

Many companies want to emphasize the importance of a certain dimension in order to ensure the performance of the product or to avoid hazardous or unsafe conditions. To draw attention to this “critical dimension” they use a drawing note or place a symbol next to the critical dimension. This practice is controversial for a number of reasons, but before taking a closer look at these issues, let’s consider a few examples of why a company would consider using a critical dimension notation.

1. A specific dimension needs to be inspected on every part that is produced. This “100% inspection” could be denoted by using “100%” inside of a circle next to the dimension with a drawing note stating “100% inspection required.”
2. For a specific dimension a Control Plan or special Inspection Procedure is required. These plans specify a method of measuring/inspecting the dimension, a special sample size, an increased frequency of inspection, etc. The use of such a plan or procedure is denoted by placing a symbol or letter next to the dimension. To implement such a plan or procedure a general note may be placed on the drawing. For example,

“##” SYMBOL DENOTES CRITICAL DIMENSION/FEATURE IN  
ACCORDANCE WITH PROCEDURE #####.

3. There is a need to point out a critical safety issue/problem that may occur with a part or function failure. Again, this would require a general note explaining the safety issue.

These examples of where a critical dimension note/symbol should be used seem plausible, but currently the only critical characteristic symbol found in the GD&T standard, ASME Y14.5M-1994, is a statistical requirement symbol. Why aren’t there other standards for applying critical dimension symbols or notes? There are many reasons:

1. First and foremost is that a critical dimension must relate to form or fit and/or relate to a safety problem associated with system failure. Otherwise, with respect to engineering drawings, the dimension should not be considered critical.
2. If a dimension is produced within tolerance it should be acceptable and “do the job.” If there is a problem, then there is most likely a problem with manufacturing not being able to meet the tolerance. Imposing a critical dimension criteria does not solve the problem.
3. If you need to impose a critical dimension in order to ensure correct manufacturing, then probably the tolerance is too tight. If the tolerance cannot be adjusted to fit reality then a part redesign may be required.
4. A dimension characterized as “critical” may not truly be critical for form, fit, or safety.
5. Use of a critical dimension may mean that only that dimension gets inspected or other dimensional requirements may have lax inspection due to the emphasis on the critical dimension.
6. There is a tendency to overuse a critical dimension symbol/note. The result is that it is ignored or conversely too much attention is paid to it, resulting in an unnecessary part cost increase.
7. If a critical dimension symbol/note is suddenly implemented a job shop may figure that their best efforts are good enough because in the past the customer has always been satisfied.
8. Are you really increasing product quality and functionality or is this just adding more paperwork?
9. Rather than focusing on a critical dimension it may be better to have the quality/inspection department control important characteristics via a Quality Control Plan.

The lesson to be learned is that even though it may seem reasonable to establish a system for drawing attention to what you consider to be “critical dimensions,” it should only be done after careful consideration. Because of the many concerns surrounding this issue, there is no standard or generally accepted practice. So if you decide to use

the critical dimension concept your company needs to make sure that everyone, both inside and outside the company, fully understands the meaning of the critical dimension symbol/note. Such a practice cannot be established with a few sentences in a memo or letter. It requires a well-documented procedure and implementation plan so that everyone understands the meaning and implication of the symbol/note.