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WORKING CASTS AND DIES
• **Working (or master) cast** is the positive reproduction of the prepared teeth, ridge areas, and other parts of the dental arch.

• **Die** is the positive reproduction of the prepared tooth and consists of a suitable hard substance of sufficient accuracy.
Requirements of the cast

1- It must reproduce both prepared and unprepared tooth surfaces.
2- Should be free of any bubbles or defects
Requirements of the cast

3- **All surfaces** of the teeth involved in the **anterior guidance** and the **occlusal surfaces** of all unprepared teeth must be properly reproduced to allow for precise articulation of the opposing casts.
Requirements of the cast

4- All soft tissues should be reproduced in the working cast, including all edentulous spaces and residual ridge contours for proper pontic fabrication.

5- Reproduction of the adjacent & contralateral teeth to allow proper alignment & contouring.

6- Reproduction of the gingival tissue accurately.
Requirements of the die

1- It must reproduce the **prepared teeth exactly**; all surfaces must be accurately duplicated and **no air bubbles or voids** can be accepted.

2- **Finish line** complete.

3- The remaining unprepared tooth structure immediately **cervical** to the finish line should be easily **discernible** on the die, ideally with 0.5 to 1 mm visible to identify the contour of the tooth & allow margin adaptation.
Materials Science
SELECTION CRITERIA
(Requirement of die material)

1- High **strength** properties to withstand handling without fracture or distortion.

2- High **surface hardness** to resist scratching or abrasion during wax pattern forming.

3- High **stability** and excellent **dimensional accuracy**.

4- **Accurate** detail reproduction.

5- Easily **sectioned and trimmed**.
6- Available in **contrasting colors**, so that the preparation margin can be easily detected.

7- Compatible with separating agents.

8- **Wettable** by wax.

9- Compatible with impression materials.
Die Materials

1. Improved stone
2. Epoxy resins
3. Amalgam
4. Ceramic (refractory die)
5. Electroplated
Working cast and die systems

I. Working cast and a separate die
II. Working cast with removable dies
III. Single Die:
   - Stone die
   - Amalgam die
   - Acrylic die
   - Ceramic die (refractory die)
   - Electroplated die
I. Working cast and a separate die

- Full arch cast for proximal contact and occlusion
- Sectional cast (Separate die) for wax coping and margins
I. Working cast and a separate die

The working cast & separate dies can be obtained either from:

1- Separate impression.
2- Pouring full arch impression twice (double pour). In this case the impression material must be rubber base because hydrocolloid (alginate will be distorted if poured twice.
Advantages:

- Ease of fabrication
- Keep the relationship between abutments **fixed and immovable**.
- The gingival tissues are **intact**, so we can easily obtain harmonious contour of the wax pattern.
Disadvantages:

• Fragile wax patterns are difficult to transfer between the two parts (from cast to die). So distortion of some of the internal adaptation

• The second pour of the impression may be different (slightly larger) than the first, therefore, seating of the wax pattern may be problematic. It may be necessary to relieve the stone slightly to seat the pattern.
Impression pouring
Impression pouring

• Hard **improved stone** should be used for fabricating the die & cast to prevent surface abrasion

• **Wash the impression** under cold running tap water to remove mucous & saliva.

• Follow the manufacturer’s instructions for the **correct water/powder ratio**, which may affect **setting time, porosity, setting expansion** and ultimate strength.
Impression pouring
. Mix water and stone by hand with spatula until the powder is completely wet then use vacuum.
. Rubber impression should be completely dry, the surface should be free of visible water, but it should still shiny, if the surface appears dull, it has been over dried, and some distortion may occur, then apply the surfactant.
Impression pouring

Proportion P and L

Bulk P

Pre-packaged P

Microstone
Impression pouring

• Using a **small instrument** to carry stone to the impression of the prepared tooth, place a small amount of stone on the side of the impression above the preparation and vibrate till stone reaches the **occlusal surface** of the preparation.

• Tilt the impression so that the **stone flows** slowly across the bottom of the preparation, add stone in small increments. If a large amount of stone is dropped, air will be trapped, and voids will result in the cast.
Impression pouring

• Add small increments of stone to the distal most area of one side of the impression, slowly raise the distal end of the impression, so that stone will move mesially flowing from tooth to tooth and filling each of them from the bottom.

• Add stone and vibrate until all the teeth in the arch are filled.
• Build the stone up to a height approximately one inch over the preparation to allow bulk for an adequate handle of the die.

• To pour a full arch impression, place the tray on the vibrator.
Die Preparation

- The cast from which the die is made, is trimmed on a model trimmer to remove all excess stone around the prepared tooth.

- The cast cutting it down to form the handle of the die, the handle of the die should be slightly large in the diameter than the preparation. Its sides should be parallel or slightly tapered toward the base, and should be parallel to the long axis of the tooth. The handle is approximately one inch long.

- Trim the die gingival to the finish line of the preparation, this area should be smooth and free from irregularities.
Die Preparation

- After the die has been trimmed, **the finish line should be highlighted with a sharp color bright red pencil**, this facilitate carving the margins of the wax pattern.

- The die is then **painted with a die strengthening material** to **close the stone micro porosities**, and **harden it and decrease scratching**

- The preparation area of the die should be **painted with a die relief** material to provide space for cement, a relief of 25-50 microns is desired, the tooth preparation on the die is painted within 1-0.5 mm of the finish line.
WORKING CAST WITH A REMOVABLE DIE SYSTEM

In this system a special type of working cast is prepared and the dies are carefully sectioned so that the individual dies can be removed and replaced in their original position in the cast.

Methods of repositioning die in its working cast

- Systems using die pins
- Dowel pin systems
- Systems using pre formed plastic trays without die pins

A straight
B curved
II. Working cast with removable dies

• Retained by pins in a base (stone or plastic)
• One die used for proximal contacts, occlusion and margins
Requirements of Removable Dies

1. The dies must return to their exact positions.
2. Dies are stable even when inverted and accurately related to adjacent and opposing teeth.
3. Dies are removable individually.
4. The cast containing the die must be easily mounted on the articulator.
Removable Die construction Techniques:

A. Dowel Pin technique
B. Pindex system
C. Di-lock tray technique
D. DVA Model system
E. Zeiser Model system.
A. Dowel Pin Technique
1 - A dowel pin is positioned over each prepared tooth in the impression.
2 - If the dowel pins are positioned inaccurately, they may:
   A - Impinge on the margins,
   B - Weaken the die,
   C - Prevent it from being easily removed from the cast.
3- **Bobby pins** can be used for positioning the dowel pins.
4- A dowel is placed between **the arms** of the bobby pins.
5- The bobby pin is positioned **bucco-lingually across the impression** so that the dowel pin will be entered directly over the preparation & must not touch the impression.
6-The pins should be flat from one side to prevent rotation.
7-Stabilize the dowel in the booby pin with sticky wax.
8-Die stone is then poured into the impression, filling the impression of the teeth and covering the end “constriction” of the dowel pin
9-Place **a ball of soft wax** on the tip of each dowel.

10-The stone around each dowel is **lubricated** with a thin coat of petrolatum to permit easier separation of the die from the working cast.

11- Then pour stone of the complete base. After complete setting of the stone, remove the cast from the impression and trim off the excess on a model trimmer.
• 12-Use sharp knife to remove the spheres of utility wax.

• 13-When the stone is hard and dry, use a saw to cut through the layer of die stone, mesially and distally on each die, the cuts should taper toward each other slightly from occlusal to gingival.
14-Loosen the die gently using an instrument handle.

15-Place wax around the tips of the dowels to protect them from the plaster contamination.

16-Soak the cast in the water and mount it on the articulator, using mounting plaster. After hardening of the plaster remove the wax covering the tips of the dowels.
17-Trim away any excess stone **gingival to finish line**, then mark the finish line with the **red pencil**.

18-Repeat the procedure for each die on the cast.

19-Reseat the dies to make certain that they will seat completely and will be stable.
Sectioning and die preparation
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.
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.
Die Preparation

• 1. Apply die hardener
  – Cover die beyond finish lines
  – Allow to set for 5 minutes

• 2. Apply die spacer
  – 40 micron thickness allows space for cement
  – 2-3 coats placed
  – Spacer 1 mm from finish line
  – Remove excess with die setting retardant
STONE DIE & PLASTER HARDENER RESIN

A LIQUID PLASTIC which impregnates the stone die. Hardens stone, protects margins, seals and waterproofs. Does not change dimensions of die, or model.

Brush liquid on the stone die or model. Apply 1 or 2 thin coats, allowing 10 to 15 seconds between applications for liquid to be completely absorbed.
Thank you!