally following the inclination of this surface to remove any islands of tooth structure between D.O.G. The gingival extent of the preparation will determine the position of the margin (whether to be placed supra-gingivally, which is preferable, or there is a need to extend the finishing line sub-gingivally. A round-end tapered fissure bur is used during axial reduction to obtain chamfer finishing line.



Lingual surface preparation

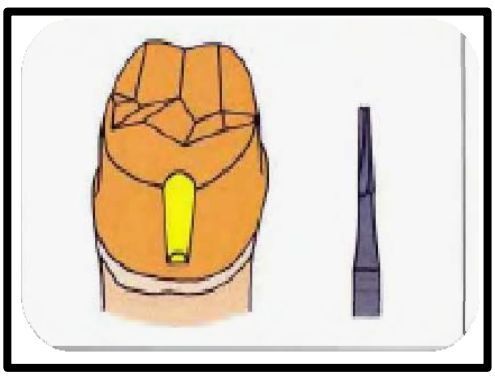
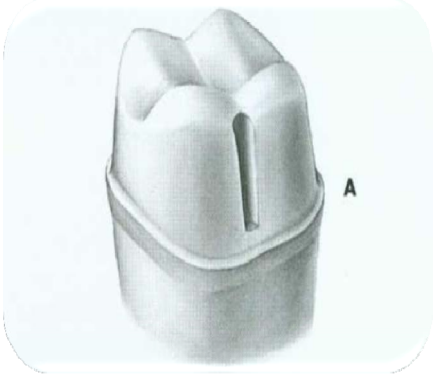
The preparation of the lingual surface is the same as that of the buccal surface.




Proximal surfaces preparation

Using a very thin long pointed tapered diamond bur (long needle), the contact is removed carefully with the bur rested on the prepared tooth (to prevent any damage to the adjacent tooth), moving the bur up & down, the contact will be opened bucco-lingually. Once the contact is opened, a round-end tapered fissure bur is used to plane the wall while forming a chamfer finishing line. Safe-sided disc can also be used during the proximal reduction in order to prevent any damage to the adjacent tooth. Placing a matrix band on the adjacent tooth can also help.

After completing the preparation of the occlusal and axial surfaces, smoothening of all surfaces is done to remove sharp line and point angles because they act as stress concentration areas.

A seating groove is finally placed in the buccal surface of the lower molar and the palatal surface of the upper molar. The advantages of placing a seating groove are:

1. It acts as a guide during the placement of the crown.
2. It prevents the rotation of the crown (by increasing the resistance).
3. It improves the retention.

II. Porcelain Fused to Metal Crown

This type combines the advantages of the strength of full metal crown and esthetic of all ceramic crown.

Disadvantages of PFM crown

1. Removal of substantial amount of tooth structure.

2. Subject to fracture because of the brittle nature of porcelain.

3. Shade selection can be difficult.

4. Inferior esthetic compared to porcelain jacket crown.

5. Discoloration of the gingival margin may occur with time.

6. More expensive.

Indications of PFM crown

1. Teeth need to be completely covered for esthetic demand.

2. As a retainer for fixed partial denture.

3. Similar to those of full metal crown.

Contra-indications of PFM crown

1. Teeth with large pulp (because of the possibility of pulp exposure during preparation).

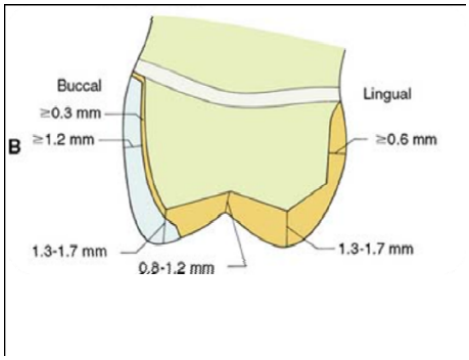
2. Intact buccal wall where a more conservative retainer can be used.

3. Teeth with short crowns.

4. Patient with bad oral hygiene.

Preparation Requirements:

- Deep facial reduction to provide enough space for the metal coping and porcelain and shallower reduction on the other surfaces covered with metal only.
- Shoulder, radial shoulder, or heavy chamfer can be used as a gingivo-facial finishing line, whereas chamfer or knife edge finishing line is used for the remaining surfaces covered with metal only.



Tooth preparation of PFM crown (for anterior teeth)

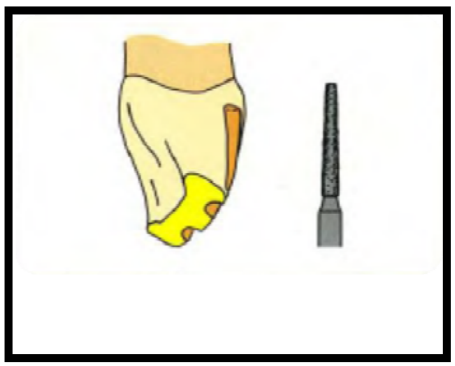
Fabrication of silicone index

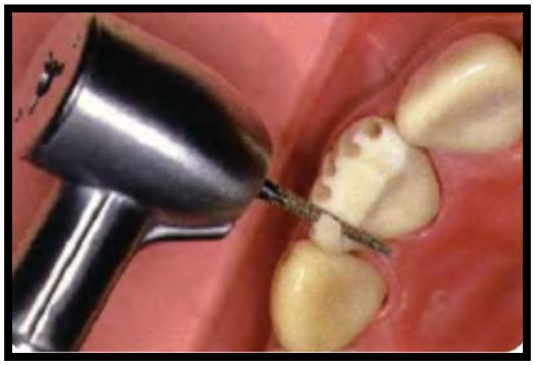
The silicone index acts as a guide to check the amount of tooth structure removal.

Incisal reduction

2 mm should be removed from the incisal edge to allow for adequate translucency of the restoration.

Flat-end tapered diamond bur is used, placed parallel to the incisal inclination (with a slight palatal inclination in the upper incisors and labial inclination in the lower incisors).

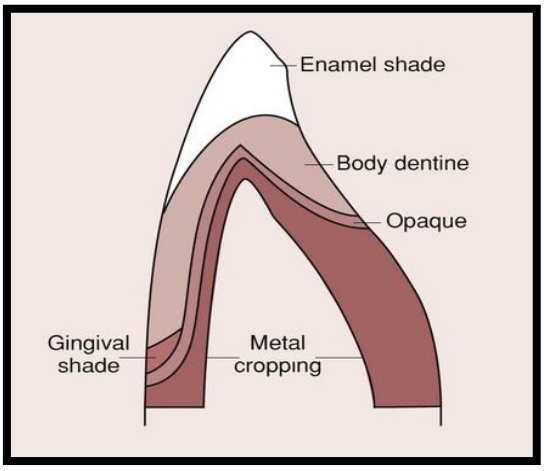




Labial reduction

PFM crown preparation requires deep facial reduction to give enough space for metal and porcelain, and thus avoiding over contouring and poor esthetic which would inevitably occur when no enough tooth structure is removed. The amount of labial reduction is 1.5-2 mm.

- 0.5 mm for the metal coping.
- 1 mm for porcelain (0.2 mm opaque layer, 0.5 mm body “dentin” layer, and 0.3 mm incisal “enamel” layer).



Advantages of adequate reduction (deep facial reduction)

1. The restoration will properly contour (effect on esthetic & gingival health).
2. The shade & translucency of the restoration will match that of the adjacent natural tooth.

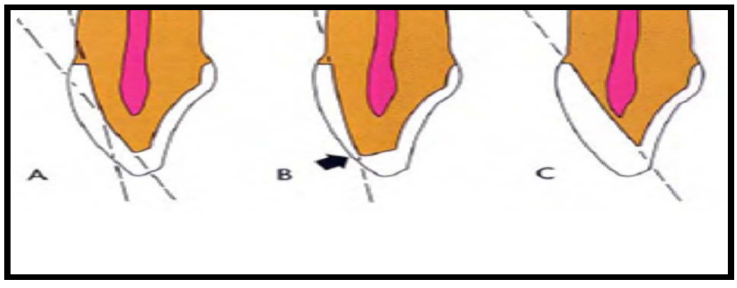
Because of the anatomy of the tooth labially, it should be reduced in two planes corresponding to the two geometric planes of the labial surface: a gingival plane and an incisal plane.

Advantages of two plane reduction

1. To follow the anatomy of the surface.

2. To avoid hitting the pulp.

3. To give enough space for the metal and porcelain layers, so that avoiding poor esthetic or over contour.



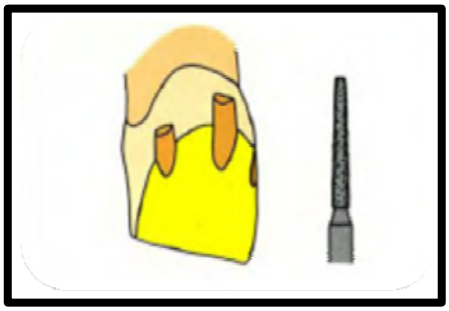
a. Gingival plane

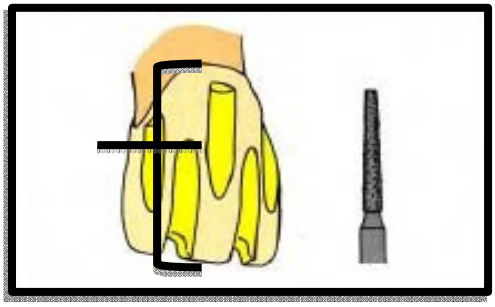
Three D.O.G (1.5 mm in depth) are placed in the gingival third of the labial surface parallel to the long axis of the tooth.

b. Incisal plane

Three D.O.G (1.5 mm in depth) are prepared parallel to the inclination of this area.

Flat-end tapered fissure bur is used to create a shoulder finishing line extended 1mm lingual to the contact.





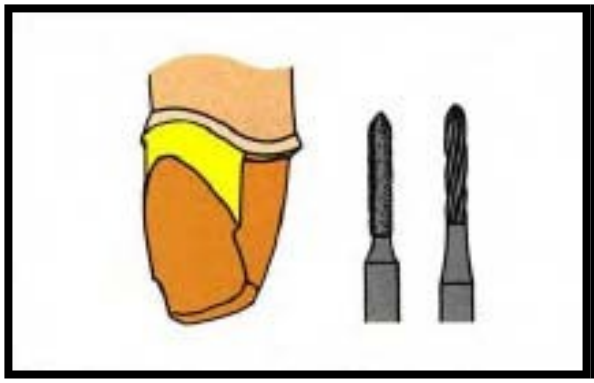
Palatal (lingual) reduction

a. Cingulum area reduction

D.O.G. of 1mm in depth is placed in the center using a round bur 1 mm in diameter. A small wheel diamond bur is then used to reduce this area following the concavity of this part of tooth surface.

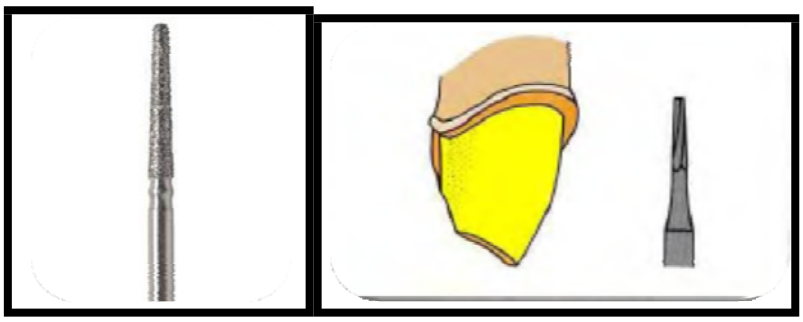
b. Lingual axial reduction

D.O.G. of 1mm in depth is placed parallel to the long axis of the tooth. A round- end tapered fissure bur is then used to reduce this area parallel to the long axis of the tooth to create chamfer finishing line.



Proximal reduction

A pointed tapered fissure bur (long needle) is used to break the contact with the adjacent tooth, moving the bur up and down from the palatal to the labial. A round-end tapered fissure bur is then used to create a chamfer finishing line continuous with the chamfer finishing line of the palatal surface and joining the shoulder finishing line of the labial surface at a line angle called "wing".

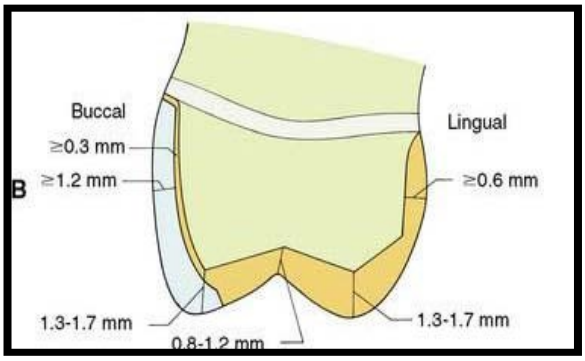


Checking of the amount of tooth reduction using the silicone index.

Tooth preparation of PFM crown for posterior teeth

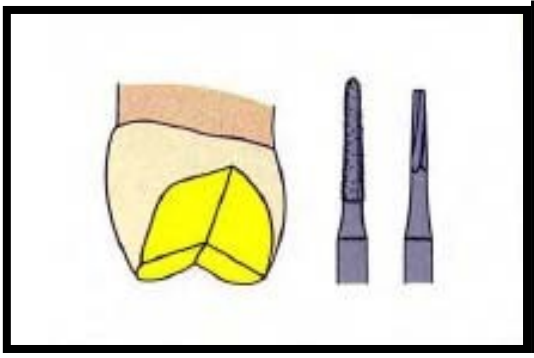
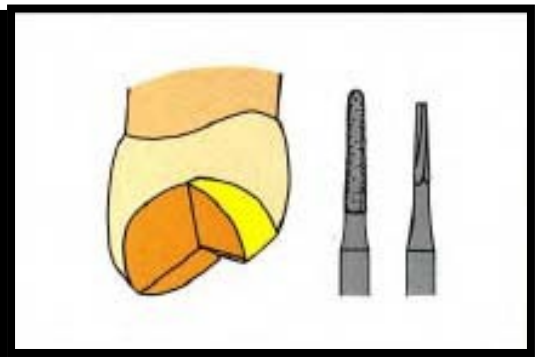
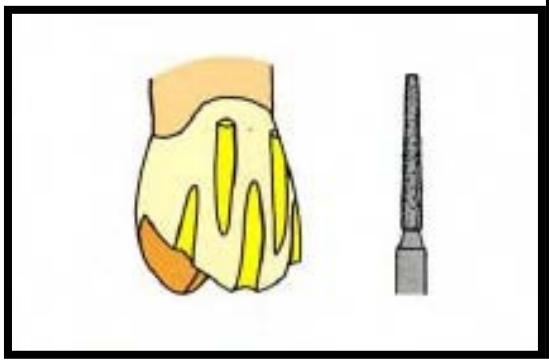
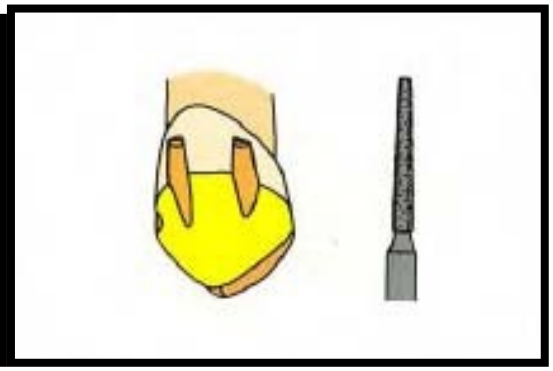
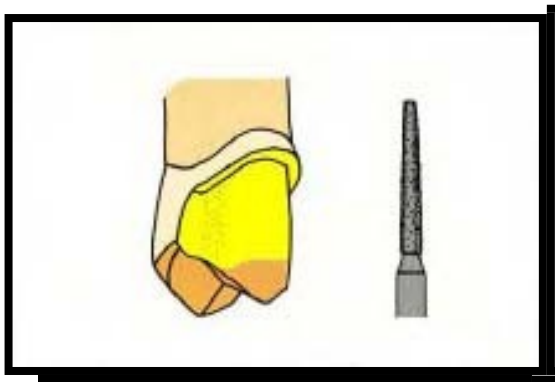
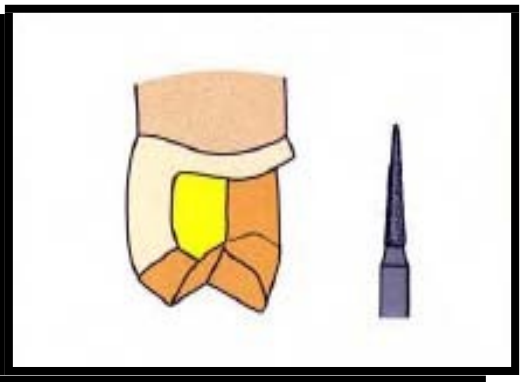
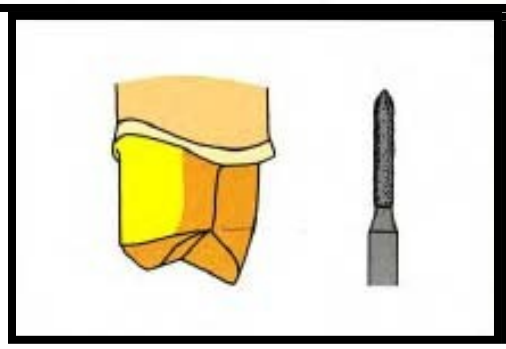
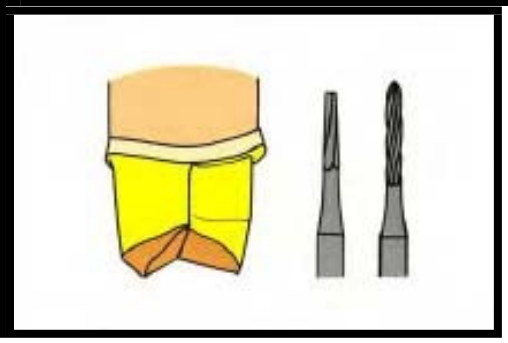
The same principles of full metal crown preparation are used with exception of providing a deep reduction in the area that is to be covered with both metal and porcelain.

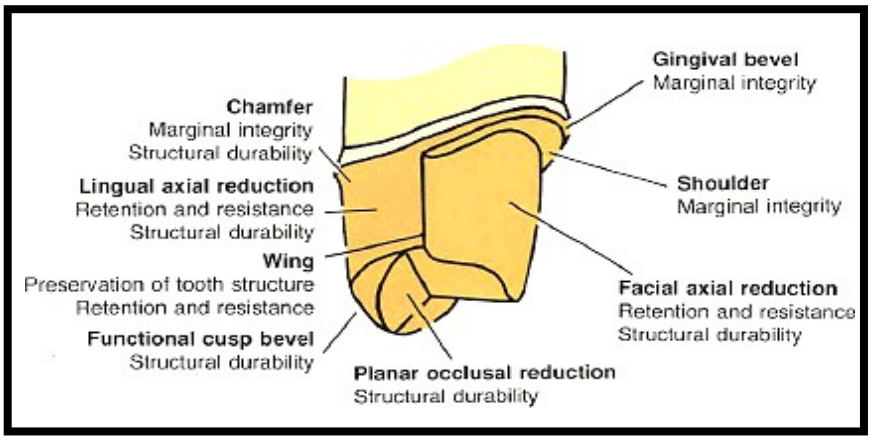
- 1.5 mm for the non-functional cusps.
- 2 mm for the functional cusps.
- 1.5-2 mm for the facial reduction.



The same steps of PFM crown preparation for the anterior teeth are used for the posterior teeth starting with fabrication of a silicone index.





Full metal crown with acrylic facing

- It is a full metal crown whose labial or buccal surface is covered with tooth-colored acrylic resin. It has been widely used previously before the use of porcelain as a facing material, but still used nowadays due to its lower cost as compared to PFM.
- It combines the strength and accuracy of full metal crown with the esthetics of tooth-colored acrylic resin.
- It is less expensive than PFM crown.
- The preparation involves deep facial reduction to provide enough space for both metal and facing material.
- The finishing line is shoulder with bevel facially (labially or buccally) and chamfer or knife edge for the other surfaces. When esthetic is critical, sub-gingival positioning of the finish line is recommended.

The main disadvantages of this type of crown are related to the acrylic facing material, including discoloration with time, wearing, and poor compatibility of the acrylic resin with the gingival tissue