NONMANDATORY APPENDIX C
REGARDLESS OF FEATURE SIZE (RFS) AND REGARDLESS OF MATERIAL BOUNDARY (RMB)

C-1 RFS AND RMB GAGING

Regardless of feature size (RFS) is a term used to indicate that a geometric tolerance applies at any increment of the feature size within its size tolerance. Regardless of material boundary (RMB) is a term used to indicate that a geometric tolerance applies at any increment of the datum feature boundary. As such, the geometric tolerance is independent of the finished size of the feature and the datum feature. RMB can be applied to the datum features and RFS to other features whose axes or center planes are controlled by geometric tolerances.

With this concept, the actual axis of a part datum feature shall be used for inspection regardless of the finished size of the feature. Therefore, this type of inspection equipment usually is characterized by expanding devices, tapered locators, V-blocks, spring-loaded devices, or other units capable of locating the axis or center plane of the feature and the datum feature. Fixed-size elements are not appropriate for ascertaining the compliance of geometrically controlled features. Therefore, when a geometric tolerance is independent of feature size, the design frequently uses dial indicators or other devices capable of variables data collection.

Inspection equipment designs of this nature apply to situations in which the callout for positional tolerance directly states the RFS or RMB requirement. When no modifier is specified after the geometric tolerance, the RFS condition applies. When no modifier is specified after the datum feature, the RMB condition applies.

The basic advantage of the RFS and RMB type of inspection equipment design is its ability to perform a measurement accurately and independently of feature size and geometry variations. In some cases, RFS and RMB measurements are the only functional inspection method. Gage designs for these callouts often employ dial indicators that provide easy recalibration. Wear adjustments are an inherent part of the design. This ease of recalibration also provides a means of compensating for revisions in product size or tolerance requirements quickly. When dial indicators or similar units are incorporated into the design, RFS and RMB inspection equipment can determine not only whether the product is within specified limits, but also the magnitude and support phase of the life cycle, in which the product rebuild design may provide for adjustment to compensate for wear. Under these circumstances, RFS and RMB can be a desirable tolerancing concept.

The disadvantage of the RFS and RMB concepts is that the cost of the required inspection equipment is generally higher, as is the level of operator skill needed. Also, if expanding and contracting gage elements are not used, an infinite range of gage element sizes would be required to gage a part dimensioned with RFS and RMB modifiers, as this modifier does not allow use of fixed-size gaging elements.

(a) Gage Example With Both RMB and MMC References (See Fig. C-1). This example shows a workpiece that has two rectangular size datum features referenced at RMB, with round considered features referenced at MMC. While the gage has a complex datum feature simulator for the RMB references, it has a conventional set of fixed-size gage elements for the holes at MMC. This gage represents a combination of hole pattern alignment to the datums, while the pattern takes advantage of MMC for assemblability of the feature relationship. Figures C-1(a) and C-1(b) show the gage and describe its features.

(b) Gage Example With All RFS and RMB References [See Fig. C-2 (Fig. 5-60 of ASME Y14.5-2009)]. This example shows a workpiece that has a single-size datum feature referenced at RMB and a considered feature referenced at RFS. While the workpiece appears to be simple, the gage required to inspect the requirements is complex. A description for the use of the gage follows:

(1) Figure C-2(b) shows the workpiece restrained to simulated datum features as specified by the workpiece shown in Fig. C-2.

The guide block and three pins are shown assembled over guide rail 1. The guide block and three pins have been omitted over guide rail 2 for illustration clarity. The complete gage is shown in Fig. C-2(a).

Datum A feature of the workpiece makes contact on the datum A simulator. Clockwise rotation of the crank causes guide rails 1 and 2 to move inward simultaneously to simulate datum feature B center plane of the workpiece.

The workpiece is brought into contact with the pin or pins indicated as ③. See Fig. C-2(f).

The expanding block is inserted into the slot of the workpiece and is expanded to contact the sides of the slot.