

PROSTHESIS

COMPLETE DENTURE



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LEC 5

Impression tray

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Terminology

Impression trays :	❖ is a device used to carry, confine & control the impression material from the patient's mouth. During impression making the tray facilitate insertion & removal of impression material from the patient's mouth.
Impression:	❖ is an imprint or negative reproduction or replica of an object from which appositive cast can be made. In complete denture, an impression is a negative registration of the entire denture bearing area.
Preliminary impressions :	❖ it is an impression made in stock tray for making study cast on which a custom tray is constructed.
Final impressions :	❖ it is an impression made in custom tray and used for making the master cast on which the denture is constructed.
Cast:	❖ it is a positive reproduction of the form of tissues of the upper or lower arch
Types of casts	A. Facial cast done by impression to patient face used in maxillofacial prosthesis B. Dental cast
Dental cast	<ol style="list-style-type: none"> 1. Study (diagnostic)(Iry)→formed by primary impression used for diagnosis and construction of special tray . 2. Master (secondary)→formed by secondary impression ,used for construction of denture(through record block , flasking) 3. Refractory cast →made of investment material as casting to metal framework done on it 4. Working cast →it is master cast which placed in flasking ,processing in complete denture ,removable partial denture 5. Optical/digital →imaged by camera to oral cavity ,can make design on the computer 6. Die →positive replica to one tooth where crown is fabricated

➤ Requirements Of Impression Trays

- 1) The tray should be **rigid and strong** but not too thick as Flexible trays cause distortion of impression
- 2) The tray should simulate the finished denture in size and shape.

- 3) The border extension of the tray should be **2mm short of the vestibular depth** with no interference with muscle or frenal attachment.
- 4) It should **provide uniform space for impression material**
- 5) The entire borders of the tray **should be smooth and rounded.**
- 6) The tray should **retain its shape** throughout the impression procedure and pouring of impression (dimensionally stable)
- 7) The **handle** of the tray should be **angulated.**
- 8) It should not distort the tissue in the vestibular areas
- 9) It should support set impression materials when removed from mouth so that a cast can be poured

➤ **Parts of the tray:**

✓ **The tray consists of:**

➤ **Body**

- **Floor**
- **Flanges**

➤ **Handle**

- ✓ The body consists of floor and flanges.
- ✓ The upper tray has a vault portion instead of lingual flanges of the lower one.
- ✓ The Handle is an extension from the union of the floor and labial flange.



➤ **Classifications of Impression Tray:**

- 1) According to the material used to fabricate the trays.
- 2) According to the method of fabrication of trays.
- 3) According to the teeth present /absent in mouth.
- 4) According to the method of interlocking of material.

According to the material used to fabricate the trays:

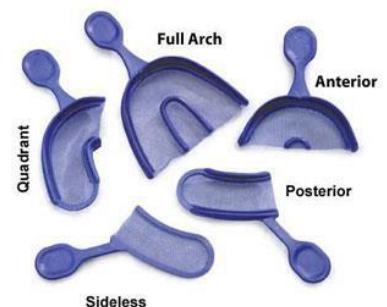
- a) **Metallic trays** (stainless steel, Aluminum)
- b) **Non-metallic trays** (plastic trays, acrylic resin trays)



According to the method of fabrication of trays:

a) **Stock trays:**

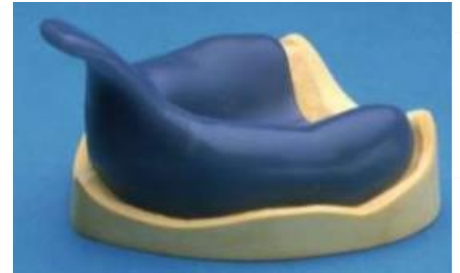
- ✓ Full arch trays



- ✓ Sectional trays
- ✓ Quadrant trays
 - ❖ Stock trays are ready-made and comes in specific sizes.
 - ❖ Stock trays must be selected for best fit.
 - ❖ Some types are re-useable after sterilization.

b) Custom trays or Special trays

- ✓ Close fitting special try
- ✓ Loss fitting or spacer special try
 - ❖ Custom trays are fabricated on the particular patient's cast thereby making it unique to the patient.
 - ❖ This is why custom trays always are a better fit than stock trays.
 - ❖ They are useful only for the particular patient- then discarded.



According to the teeth present /absent in mouth:

a) Edentulous trays

- ✓ **Rounded Cross-Section**
- ✓ It has **oval floor and short flanges**, to conform the shape of the ridge
- ✓ **L- shaped handle** to clear the lip to allow proper molding of the impression in the labial portion

b) Dentulous trays

- ✓ **Square Cross-Section**
- ✓ For patients with teeth
- ✓ It has **flat floor and vertical high flanges**, to accommodate the teeth
- ✓ **Straight handle** that extend across the floor of the tray



According to the method of interlocking of material:

a) Perforated trays

- ✓ Allow **mechanical retention** of alginate impression material



b) Non-perforated trays (plain)

- ✓ Allow **easy applying and removal** of molding compound impression



c) Rim-lock trays

- ✓ Water-cooled
- ✓ Non water-cooled
 - ❖ Rim locked with cooling system : to allow circulating cooling system for agar agar impression



Stock Trays

- ✓ Impression tray that serve to carry the impression material to the mouth & support it in the correct position while it is hardening.
- ✓ This type of the trays can be used for several patients & used for making primary impression.
- ✓ Have 4 size (1,2,3,4) according to ridge shape and size
- ✓ They are made of different materials such as Al, Tin, Brass or Plastic, in variety of shapes, size to fit different mouth.

➤ Material used for construction

A) Metallic

- ✓ Either aluminum, tin, stainless steel or low fusing alloy.
- ✓ Provide maximum support for impression materials
- ✓ Rigid
- ✓ Durable and long lasting
- ✓ Can be perforated or solid
- ✓ Can be used with all elastometric materials

B) Plastic:

- ✓ Disposable
- ✓ Eliminate cross-contamination
- ✓ Rigid, thick walls to provide lateral support for the tray impression material to prevent distortion when pouring the model

➤ Modifications of stock trays

- ✓ After selecting of proper size, form and shape of stock trays for the patient, some modification must be carried out to be individually adapted to the patient to achieve accurate impression.

❖ The modification includes:

a) **Bending**, either open or close the flange with pliers to provide adequate space for impression material (3-4mm space between the tray and the tissue).

b) **Building (adding):**

- Building a shallow vault of tray by compound in unusual high vault.

- Building short labial or buccal flange by compound.
- c) **Cutting**, the flange can be cut to accommodate labial or buccal frenum

➤ **Factors effect in selection of stock tray:**

- 1) **The presence of the teeth** (dentulous, edntolous , partial edentolous trays)
- 2) **Size of the arch** (different sizes of stock trays are available for different arch sizes 1, 2, 3 and 4).
- 3) **Form of the arch.** (Different form of stock trays are available for different arch form. They may be ovoid, square, taper).
- 4) The stock tray **must covered all the anatomical landmarks** needed in complete denture & this is a most important point.
- 5) Stock tray should **give a sufficient space** to impression material in all direction
- 6) The **type of material** used in the **primary impression** procedure
 - ✓ **Compound we used non-perforated tray**, because it will be stick on the tray.
 - ✓ And if we use **alginate material we should use perforated stock tray**.
 - ✓ Use **agar agar material** we should use **Rim locked tray with cooling system**.

Custom Trays (special)

- ✓ An individualized impression tray made from a cast recovered from primary impression.
- ✓ It is **used in making a final impression**.
- ✓ They are designed to enable the dentist to make a more accurate and detailed impression than is possible with stock trays.
- ✓ Custom trays are **constructed for a specific impression procedure** for one patient and they are **discarded after use**.

➤ **Advantages of special trays:**

- 1) **Economy in impression material** (used less impression material required in special tray).
- 2) **More accurate impression.**
- 3) Special tray provides **even thickness of impression material**. This minimize tissue displacement & dimensional changes of impression material.
- 4) The work with special tray is **easier & quicker** than modifying stock tray to provide accurate impression.
- 5) Special tray is **more accurately adapted to the oral vestibules**, this helps in better retention of denture.

6) Special tray are **less bulky than stock tray** which is **more comfortable** for the patient.

➤ **Requirements of special tray materials**

- 1) The impression tray **must not impinge** upon movable structures.
- 2) The **borders must be under extended (2mm)** .
- 3) The **posterior limits** of the impression tray should be slightly **over- extended to ensure inclusion of the posterior detail** for development of the post-dam area in upper tray.
- 4) The tray should **be rigid & of sufficient thickness** that it will not fracture during its use.
- 5) The tray must **have a handle for manipulation** & the handle must not interfere with functional movement of the oral structures.
- 6) The **tray must be smooth** on its exposed surfaces, and should have no sharp corner or edges which would injury the patient.
- 7) **Dimension accuracy** (no distortion or warpage)
- 8) **Easily modified or trimmed**
- 9) **Can accept border tracing material**

➤ **Types of special tray materials**

a) **According to material used for construction**

1) **Thermoplastic Materials:**

- ✓ Shellac Base Plate
- ✓ Modeling Compound

2) **Resins:**

- ✓ Self-Cure (cold cure, room temperature, chemical)
- ✓ Heat Cure (hot cure)
- ✓ Light Cure
- ✓ Plastic Sheets

3) **Metals:**

- ✓ Casted
- ✓ Swaged

4) **Old denture**

b) **According to the relation of the tissue to the custom tray:**

1) **Close fit tray (tray without spacer)**

2) **Open fit tray (tray with spacer)**

- ✓ In some techniques modeling compound impressions are used as custom trays after scraping 2-3mm from the fitting surface and flanges of the impressions.
- ✓ This custom tray is used for a plaster wash impression or zinc oxide eugenol paste lining.
- ✓ The advantage of this method is that it involves one less visit by the patient to the dentist's office. **Is called wash impression technique**

Methods of Construction

1) Thermoplastic Materials: Shellac special tray:

- ✓ Shellac special trays are made from a **resinous material that softens upon heating and hardens when cooled.**
- ✓ It comes in pink and brown color sheets in two thicknesses, the single thickness and the double thickness.
- ✓ The **single is used for base plate construction**, and the **double is used to construct custom tray.**
- ✓ Shellac base plate is supplied commercially in forms shaped to correspond to the general shapes of the maxillary and mandibular arches

➤ Advantages:

- 1) Easily constructed, easily modified
- 2) Light in weight
- 3) Less expensive.

➤ Disadvantages:

- 1) Warpage and distortion
- 2) Less rigid (brittle).
- 3) Cannot accept border tracing material.

➤ Steps (read only)

✓ Before adapting the shellac base plate, the cast must be treated so that the material will not adhere to it. This may be done either by dusting the cast with talcum powder or by the application of a light coat of vaseline.

✓ The shellac base plate is centered on the cast the bunsen burner is inverted and the flame played on the surface of the shellac material.

✓ As the shellac material becomes softened, it will sag. It is then pressed firmly in place by the finger.

✓ After the preliminary adaptation is completed, the base plate is removed from the cast and borders are heated and excess is trimmed with scissors.



- ✓ The borders are heated, the edges are rolled on themselves so that the border is composed of a double thickness.
- ✓ The base plate is returned to the cast and the borders re-adapted with a wet cotton roll. The borders are then smoothed.
- ✓ A handle can be made by softening a piece of the same material and attaching it to the tray in such a manner as to avoid lip interference.

2) Modeling compound

- ✓ Modeling compound is a thermoplastic material that is made either as a tray or as an impression material.
- ✓ The **cake form** is used **primarily as a tray material**, where as the **stick form** is used **primarily as an impression material**.
- ✓ The tray material requires a higher heat to soften, does not record detail accurately, and is rigid when it is hardened.

❖ **Advantage:** less visits by the patient



3) Resins:

a) Self curing acrylic:

- ✓ Modified methyl methacrylates are the most widely used material for making custom trays.

➤ **Advantages:**

- 1) Easily constructed.
- 2) More rigid than shellac base plate trays.
- 3) Can accept border tracing material.

➤ **Disadvantages:**

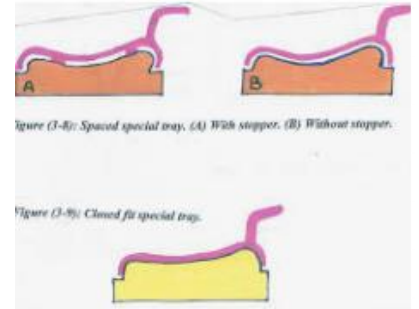
- 1) Polymerization shrinkage
- 2) A time interval must be allowed between the fabrication and the use of these custom trays

3) The hazardous effects caused by the monomer (methyl methacrylate) include dermatologic reactions

➤ **Types of Custom Tray**

1) **Close -fit tray :**

- ✓ as the name suggests, it is adapted directly on to the cast without any wax spacer.
- ✓ Usually used with impression materials that have a light viscosity to obtain a wash impression, e.G. Light bodied elastomers, zoe impression paste.



2) **Tray with spacer and stops :**

- ✓ These trays use a wax spacer to provide Space for the impression material.
- ✓ This is because impression materials used here need extra space as they have higher viscosity e.G. Alginate, medium and heavy bodied elastomers.

Fabrication of Acrylic custom tray

➤ **Three methods are used for construct the acrylic resin tray**

- 1) **Sprinkle-on method.**
- 2) **Open finger – adapted dough method**
- 3) **Closed flasking method**

➤ **Factors affecting the accuracy of resin trays**

1) **Dimensional changes:**

- ✓ Due to polymerization shrinkage of resin more in posterior palatal areas and lingual flanges

2) **Construction techniques:**

- ✓ **Open methods** produce more polymerization shrinkage due to lack of continuous pressure
- ✓ **Sprinkled methods** allow layering construction compensate for each layering shrinkages
- ✓ **Closed flasking method** provide less polymerization shrinkage

3) **Material used:**

- ✓ residual monomer after polymerization of Heat cure resin is minimal compared to light and autopolymerized resin so it's more accurate and more fitted

➤ **Procedural Steps for custom tray with spacer and stop**

a) Preparation of the primary cast :

- 1) Undercuts should be find out with the help of surveyor and should be blocked out
- 2) Outline of the border of the tray should be marked with pencil which is 2/3 mm short of the reflection.
- 3) The relief areas should also be marked in the cast.
- 4) The border of the tray marked on the cast may be grooved deeper using a carver.

b) Relief areas are made

c) Adapting the spacer:

- ✓ A spacer should be adapted throughout the extent of special tray (coincide with the second line), except posterior palatal seal area in maxilla and buccal shelf area in mandible.
- ✓ The spacer is in the form of one thickness of modeling wax or shellac base plate adapted on the primary cast.
- ✓ This spacer will be removed from the custom tray before impression making leaving a space for the impression material. Some dentists will not use any spacer in the tray, but will relieve the tray at the time the impression is to be made

➤ **Function of spacer:**

- a) The spacer allows the tray to be properly positioned in the mouth during border molding procedure.
- b) To allow the impression to have an even thickness of impression material.
- c) Prevent distortion of the material at final stage.

➤ **Materials used in spacer:**

- a) Baseplate wax
- b) Non asbestos casting liner

➤ **Methods of construction:**

1) The first method:

- ✓ The outline of the impression tray is drawn on the cast using an indelible pencil.
- ✓ The outline for the wax spacer is drawn on the cast 2-3 mm. shorter of the tray border.
- ✓ The cast is then dusted by powder or immersed in a water bath for 10 minutes to prevent sticking of the heated wax to the cast.
- ✓ One layer of base plate wax is adapted to the cast and trimmed to the previously drawn outline.

✓ Tissue stops are made by removing 4mm. square of wax to expose the cast in the canine and molar regions .

2) The second method:

✓ The cast is immersed in cold water for 10 minutes.

✓ Then dipped in molten wax for several times. Each dip will add a layer to the cast, three dips are sufficient.

✓ The excess wax is trimmed to leave a spacer 2.3 mm. shorter than the tray border.

➤ The use of stops:

✓ The spacer should be cut out in 2-4 places so that the special tray touches the ridge in these areas .

✓ **Location:** Usually 4 stoppers are placed (2 canine , 2 first molar) 3 only in case of Vshaped arch

✓ **Size and shape :** Stopper can be 2mm square or 2 by 4 mm rectangle or 2 mm mesiodistally, palatally over the crest of the ridge and buccally half way into the sulcus



➤ Function of Tissue Stops:

1) To orient the tray

2) For uniform thickness of the impression material

d) Application of separating medium

✓ Apply separating media on the cast so that acrylic resin does not stick to the cast.

e) Acrylization:

➤ When monomer and polymer are mixed in the proper proportions, a workable mass is produced. Upon standing, the resultant mass passes through five distinct stages.

1) Sandy

2) Stringy

3) Dough,

4) Rubbery, or elastic, and

5) Stiff

✓ The acrylic resin powder and liquid are mixed according to the manufacturer instructions in a glass container. The consistency of the mix is checked periodically till it reaches the dough stage, wooden blade is used for mixing.

- ✓ The dough is placed within a form on a glass slab. It is patted out to form a wafer of uniform thickness, or two wet plastic sheets or glass plates are used to shape the dough into a wafer or sheet of, suitable thickness. Two small pieces of shellac base plate are placed between the two glass plates to get the desired thickness.
- ✓ The wafer of the tray material is lifted from the slab and adapted to the cast with light finger pressure. Excessive pressure will cause thin areas in the tray.
- ✓ A warm knife may be used to trim the soft material from around the borders of the cast, final trimming is done after curing.

f) Fabrication of handle:

➤ **Criteria of handle :**

- 1) The handle should be parallel to the long axis of the teeth that are to be replaced.
- 2) The handle should not arise horizontally from the tray because it may interfere with lip movements.
- 3) It should be 3-4 mm thick ,8 mm long , and 8 mm high.
- 4) The vertical distance from the sulcus to the handle is 2 cm
- 5) The handle upstand must be made long enough for the handle to exit through the
4. The vertical distance from the sulcus to the handle is 2 cm
- 6) The handle upstand must be made long enough for the handle to exit through the oral commissure.

➤ **Functions of handle**

- 1) Supports the lip while making impression.
- 2) Tray handles are particularly helpful when loading, placing and orientating custom trays in the mouth.

g) Finishing

➤ **Sterilizing trays**

- ✓ Trays should be cleaned properly and sterilized before use
- ✓ Disposable trays are recommended
- ✓ Sterilization can be achieved by autoclaving, dry heat or chemical vapors



➤ **Heat curing acrylic:**

✓ 2 sheets of wax adapted to the primary cast 2mm shorter from the depth of the sulcus, cast flaked, wax eliminated, packing of heat cure acrylic resin was made in usual manner, the tray finished and polished

❖ **Advantages**

- 1) Highly fitted to the primary cast
- 2) Minimal dimensional changes

❖ **Disadvantages**

- 1) Long time of construction, expensive
- 2) Produce pressure areas in the impression due to high fitness to oral tissues so need relief

➤ **light cure acrylics:**

✓ Acrylic sheet adapted to the cast and trimmed 2mm short from sulcus depth, then cured with light curing unit

❖ **Advantages**

✓ Give the time for necessary modification in border extension of the tray, and when desired shape obtained, curing is made by light

❖ **Disadvantages**

✓ Time consuming, expensive

➤ **Plastic sheets:**

✓ uniform clear (polyvinyl) plastic sheets are adapted to the cast with vacuum or pressure forming machine

✓ After curing, it is trimmed 2mm short of sulcus depth

❖ **Advantages:** time saving

➤ **Casted metal**

✓ Wax pattern for the special tray is made on the primary cast, invested, wax is eliminated to form a mold in the investment

✓ Metal is melted and poured inside the mold

✓ Deflasking, finishing and polishing was made in usual manner

❖ **Advantages**

✓ High rigidity

✓ High fitness to the underlying tissue- minimal dimensional changes

❖ **Disadvantages**

✓ Long time of construction

✓ Expensive

✓ Difficult to be modified or trimmed

➤ **Swaged metal**

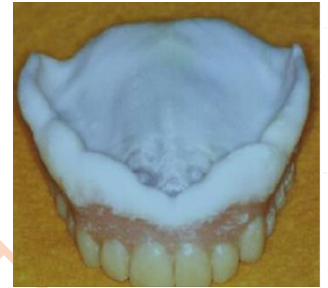
✓ Die and counter-die is made for the primary cast with low fusing metal

✓ Stainless steel metal (or stock tray) is hammered between die and counter-die

- ✓ Excess metal was trimmed 2mm short of the depth of the sulcus

❖ **Disadvantages**

- ✓ Long time of construction
- ✓ Expensive
- ✓ Difficult to be modified or trimmed
- **Old denture**
 - ✓ Used as a special tray in relining and rebasing procedures or if new denture is needed
 - ✓ The fitting surface of the denture is relieved 2mm and the borders are shortened 2mm



Pouring the Casts

➤ **Casting procedure:**

- 1) Preparation of impression before casting:
 - ✓ Washing and adherent saliva
 - ✓ Only for plaster impression material separating medium applied to prevent chemical union between it and cast plaster
- 2) Mixing the gypsum products:
 - ✓ Placing the measured volume of water and stone powder in mixing bowl
- 3) Spatulation the mix by:
 - ✓ **mechanical spatulation:** automatically remove the air bubbles intertid through the mix
 - ✓ **Hand spatulation :** air bubbles eliminated by vacuum or mechanical vibrator

a) Pouring the primary cast

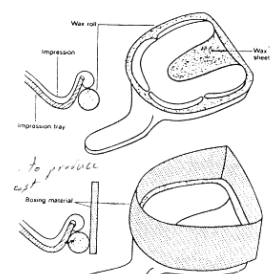
- ✓ Plaster is mixed to a thick consistency and placed into one corner of the impression and allowed to flow around the impression to avoid trapping of air bubbles.
- ✓ A putty of plaster is placed on a glass slab, the filled impression is inverted on it. The plaster is pulled up around the impression with a plaster spatula or knife and then smoothed.

b) Pouring the master cast:

- ✓ The master cast is poured either by inverting the impression on a putty of stone (Conventional casting method without boxing) or by boxing the final impression to maintain the border

➤ **Boxing of an impression:**

❖ **Advantages of boxing:**



- 1) produces a container into which stone can be poured.
- 2) It allows preservation of the borders of the impression.
- 3) It allows the use of a mounting plate which in turn permits the master cast to be repositioned accurately on the articulator after the denture has been cured.
- 4) allows vibration to get rid of air bubbles.
- 5) Boxing produce a dense accurate master cast of a predetermined thickness.
- 6) Save stone material

❖ **Methods of boxing:**

a) Wax boxing method

✓ The impression is beaded using 4mm roll of beading wax which placed around the impression 3mm. below the border and parallel to it.



✓ This boxing method is suitable for **zinc oxide or plaster**, as the **beading wax adheres readily to these impression material**

✓ The tongue space of the lower impression is sealed by adapting a sheet of base plate wax 3-4 mm. below the border of the impression.

✓ A sidewall 12mm of base plate wax is then built against the beading wax to make a box into which stone is poured.

b) Plaster of pairs and pumice boxing method

✓ Used for **boxing alginate, rubber base and silicon impressions.**



✓ pairs and pumice is mixed, placed on a glass slab and the impression is seated into it with the fitting surface upward.

✓ The mix is drawn with a spatula to a height of approximately 3-4mm below the borders of the impression and 5mm wide.

✓ After setting it is removed from the glass slab, washed with water and trimmed, painted with separating medium

✓ Boxing wax is adapted to the plaster and pumics to be 12 mm above the highest point of the impression.

➤ **Requirements of a dental cast:**

- 1) The peripheral roll should be complete and no deeper than 3-4 mm, and the edge of the cast extending out from this roll should be approximately 3-4mm wide
- 2) The side walls of a cast should be vertical.
- 3) The cast base should not less than 10 mm at the thinnest point.

- 4) The base is trimmed so the plane of the edentulous ridge is parallel to the base.
- 5) The tongue space on a mandibular cast should be flat and smooth when trimmed, but the lingual peripheral roll should remain intact
- 6) The anterior border of the maxillary cast is pointed at the midline, anterior border of the mandibular cast is curved from canine to canine.
- 7) Grooves have been placed for indexing
- 8) All surfaces should be hard, dense, free of voids or nodules
- 9) A cast should include all of the area available for denture support.

➤ **Note :**

- ✓ When zinc oxide-eugenol impression paste is used a close-fitting tray without spacer is required.
- ✓ When polysulfide rubber, or silicone impression material are used, a single layer of baseplate wax is required.
- ✓ When alginate or plaster are used as a final impression material, a spacer of double thickness of baseplate wax is desirable. (3 mm spacer)

- ❖ Cast have two line if closely fit tray is constructed (denture line , tray line)
- ❖ Cast have 3 line if spaced tray is constructed
- ❖ we have 3 concepts of impression methods:
 - 1) Mucco-static or minimal pressure technique (with spacer)
 - 2) Muccocompressive or pressure technique (without spacer)
 - 3) Selective pressure tech
- ✓ In compound we use selective pressure impression technique by scraping 2mm of compound from relief area and 1 mm from 2ry stress bearing area and scrap at area of 1ry stress bearing area.
- Why we don't use shellac?
 - ✓ Warpage during impression taking as the border tracing material is hot even if it's reinforced.
 - ✓ Easy breaking.