College of Dental Medicine

Department of Preventive and Restorative Dentistry

BDS4-DCP 4B-Orthodontics

2019-2020

Ortho Lab Manual

Director: Dr Khaled Khalaf

Instructor: Dr Manal El-Bekaai

Contents:

Tools needed

I. An upper study model
II. Adam's plier (preferable serrated)
III. Bird Beak plier ("Flat-Round", universal plier)
IV. Mauns cutter (heavy wire cutter) (will be provided)
V. Orthodontic Archwire Marker
VI. Pencil
VII. 0.5mm, 0.6mm and 0.7mm hard-round stainless steel wire (will be provided)

Adam’s plier

Bird Beak or universal plier

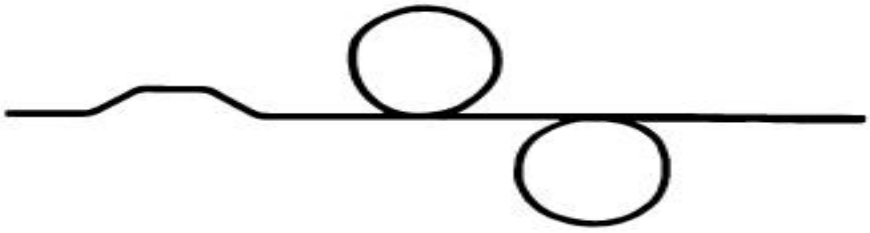
Mauns cutter

Orthodontic archwire marker

Round stainless steel wire

Wire bending exercise

A. Exercise #1



B. Exercise #2

C. Exercise #3

Adam's Clasp

- It is the most useful clasp in removable appliances.
- It doesn't separate teeth and has an excellent retention.
- It is used to retain removable orthodontic appliances
- Can be used on any tooth, but is most commonly used on premolars and molars
- Can be modified

- **Components of Adam's clasp:**

a. Two arrow heads
b. Bridge
c. Two retentive arms

- **Construction**

I. Tools needed :

- 0.7mm hard round stainless steel wire
- Mauns wire cutter
- Adam's plier

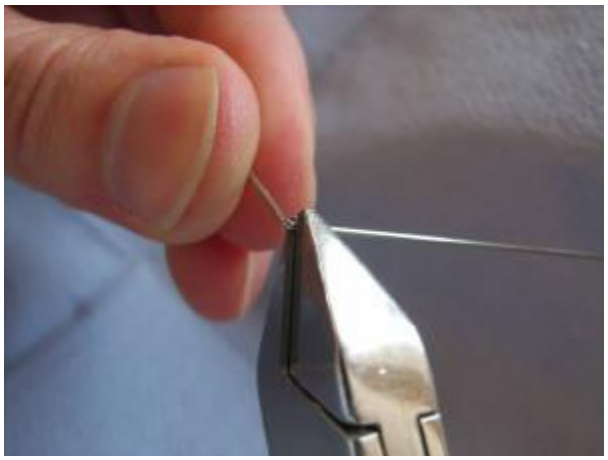
II. Steps of fabrication:

- Mark mesial and distal undercuts of the molar for arrow head placement

- The undercuts are then prepared to a depth of 1mm. This image clearly shows the undercuts have not been enhanced on the molar tooth because the tooth is fully erupted. Only partly erupted teeth should have the undercuts enhanced. Do not trim the buccal surfaces of the molar.

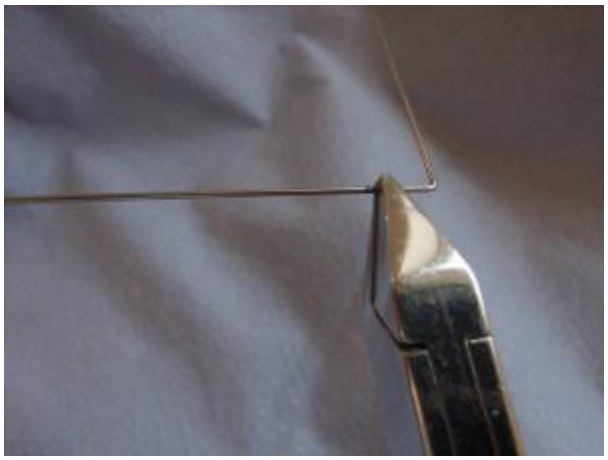
- Straighten a piece of wire

- A bend slightly more than 90 degrees is made mid-way along the 0.7mm SS wire



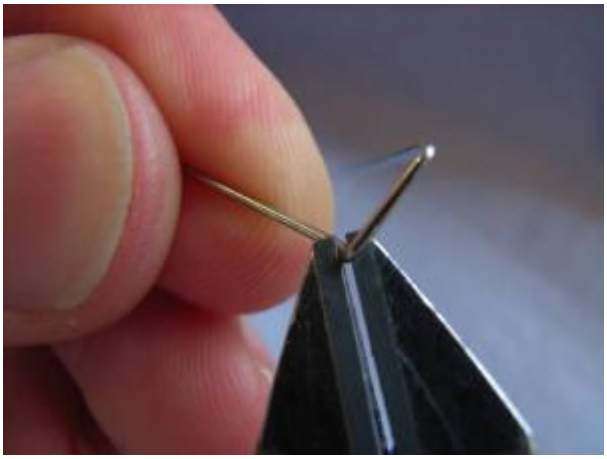
- Hold the wire to mesial mark in the tooth
- Mark with a pencil to show a second bend point distally. The overall length should be between the two pencil marks on the model as this is the position the arrowheads will engage.

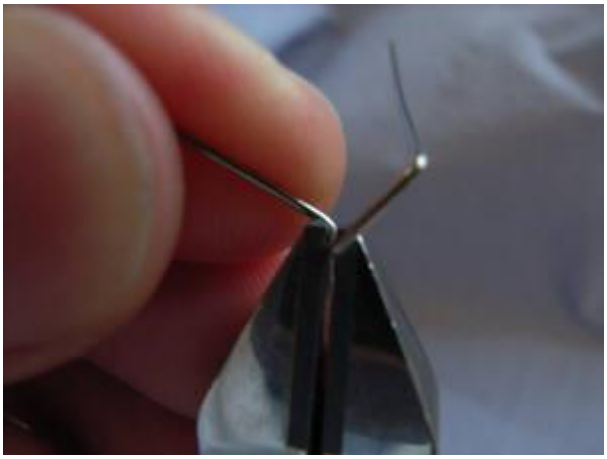
- The second 90 degree bend is made in the 0.7mm SS wire

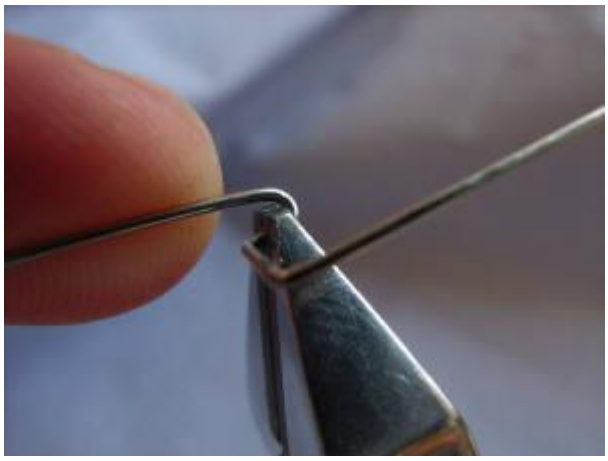


- The bridge should be parallel with the buccal cusps and half-way up the crown
- Hold the wire to the model to see that the dimensions are correct

- Hold in the pliers just below one of the bends
- Proceed with a further right angled bend on each side
- Tilt the wire down
- Bend the arm upwards so it follows the line of the opening of the beaks of the pliers thus forming a “U” shaped arrow head. The length of the arrowhead is determined by the height of the tooth. A 'tall' / 'long' tooth for example from tip of cusp to gingival margin would require a longer arrowhead. Both sides of the arrowhead should be 90 degrees to the bridge.

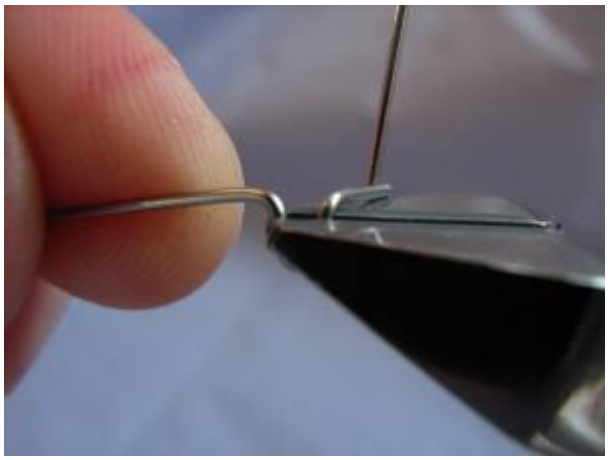




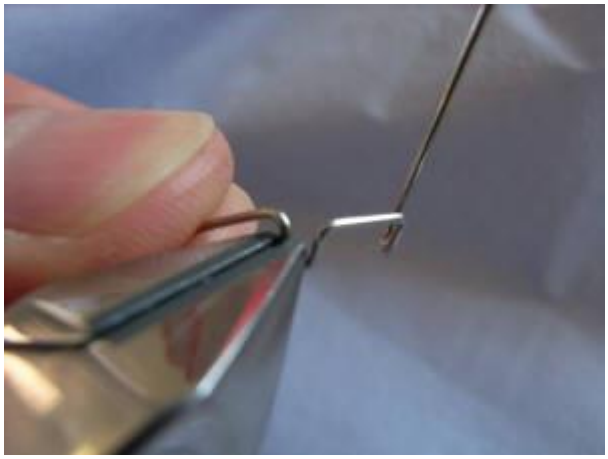


- The second arrowhead is formed in the same way.
- The arrowheads are formed to follow the tooth's contours (approx 45 degrees). The arrowheads should be parallel.

- Check that the arrow heads fit into marked undercuts of the tooth
- The second 90 degree bend from the arrowhead is then performed by holding the arrowhead in the beaks of the Adams pliers approximately half way along its length as shown. The outer arm of the arrowhead should be below the height of the bridge. (Certainly no higher).



- The outer arm of the arrowhead is adjusted until the wire contacts the embrasure point prior to the interstitial area (crossing the occlusion) of the occlusion. N.B. The angle of the bridge should be at 45 degrees to the long axis of the molar tooth.



- The outer arm of the first arrowhead is then formed over the interstitial area of the molar tooth and the tag formed approximately two thirds into the palate. N.B. The distal tag arm should be positioned forwards to allow for contouring of the acrylic base plate. Finish the arms with tags (right angled or zig-zag) that will be embedded in the acrylic.
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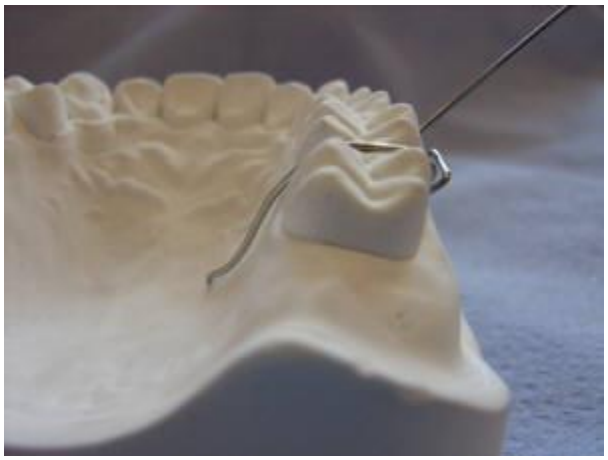
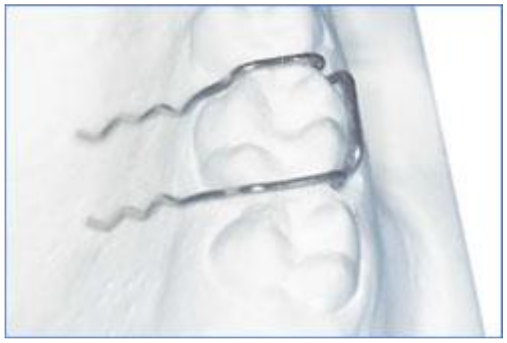
- The spacing between the palate and the 0.7mm SS wire should be 1mm for acrylic to flow underneath the wire.

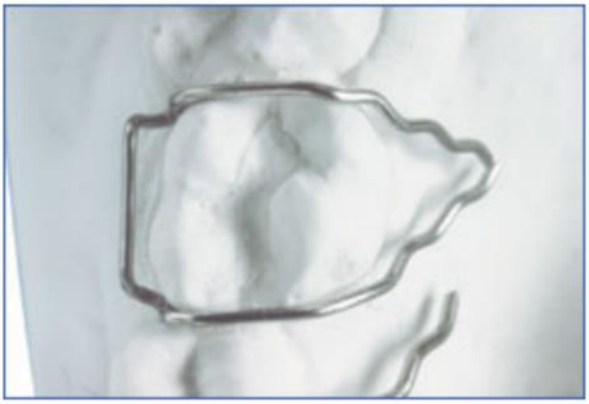


- The anterior tag arm is formed over the interstitial area and into the palate in the same way. N.B. The bridge is parallel to the occlusal plane.

- The bridge should be long enough to allow the arrowheads to engage the undercuts.

- The bridge should be at approximately 45 degrees to the log axis of the tooth.





Palatal Finger Spring

- Also called single cantilever spring as one end is fixed in acrylic and the other end is free
- It is used for mesio-distal tooth movement.
- It is activated by moving the active part and as close as possible to the helix by 2-3 mm in the direction of tooth movement

- **<u>Components of finger spring:</u>**

  a. Retentive arm
  b. Loop or helix (3mm)
  c. Connecting part

- **<u>Construction:</u>**

  I. Tools needed:

  - "Flat-Round" or universal plier
  - 0.5mm hard round stainless steel wire
  - Mauns cutter

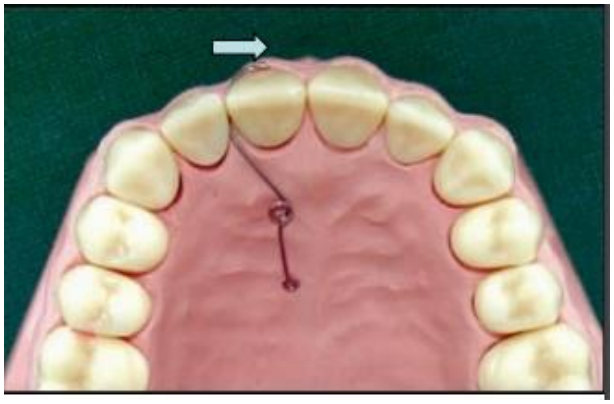
  II. Steps of Fabrication:

  - The position of the coil and guide arm may be marked on the model.

- A piece of wire is straightened using 'Flat Round' pliers and 0.6 mm SS archwire

- The palatal finger spring is fabricated making sure the following criteria are achieved:
  - Retentive arm of 4-5 mm length from the gingival margin
  - A loop is fabricated of 3mm internal diameter.
  - The helix is positioned opposite to the direction of intended tooth movement so that the coil should unwind in the direction of tooth movement and be tightly wound.
  - The helix should be placed along the long axis of the tooth to be moved
  - Connecting part forms an angle of about 45 degrees with the rest of the spring so that the active part is perpendicular to the long axis of the tooth

- Finish the finger spring with the tag leaving 1mm space between the model / soft tissues and the wire and it isn't interfering with other components such as mid-line screw if present.
- N.B. There are many discussions regarding the requirement of the 'active arm' arising from the underside or the upper-side of the coil. Fabricate to the instructor’s preference
- The palatal finger spring is now waxed / boxed out as shown and smoothed with a flame gun or similar.



Z-Spring

- It is a variation of the finger spring where a second limb is formed with a second coil
- It is used for labial/ buccal movement of one or more teeth especially the anterior teeth
  E.g. proclining 2 or more upper incisors for the correction of anterior tooth crossbites
- It can also be used for the correction of minor rotations if only one helix is activated
- It is placed perpendicular to the palatal surface of the tooth to be moved.
- It consists of two coils of 1-2 mm internal diameter each.
- It is activated by opening both the helices up to 2 mm at a time

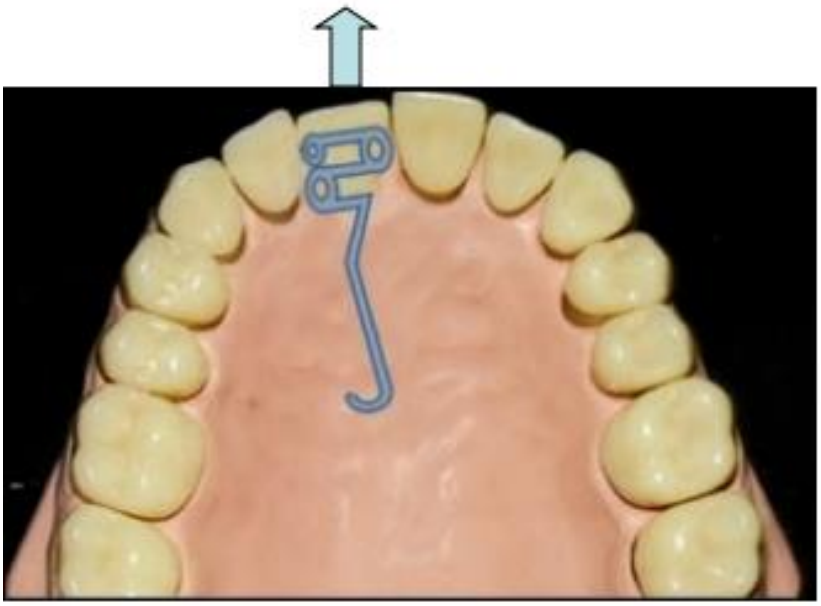
- **<u>Construction</u>**

I. Tools needed:

- 0.5mm hard round stainless steel wire
- "Flat –Round" or "universal plier"
- Mauns wire cutter

II. Steps of fabrication:

- A piece of wire is straightened
- Make the free end equal to the mesio-distal width of the tooth
- Preferably make the free end of the first loop up and the free end of the second loop down
- The first two arms of the Z spring are equal in length
- The third arm is half the mesio-distal width of the tooth
- The connecting part forms an angle about 45 degrees with the rest of the spring so that it is perpendicular to the palatal surface of the tooth to be moved
- Finish the Z-spring with a tag that goes in the acrylic
- The Z-spring needs to be boxed in wax prior to acrylization



T-Spring

- It's used for buccal movement of posterior teeth, but is commonly used on premolar teeth that require a buccal movement and is an excellent alternative to the 'Z' spring (cantilever spring).
- The clinician will adjust the 'T' spring in small increments and is carried out by pulling it away from the base plate.
- Occasionally it is necessary for the clinician to elongate the adjustment loops, to gain some extra active force in the 'T' spring, after the premolar tooth has been moved buccally (by a considerable distance).
- This type of spring is easily managed by the patient (for insertion reasons) and by the clinician (for activation purposes).

- **<u>Construction</u>**

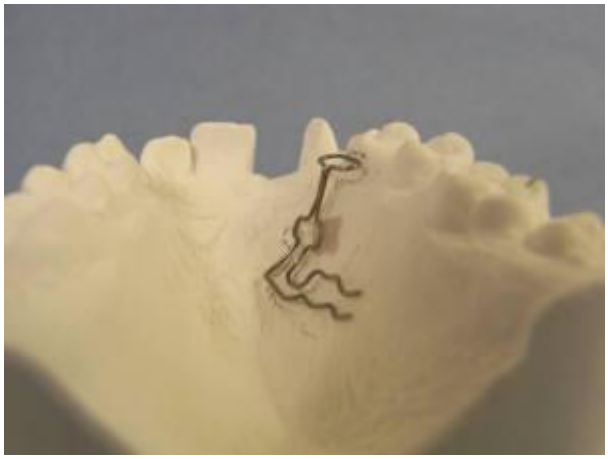
I. Tools needed:

- 0.5mm hard-round stainless steel wire
- "Flat-Round" or "universal plier"
- Mauns wire cutter

II. Steps of fabrication:

- A piece of wire is straightened
- The spring is fabricated making sure the following criteria are achieved:
  - the 'head' of the 'T' spring is flat and horizontal against the premolar tooth
  - Length of first loop equal to the mesio-distal width of tooth so that it does not interfere with any other tooth during its buccal movement.
  - Width of first loop equal to 2-3mm
  - Length of second loop not more than the length of the first loop
  - Width of second loop equal to 2-3mm
  - Inter loops section position in the middle third width of tooth
  - Distance between the two loops equal to 4-5mm
  - Finish the T-spring with the tags that will be embedded in the acrylic

- The 'T' spring is waxed out in a similar way as to the palatal finger spring, leaving the retentive tags free to be incorporated into the acrylic base plate. The coverage of the wax over the 'T' spring is not excessive, to allow the thickness of the finished acrylic base plate to be kept to a minimum



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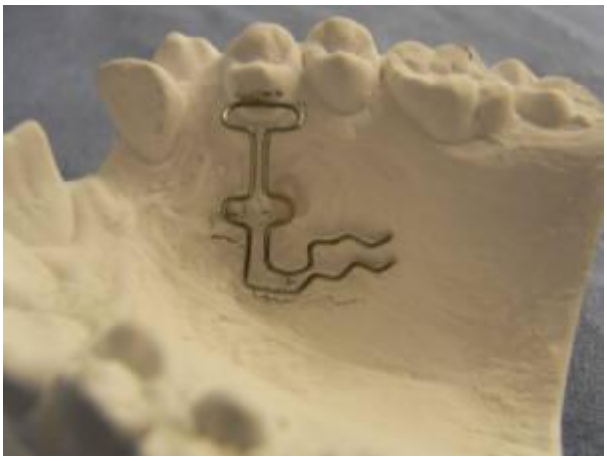

Direction for assessing the lab components

Requirement	Guidance	How assessed
You are required to complete 5 components which are commonly used as parts of upper removable appliances (Adams Clasps: 2 on 16, 26, Z-spring on 12, palatal finger spring on 13 and T-spring on 24)	You will have an orthodontic lab session every other week. You will spend one session to construct each component. By the end of each session you will be given a mark for each component.	Each component will be assessed using a rubric and will be given a mark out of a total of 2. Together the 5 orthodontic laboratory components will count for 10 marks.

Rubrics for assessing the lab components

Adams Clasps

Part/ Item	Unsatisfactory (1)	Satisfactory (1.5)	Outstanding (2)
Bridge	• Length is significantly less than 2/3rd of MD length of the tooth (cusp to cusp) • Vertical position is significantly less or more than ½ way of the clinical crown and not parallel to the occlusal surface	• Length is slightly less than 2/3rd of MD length of the tooth (cusp to cusp) • Vertical position is slightly less or more than ½ way of the clinical crown and almost parallel to the occlusal surface	• Length is 2/3rd of MD length of the tooth (cusp to cusp) • Vertical position ½ way of the clinical crown and parallel to the occlusal surface
Arrowhead (2)	Both arrowheads do not engage in the mesial and distal undercuts	Only one arrowhead engages in the mesial or distal undercuts	Both arrowheads engage in the mesial and distal undercuts
Occlusal part (2)	Both occlusal parts do not match the marginal ridges precisely	Only one occlusal part matches the marginal ridge precisely	Both occlusal parts match the marginal ridges precisely
Tags (2)	Both tags are not retentive and away from the palate by 1mm	Only one tag is retentive and away from the palate by 1mm	Both tags are retentive and away from the palate by 1mm

Z-Spring

Part/ Item	**Unsatisfactory (1)**	**Satisfactory (1.5)**	**Outstanding (2)**
Length of the free end	Is significantly less or more than the MD of the tooth	Is slightly less or more than the MD of the tooth	Equal to the MD of the tooth
Length of the second arm	Is significantly less or more than the MD of the tooth	Is slightly less or more than the MD of the tooth	Equal to the MD of the tooth
Length of the third arm	Is significantly less or more than ½ of the MD of the tooth	Is slightly less or more than ½ of the MD of the tooth	½ of the MD of the tooth
Size of 1st loop	Is significantly less or more than 2-3mm diameter	Is slightly less or more than 2-3mm diameter	2-3mm diameter
Size of 2nd loop	Is significantly less or more than 2-3mm diameter	Is slightly less or more than 2-3mm diameter	2-3mm diameter
Connecting part of the spring to the acrylic	Is not forming an angle at all with the rest of the spring	Forming an angle with the rest of the spring but less or more than 45 degrees	Forming an angle about 45 degrees with the rest of the spring
Tag	Neither retentive nor away from the palate by 1mm	Either retentive or away from the palate by 1mm	Retentive and away from the palate by 1mm

Palatal finger spring

Part/ Item	**Unsatisfactory (1)**	**Satisfactory (1.5)**	**Outstanding (2)**
Size of the loop	Is significantly less or more than 2-3mm diameter	Is slightly less or more than 2-3mm diameter	2-3mm diameter
Position of the loop relevant to the free arm	Is not opposite to the direction of tooth movement	Opposite to the direction of tooth movement	Opposite to the direction of tooth movement
Position of the loop mesio-distally	Is significantly less or more than mid-point of the MD of the tooth	Is slightly less or more than mid-point of the MD of the tooth	Mid-point of the MD of the tooth
Position of the loop buco-lingually	Is significantly less or more than 4-5mm away from the palatal gingival margin	Is slightly less or more than 4-5mm away from the palatal gingival margin	4-5mm away from the palatal gingival margin
Connecting part of spring to the acrylic	Is not forming an angle at all with the rest of the spring	Forming an angle with the rest of the spring but less or more than 45 degrees	Forming an angle about 45 degrees with the rest of the spring
Tag	Neither retentive nor away from the palate by 1mm	Either retentive or away from the palate by 1mm	Retentive and away from the palate by 1mm

T-Spring

Part/ Item	**Unsatisfactory (1)**	**Satisfactory (1.5)**	**Outstanding (2)**
Head of the spring (1st loop)	Forming an angle significantly less or more than 90 degrees with the palatal surface of the tooth	Forming an angle slightly less or more than 90 degrees with the palatal surface of the tooth	Forming 90 degrees with the palatal surface of the tooth
Length of the 1st loop	Is significantly less or more than the MD of the tooth	Is slightly less or more than the MD of the tooth	Equal to the MD of the tooth
Width of the 1st loop (distance between the legs)	Is significantly less 2mm or significantly more than 3mm	Is slightly less 2mm or slightly more than 3mm	2-3mm
Length of the 2nd loop	Is significantly less or more than the MD of the tooth	Is slightly less or more than the MD of the tooth	Equal to the MD of the tooth
Width of the 2nd loop (distance between the legs)	Is significantly less 2mm or significantly more than 3mm	Is slightly less 2mm or slightly more than 3mm	2-3mm
Inter-loops section position	Is significantly off to either sides of the middle 1/3 of the tooth	Is slightly off to either sides of the middle 1/3 of the tooth	Middle 1/3 of the tooth
Distance between the 2 loops	Is significantly less 4mm or significantly more than 6mm	Is slightly less 4mm or slightly more than 6mm	4-6mm
Tags (2)	Both tags are not retentive and away from the palate by 1mm	Only one tag is retentive and away from the palate by 1mm	Both tags are retentive and away from the palate by 1mm