**WAX PATTERN**

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A wax pattern is shaped on the cast.

Success in clinical practice depends upon every step in the treatment procedure.
Variety of natural waxes and resins have been used in dentistry for specific applications.

Waxes are thermoplastic materials which are solids at room temperature but melt without decomposition to form mobile liquids.

They consist of two or more components which may be natural or synthetic waxes, resins, oils and pigments.
**Correction of defects**

- Any small dimples (undercut) in die must be corrected

  This correction can be made:

  a- Clinically: *with glass ionomer or amalgam or others*.

  b- Laboratory: blocking them out on the working die by:

  1- Zinc phosphate cement
  2- Other commercial products (e.g., resin)
1. If the free gingiva is represented on the die at a higher level than the finish line it should be trimmed away to define the margin.

**Die trimming:**

- Remove most of excess stone with Arbor band.
- Use a pear shaped acrylic bur to trim the die apical to the finish line of the preparation.
- Then fine trimming and smoothening with scalpel or cleoid-discoid carver.
2- Ditching of the die below the finish line to 0.3 mm.

Ditching is a circumferential groove that facilitates the establishment of good margin.
Advantages of die trimming:

- Accentuate the finish line.
- Resembling the normal contour of the natural root for proper cervical contouring of the wax pattern.
- Produce smooth area gingival to the finish line.

The original contour of the tooth structure below the margin must be preserved. Over trimming (dotted line) will result in over contoured restoration.
The finish line of the preparation should be colored by red pencil without any pressure to preserve the finish line without scratches.

Marking the preparation margin. Note that the side of the colored pencil tip is used to keep line width to a minimum.
DIE PREPARATION

• Apply die hardener

• Cover die beyond finish lines.

• Allow to set for 5 minutes.

• Apply die spacer

• 40 micron thickness allows space for cement.

• 2-3 coats placed.
• Spacer 1 mm away from finish line.
• Remove excess with die setting retardant.
Die spacer is used to maintain constant space between the side walls of the preparation and the restoration.

A band of about 1 mm must be left unpainted at the margin to maintain good margin adaptation.
The die is thoroughly lubricated with a water soluble lubricant which decreases the surface tension of the die and enhances the flow of the wax.
Factors that cause increase in the cement space:
1. Increased thermal and polymerization shrinkage of the impression material
2. Use of a solid cast with individual stone dies
3. Use of an internal (initial) layer of soft wax
4. Use of die spacers
5. Increased expansion of the investment mold
6. Removal of metal from the fitting surface by grinding, airborne-particle abrasion, etching with aqua regia, or electrochemical milling the impression material

Factors that cause decrease in the cement space:
1. Reduced thermal and polymerization shrinkage of the impression material
2. Use of resin or electroplated dies
3. Use of alloys with a higher melting range
4. Reduced expansion of the investment by altering:
   a- selected technique
   b- burnout temperature
   c- water/powder ratio

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**Material science**

- **Composition**: (Blue inlay casting wax)
  - increase melting temperature
  - increase stickiness
  - Increase hardness

* Dyes → provide color contrast
2- Types: ANSI & ADA have classified wax into:

a- Type I: Medium hardness wax
   - Used in direct technique
   - Not flow at mouth temperature
   - Accurate shape
   - Enough strength to resist any deformation
   - Support fine details

b- Type II: Softer wax
   - Used in indirect technique
   - Resist flow at room temperature
   - Maximize fitness between wax and die

3. Requirements of the casting wax:
   1. Has different color than the die material.
   2. Flow readily and record fine details.
   3. Carved without shipping or flaking.
   4. Accept addition.
   5. Can be finished and polished.
   6. Has sufficient strength and rigidity after cooling.
   7. Shows fracture rather than distortion if it gets in undercut.
   8. Shows minimal rate of stress relaxation.
   9. Evaporate without residue during burn out.
   10. Can compensate part of metal solidification shrinkage.
Properties:

a- **Flow** ➔ depends on the temperature (↑ temp ➔ ↑ flow)
   (Type I wax) ➔ carved at 37 C (99 F)
   (Type II wax) ➔ carved at 35 C (77 F)

b- **Thermal expansion** ➔
   Coefficient of Thermal expansion of wax is high

c- **Wettability** ➔
   * wax is poorly wetted by investment slurry
   * overcome by application of surfactant to flow

d- **Memory**:
   * wax exhibits some elasticity till it liquefied.
   * overcome by applying the initial layer of wax in melted increments or drops.
   * Alternatively, dipping of initial coping in melted wax

Techniques used for fabrication of the wax pattern:

- **Direct technique.**
- **Indirect technique**
- **Indirect – direct technique**