Section 6.2
ODDLY CONFIGURED AND CURVED SURFACES AS DATUM FEATURES

It is now legal to identify a compound curve or contoured surface as a datum feature. Whereas before these surfaces were not mentioned as possible datum features in the Y14.5 Standard, except with the use of datum targets, one may now identify the entire surface as a datum feature. As an extension of the principles of datum target points, one may speculate as to the limitless possibilities this concept opens to us. If, for example, a primary datum feature can be used to construct a primary datum plane from a minimum of 3 points of contact (high points if an entire planar surface is labeled as the datum feature, or specific points if datum targets are used), one might ask: "What is the maximum number of points that can be used?"

The answer is, of course, there is no maximum. If no datum targets were used and (theoretically) a surface was produced perfectly flat, all points, being of equal height and lying in the same plane, would be high points. If datum targets are used, especially on very flexible parts, such as sheet metal panels, it is not unusual to use more than three specific points to establish the datum plane. It is also quite common to use step datums, with some of these datum target points given height dimensions from the other target points to allow the panel to nest well. If the surface is a curve that has been mathematically defined, if using datum targets at varying stepped heights, we would pick the number of points we felt necessary to stabilize the part, then specify each as a datum target point. We would identify the location and height of each, perhaps with basic dimensions (toleranced dimensions are also allowed).

Suppose, instead, we decided we needed more than the 3 point minimum to properly nest the part, more than 5, and more than 100 or even 1,000 points. At some moment we may reach the decision that it would be functionally appropriate, as well as less cluttered on the drawing, to specify an infinite number of points on the surface to stabilize the part, establish the primary datum plane and to allow the part to nest in the same manner in which it functions, even as it seats in assembly.

Upon reaching this decision, it seems logical to simply call the entire surface the datum feature, using all the basic mathematically defined points on the curved or otherwise complex surface to define the primary datum. We would create a simulation of a perfect representation of this basically defined surface on which to seat the actual (less than perfect) produced surface. This simulation of a perfect counterpart for the surface could be thought of as a fixture on which to nest the part. In other words, a fixture could be made to the basic dimensions given and the contoured surface seated on the datum feature simulator (fixture, in this case) to establish the datum.

In summary, in the Y14.5 standard, it is now technically legal to identify a compound curve or a contoured feature as a datum feature. This mathematically defined surface must be able to be related to a three plane datum reference frame and, as stated, is represented by the true geometric counterpart of the surface's shape to establish the datum.

A Curved Surface as a Datum Feature

39. The ASME Y14.5M-1994 standard allows mathematically-defined curved surfaces to be used as datum features. Datum feature A on the figure below demonstrates this concept. It is a thin plastic part about to be seated on the fixture for stabilization.
    a) How many spacial degrees of freedom will datum feature A eliminate?

    b) How many datum planes does A alone create?

    c) What is the virtual condition of each hole that is positioned to A and B?

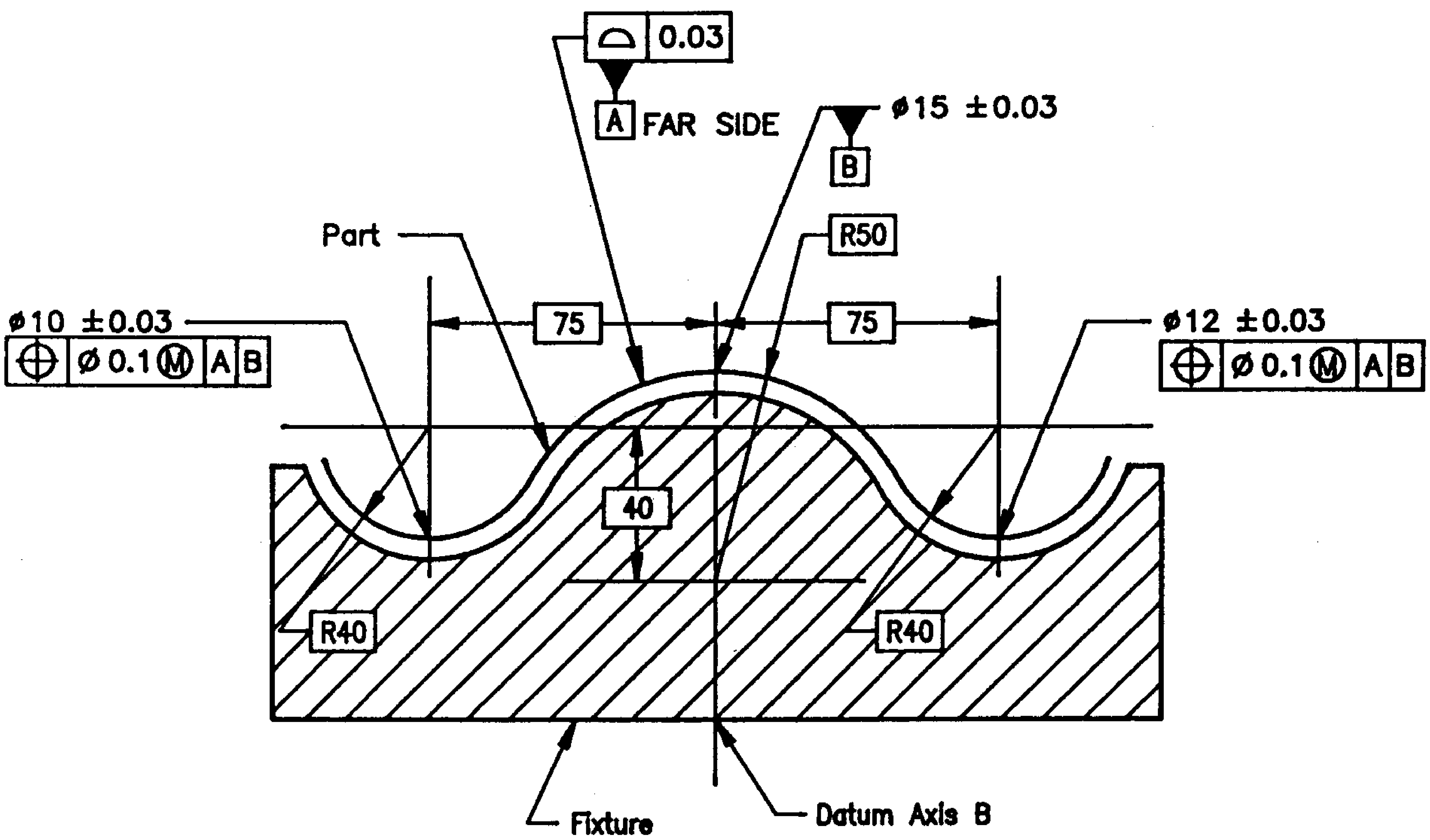
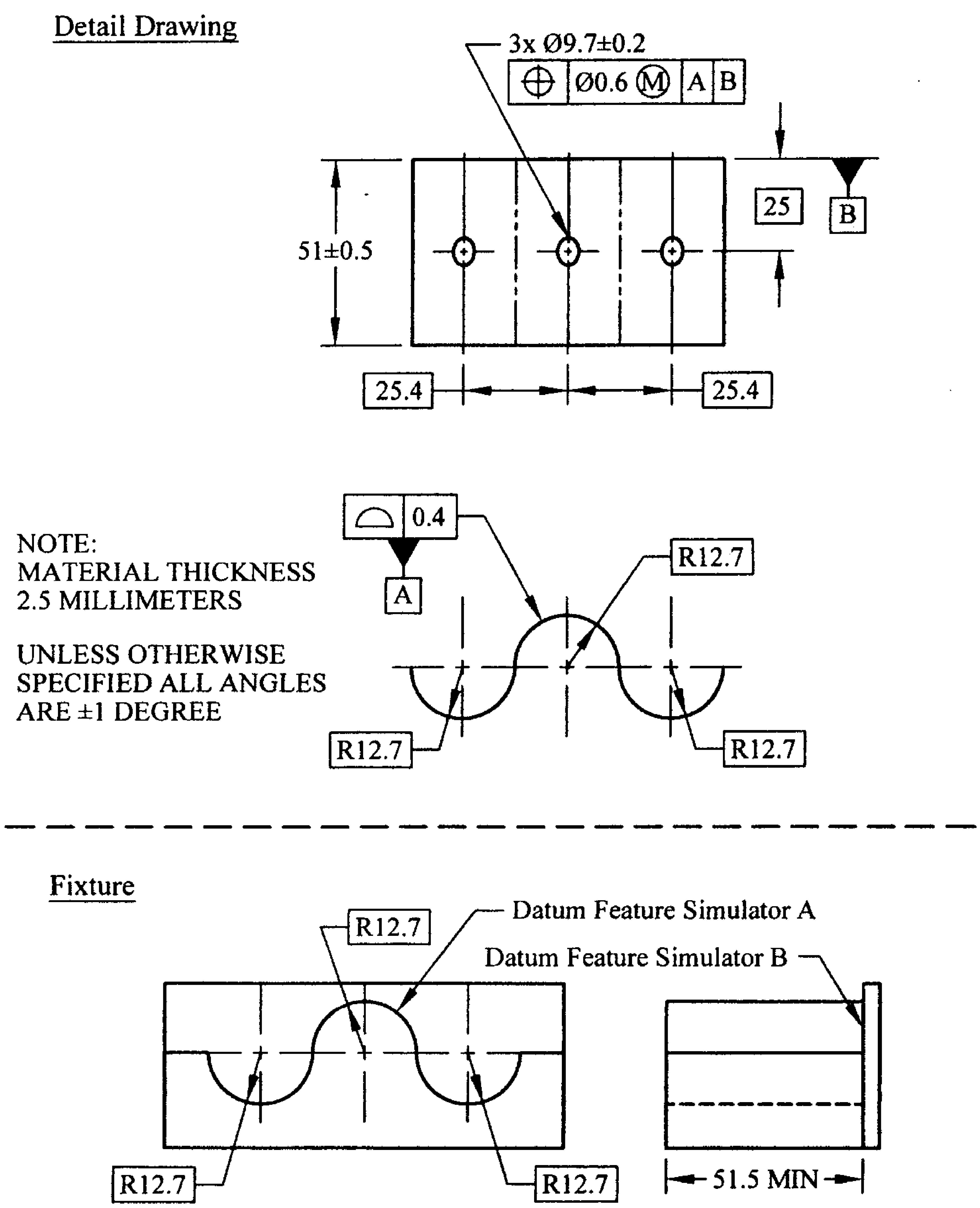


FIGURE 11-17 [Curved Surface as a Datum Feature]



A curved surface may be used as a datum feature. These complex datum features stem more spacial degrees of freedom than either planar datum features or cylindrical datum features. For