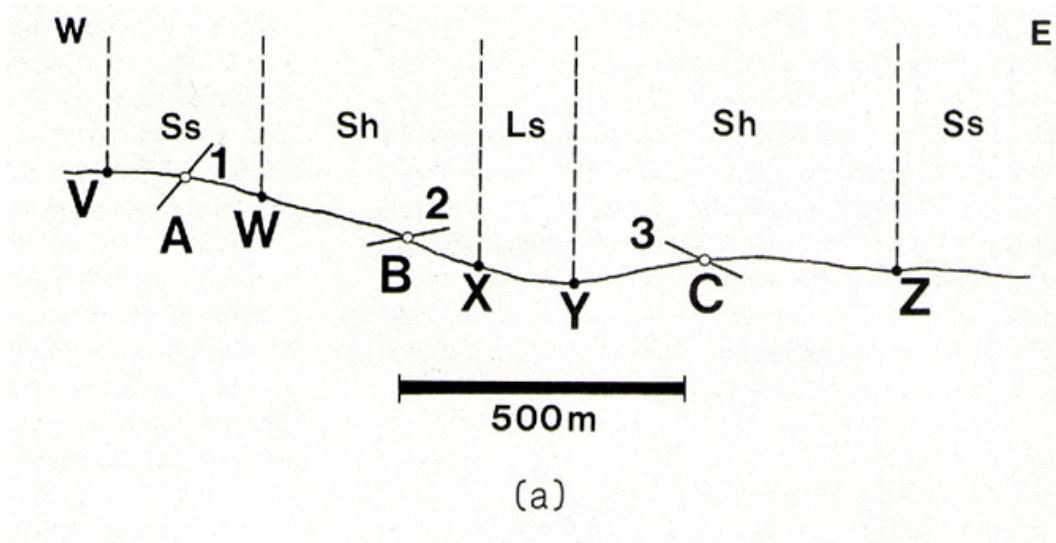


Kink method for construction of cross sections when layers have a constant thickness

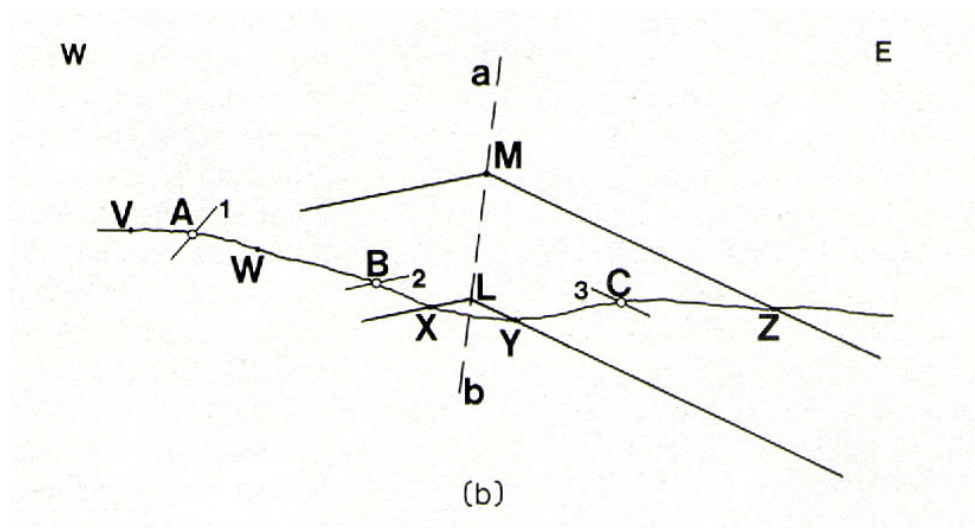
Problem

The stratigraphic contact between a limestone and a shale crops out at points X and Y along a N75°W-trending line of section across an angular parallel fold (see Fig.). The contact between the shale and a sandstone crops out at points W and Z, and the top of the sandstone crops out at point V. Line segments 1, 2, and 3 at points A, B, and C, respectively, give the dip values of different domains. Points V and W fall in dip domain 1 ($295^{\circ}/50^{\circ}$), point X falls in dip domain 2 ($295^{\circ}/10^{\circ}$), and points Y and Z fall in dip domain 3 ($115^{\circ}/25^{\circ}$). Use the kink method to draw a profile of the fold.



Method

Step 1: First, we locate the fold hinges. We assume that the limestone/shale contact that passes through point X is a straight-line segment. This line must have an inclination in the plane of the section that corresponds to the dip value of this domain, so we draw this segment of the contact parallel to line segment 2 at B. Likewise, draw the segment of the limestone/shale contact that passes through point Y parallel to line segment 3 at C. The two segments of the limestone/shale contact intersect at point L (Fig). Point L is the intersection between the trace of a kink hinge plane and the limestone/shale contact.



Step 2: To determine the trace of the hinge plane that passes through point L, bisect angle XLY. The hinge-plane trace is line *ab* (Fig. b).

Step 3: Draw the segment of the shale/sandstone contact trace passing through Z as a straight line parallel to YL. This line intersects hinge *ab* at point M. To continue the trace of this contact beyond the hinge, draw a line from M that is parallel to XL.

Step 4: Next, we position the second hinge-plane trace. The segment of the shale/sandstone contact passing through W must have an inclination in the plane of section that corresponds to the dip value for its domain. Draw the segment of this shale/sandstone contact passing through W as a straight-line segment parallel to line segment *l* at A. This portion of the shale/sandstone contact intersects the segment of the contact passing through M at the point N. Bisect Z WNM to determine the orientation of the second hinge-plane trace, which is line *cd* (Fig. 13-12c).

Step 5: Now we can complete the outer portion of the fold. The limestone/shale contact intersects line *cd* at point O. We can extend this contact beyond hinge *cd* as line segment $\ddot{O}P$, where angle $POd = Z XOd$. Draw the upper contact of the sandstone (QV parallel to PO, etc.).

Step 6: When any two kink-fold hinge traces intersect, they are supplanted by a single hinge trace that bisects the angle between the remaining opposing limbs (provided the layers' thicknesses remain constant). Hinge traces *ab* and *cd* intersect in the subsurface at point *e*. To position the traces of layers in the core of the fold, draw *eS* parallel to $\ddot{O}P$ and *eT* parallel to LY. Draw fold hinge *ef* so that it bisects the angle between *eS* and *eT*.

