CLASS I AMALGAM

Design Principles
### Dental Amalgam vs. Composite Resin

<table>
<thead>
<tr>
<th>Category</th>
<th>Dental Amalgam</th>
<th>Composite Resin</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Retentive Form</strong></td>
<td>macro mechanical (opposing walls, grooves, mortise-form)</td>
<td>micro mechanical (bonding)</td>
</tr>
<tr>
<td><strong>Resistance Form, Restorative Material</strong></td>
<td>right angle butt joints, adequate bulk, smooth &amp; flat walls</td>
<td>bevel enamel, feather edge acceptable</td>
</tr>
<tr>
<td><strong>Resistance Form, Tooth</strong></td>
<td>right angle butt joints, remove all unsupported enamel</td>
<td>lesion dictates form, preserve unsupported enamel</td>
</tr>
<tr>
<td><strong>Proximal Clearance</strong></td>
<td>break contact with adjacent teeth</td>
<td>contact with adjacent tooth acceptable</td>
</tr>
</tbody>
</table>
CLASS I
Appearance of Class I caries lesion on bitewing radiograph
<table>
<thead>
<tr>
<th>Accepted Terminology</th>
<th>Jargon</th>
<th>Lay Terms</th>
</tr>
</thead>
<tbody>
<tr>
<td>preparing a cavity</td>
<td>prep</td>
<td>drilling</td>
</tr>
<tr>
<td>cavity preparation</td>
<td>prepping</td>
<td>hole</td>
</tr>
<tr>
<td>prepared cavity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accepted Terminology</td>
<td>Jargon</td>
<td>Lay Terms</td>
</tr>
<tr>
<td>----------------------</td>
<td>-------------</td>
<td>--------------</td>
</tr>
<tr>
<td>extend</td>
<td>widen</td>
<td>widen</td>
</tr>
<tr>
<td>extension</td>
<td>deepen</td>
<td>deepen</td>
</tr>
<tr>
<td>incorporate</td>
<td>chase</td>
<td>drill out</td>
</tr>
</tbody>
</table>
DISTAL CUSP

MESIOBUCCAL CUSP

DISTOBUCAL CUSP

DISTAL CUSP

MESIOLINGUAL CUSP

DISTOLINGUAL CUSP
OUTLINE FORM

FEATURE
• smooth flowing, gentle curves

RATIONALE
• angular contours can chip during condensation
• angular contours can concentrate stresses & lead to restoration fracture
• easier to find when carving back fresh amalgam
Angular Irregularities

**INVAGINATION**
- susceptible to fracture during condensation

**EVAGINATION**
- difficult to condense into
EXTENSION

a balance between conservation of tooth structure and the need for access and to remove defective tooth structure
## EXTENSION

<table>
<thead>
<tr>
<th>PRINCIPLE</th>
<th>RATIONALE</th>
</tr>
</thead>
<tbody>
<tr>
<td>• encompasses carious tissue</td>
<td>• eliminates infected tissue</td>
</tr>
<tr>
<td>• eliminates unsupported enamel</td>
<td>• eliminates weakened tooth structure</td>
</tr>
<tr>
<td>• encompasses contiguous fissures</td>
<td>• reduces risk of secondary caries</td>
</tr>
<tr>
<td>• encompasses contiguous restorations</td>
<td>• maximizes restoration lifespan</td>
</tr>
</tbody>
</table>

*Image: Close-up of teeth showing extension and fissures.*
BUCCO-LINGUAL EXTENSION

**PRINCIPLE**
- extends far enough up B & L grooves to terminate on gentle contours

**RATIONALE**
- margin in sharp anatomy difficult to finish & keep clean
BUCCO-LINGUAL EXTENSION

PRINCIPLE
• extend minimally in area of triangular ridges (optimally: isthmus width is <1/3 intercuspal distance)

RATIONALE
• provides convenience form while preserving cusp strength
MESIO-DISTAL EXTENSION

PRINCIPLE
• stop short of marginal ridge crests

RATIONALE
• preserve strength of marginal ridge (resistance form)
MESIO-DISTAL EXTENSION

PRINCIPLE
• groove extensions kept narrow

RATIONALE
• preserve strength of cusps (resistance form)
OCCLUSAL DEPTH

**PRINCIPLE**
- 0.5mm into dentin
- about 2 mm measured at triangular ridge

**RATIONALE**
- sufficient bulk of amalgam to prevent fracture
- maximum thickness of dentin protecting pulp
PULPAL FLOOR

PRINCIPLE
- smooth & flat
- parallel to occlusal table

RATIONALE
- uniform bulk of amalgam to prevent fracture
- best resistance to occlusal stresses & forces of condensation
BUCCAL & LINGUAL WALLS

PRINCIPLE
- smooth
- curved mesio-distally
- straight pulpo-occlusally

RATIONALE
- optimize adaptation of amalgam to walls
- elimination of weak tooth structure
BUCCAL & LINGUAL WALLS

**PRINCIPLE**
- convergent 6° pulpo-occlusally under triangular ridges
- divergent 6° pulpo-occlusally in groove extensions

**RATIONALE**
- helps lock restoration in tooth (retention)
- keep amalgam from being too thin at margins (resistance form)
- preserves strength of cuspal ridge (resistance form)
MESIAL & DISTAL WALLS

PRINCIPLE

• smooth
• straight & divergent 6° pulpo-occlusally

RATIONALE

• optimize adaptation of amalgam to walls
• elimination of weak tooth structure
• preserves strength of marginal ridge (resistance form)
CAVITY REFINEMENT

PRINCIPLE
• internal line angles well-defined but not sharp

RATIONALE
• maximizes amalgam resistance to dislodgement
• reduces stress concentration & risk of subsequent tooth fracture
CAVITY REFINEMENT

**PRINCIPLE**
- cavosurface margins regular, well-defined, well-supported

**RATIONALE**
- easier to visualize & carve following condensation
- optimize adaptation of amalgam to margins
- eliminates weak tooth structure
- maximizes marginal integrity
CAVOSURFACE MARGINS

unsupported, rough

cavosurface margin

tooth surface

enamel

poorly defined
CAVOSURFACE MARGINS

Unsupported, rough

cavosurface margin

tooth surface

poorly defined

amalgam

enamel
CAVOSURFACE MARGINS

un_supported, rough

cavosurface margin

tooth surface

poorly defined

amalgam

enamel
CLEANLINESS

PRINCIPLE
• cavity is free of debris & moisture

RATIONALE
• facilitates adaptation of amalgam to the cavity
• improves physical properties of the restoration by elimination of voids & foreign material
CLASS I AMALGAM

Preparation Technique
Plaster tooth #30
2X normal size
#245
rounded straight fissure bur
3.5mm head length
initial penetration in central pit perpendicular to occlusal table
penetrate 3mm (length of cutting head) will translate into 4mm at B & L walls
extend down central groove toward M & D fossae
keep bur perpendicular to occlusal table & spatially at the same level to create a flat pulpal floor
stop short of M & D pencil lines
leave room for refinement
extend into B & L grooves
stop short of pencil lines
tip bur slightly to create divergent M & D walls
tip bur slightly to create divergent MB, DB, & L groove terminuses
shape B & L walls into smooth flowing curves perpendicular to the pulpal floor extended to the pencil line
be careful not to widen the B & L groove extensions
round off sharp corner at D triangular ridge without encroaching on cusp
measure occlusal depth with perio probe at triangular ridge
create 6° convergence at base of triangular ridges
large straight hatchet  smooth pulpal floor with primary cutting edge

smooth vertical walls and sharpen cavosurface margin with secondary cutting edge
self-evaluate in pencil before seeking instructor evaluation

CLASS I AMALGAM PREPARATION EVALUATION

STUDENTS: Please evaluate your work prior to asking faculty to do so. Mark your assessment in pencil. This step is important in order for your instructor to help you develop appropriate self-assessment skills.

<table>
<thead>
<tr>
<th>PREPARATION FEATURES/PRINCIPLES</th>
<th>ERRORS</th>
<th>LOCATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. OUTLINE FORM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. smooth, regular, flowing curves</td>
<td>rough</td>
<td>2</td>
</tr>
<tr>
<td>B. bucco-lingual extensions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. extends into B &amp; L grooves</td>
<td>underextended</td>
<td>1</td>
</tr>
<tr>
<td>2. extends minimally at triangular ridges</td>
<td>overextended at triangular ridge</td>
<td>0</td>
</tr>
<tr>
<td>C. mesio-distal extension</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. short of marginal / oblique ridge</td>
<td>overextended</td>
<td>2</td>
</tr>
<tr>
<td>2. minimal width of B and L grooves</td>
<td>underextended</td>
<td>0</td>
</tr>
<tr>
<td>II. EXTENSION</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. includes contiguous pits &amp; fissures</td>
<td>does not include</td>
<td>0</td>
</tr>
<tr>
<td>B. bucco-lingual extensions</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>2. minimal width of B and L grooves</td>
<td>underextended</td>
<td>0</td>
</tr>
<tr>
<td>III. OCCLUSAL DEPTH/PULPAL FLOOR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. depth = 1.5 - 2.5mm at triangular ridges</td>
<td>&lt;1.5 but ≥ 1.0</td>
<td>0</td>
</tr>
<tr>
<td>B. smooth and flat</td>
<td>rough or uneven</td>
<td>0</td>
</tr>
<tr>
<td>C. parallel to occlusal table</td>
<td>slants</td>
<td>0</td>
</tr>
<tr>
<td>IV. OCCLUSAL WALLS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. smooth</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. straight pulpo-occlusally</td>
<td>not straight pulpo-occlusally</td>
<td>0</td>
</tr>
<tr>
<td>C. converge at triangular ridges</td>
<td>over-convergent</td>
<td>1</td>
</tr>
<tr>
<td>D. diverge at groove extensions</td>
<td>over-divergent</td>
<td>0</td>
</tr>
<tr>
<td>C. diverge at mesial &amp; distal walls</td>
<td>over-divergent</td>
<td>0</td>
</tr>
<tr>
<td>V. CAVITY REFINEMENT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. line angles well-defined</td>
<td>line angles indistinct</td>
<td>2</td>
</tr>
<tr>
<td>B. cavosurface smooth, crisp, supported</td>
<td>rough</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>nicked</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>indistinct</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>unsupported enamel</td>
<td>0</td>
</tr>
<tr>
<td>VI. TISSUE PRESERVATION, RUBBER DAM ISOLATION, CLEANLINESS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. preparation is clean</td>
<td>preparation is contaminated</td>
<td>0</td>
</tr>
<tr>
<td>B. rubber dam is intact</td>
<td>rubber dam is torn</td>
<td>0</td>
</tr>
<tr>
<td>C. uninvolved tooth structure intact</td>
<td>damage is: slight</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>moderate</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>severe</td>
<td>0</td>
</tr>
<tr>
<td>D. soft tissue is intact</td>
<td>soft tissue damage</td>
<td>0</td>
</tr>
</tbody>
</table>

Name  
Practical ID#  
Date  
Tooth 30 Surfaces O  
PLASTER TOOTH  
INSTRUCTOR SIGNATURE  
TOTAL (possible 12)
Rubber Dam isolation full LR quadrant
Use W8A retainer ligated
planned: 30-O Class I cavity preparation for amalgam
imagine there is a Class I caries lesion
30-O

#245 has 3.5mm head length

occlusal depth 2.0mm (±0.5) measured at base of triangular ridge
extend into M & D fossae, stay shy of marginal ridges

extend into MB, DB & L grooves, stay shy of cusp ridges
1. round irregularities in perimeter walls,
2. add slight divergence at marginal ridges and ends of groove extensions,
3. add slight convergence at base of triangular ridges,
4. smooth pulpal floor & refine internal line angles
self-evaluate before seeking instructor evaluation