DT19 Design and manufacture fixed orthodontic appliances

OVERVIEW

This standard describes the design and manufacture of fixed orthodontic appliances. This includes the processes of manufacturing fixed appliances themselves and the fixed components of fixed/removable appliances. It covers the processes of designing, manufacturing and positioning components, assembling and joining components, and final finishing.

The term client has been used to mean the clinician who has prescribed and specified the orthodontic appliance. Clients may be external to the organisation (such as other laboratories, dental practitioners, training schools) or internal (eg within a dental hospital). The patient is the individual for whom the appliance is being made.

Users of this standard will need to ensure that practice reflects up to date information and policies.

Version No 1

KNOWLEDGE AND UNDERSTANDING

You will need to know and understand:

1. skeletal anatomy and physiology necessary for fixed orthodontic appliance construction
2. the function and movement of the oral musculature and temporomandibular joint
3. principles of balanced articulation and its effect on the function of fixed orthodontic appliances
4. disorders and diseases affecting the oral cavity
5. tooth morphology (both deciduous and permanent) including crowns and roots, and the form of the anterior and posterior teeth
6. the aetiology and classifications of malocclusions
7. growth and eruption patterns of both deciduous and permanent teeth
8. the physiological changes related to tooth movement
9. growth and development of maxilla and mandible
10. limitations of growth modifications; restrictions and contraindications to growth modification
11. the broader factors (sociological, behavioural, environmental and economic) that
12. the principles of fixed orthodontic appliance design and construction
13. the scope of orthodontic treatment using fixed orthodontic appliances (including the range and direction of movement possible)
14. indications and contra-indications for fixed appliance treatment
15. the different types of fixed orthodontic appliances and the components that are required
16. the function of different components used in fixed orthodontic appliances, the positioning, purposes, functions and uses of each
17. the use of casts in the design, manufacture and positioning of components for appliances
18. uses of combined treatments
19. interaction of treatments
20. how the curing process affects the choice of materials and manufacturing processes
21. how to identify the size and type of components that will be required
22. the range of pre-formed components that are available and methods to assess their suitability for use in constructing an appliance
23. the different gauges of wire that are used for different types of components and methods for identifying which is required and suitable
24. methods of straightening and bending wire and the tools that are used
25. handling tolerances of wires, the effects of over-handling and how to identify when this has happened
26. the purpose, function and use of protective equipment in the manufacture of components
27. methods of assessing the suitability of manufactured components
28. the purpose and use of the different types of biteplanes and how these are constructed
29. methods for the application of polymeric, why different techniques are used
30. uses of spot welding and soldering - when, where, how, why and what
31. how the duration and level of current affects the strength and viability of the join produced
32. methods of calibrating equipment, how to determine the correct settings for the size and type of materials being welded
33. how to judge when metals have been heated sufficiently to melt solder, but not interfere with the metals mechanical structure
34. the consequences of over-heating metals and solder during soldering (such as weakening and softening metals and causing solder to spatter rather than flow smoothly), the effect of these on the strength and integrity of the join and the remedial action that can be taken
35. how to identify reasons for soldered joint failure
36. the different curing methods, how each works, their effect and the situations in which each is best used
37. how the curing process affects the materials and components that can be used
38. physical characteristics of materials used in appliances and how the curing processes affect them
39. the different separating media, when and why these are used
40. methods of deflasking
41. the ways in which appliances are cleaned in preparation for finishing and polishing
42. techniques for finishing and polishing appliances
43. the different types of abrasive and polish, the purposes and uses of each
44. methods for the safe, effective disinfection of appliances
45. methods of assessing and checking the safety, aesthetic, functional and clinical acceptability of completed appliances
46. the selection of a suitable articulator for the type of appliance being designed and manufactured
47. centric occlusion records
48. lateral and protrusive movement records and their uses
49. analysis of dentate occlusions requiring onlays
50. methods of protection against contamination and cross-infection when handling received impressions and other items which may have been in the mouth, or which are intended to be placed in the mouth; why it is important to do so
51. the purpose of personal protective equipment.
52. methods for the safe moving, handling and storage of materials and equipment
53. location, function and use of emergency equipment.
54. the reasons for maintaining records throughout the process and of clearly identifying the products during the manufacturing process
55. organisational procedures and requirements for the recording of information about incoming work, work in progress and work delivered to clients, and the purpose of this
56. quality audit systems: their purpose, nature and procedures; impact of the Medical Devices Directive on the recording of incoming work, the detailed design and manufacturing specification and the recording of materials and processes
57. principles of quality assurance (including effective recording and sampling); processes and procedures for quality assurance in the workers workplace
58. methods of setting and calibrating equipment and of testing that this is correct
59. the effects of modifying manufacturers products to meet laboratory requirements on the physical properties of products, on quality assured products and the legal implications (eg of inaccurate mixing, inadequate processing).
60. the requirements of the Medical Devices Directive in monitoring the progress of devices through the production process
61. legal requirements of the contract of employment, confidentiality and employers regulations
62. health and safety at work legislation and related procedures and liability; principles of, and how to apply, legislation and regulations (eg COSHH regulations, the Health and Safety at Work Act, Environmental Protection Act)
63. legal requirements relating to third party insurance.
64. the competency range of other members of the oral healthcare team (and the wider health and social care team)
65. the regulatory functions of the General Dental Council
66. legal and ethical obligations of regulated members of the oral healthcare team
67. the need for lifelong learning and professional development and responsibilities in relation to this for regulated members of the oral healthcare team
68. the oral healthcare teams wider responsibility to the community as a whole

**PERFORMANCE CRITERIA**

You must be able to do the following:

1. correctly identify the position of bands from the prescription and cast, and assess
whether this location is likely to be technically and functionally acceptable
2. report immediately to the client any bands which have been incorrectly positioned on the cast and propose alternative positions which are more likely to be technically and functionally acceptable
3. determine whether the cast needs to be modified to design and manufacture the required fixed orthodontic appliance
4. evaluate the cast and design and decide on the basis of cost, time and function
5. select the required pre-formed components, make any necessary modifications for them to perform the correct function, and confirm they are fit for purpose
6. prepare clean and sculpted surfaces on those areas of the cast where bands are to be attached which are appropriate to the band and the method of attachment
7. attach preformed bands to the correct teeth on the cast and confirm they:
8. form custom-made bands from stainless steel tape:
9. select wire of the correct gauge and material for the required custom-made components, cut it accurately to the required length and straighten it in a manner which avoids unwanted material stress
10. form wire components to the required design and size in a manner which minimises the risks of over-work of the material
11. repeatedly check components during manufacture to confirm that:
12. evaluate the design of the developing appliance to confirm that it:
1. will function as required by the prescription
2. will not interfere with or damage the patients tissues
13. assemble the appliance and confirm that components are fixed onto the cast:
1. securely
2. in the required position
3. using an appropriate material
14. prepare wire components and the cast for joining to bands in a manner appropriate to the materials used
15. select methods, materials and equipment for joining components that are appropriate to:
1. the type and materials of the components to be joined
2. the strength and type of join required
3. the sequence in which the components need to be joined
16. identify accurately areas where a soldered joint would not interfere with the function and performance of the component being joined
17. position components:
1. accurately for the design
2. in a manner that enables the optimum joint to be made
18. calibrate the level and duration of current in spot-welding equipment so that it is correct for the size, thickness and type of material to be joined
19. confirm that electrodes are free from erosion and take the appropriate action to remedy those that display levels of erosion which are likely to adversely affect the quality of the joint
20. identify accurately areas where a spot-welded join would not interfere with the function and performance of the component, correctly position components and accurately spot-weld them at the correct points to form secure, strong and viable joins
21. accurately apply flux to those areas where solder is required and block out with anti-flux those where solder is not required so that:
1. there is no incursion of solder
2. the required range of movement is allowed
22. apply an appropriate heat-protective material to minimise damage to surrounding
areas
23. heat components to be soldered to a temperature that:
24. apply and control the solder to:
   1. give an even flow
   2. achieve the thickness and coverage required for optimum durability and
      maximum strength
25. place the appliance on the cast after joining and check that the appliance:
   1. fits the cast
   2. complies with the prescription
   3. will not damage surrounding tissues in the patient's mouth
   4. and make any necessary adjustments
26. evaluate each finished join for its:
   1. position
   2. strength
   3. integrity
   4. function
   5. fitness for purpose (and remake any which give cause for concern)
27. remove flux, anti-flux and excess solder once welding and soldering is complete,
    replace the appliance on the cast and confirm the fit
28. remove oxide from the surfaces of bands and wire components and finish and
    polish metal components to leave a smooth surface free of sharp edges and
    irregularities.
29. remove any residual wax and resin to allow the active components free range of
    movement as specified in the prescription
30. select methods, materials and equipment for trimming, finishing and polishing the
    fixed orthodontic appliance which are appropriate to the type and materials of the
    components in the appliance
31. trim and polish the appliance to leave smooth fitting and polished surfaces free of
    sharp edges and irregularities that may cause damage to the patients teeth,
    bones and soft tissues
32. identify any further ancillary components which need to be added to the appliance,
    reposition the trimmed and polished appliance on the cast and plan the procedure
33. block out with an appropriate material any undercuts for the addition of ancillary
    components, add any required wax outline and prepare the cast using an
    appropriate separating medium for any additional polymeric components
34. apply material to form any required ancillary components, trim and finish them to
    the thickness and coverage required leaving smooth surfaces that are free of
    sharp edges and irregularities
35. evaluate the finished appliance and confirm that it:
   1. is effective
   2. fits the cast
   3. is free of defects
   4. meets the requirements of the planned design
   5. complies with the prescription
   6. is fit for purpose
36. correctly identify the finished appliance with the patients unique reference and
    date of production
37. effectively clean and disinfect the finished appliance, prepare and package it
    safely for despatch together with instructions for the patient and client
38. make complete, accurate and up-to-date records relating to the identification,
    components and manufacture of the appliance and store the records in the correct
    location consistent with relevant legislation
ADDITIONAL INFORMATION

This National Occupational Standard was developed by Skills for Health.

This standard links with the following dimension within the NHS Knowledge and Skills Framework (October 2004):

Dimension: HWB9 Equipment and devices to meet health and wellbeing needs