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Papers Delivered in the

AUTOMOTIVE and MACHINE SHOP SESSIONS

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THE PROTECTIVE FOOTWEAR STORY

By W. EUGENE STUFFING

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In 1967 it had been 23 years since Standard Z41.1, "Men's Safety-Toe Footwear," had been revised. It was, of course, badly in need of revision due to the development of new shoe styles, new materials, new techniques in shoe manufacturing, and expanded applications for the use of occupational protective footwear.

As a member of the committee which developed the 1967 version I can report that the committee meetings did not run smoothly as far as all areas of the Standard were concerned. There was considerable controversy on some of the points which required a great amount of diplomacy and soul searching to resolve. The development of a complete Standard which has the unanimous approval of all members of the committee, who in turn represent all interested groups, is not easy. The United States of America Standards Institute has a mechanism whereby differences of opinion and strong convictions can be resolved. This is known as the "consensus" principle, and while the Standards Institute's definition of consensus is rather vague, the meat of the mechanism is that all of the various opinions and convictions of the various committee members are carefully weighed and evaluated before a decision is made as to the direction the Standard will take. I am firmly convinced that the consensus principle is a necessary mechanism in the development of Standards; otherwise, many of the Standards which have been released by the Standards Institute would not now be in existence.

The Z41.1 Standard outlines the specifications, performance requirements, and methods of tests for safety footwear designed primarily to protect the toes of the wearer. Perhaps the greatest change in the 1967 version of the Standard over the previous version was the introduction of three classes of acceptable safety shoes:

1. *Class 75.* This shoe must provide 16/32 inch clearance after 75 foot-pounds of impact, and 1½ inch clearance after 2,500 pounds compression.

2. *Class 50* must provide 16/32 inch clearance after 50 foot-pounds impact and 1,750 pounds compression.

3. *Class 30.* This shoe must provide 16/32 inch clearance after 30 foot-pounds of impact and 1,000 pounds compression.

The new Standard requires that all shoes be clearly marked to indicate the class of protection they provide. For example, a Class 75 shoe would be marked *USAS Z41.1-1967/75*. Such a marking technique would appear to be a fairly simple step to take. Actually, the marking of shoes became a most difficult problem because at the time the Z41.1 Standard was released the shoe manufacturers had literally millions of pairs of safety shoes in stock which were not marked in accordance with the new Standard. This meant that safety shoe manufacturers had to immediately start marking all newly manufactured shoes and to hold them in reserve until all existing shoes could be moved out of the warehouses and sold. As time went on it became quite apparent a deadline was going to have to be established after which time all shoes sold would be marked in accordance with their test results. It was agreed that all safety footwear manufacturers would have their shoes stamped by January 1, 1969.

As previously indicated, the Z16.1 Standard calls for three levels or classifications of shoes: the "75" shoe, the "50" shoe and the "30" shoe. Although the Standard does not suggest where each of these classifications are most appropriate, the implication is that they are, respectively, for heavy, medium, or light exposures or industries.

The impact and compression tests which are required to be made before a shoe can be marked are fairly detailed and lengthy as to procedures and restrictions. The impact test calls for a 50 pound weight to be dropped from a height of 18 inches with at least ½-inch clearance remaining between the toe cap and the insole. The compression test calls for applying a load, at the rate of 50 pounds per second, after the first 500 pounds of load, to the highest point of the

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toe box. Again, clearance between the toe cap and the insole must be at least $\frac{1}{2}$ -inch.

Some safety shoe manufacturers claim that the compression test is unfair and unrealistic. Their objections are based on their belief that almost all foot injuries are caused by impact type situations. They point out that many countries have rejected compression testing as a criterion for approval. In France, England, and Germany a shoe must pass or fail on its ability to withstand impact only. Shoes built with the cellular type sole, in general, will not pass the severe compression test, although they do pass the impact test with flying colors.

The Z41.1 is a general standard for safety footwear designed primarily to protect the toes of the wearer. After the Z41.1 Standard was completed, sub-committees were formed to produce standards for metatarsal protection, conductive and non-conductive shoes, and shoes for electrical hazards. These standards will eventually appear as Z41.2, 3, 4, and 5.

Very little action is taking place toward the formation of standards in any of these specialty areas with the exception of the metatarsal shoe. Again, there are some strong and conflicting viewpoints as to how the shoe should be constructed and tested. However, a metatarsal standard will be completed and published sometime next year.

In my discussions with general sales managers of some of the major protective footwear manufacturers I have learned that they

are most eager to get as many of their styles into the "75" classification as is feasible. They are constantly working on upgrading their shoes, pointing towards higher test results.

In correspondence and conversations with these same general sales managers I asked for information as to what percentage of their styles of shoes were in each of the three classifications. Interestingly enough, these percentages by classification among the major shoe manufacturing companies were almost identical:

Class 75—82 per cent; Class 50—13 per cent; Class 30—5 per cent.

I have also been advised that the majority of industry today is not genuinely concerned about the three testing standards, but are more concerned that a shoe does carry a USA Standard classification.

While I have no information as to the total volumes of personal protective footwear being sold, it is my personal estimate and judgment that the sales of safety shoes per industrial employee on a prorated basis has increased over the years. I am not sure that this increase can be attributed to improved selling techniques on the part of shoe manufacturers, or to the safety shoe programs instituted by safety directors. I have a strong suspicion that improved styling, materials, and workmanship have played a most significant part in the acceptance of occupational protective footwear by our industrial workforce.