FIXED PROSTHODONTICS · PREPARATION STANDARDS

# Crown Preparation Guide

Minimum reduction, margin design, and geometry standards by restoration type — so the case you send in fits, seats, and shades the way it's supposed to on the first try.

FOR REFERRING PRACTICES | CROWNS · ONLAYS · INLAYS · VENEERS | PRINT & KEEP CHAIRSIDE

## General Principles

applies across every restoration type

Every restoration type below still depends on the same handful of fundamentals. Get these right and most fit/seat issues disappear before a single case is designed.

01

### Round every internal line angle

Sharp axio-occlusal and axio-pulpal angles concentrate stress in the restoration and are the single most common cause of ceramic fracture at delivery.

02

### One continuous, legible margin

The finish line should be a single unbroken curve the scanner or optical system can read cleanly — no ledges, no double margins, no burnished-over areas.

03

### Zero undercuts

Check axial walls from the intended path of draw before finishing. A single undercut anywhere on the prep will hold up the whole case for a die trim or remake.

04

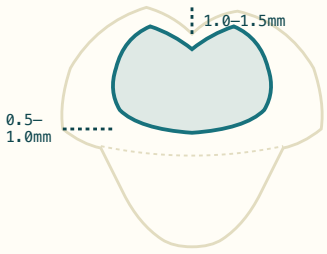
### Reduce to the type and the material

"Enough room" depends on both what you're preparing and what it'll be milled from — a monolithic zirconia onlay and a layered PFM crown need meaningfully different clearance. See each section below.

# Full-Coverage Crown

anterior & posterior, minimum clearance

Figures below are minimums for a single unit under normal occlusal load — increase reduction for bruxers, long-span bridges, or any case where you're unsure. When in doubt, call the lab before you finish the prep, not after.

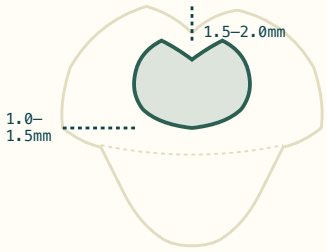



near-vertical axial wall tolerated

## Full-Contour (Monolithic) Zirconia

| | |
|---|---|
| Occlusal — functional cusp | **1.0–1.5 mm** |
| Occlusal — non-functional cusp | **1.0 mm** |
| Axial reduction | **0.5–1.0 mm** |
| Recommended margin | **Light chamfer** |

Most conservative all-ceramic option. Material strength tolerates near-vertical walls — good choice when interocclusal space or remaining tooth structure is limited.

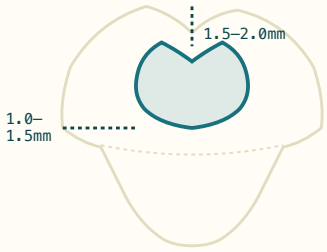



extra bulk for veneering porcelain

## Layered Zirconia (PFZ)

| | |
|---|---|
| Occlusal — functional cusp | **1.5–2.0 mm** |
| Occlusal — non-functional cusp | **1.5 mm** |
| Axial reduction | **1.0–1.5 mm** |
| Recommended margin | **Rounded shoulder / heavy chamfer** |

The zirconia coping plus a veneering porcelain layer both need room — under-reduce here and the ceramist is forced to either over-contour or thin the porcelain past its fracture threshold.

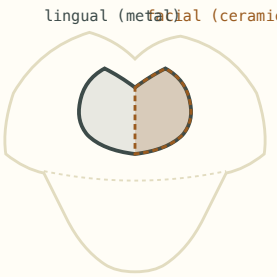



## Lithium Disilicate (e.max)

| | |
|---|---|
| Occlusal — functional cusp | **1.5–2.0 mm** |
| Occlusal — non-functional cusp | **1.0–1.5 mm** |
| Axial reduction | **1.0–1.5 mm** |
| Recommended margin | **Rounded shoulder / deep chamfer** |

no sharp internal angles — stress risers

Minimum material thickness is 1.0 mm at every point on the restoration, not just at the margin — a locally thin spot from an uneven prep is the most common cause of early fracture.

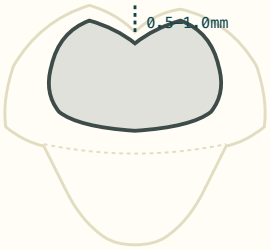



facial ceramic vs. lingual metal collar

## Porcelain-Fused-to-Metal (PFM)

| | |
|---|---|
| Occlusal / facial (ceramic) | **1.5–2.0 mm** |
| Lingual (metal only) | **1.0 mm** |
| Axial — facial | **1.2–1.5 mm** |
| Axial — lingual collar | **0.5 mm** |
| Recommended margin | **90° shoulder facial · chamfer lingual** |

Two different reduction depths on one prep — the facial surface carries a metal coping *plus* porcelain, the lingual can stay metal-only and needs far less room.




thinnest possible reduction of any option

## Full Cast Metal (Gold / High-Noble)

| | |
|---|---|
| Occlusal — functional cusp | **0.5–1.0 mm** |
| Occlusal — non-functional cusp | **0.5 mm** |
| Axial reduction | **0.5 mm** |
| Recommended margin | **Chamfer** |

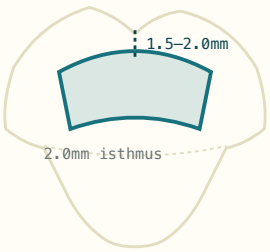
The most conservative reduction of any restoration type — the right call whenever interocclusal space is tight, most often on second molars.

! **Anterior-specific:** incisal reduction runs deeper than the occlusal figures above — 1.5–2.0 mm for all-ceramic/PFM, 0.75–1.0 mm for full metal — since incisal edge material carries both strength and translucency. Facial reduction mirrors the axial figures above; lingual concavity needs only 0.5–1.0 mm as it's rarely load-bearing.

# Onlay

premolars & molars, cuspal coverage

An onlay caps one or more cusps, so occlusal and cuspal reduction both matter — under-reducing a cusp you intend to cover is the most common reason an onlay comes back as a die-trim.

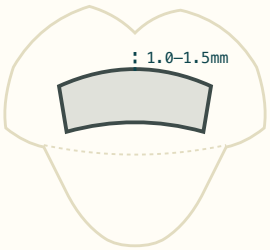



cuspal coverage over the occlusal box

## Ceramic (Zirconia / e.max)

| | |
|---|---|
| Occlusal / pulpal floor | **1.5–2.0 mm** |
| Cuspal reduction | **1.0–1.5 mm** |
| Gingival floor width | **1.0–1.5 mm** |
| Isthmus width (minimum) | **2.0 mm** |
| Recommended margin | **Light chamfer** |

Proximal box walls should diverge slightly occlusally (light flare, no undercut). A narrower isthmus concentrates stress and is a common fracture point under occlusal load.




thinner box tolerated than ceramic

## Full Cast Metal

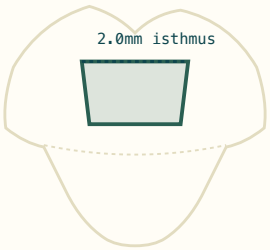
| | |
|---|---|
| Occlusal / pulpal floor | **1.0–1.5 mm** |
| Cuspal reduction | **0.5–1.0 mm** |
| Gingival floor width | **1.0 mm** |
| Recommended margin | **Light chamfer / feather** |

Metal's burnishability tolerates a shallower box than ceramic — the right call whenever remaining tooth structure or interocclusal space is limited.

! Where in doubt between an inlay and onlay, cap the cusp — an under-supported cusp left uncovered is a common reason for a post-cementation fracture the lab never sees coming. Internal line angles stay rounded throughout; a ceramic onlay is the least forgiving restoration type on this list for a sharp axio-pulpal angle.

# Inlay premolars & molars, no cuspal coverage

Same box-form fundamentals as an onlay, without cuspal coverage — reserved for cases where the remaining cuspal structure is sound and doesn't need to be capped.

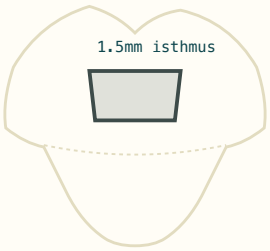



box confined within the occlusal surface

## Ceramic (Zirconia / e.max)

| | |
|---|---|
| Occlusal / pulpal floor | **1.5–2.0 mm** |
| Isthmus width (minimum) | **2.0 mm** |
| Cavosurface angle | **90°** |
| Recommended margin | **Light chamfer, 90° cavosurface** |

A ceramic inlay has no cuspal coverage to fall back on — every internal angle stays rounded, and box walls flare slightly occlusally with zero undercut.




narrower isthmus tolerated than ceramic

## Full Cast Metal

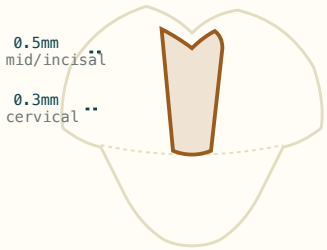
| | |
|---|---|
| Occlusal / pulpal floor | **1.0–1.5 mm** |
| Isthmus width (minimum) | **1.5 mm** |
| Recommended margin | **Feather edge or light chamfer** |

The classic conservative inlay — reserve for cases where a gold restoration is otherwise indicated and remaining structure is genuinely sound.

# Veneer

anterior, esthetic zone

Minimal-prep by design — most of a veneer's job is optical, and over-reducing facial enamel gains nothing but risk.




facial-only reduction, kept in enamel

## Facial Reduction, Enamel-Confined

| | |
|---|---|
| Cervical facial | **0.3 mm** |
| Mid-facial / incisal-facial | **0.5 mm** |
| Incisal edge | **0.75–1.5 mm** |
| Recommended margin | **Supragingival chamfer** |

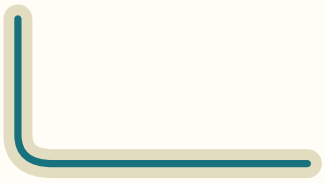
Incisal reduction depends on whether the veneer wraps the incisal edge or butt-joints against it. Keep every depth cut in enamel — extending into dentin weakens the bond and is the leading cause of a debonded veneer.

! Margin stays supragingival or right at the free gingival margin wherever esthetics allow — a subgingival veneer margin is harder to finish cleanly and offers no real benefit for a facial-only restoration.

# Margin Design

six finish-line geometries

The margin does two jobs at once: it gives the restoration a defined, seatable edge, and it gives the material enough bulk right where it's most likely to chip. Pick the geometry the restoration type and material actually need — not the one that's fastest to cut.



### Chamfer

ZIRCONIA · FULL METAL

Rounded internal angle, 0.3–0.8 mm. The most versatile margin — clean for the scanner, forgiving to cut, adequate bulk for conservative-reduction materials.

### 90° Shoulder

LAYERED CERAMIC · ONLAY/INLAY BOX

Flat floor, defined angle. Gives layered porcelain the bulk it needs where it's veneered — required wherever a material can't rely on axial-wall strength alone.

### Modified Shoulder

PFM · E.MAX

A short bevel added to the shoulder floor. Hybrid choice — most of a shoulder's bulk, a chamfer's easier scan/impression capture.

### Deep Chamfer

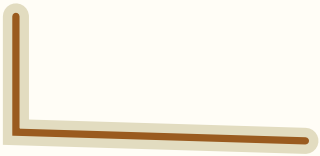
MONOLITHIC ZIRCONIA · E.MAX

A wider, deeper version of the standard chamfer. Common default for CAD/CAM monolithic materials — scans cleanly and mills predictably.

### Feather / Knife Edge

FULL CAST METAL ONLY

No defined bulk — fine for burnishable metal margins, not enough material for any ceramic. Avoid for all-ceramic and PFM cases.



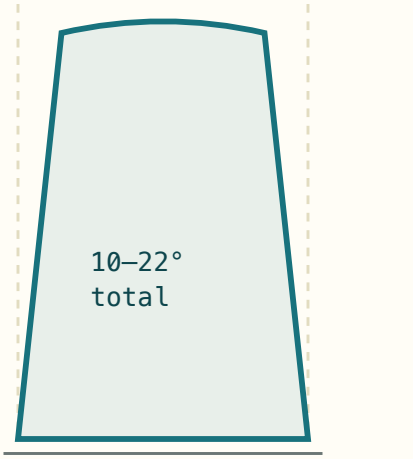
### Facial Chamfer, Supragingival

VENEER

Light chamfer kept at or above the free gingival margin — esthetics without a subgingival finish line to keep clean.

# Taper & Geometry

full-coverage crowns only




| | |
|---|---|
| Total occlusal convergence | **10°–22°** |
| Theoretical ideal (rarely achievable) | **~6°/wall** |
| Minimum wall height for retention | **3–4 mm** |
| Internal line angles | **Rounded, no sharp corners** |

Under-tapering (too vertical) risks undercuts and a prep that won't fully seat. Over-tapering trades retention for ease of seating — past roughly 22° total convergence, resistance form starts to depend entirely on cement. Doesn't apply to onlay/inlay box walls (light flare, no formal taper spec) or veneers (no axial walls to taper).

# Quick Reference

every restoration type, one table

| MATERIAL | OCCLUSAL / INCISAL | AXIAL / FACIAL | MARGIN |
|---|---|---|---|
| **FULL-COVERAGE CROWN** | | | |
| Monolithic Zirconia | 1.0–1.5 mm | 0.5–1.0 mm | Light chamfer |
| Layered Zirconia (PFZ) | 1.5–2.0 mm | 1.0–1.5 mm | Rounded shoulder / heavy chamfer |
| Lithium Disilicate (e.max) | 1.5–2.0 mm | 1.0–1.5 mm | Rounded shoulder / deep chamfer |
| PFM — facial / lingual | 1.5–2.0 / 1.0 mm | 1.2–1.5 / 0.5 mm | 90° shoulder facial · chamfer lingual |
| Full Cast Metal | 0.5–1.0 mm | 0.5 mm | Chamfer |
| **ONLAY** | | | |
| Ceramic | 1.5–2.0 mm | 1.0–1.5 mm | Light chamfer |
| Full Cast Metal | 1.0–1.5 mm | 0.5–1.0 mm | Light chamfer / feather |
| **INLAY** | | | |
| Ceramic | 1.5–2.0 mm | 2.0 mm isthmus | Light chamfer, 90° cavosurface |
| Full Cast Metal | 1.0–1.5 mm | 1.5 mm isthmus | Feather edge |
| **VENEER** | | | |
| Facial (cervical / mid-incisal) | 0.75–1.5 mm incisal | 0.3 / 0.5 mm | Supragingival chamfer |

! These figures reflect established prosthodontic literature and standard laboratory practice — not a substitute for the specific material manufacturer's IFU, or your own clinical judgment on a given case. Unsure about a prep before you send it? Call the lab first.

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**Questions on a specific case**

915.200.2931
Case-specific prep questions are always faster by phone than by guesswork.

**Document control**

SDL-PREP-01, Rev. 2026-07
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