Anterior cavity preparation
(Class III, Class IV and Class V)

Almost all Class III and Class IV restorations are appropriately restored with composite. Most Class V restorations that are in esthetic prominent areas are also appropriately restored with composite. In addition to esthetics, these materials with adequate strength and with the benefits of being able to bond to tooth structure, often resulting in less tooth structure removal during tooth preparation. Thus tooth preparations for composite materials should be as conservative as possible. The extent of the preparation is usually determined by the size, shape, and location of the defect and whatever extensions are necessary to provide access for vision and instrumentation.
Class III tooth preparations:
By definition, are located on proximal surfaces of anterior teeth.

Conventional Class III Tooth Preparation:
The primary indication for this type of Class III preparation is for the restoration of root surfaces, preparation the portion on the root surface that has no enamel.

The outline form on the root surface,
Box-like design may be considered, extending the external walls to sound tooth structure while extending pulpally to an initial depth of 0.75 mm. Any remaining infected dentin on the axial wall will be removed during the final tooth-preparation stage. The external walls are prepared perpendicular to the root surface. The cavosurface margins exhibit a 90-degree cavosurface angle and provide butt joints between the tooth and the composite material.

Resistance form
Extending the external walls pulpally to an initial depth of 0.75 mm thus providing adequate dimension for composite strength, placement of a retention groove (if necessary), and maintenance of strength of the gingival wall and margin.
More likely only a portion of a tooth preparation—the portion on the root surface that has no enamel margin—would be prepared in this manner.

**Beveled conventional Class III Tooth Preparation.**
The beveled conventional tooth preparation for composite restorations is indicated primarily for replacing an existing defective restoration in the crown portion of the tooth. However, it also may be used when restoring a large carious lesion for which the need for increased retention and/or resistance form is anticipated.

Class III beveled conventional tooth preparations are prepared as conventional preparations with the addition of a cavosurface bevel or flare of the enamel rather than a butt joint margin.

**The access of Class III.**
The lingual approach is preferable, unless such an approach would necessitate excessive cutting of tooth structure, such as in instances of irregular alignment of the teeth or facial positioning of the lesion.
Use a round carbide bur (No. 1/2, 1, or 2) or diamond stone, the size depending on the extent of the caries to prepare the outline form.
The point of entry is within the incisogingival dimension of the carious lesion or defective restoration and as close to the adjacent tooth as possible, without contacting it.

Direct the cutting instrument perpendicular to the enamel surface, but at an entry angle that places the neck portion of the bur as far into the embrasure (next to the adjacent tooth) as possible. Incorrect entry overextends the lingual outline.
The advantages of restoring the proximal lesion from the lingual approach include:
1. The facial enamel is conserved for enhanced esthetics.
2. Some unsupported, but not friable, enamel may be left on the facial wall of a Class III or Class IV preparation.
3. Color matching of the composite is not as critical.
4. Discoloration or deterioration of the restoration is less visible.

Prepare the enamel walls perpendicular to the external tooth surface, with the enamel margin beveled.

The axial wall depth approximately 0.75 to 1.25 mm (0.2 mm inside the dentinoenamel junction (DEJ)).

Extend the external walls to sound tooth structure during preparation of the outline form.
The axial wall will be outwardly convex, Following normal external tooth contour and the DEJ, both incisogingivally and faciolingually.
Any remaining infected dentin or old, defective restorative material on the axial wall will be removed during the final tooth-preparation stage. Usually retention is obtained by bonding to the enamel and dentin and no groove retention is necessary. However, when replacing a large restoration or restoring a large Class III lesion, the operator
may decide that retention form should be enhanced by placing groove (at gingival) and/or cove (at incisal) retention features in addition to the bonded tooth structure.

For most Class III using the beveled conventional preparation, the preparation would be complete at this time except for placing an **enamel bevel**.

The cavosurface bevel provides more surface area for end-on etching of the enamel rods. The cavosurface bevel or flare is best prepared with either a flame-shaped or round diamond instrument, resulting in an angle approximately 45 degrees to the external tooth surface all accessible enamel margins usually are beveled, with the exception of the gingival margin. This margin is usually not beveled if little or no enamel is present or access is difficult for finishing procedures. In addition, bevels may not be recommended on lingual surface margins that are in or subjected to heavy masticatory forces because composite has less wear resistance than enamel for withstanding heavy attritional forces.
--- When the lesion extends from the coronal to root surface, so a combination preparation design for a Class III.

The root-surface portion is a conventional tooth preparation design utilizing butt joint marginal configuration and retention groove in dentin.
The coronal portion is a beveled conventional tooth preparation design.
Modified Class III tooth Preparation.

A modified tooth preparation is the most used type of Class III tooth preparation. It is indicated for small and moderate lesions or faults and is designed to be as conservative as possible. Thus, the preparation design appears to be "scooped" or concave, the cavosurface margins in a beveled configuration the retention of the material in the tooth will result from the bond created between the composite material and the etched peripheral enamel.

*For all types of Class III*

-If possible, the outline form should not:
  1. Include the entire proximal contact area
  2. Extend onto the facial surface
  3. Or be extended subgingivally.
Retention form
Because the bond of composite to enamel and dentin is so strong, most Class III composite restorations are retained only by the micromechanical bond from acid-etching and resin bonding, so no additional preparation retention form is usually necessary. Using diamond stones for the tooth preparation leaves the prepared surfaces rougher, thereby increasing the surface area and the micromechanical retention. Sometimes a groove or cove may be necessary for Class III restorations that either extend onto the root surface or are very large. Usually, however, additional needed retention form can be achieved simply by increasing the surface area with a wider enamel bevel or flare along the margin.

Class IV tooth preparation
Class IV tooth preparation is indicated for restoring proximal areas that also include the incisal surface of an anterior tooth.

The Class IV composite restoration has provided the profession with a conservative treatment to restore fractured, defective, or cariously involved anterior teeth when, previously, a porcelain crown may have been the treatment of choice.

The preoperative assessment of the occlusion is even more important for Class IV restorations because it may influence the tooth preparation extension (placing margins in non contact areas)

Conventional Class IV Tooth preparation.
The conventional tooth preparation design (preparation design with 90-degree cavosurface margins) has minimal clinical Class IV application except in those areas that have margins located on root surfaces.

Beveled Conventional Class IV Tooth Preparation.
The beveled conventional Class IV tooth preparation is indicated for restoring large Class IV areas.

The outline form
Using an appropriate size round carbide bur or diamond instrument at high speed with air-water coolant. Remove all weakened enamel and establish the initial axial wall depth at 0.5mm into dentin (because groove retention form will likely be utilized). Prepare the walls as much as possible parallel and perpendicular to the long axis of the tooth. Excavate any remaining infected dentin as the first step of final tooth preparation. If necessary, apply a calcium hydroxide liner. Bevel the cavosurface margin of all accessible enamel margins of the preparation. The bevel is prepared at a 45-degree angle to the external tooth surface with a flame-shaped or round diamond instrument.
The width of the bevel should be 0.25 to 2 mm, depending on the amount of tooth structure missing and the retention perceived necessary.

**Retention and resistance form:** -
(Heavy occlusion and large Class IV requires increased retention and resistance form).

Thus, may dictate a **more conventional tooth preparation** form, with **more resistance form feature:** to provide appropriate resistance form, the preparation walls may need to be prepared in such a way as to resist occlusal forces. This often requires proximal facial and lingual preparation walls that form 90-degree cavosurface angles, which are subsequently beveled, and a gingival floor prepared perpendicular to the long axis of the tooth. This boxlike form may provide greater resistance to fracture of the restoration and tooth from masticatory forces.

**Retention form features:**
Which include in addition to the etched enamel margin (which may be with wider bevels), retention of the composite restorative material in beveled conventional Class IV tooth preparations may be obtained by groove or other shaped undercuts, dovetail extensions, threaded pins, or a combination of these gingival and incisal retentive undercuts may be indicated in large Class IV preparations in which rounded undercuts are placed in the dentin along line angles and into point angles wherever possible, without undermining the enamel, prepare a gingival retention groove using a No. 1/4 round bur. It is prepared 0.2 mm inside the DEJ at a depth of 0.25mm (half the diameter of the No. 1/4 bur) and at an angle bisecting the junction of the axial wall and gingival wall.

An arbitrary dovetail extension onto the lingual surface of the tooth may enhance both the restorations strength and retention, but it is
less conservative and therefore not used often. Although pin retention is sometimes necessary, the use of pins in composite restorations is discouraged for several reasons:
(1) The placement of pins in anterior teeth involves the risk of perforation either into the pulp or through the external surface.
(2) Pins do not enhance the strength of the restorative material.
(3) Some pins may corrode resulting in significant discoloration of the tooth and restoration.

Modified Class IV Tooth Preparation.
The modified Class IV preparation for composite is indicated for small or moderate Class IV lesions or traumatic defects.

The objective of the tooth preparation is to remove as little tooth structure as possible, while removing the fault and providing for appropriate retention and resistance forms. Usually little or no initial tooth preparation is indicated for fractured incisal corners, other than roughening the fractured tooth structure. The cavosurface margins are prepared with a beveled configuration; the axial depth is dependent on the extent of the lesion, previous restoration, or fracture, but initially no deeper than 0.2 mm inside the DEJ.
The retention is obtained primarily from the bonding strength of the composite to the enamel and dentin.

The treatment of teeth with minor traumatic fractures requires less preparation than the beveled conventional.

Example. If the fracture is confined to enamel, adequate retention usually can be attained by simply beveling sharp cavosurface margins in the fractured area with a flame-shaped diamond instrument followed by bonding.

**CLASS V COMPOSITE RESTORATIONS**

Class V tooth preparations, by definition, are located in the gingival one third of the facial and lingual tooth surfaces. Because of esthetic considerations, composite materials most frequently are used for the restoration of Class V lesions in anterior teeth.

**Conventional Class V tooth preparation:**

A lesion entirely on root surface.

The outline form extension of the mesial, distal, occlusal (incisal), and gingival walls is dictated by the extent of the caries, defect, or old restorative material indicated for replacement.

**All of the external preparation walls of a Class V conventional tooth preparation are visible when viewed from a facial position (outwardly divergent walls).**
A tapered fissure carbide bur (No. 700, 701, or 271) or similarly shaped diamond is used at high speed with air-water spray. If access interproximally or gingivally is limited, a No. 1 or No. 2 round bur or diamond may be used to prepare the tooth. Initial tooth preparation with 90-degree cavosurface margins and axial wall depth of 0.75 mm. Remaining infected dentin excavated and incisal and gingival retention form prepared.

If retention grooves are necessary, they are prepared with a No. 1/4 bur along the full length of the gingivoaxial and incisoaxial (occlusoaxial) line angles.

Beveled Conventional Class V Tooth reparation.
The beveled conventional Class V tooth preparation has beveled enamel margins and is indicated either for:
(1) The replacement of defective Class V restoration or
(2) For a large, new carious lesion.
Cutting proceeds distally (0.2 mm into dentin), bur shank is held perpendicular to enamel surface, then the mesial extension by keeping bur shank perpendicular to surface and maintaining initial depth.

Class V preparation initially will exhibit 90-degree cavosurface margins (that subsequently will be beveled)
and an axial wall that is uniform in depth initial axial
wall depth only 0.2 mm into dentin then:
(1) Remove any remaining infected dentin.
(2) Bevel the enamel margins.

Modified Class V Tooth Preparation.

The modified Class V tooth preparation is indicated for the
restoration of small and moderate Class V lesions or defects.
The lesion or defect is "scooped" out, with a round or elliptical
diamond instrument, resulting in a preparation form that may have
a divergent wall configuration and an axial surface that usually is
not uniform in depth.
Class V modified tooth preparations also are used to restore
abraded or eroded cervical areas.