

CHAPTER 12

SURVEY LINES

DEFINITIONS

A SURVEY LINE is a line produced on a cast by a surveyor or scribe marking the greatest prominence of contour in relation to the planned path of placement of a restoration.¹

A survey line marks the HEIGHT OF CONTOUR (greatest prominence) of a tooth or bony prominence AT THE SELECTED PATH OF PLACEMENT of the denture (TILT OF THE CAST). If the tilt of the cast is changed (changing the path of placement of the denture) the height of contour (survey line) will change (Fig. 12-1).

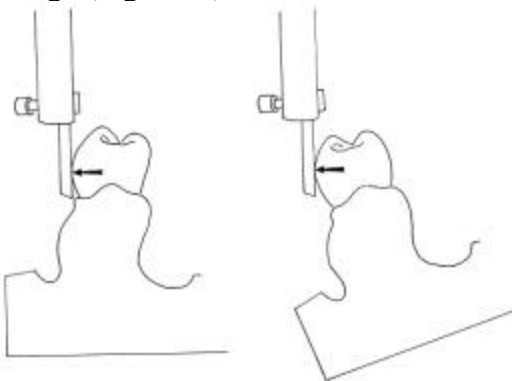


Fig. 12-1. ■ Changing the tilt of the cast changes the heights of contour.

The survey line divides a tooth crown into a suprabulge and infrabulge (Fig. 12-2). The SUPRABULGE is the portion of a tooth crown that converges toward the occlusal surface, i.e. above the height of contour.¹ The INFRABULGE is the portion of the crown of a tooth apical to the survey line.¹ The infrabulge

portion of the tooth is undercut to the path of placement of the denture.

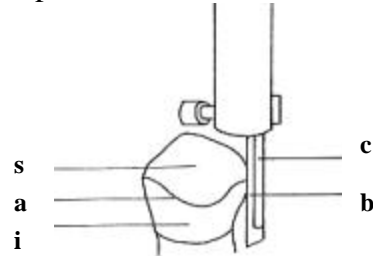


Fig. 12-2. ■ Marking survey lines, a) survey line, b) carbon marker, c) protective sheath, s) suprabulge, i) infrabulge. Note that the carbon marker is beveled and the long side of the rod is placed adjacent to the tooth and the protective sheath is placed on the opposite side of the vertical spindle from the tightening screw.

IDENTIFYING SURVEY LINES

Survey lines are marked on a cast by first orienting the cast in the cast holder at the tilt indicating the path of placement for the denture and then sliding the cast holder along the surveyor table so that the cast surface is lightly rubbed against a carbon marker held in the chuck in the spindle of the surveyor (Fig. 12-2). Survey lines are marked on non-polished metal and non-glazed porcelain crown surfaces with a carbon marker in a similar fashion. Survey lines are marked on wax patterns for crowns by dusting the surface with zinc stearate or powdered white wax, then sliding the cast holder on the surveyor table so that the surface of the wax pattern is lightly rubbed against an analyzing rod held in the chuck in the spindle of the surveyor. Survey lines are marked on polished metal and glazed porcelain crown surfaces in a similar manner substituting a layer of disclosing medium (i.e. Occlude, Die Mark, etc.) on the surface of the crown.

The carbon marker or analyzing rod must be TANGENT to the tooth surface to indicate a survey line. A line produced by the end of the carbon marker contacting the cast is just a line.

USES OF SURVEY LINES

Survey Lines on Teeth

Survey lines on RPD diagnostic casts are marked on all vertical surfaces of teeth involved in the RPD design which can be reached with the carbon marker in the surveyor (Fig. 12-3). The survey line on the facial and lingual of abutment teeth is important in selecting clasps and planning the modifications of the teeth necessary for the selected clasps. The survey line on the proximal tooth surface is important to minor connector design. The survey line on non-abutment teeth involved in the RPD design is important in selecting and designing major and minor connectors.

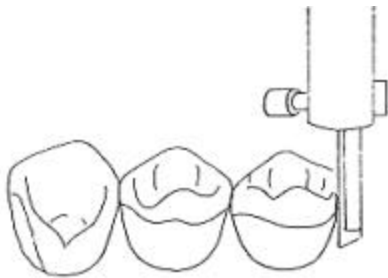


Fig. 12-3. Survey lines are marked on the facial, lingual, and proximal (if possible) of all teeth in the area of the framework design.

Survey Lines on Bony Prominences

Survey lines are marked on all bony and soft tissue prominences located in the area of the denture (Fig. 12-4). These lines are important in the selection, location, and design of major and minor connectors, and bar clasp approach arms,

and in planning preprosthetic surgical modifications to improve the soft/hard tissue contours for the denture.

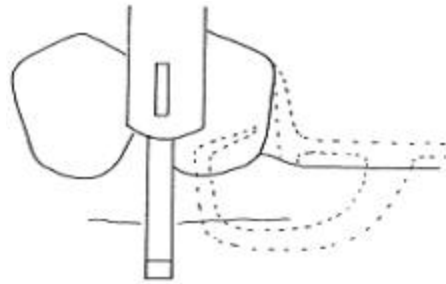


Fig. 12-4. Survey lines are marked on bony and soft tissue prominence in the area of the framework design.

CLASSIFICATION OF RETENTIVE SURVEY LINES

There are two types of survey lines on the facial and lingual of RPD abutment teeth: retentive and reciprocal. **RETENTIVE SURVEY LINES** are used on the surface of the tooth on which the direct retainer clasp arm will be located. **RECIPROCAL SURVEY LINES** are used on the tooth surface opposite to the retentive survey lines where the reciprocal component will be located.

Retentive survey lines are further divided into three classes based on their shape in relation to the edentulous space or the origin of the retentive clasp arm to be used:

Class I

A class I survey line on a tooth adjacent to an edentulous space is low (cervical) on the portion of the tooth adjacent to the edentulous space and high on the portion of the tooth away from the edentulous space (Fig. 12-5). The deepest undercut is in the portion of the tooth away from the edentulous space.

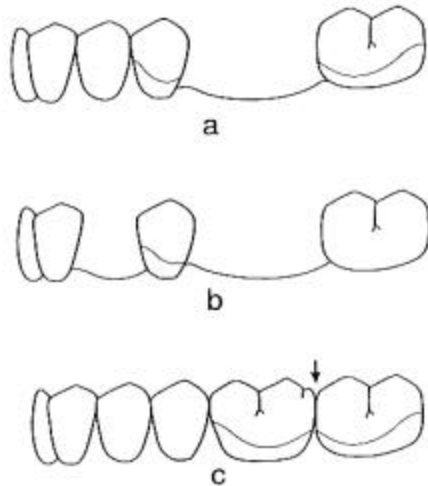


Fig. 12-5.■ Class I survey lines: a) on teeth adjacent at an edentulous space, b) on a lone standing abutment, c) on teeth where there is no edentulous space.

Class II

A class II survey line on a tooth adjacent to an edentulous space is high (occlusal/incisal) on the portion of the tooth adjacent to the edentulous space and low on the portion of the tooth away from the edentulous space (Fig. 12-6). The deepest undercut is in the portion of the tooth adjacent to the edentulous space.

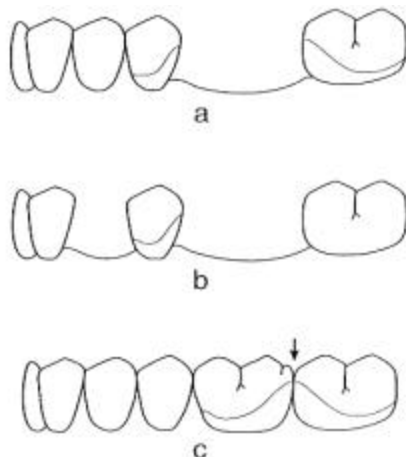


Fig. 12-6.■ Class II survey lines: a) on teeth adjacent to an edentulous space, b) on a lone standing abutment, c) on teeth where there is no edentulous space.

Class III

Class III survey lines are all survey lines which are not readily identified as class I or class II. Class III survey lines are generally U-shaped. The shape of the U ranges from very long occlusal/incisal-lingivally to relatively flat (Fig. 12-7). The deepest undercut may be anywhere on the tooth below the survey line.

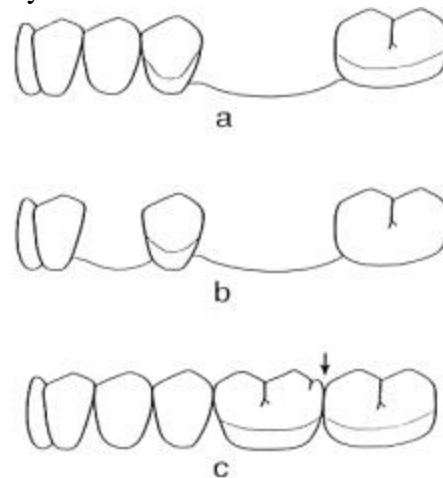


Fig. 12-7.■ Class III survey lines: a) on teeth adjacent to an edentulous space, b) on a lone standing abutment, c) on teeth where there is no edentulous space.

FURTHER CLARIFICATION

If there is an edentulous space on each side of the abutment tooth, the survey line is classified using the longest edentulous space being restored by the RPD. If both edentulous spaces are the same size, the survey line is classified using the origin of the retentive clasp arm as the reference point. If there is no edentulous space, the survey line is classified using the origin of the retentive clasp arm as the reference point.

THE IDEAL CLASS I SURVEY LINE

The ideal class I survey line begins at the junction of the middle and cervical thirds of the tooth at the

proximal line angle adjacent to the edentulous space, curves into the cervical third to the mesiodistal center of the tooth, then curves occlusally/incisally to a point in the middle third of the tooth at the opposite proximal line angle (Fig. 12-8).

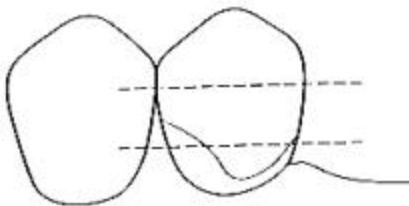


Fig. 12-8. ■ An "ideal" Class I survey line

THE IDEAL CLASS II SURVEY LINE

The ideal class II survey line begins at a point in the middle third of the tooth at the proximal line angle adjacent to the edentulous space, curves into the cervical third of the tooth to the mesiodistal center of the tooth, then curves occlusally/incisally to the junction of the cervical and middle thirds of the tooth at the opposite proximal line angle (Fig. 12-9).

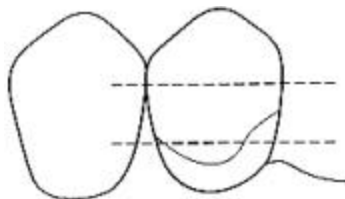


Fig. 12-9. ■ An "ideal" Class II survey Line.

RECIPROCAL SURVEY LINES

The reciprocal survey line of a tooth is the contour of the tooth surface on the side of the tooth opposite the retentive survey line (Fig. 12-10). The reciprocal survey line may be a simple line or an area of tooth surface parallel to the path of placement and removal of the RPD. Areas of a tooth surface parallel to the path of placement and removal of an RPD are termed **GUIDING SURFACES** or **GUIDING PLANES**.¹

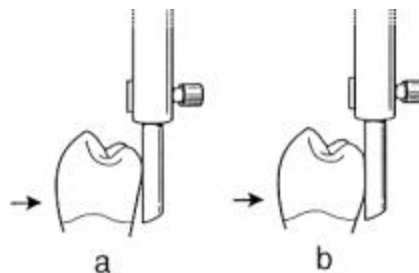


Fig. 12-10. ■ Reciprocal survey lines are located on the side of the tooth opposite the retentive survey line. Reciprocal survey lines may be a simple line, a) or an area of tooth surface parallel to the path of placement and removal of the RPD (a **GUIDING PLANE** or **GUIDING SURFACE**), b).

THE IDEAL RECIPROCAL SURVEY LINE

An ideal reciprocal survey line is a tooth surface parallel to the path of placement and removal of the RPD (a guiding plane) and located at the same occlusal/incisal-gingival height as the retentive survey line and undercut (Fig. 12-11).

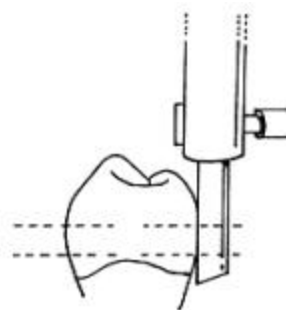


Fig. 12-11. ■ This "ideal" reciprocal survey line is a guiding plane located at the same vertical height as the retentive undercut.

USING SURVEY LINES

The survey lines on the facial and lingual of abutment teeth is one factor which is used to select the retentive clasp arm and reciprocal component of the clasp for that tooth. Certain retentive clasp arms are indicated for use with each of the three

classes of retentive survey lines (Fig. 12-12 through 12-14). A Class III retentive survey line is frequently converted to a Class I or Class II survey line thus simplifying retentive clasp arm selection (Fig. 12-15).

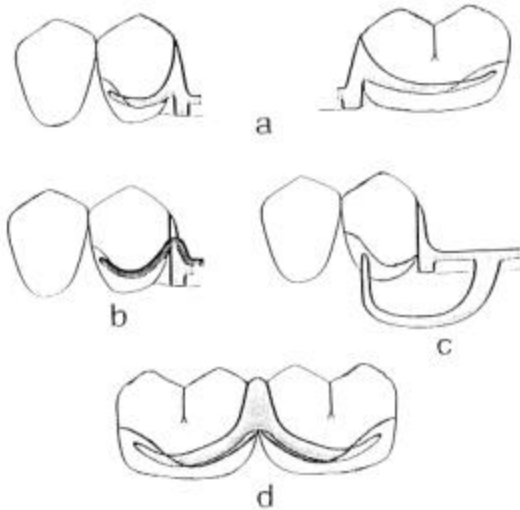


Fig. 12-12. Some retentive clasp arms that can be used with Class I survey line: a) cast circumferential, b) wrought wire, c) I-bar, d) (double) transocclusal.

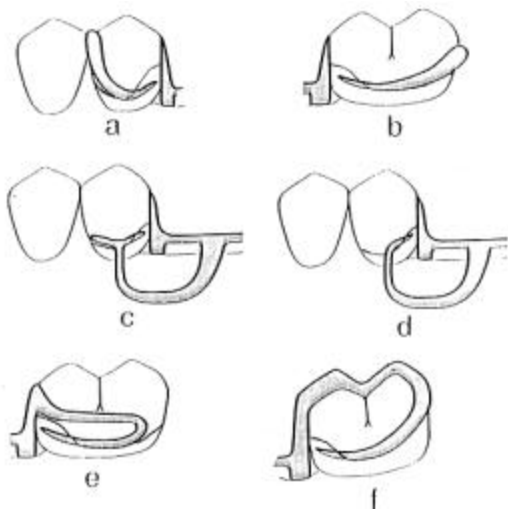


Fig. 12-13. Some retentive clasp arms that can be used with a Class II survey line: a) reverse circumferential, b) ring, c) T-bar, d) R-bar (1/2 T-bar), e) hairpin, f) overlay.

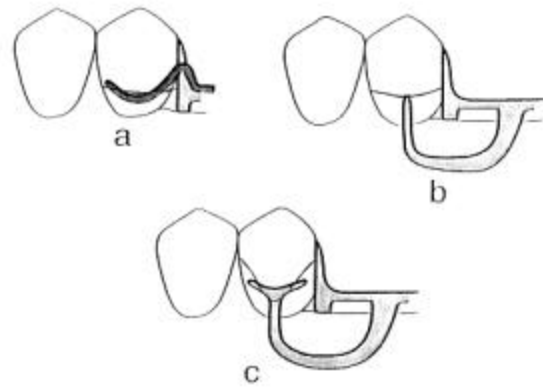


Fig. 12-14. Some retentive clasp arms that can be used with Class III survey line: a) wrought wire, b) T-bar, c) Y-bar.

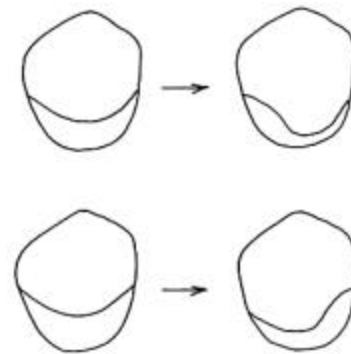


Fig. 12-15. A Class III retentive survey line can frequently be altered to a Class I or Class II by removing tooth structure.

The shape and location of the reciprocal survey line determines the type of reciprocal component which may be used. If the reciprocal survey line is a guiding plane (an area of tooth surface parallel to the path of placement and removal of the RPD) located at the same vertical height on the tooth as the retentive undercut, a clasp arm, plate or minor connector can be used as the reciprocal component (Fig. 12-16). If the reciprocal survey line is a guiding plane located occlusal/incisal to the level of the retentive undercut, a plate or minor connect must be used as the reciprocal component. If the reciprocal survey line is simply a line, a plate or minor connector must be used as the reciprocal component (Fig. 12-17).

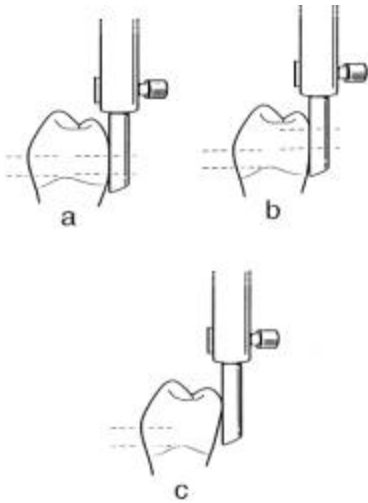


Fig. 12-16. ■ Selecting the reciprocal component of a retentive clasp: a) any reciprocal component (clasp arm, plate or minor connector) can be used, b) and c) only a plate or minor connector can be used.

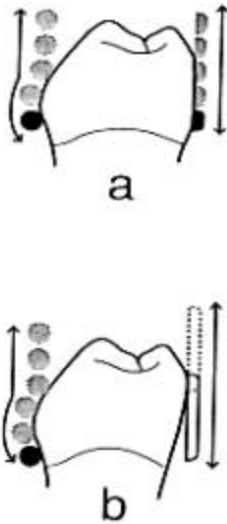


Fig. 12-17. ■ Reciprocation by means of a guiding plane located at the same vertical height as the retentive undercut, a) and by a plate or minor connector which is parallel to the path of placement and removal of the RPD contacting a simple survey line, b).

The survey line on soft/hard tissue prominences influences the selection of retentive clasp arms and the selection and location of major connectors. Retentive bar clasps are contraindicated if the approach arm would be located over a soft/hard tissue undercut (Fig. 12-18). Tori, exostoses, and

undercut alveolar ridges must be considered when selecting the major connector to be used as discussed in Chapter 4.

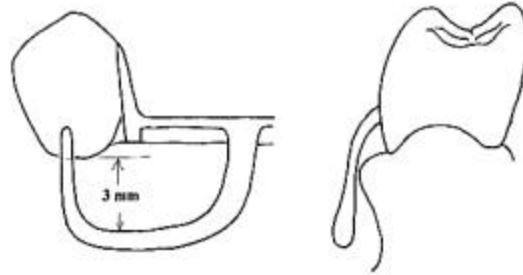


Fig. 12-18. ■ A bar clasp is contraindicated if the approach arm would be located over a soft/hard tissue undercut, or if it would interfere with the movement of frena or muscles.

Use of this classification system for survey lines facilitates communication with dental laboratory technicians fabricating surveyed crowns for RPD abutment teeth. By knowing what clasps are to be used, the contours of the tooth for the components of the clasp are known, and can be communicated to the laboratory technician (Fig. 12-19).

DENTAL PROSTHETIC WORK AUTHORIZATION
Student's Name & #
MCV/VCU Dental
Service Laboratory

Prepared to fulfill the Dental Practice Act of Virginia and approved by the State Board of Dental Examiners

PATIENT OR CASE NUMBER: Name: <i>d chart #</i>	DATE:
REPAIR AND/OR MODIFICATION:	CLASS OF TEETH:
	SIDE: <i>Vm A3</i>

Description of Work: *Surveyed Crown*

Instructions: *Tooth #28 P1M*

Contours:
 1. lingual margin 1.5mm anterior color
 2. distal rest preparation
 D-guiding plane 2mm long
 F-class II survey line
 MF-undercut 0.015"
 L-guiding plane for clasps
 m-proximal contact in proximal
 L&S no seal

1. wax-up of crown
2. porcelain in bisque bake

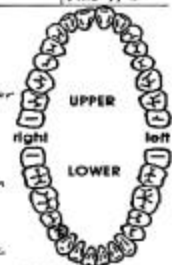


Fig. 12-19. ■ Communicating with the dental laboratory with a work authorization specifying the contours for a surveyed crown.

REFERENCES

1. The glossary of prosthodontic terms, 6th ed. St. Louis, C V Mosby, 1994.

SUGGESTED READING

1. Blatterfein L. A study of partial denture clasping. JADA 1951, 43:169-?