Definition: It may be well defined as
I. Line of demarcation
II. Peripheral extension of tooth preparation
III. The planned junction of different materials

Features of finish lines: must be distinct, uniform, and smooth and should follow alveolar bone crest and free gingival margin.

Requirements of finish lines: it should be
- Easy to prepare, easy to duplicate in impression, conservative and provide sufficient strength to restoring material.

Functions of finish lines:
- Finish line design provides an estimation of tooth reduction as feather edge is most conservative and shoulder is the least conservative.
- Finish line design helps in measuring surface detail recording ability of an impression material.
- Distinct finish line helps in ditching
- Distinct finish line aids in remargination for proper marginal adaptation of wax pattern.

Criteria for successful finish line design: these are as under
I. Acceptable marginal adaptation: According to David F Pascoe, sealing discrepancy equals seating discrepancy times sine of marginal metal angle. Shoulder finish line produces marginal metal angle of 90°. That is why, sealing discrepancy equals seating discrepancy. Beveling reduces marginal metal angle, thus minimizes seating discrepancy.
- Tissue tolerant surface
- Adequate contour: conservative finish lines like feather edge and knife edge produce overcontoured restoration leading to periodontal problems gingival recession, unaesthetic black triangular spaces, alveolar bone loss.
- Adequate strength: finish line design should provide adequate strength to restoring material.

Criteria for finish line design selection: The selected finish line design should
I. provide predictable level of marginal integrity.
ii. present smooth materials to the sulcus, to minimize plaque accumulation.
iii. provide acceptable esthetics.

Classification of finish line design configuration:
I. Based on configuration of finish line
   a. Feather edge
   b. Knife edge
   c. bevel
   d. shoulder
   e. chamfer

FEATHER EDGE
I. ADVANTAGE: Most conservative
II. DISADVANTAGE: Over contoured restorations
- Not recommended now

KNIFE EDGE
I. It is most conservative type of f.l.
ii. It gives >135° cavosurface angle.
iii. Pointed end tapered fissure bur is used

INDICATIONS
i. Large pulp chambered tooth
ii. Finish line on cementum
iii. MOD onlay

ADVANTAGES
I. Easy to prepare
ii. Most conservative
iii. Burnishable type of finish line
iv. Ideal for marginal adaptation

DISADVANTAGES
I. Indistinct margin
ii. Over contoured restoration
iii. Marginal distortion
iv. Difficult to wax and cast

Bevel: It may be well defined as “SLANTING EDGE”. GPT8 edition.

It is classified as low angled short bevel and high angled long bevel in accordance with A.J. Hunter.

Functions of bevel: it improves marginal seal, produces strongest enamel margin, improves retention and resistance form of the preparation, creates sliding joint effect and produces burnishable margins.
INDICATION of BEVEL:
Facial margin of maxillary partial coverage restoration
Inlay margin
Onlay margin

SHOULDER FINISH LINE: finish line design for tooth preparation in which the gingival floor meets the external axial surfaces at approximately a right angle. Flat-end tapered diamond end cutting diamonds are used to prepare shoulder finish line.

INDICATION: All ceramic crowns and labial margin of porcelain fused to metal crowns.

ADVANTAGES
I. Aesthetically acceptable
ii. Good crown contour
iii. Adequate bulk
iv. Less distortion

DISADVANTAGES
I. Arduous to prepare
II. Least conservative
III. Danger of pulp exposure
IV. Inferior marginal integrity
V. Lacks sliding joint fit

Types of the shoulder are sloped shoulder, radial shoulder and shoulder with bevel.

Sloped shoulder: finish line design for tooth preparation in which the gingival floor meets the external axial surfaces at approximately 120°. It is indicated in facial margin of metal ceramic crown.

Radial shoulder: Shoulder finish line with rounded gingivoaxial line angle and 90° cavosurface angle. Radial shoulder on all ceramic preparation combines the support of ceramic with stress reducing radial shoulder.

Shoulder with bevel: it is used in facial margin of metal-ceramic crowns, proximal box of inlays and onlays and occlusal shoulder of onlays and mandibular three-fourth crowns.

Factors deciding placement of finish lines:

Aesthetics: The subgingival finish line suits for the high lip line and equigingival and subgingival suits for low lip line patients.

Biological width: it is the combined dimension of epithelial attachment (0.97mm) and connective tissue attachment (1.07mm) coronal to alveolar bone crest. It is measured by bone sounding. Minimizing transgingival probing depth by sulcus depth measures the biological width.

Table 1. Biological width as per authors

<table>
<thead>
<tr>
<th>Author</th>
<th>Biologic width</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nevin and Sukrow</td>
<td>2.73mm</td>
</tr>
<tr>
<td>Garguilo et al</td>
<td>2.04mm</td>
</tr>
</tbody>
</table>

Table 2. Biological width variation as per intraoral position:

<table>
<thead>
<tr>
<th>Tooth</th>
<th>Biologic width</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anterior</td>
<td>1.75mm</td>
</tr>
<tr>
<td>Premolar</td>
<td>1.97mm</td>
</tr>
<tr>
<td>Molar</td>
<td>2.08mm</td>
</tr>
</tbody>
</table>

Table 3. Finish line position as per various authors in relation to various landmarks

<table>
<thead>
<tr>
<th>Author</th>
<th>Landmark</th>
<th>Margin – landmark separation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nevin and Sukrow</td>
<td>Base of sulcus</td>
<td>Finish line coronal to base of sulcus</td>
</tr>
<tr>
<td>Garguilo et al</td>
<td>Base of sulcus</td>
<td>Finish line at base of sulcus</td>
</tr>
<tr>
<td>Wilson and Mynard</td>
<td>Base of sulcus</td>
<td>0.5mm coronal to sulcus</td>
</tr>
</tbody>
</table>

Eisman et al     | Alveolar bone crest ABC | Finish line 2mm coronal to ABC |
Fugazoto et al   | ABC                     | Finish line 3mm coronal to ABC  |
Glickman et al   | Free gingival margin FGM| 0.5mm apical to FGM            |

Biologic width violation causes gingivitis, periodontal pocket formation, recession and tooth-restoration interface display.

Remedy for biological width is
I. Surgical recontouring of alveolar bone
ii. Orthodontic extrusion with supracrestal fibrotomy weekly

Depending on margin placement, types of finish lines
a) SUPRAGINGIVAL FINISH LINE
b) EQUIGINGIVAL FINISH LINE
c) SUBGINGIVAL FINISH LINE

Supragingival finish line is used in low lip line cases.

Advantages are as under:
I. Easy preparation
ii. Easy to finish
iii. Easy to duplicate
iv. Easy to verify fit of restoration
v. Easy maintenance

Equigingival finish line: In a study on dogs Marcum et al found margins at crest caused less inflammation than those above or below it. F. Micheal Gardener, Margins of complete crowns – Literature review JPD Oct 1982, 48(4), 396-400.

Subgingival finish line: it is best avoided unless indicated.

Indications:
I. Aesthetics
II. Subgingival caries
III. Erosion
IV. Abfraction
V. Dental hypersensitivity

Rationale of subgingival finish lines:
• Tooth-restoration interface latency
• To maximize resistance and retention form of tooth preparation
• To make significant contour alteration

Guidelines for subgingival margin placement are as under
a. Free gingival margin(FGM)
 b. Alveolar bone crest(ABC)

i. When sulcus depth is 1.5mm, finish line 0.5mm apical to FGM.
ii. When sulcus depth (d) >1.5mm, finish line is “sulcus depth, apical to FGM.
iii. When sulcus depth is >2mm, crown lengthening is done.

Subgingival finish line exposure is carried out by mechanical, chemical, rotary gingival curetage and surgical methods.

References:
1. Contemporary fixed partial denture by Rudolph Rosenstiel
2. Fundamentals of fixed partial denture by H.T. Shillingburg
3. Theory and practice of fixed prosthodontics by Tyman
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5. Carranza's clinical periodontology 10th edition
6. Protocols for predictable aesthetic dental restoration by Iran
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14. George Salem, margin design for esthetic posterior metal ceramic crowns. JPD Oct
15. Martin Henry Berman, complete coverage crowns and the gingival sulcus JPD Mar 1973 29(3) 301-309
17. R Pilo, Incomplete seating of cemented crowns: A literature review April 1988 59(4) 429-433