# THE FITTING CHARACTERISTICS OF SAFETY BOOTS ON MILITARY WOMEN




NAVY CLOTHING & TEXTILE RESEARCH FACILITY
NATICK, MASSACHUSETTS



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The Navy Clothing and Textile Research Facility (NCTRF) tested the fitting characteristics of men's safety boots carried in the Supply System on a representative sample of Navy women and concluded that more than 95% of military females can be fitted with footwear selected from sizes 4 to 10 in whole and half sizes, in widths extra narrow (XN), narrow (N), regular (R), wide (W), and extra wide (XW). The tariff will require sizes 2 and 3

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# THE FITTING CHARACTERISTICS OF SAFETY BOOTS ON MILITARY WOMEN

## INTRODUCTION

The Navy Clothing and Textile Research Facility (NCTRF), assisted by Army, Air Force, and Marine Corps technologists, conducted a steel-toe safety-boot fitting evaluation among female recruits and female senior station personnel at the Naval Training Center, Orlando, FL. This study showed that more than 95 percent of female service personnel can be fitted with safety boots (NSN 8430-00-935-6235 series) built over the MIL-7 safety toe last (Figure 1). Based on this work, NCTRF developed a document titled THE GUIDE FOR FITTING AND MATCHING STANDARD DOD MEN'S SAFETY FOOTWEAR SIZES WITH WOMEN'S DRESS SHOE SIZES. The primary purpose of this evaluation was to determine the feasibility of fitting service women with the safety boot, which is high, leather-lined protective footwear, used mostly by Navy flight and construction battalion personnel. Another purpose was to establish a size equivalence relationship between the safety boots and the women's shoes (NSN 8435-00-577-5153 series). See Figure 2 from which the fitting guide would evolve. NCTRF initiated the study at the request of the Defense Personnel Support Center (DPSC) to learn whether men's military safety footwear in the DOD Supply System could fit military women assigned to hazardous duties. The use of men's footwear would also obviate dependence on insufficiently protective commercial women's safety shoes. DPSC at first proposed the development of high-strength, women's safety footwear, but preliminary work disclosed that designing suitable safety footwear exclusively for women would be extremely costly, time consuming, and would require 3 to 5 years to complete. Consequently, the safety boots, military safety footwear with a broad range of sizes, were chosen as the footwear with the best potential for fitting the female population.

The feasibility of fit and the size equivalence relationship were established after a random group of 255 female personnel wore tubular terry cloth socks with safety footwear that included whole and half sizes and widths ranging from 4-1/2 extra narrow (XN) to 10XN, 4 narrow (N) to 10N, 4 regular (R) to 10R, and 8 wide (W), 8-1/2W, 9-1/2W, and 10W. When both the boot size and the women's shoe size were accepted by the subject, they were recorded. Although the findings established the feasibility of fitting an overwhelming proportion of military women, the size equivalence data for men's and women's sizes indicated no precise one-to-one size relationship between the footwear of men and women. Different women wearing the same dress shoe size frequently required different sized men's boots. This variability was attributed to poorly fitted female dress shoes and to individual physiological differences not related to foot dimensions. The results showed that (a) more than 95 percent of military women can be fitted with safety boots, and (b) a size guide of first- and second-choice boot sizes correlated to women's dress shoe sizes can help individual women and organizations to requisition safety boots (see Table II and Appendix D).

To assure the essential size accommodation of the female population, NCTRF recommends that the Supply System stock a complete array of men's safety boots, including whole and half sizes from 4 to 10 and widths XN, N, R and W, and use the guide for requisitioning necessary sizes. NCTRF also recommends the wearing of terry-cloth tubular socks or cushion-soled socks to enhance the fit and comfort of the footwear. Finally, for those women who cannot be fitted with men's safety boot sizes, NCTRF recommends the development of new sizes and widths,

FIGURE 1. STANDARD SAFETY BOOT

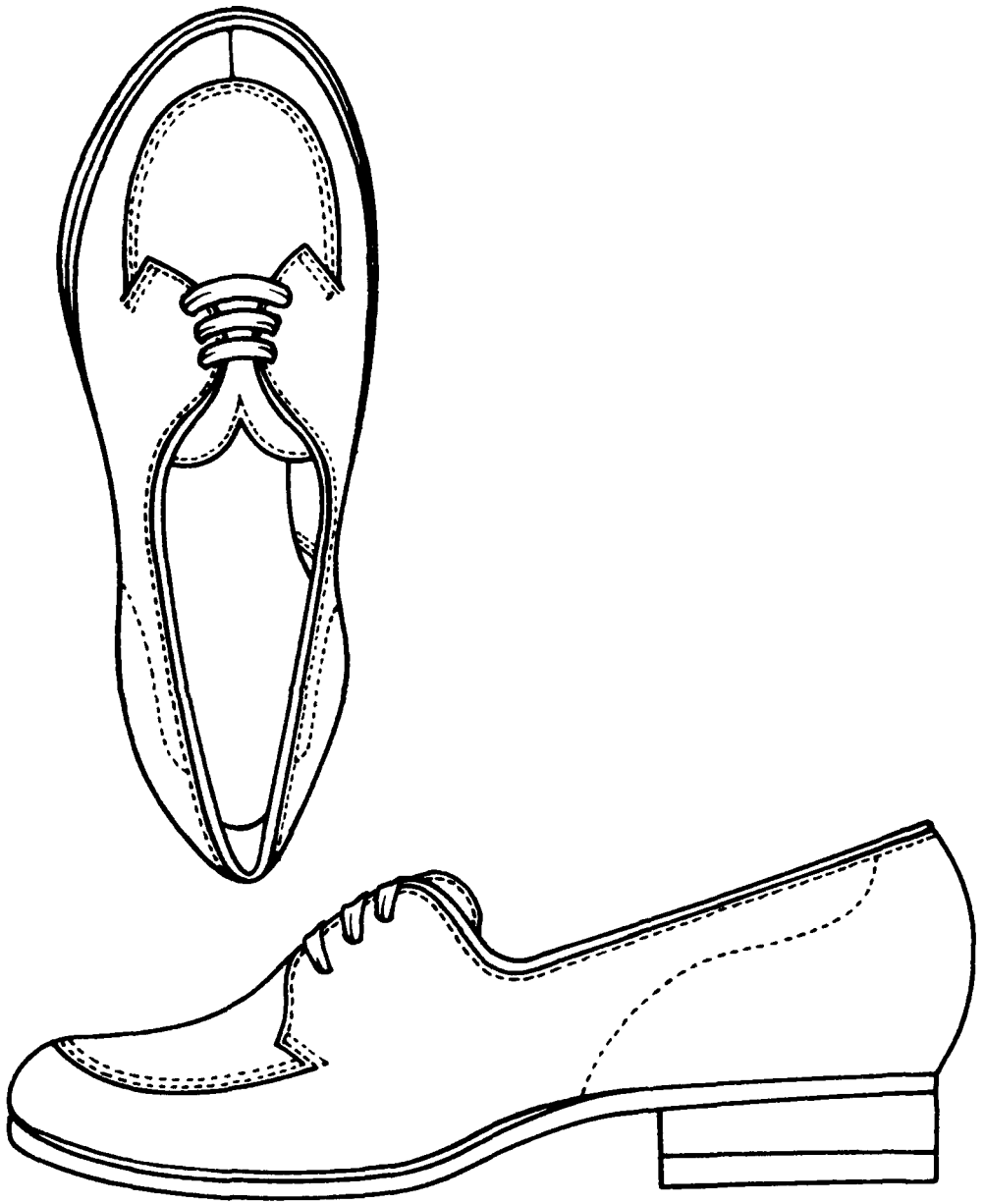


**FIGURE 2. WOMEN'S SHOES**

namely, 2 and 3 N, R, and W.

The purpose of this report is to show how this evaluation was conducted and to detail the findings.

PROCEDURE

The investigation began with accumulation of 119 pairs of safety boots in sizes 4-1/2XN to 10XN, 4N to 10N, 4R to 10R, and some safety-toe chukkas in sizes 8W, 8-1/2W, 9W, 9-1/2W and 10W. All were made over the MIL-7 safety toe last with a #400 steel toe and were sent to the Naval Training Center (NTC), Orlando, Florida. NTC provided a fitting room with a platform 9 feet long, 3 feet wide and 34 inches high that permitted three subjects to be fitted simultaneously. The subjects were 255 randomly selected Navy women, including recruits and senior station women, assigned to the Center. The five fitters (two Navy, one Army, one Air Force and one Marine) were technologists who agreed on a concept of fit that would assure maximum foot comfort. Accordingly, the fitted boots had to feel neither too tight in the toe or metatarsal regions and not cause foot discomfort. The boots could not be so loose in the vamp that the creased leather would abrade the skin, nor so loose in the heel or at the instep that the subject's feet would shift excessively within the boots while she was walking. Prior to the fitting process, every subject completed the heading of the Fitting Data Form (FDF), Fitting Data of Boots, Safety on Women of NTC, Orlando, FL, including name, rank, date, age, length of service, height, weight, organization, and the size of the standard shoes, women's. (See Appendix A.)

When the subject mounted the fitting platform, the fitter checked the correctness of the FDF entries and issued the subject a pair of single-size, heavy, stretch tubular, acrylic, nylon socks, which she donned over her nylon hose. If the subject wore heavy work hose, she removed them and put on the tubular hose over her bare feet. The tubular socks were removed immediately after the fitting sequence and dropped into a container for use by subsequent subjects. Every subject wore the single-size stretch tubular socks during the fitting process.

The process began when the subject's right foot or left foot was measured on a paper grid (see Appendix B) with an accompanying size chart (see Appendix C), a system developed by the Navy to predict initial fitting sizes for military footwear built over the geometric MIL-1 military dress shoe last. The grid and chart were applicable to MIL-7 or military safety toe last footwear since the dimensions of MIL-1 and MIL-7 lasts are identical except for a slight difference in the toe region. The measuring system required the subject to place a foot on the grid, which enabled the fitter to determine its maximum length (L) and width (W). The L x W dimensions were used as coordinates on the size chart (Appendix C), which shows the shoe size; e:g., dimensions 9.3" x 3.5" equals 5-1/2R. After subjects were fitted and the correlatd shoe and safety boot sizes were tabulated, the information was used to predict the initial fitting sizes of subsequent subjects and to test the probable effectiveness of the size correlations which would appear in the subsequent size guide.

When the dress shoe was obviously too large or too small, the fitters used a Brannock women's foot measuring device to determine the subject's apparent dress shoe size for the purpose of FDF record (Appendix A). If the predicted "try-on" boot size was not available, the closest substitute size was drawn from

the stock of test boots. One or more sizes were tried on, and the accepted size was recorded on the FDF. The fitting process proceeded until both the subject and the fitter were satisfied with the fit. When either the subject or the fitter felt the boot could not be fitted, or when the size was not available, the notation "No Fit" was made on the FDF. Each FDF was examined and handed to a recorder who entered the accepted boot size and the corresponding military women's dress shoe size on a chart of fitting equivalents. At the end of the test, the quantity of the sizes was totaled and entered in a summary table of fitting equivalencies. (See Table I, which subsequently was refined and extended to form Table II. See also Appendix D.)

In addition, 49 subjects chosen at random from the group of 255 walked in the boots from 5 to 15 minutes to verify the adequacy of fit and comfort. Each of these subjects then completed a questionnaire titled Boots, Safety Test (WT) (see Appendix E). Twenty-one of the 49 subjects, including company commanders who led recruits through vigorous marching exercises, continued to wear the boots for 2 months. These subjects subsequently gave us their comments concerning the comfort of the boots.

## DISCUSSION

### Fitting Data

Table I shows the fitting results of 255 female subjects fitted with the men's safety boots. The table matches the accepted safety boot sizes with the standard women's shoe sizes worn by subjects during the safety boot fittings. Of the 255 subjects, 11 could not be satisfactorily fitted from the sizes in the test tariff. Of the 11, 7 could have been fitted by sizes 4-1/2W, 5W, 5-1/2W, 6W, 7W and 7-1/2W, all of which are in the Supply System, but not in the inventory of test boots. No boots could have been obtained, however, for four subjects requiring estimated sizes 3-1/2N, 3R and 3-1/2R, which are not part of the safety-boots size tariff. Predicated on a potential 251:255 success ratio of randomly selected and representative subjects, the results indicate that more than 95 percent of the military females will be fitted by the existing safety boot tariff. The four "no fits" suggest that about 2 percent of the female population will not be fitted by the existing tariff.

### Fitting Experience

The test disclosed that some boots may require a wider gusset to accommodate subjects with high and wide insteps. These subjects had difficulty pushing their feet through the opening of some boots. When the gusset was slit, however, the problem disappeared. The subjects with high insteps then had no difficulty in pushing their feet into the boots.

### Tubular Socks

Thick, terry-cloth, tubular socks worn over nylons facilitated the fitting of the boots. The thick socks contributed bulk, filled the cavity of the boot, and enhanced the comfort and fit of the footwear.

TABLE I
SAFETY BOOT SIZES VS. WOMEN'S SHOE SIZES
AT NTC ORLANDO

| SAFETY BOOT SIZES (FITTED) | * | WOMEN'S SHOE SIZES (WORN) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | NO FIT | TAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 4-1/2 | | | | | 5 | | | | | 5-1/2 | | | | | 6 | | | | | 6-1/2 | | | | | 7 | | | | | 7-1/2 | | | | | 8 | | | | | | |
| | | A | B | C | D | E | A | B | C | D | E | A | B | C | D | E | A | B | C | D | F | A | B | C | D | E | AA | A | B | C | D | AA | A | B | C | D | A | B | C | D | E | | |
| 4 | N | | 1 | 1 | | | | | | | | | 5 | | | | | 1 | | | | | 1 | | | | | | | | | | | | | | | | | | | |
| | R | | | | | | | | 1 | | | | 1 | | | | | 2 | | | | | 1 | | | | | | | | | | | | | | | | | | 4 | |
| | W | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 18 |
| 4-1/2 | N | | | | | | | 1 | | | | | 1 | | | | | 2 | | | | | | | | | | 1 | | | | | | | | | | | | | |
| | R | | | | | | | | 1 | | | | 3 | 2 | | | | 2 | 2 | 1 | | | 13 | 1 | 1 | | | | | | | | | | | | | | | | | |
| | W | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 32 |
| 5 | N | | | | | | | | | | | | | | | | | | | | | | 1 | | | | | | | | | | | | | | | | | | 1 | |
| | R | | | | | | | | | | | | | | | | | 1 | 1 | 1 | | | 1 | 4 | 1 | | | | 1 | | | 1 | | | | | | | | | | |
| | W | | | | | | | | | | | | | | | | | | | | | | | | | | | | 3 | 1 | | | 4 | | | | | | | | 2 | 24 |
| 5-1/2 | N | | | | | | | | | | | | | | | | | | 1 | | | | | | | | 1 | | | 1 | | | 1 | | | | | | | | |
| | R | | | | | | | | | | | | | | | | | | | | | | | | | | | | 9 | 1 | | | 8 | 3 | | | 2 | | | | |
| | W | | | | | | | | | | | | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | 1 | 30 |
| 6 | N | | | | | | | | | | | | | | | | | | | | | | 1 | 1 | | | | | | | | 1 | 2 | | | | | | | | |
| | R | | | | | | | | | | | | | | | | | | | | | | | 2 | | | | | 1 | 1 | | | 12 | 3 | | | 4 | 2 | | | |
| | W | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 2 | | | | | | | 33 |
| 6-1/2 | N | | | | | | | | | | | | | | | | | | | | | | 1 | | | | | 3 | 6 | | | | | | | | | | | 1 | |
| | R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | 1 | 1 | | | 2 | | | | |
| | W | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 3 | 3 | | | 8 | 2 | 1 | | 32 |
| Subtotal | | - | 1 | 1 | - | - | - | 1 | 2 | - | - | - | 10 | 2 | - | - | - | 9 | 4 | 2 | 1 | 1 | 22 | 5 | 1 | - | 1 | 4 | 20 | 5 | - | 1 | 2 | 32 | 12 | - | - | 16 | 4 | 1 | - | 9 | 169 |

* Shoe Widths: N-Narrow; R-Regular; W-Wide.

TABLE I (CONTINUED)

| SAFETY BOOT SIZES (FITTED) | | WOMEN'S SHOE SIZES (WORN) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | NO FIT | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 7 | | | | | 7-1/2 | | | | | 8 | | | | | | 8-1/2 | | | | | 9 | | | | | 9-1/2 | | | | | 10 | | | | | |
| | | A | B | C | D | E | A | B | C | D | E | AA | A | B | C | D | E | A | B | C | D | E | A | B | C | D | E | A | B | C | D | E | A | B | C | D | E | | |
| 5-1/2 | N | | | | | | | | | | | | | | | | | | 1 | | | | | | | | | | | | | | | | | | | 1 |
| 6-1/2 | N | | | | | | | | | | | | | | | | | 1 | 3 | | | | | 1 | | | | | | | | | | | | | | 5 |
| 7 | XN | | | | 1 | | | | | | | | 1 | | 1 | | | | | | | | | | | | | | | | | | | | | | | | |
| | N | | | | | | | 3 | | | | | | | 5 | 1 | | | 4 | | | | | | | | | | | | | | | | | | | | 38 |
| | R | | | | | | | | | | | | | | 5 | 1 | 2 | | 6 | 2 | | | | 3 | | | | | 1 | | | | | | | | | |
| | W | | | | | | | | | | | | | | | | | | | 1 | | | | | | | | | | | | | | | | | | |
| 7-1/2 | N | | | | | | | | | | | | | | 1 | 2 | | 1 | 3 | | | | | 2 | | | | | | | | | | | | | 1 | |
| | R | | | | | | | | | | | | | | | | 2 | | 1 | | | | 1 | 3 | 2 | | | | 1 | | | | 1 | | | | | 23 |
| | W | | | | | | | | | | | | | | | | | | | 1 | | | | 1 | | | | | | | | | | | | | | |
| | XW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | |
| 8 | XN | | | | | | | | | | | | | | | | | | 1 | | | | | | | | | | | | | | | | | | | 11 |
| | N | | | | | | | | | | | | | | | | | | | | | | | 2 | 1 | | | | | | | | 1 | 2 | | | | |
| | R | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | | | | | 2 | | | | |
| | W | | | | | | | | | | | | | | | | | | | | | | | | | | | | 2 | | | | 2 | 1 | | | | 5 |
| 8-1/2 | N | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | | | | 1 | | | | | |
| | R | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | | | | 1 | | | | | 3 |
| | W | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | N | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | W | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Subtotal | | - | - | - | 1 | - | - | 3 | - | - | - | 1 | - | 12 | 4 | 4 | - | 2 | 19 | 4 | - | - | 2 | 12 | 3 | - | - | - | 6 | - | - | - | - | 5 | 6 | - | - | 2 | 86 |
| Total (No Fit) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 11 | 255 |

## Wear Test

Forty-nine randomly selected subjects walked in the boots from 5 to 15 minutes to verify the adequacy of fit and comfort. All reported the fit was satisfactory. Twenty-one of these subjects who continued the test for 2 months--doing marching drills, supply work, and recreational activities, including motorcycling and camping--reported the boots were comfortable. There were no reports of heel-slips, but a break-in period of 1 week was needed by some to condition their ankles. Although the weather at Orlando was warm (approximately 80°F), the thick, tubular socks did not detract significantly from comfort.

## Fitting Chart (Table II)

Unreliable data were generated from subjects whose dress shoes had been misfitted at retail stores and issue points prior to the test. Some of these subjects literally stepped out of their footwear while walking. Consequently, some of these poorly fitted subjects wearing 7-1/2B women's shoes during the test were fitted with nine different safety boot sizes ranging from 4-1/2W to 7N (see Table I). Table II was subsequently developed for first- and second-choice sizes from Table I. Similar variability was experienced by the Army when they conducted an informal fitting test on women using Army men's combat boots at Fort Devens, MA. (1) Table II is a refinement and extension of Table I. Obvious, non-correlating, unusual boot sizes obtained from subjects wearing dress shoe misfits listed in Table I have been omitted from Table II. The procedure for using Table II is described in Appendix D.

## Testing of Table I Size Equivalence Relationships

After fitting data for the first 75 subjects were accumulated, these beginning size matchings were used to predict the initial boot sizes of later subjects. The results suggested that most initial sizes predicted by the data in Table I were as precise as those of the measuring grid system (Appendixes B and C) used to predict the initial sizes. Applying either the fitting data or the grid system, the fitters seldom tried more than two different sizes to obtain the boot size acceptable to the subject.

## Use of Military Safety Footwear Besides Safety Boots

Safety boots were selected as the test footwear because they offered the advantages of height, a blucher pattern and a leather lining--which enhance the fit and comfort of footwear. No data were obtained, however, about the fitting characteristics of other stock safety shoes, which, nevertheless, are lower and styled differently. NCTRF believes that most military women can also be satisfactorily fitted with other military styles of safety footwear in the Supply System because they are made over the same MIL-7 lasts. These include: Shoes, Safety, MIL-S-21894; Shoes Conductive, MIL-S-3794; Shoe Molders, MIL-S-82245; Shoe, Safety, Non-Sparking, MIL-S-41821; Shoe, Safety, Men's Electrical Hazard, High, MIL-S-43860; Shoe, Safety, Men's Electrical Hazard, Oxford, MIL-S-43897. In all cases, the fit of the footwear, including safety boots, oxfords, and the low blucher footwear listed above, are improved by heavy-cushion-sole socks.

(1) Discussion between author and E. R. Cargill of the Clothing Equipment and Materials Engineering Laboratory, U.S. Army Natick Laboratories, March 19

TABLE II

CHART FOR FITTING AND MATCHING STANDARD DOD
MEN'S SAFETY FOOTWEAR SIZES WITH WOMEN'S DRESS SHOE SIZES

| Sizes (Women's) Shoes, Women MIL-S-21711 | Sizes (Men's) DoD Safety Footwear First Choice | Sizes (Men's) DoD Safety Footwear Second Choice |
|---|---|---|
| 4-1/2B | 4N | 4XN |
| 4-1/2C | 4N | 4-1/2XN |
| 5A | 4-1/2XN | 4-1/2N |
| 5B | 4-1/2N | 4-1/2XN |
| 5C | 4-1/2N | 4R |
| 5D | 4-1/2R | 5N |
| 5-1/2A | 4-1/2N | 5XN |
| 5-1/2B | 4-1/2R | 5N |
| 5-1/2C | 4-1/2R | 5N |
| 5-1/2D | 5R | 5-1/2N |
| 6A | 5N | 5-1/2XN |
| 6B | 5-1/2N | 5R |
| 6C | 5-1/2N | 5R |
| 6D | 5R | 5-1/2N |
| 6-1/2A | 5R | 5-1/2XN |
| 6-1/2B | 5R | 5-1/2XN |
| 6-1/2C | 5-1/2R | 5W |
| 6-1/2D | 5-1/2R | 5W |
| 7AA | 5-1/2N | 6XN |
| 7A | 5-1/2R | 6-1/2N |
| 7B | 5-1/2R | 6-1/2N |
| 7C | 6R | 5-1/2R |
| 7D | 6-1/2N | 7XN |
| 7-1/2AA | 6XN | 5-1/2N |
| 7-1/2A | 6-1/2N | 7XN |
| 7-1/2B | 6R | 6-1/2N |
| 7-1/2C | 6-1/2R | 7N |
| 7-1/2D | 6-1/2R | 7N |
| 8AA | 7XN | 6-1/2N |
| 8A | 7XN | 6-1/2N |
| 8B | 7N | 6-1/2R |
| 8C | 7-1/2N | 8XN |
| 8D | 7-1/2R | 7R |
| 8-1/2AA | 7XN | 7N |
| 8-1/2A | 7N | 7-1/2XN |
| 8-1/2B | 7R | 7-1/2N |
| 8-1/2C | 7R | 7W |
| 8-1/2D | 7-1/2N | 8XN |
| 9AA | 8XN | 7-1/2N |
| 9A | 8XN | 7-1/2N |
| 9B | 7-1/2R | 8R |
| 9C | 7-1/2R | 8R |
| 9D | 8N | 8R |
| 10AA | 8-1/2XN | 8-1/2N |
| 10A | 8-1/2N | 9XN |
| 10B | 8-1/2R | 9N |
| 10C | 8W | 8-1/2R |
| 10D | 8W | 8-1/2R |

## CONCLUSIONS

1. Safety boots will accommodate more than 95 percent of military women who require safety footwear.

2. It is feasible to issue other styles of military safety footwear with lower patterns built over the MIL-7 safety last to military women. Heavy-cushion-sole socks will enhance the fit of the safety shoes.

## RECOMMENDATIONS

NCTRF recommends:

1. Navy women use the men's safety boots and other Supply System footwear.

2. The Supply System stock safety footwear in whole and half sizes in the range of 4 to 10 and widths XN, N, R, W, and XW to assure a complete supply of sizes for women.

3. Additional safety shoe sizes 2 and 3 and widths N, R, and W be developed to accommodate the 2 percent of the Navy female population who cannot wear men's sizes.

4. Table II and Appendix E be used for fitting and requisitioning military safety footwear.

5. Cushion-sole socks be worn to assure superior fit and comfort.

ACKNOWLEDGEMENTS

The work of this investigation was assisted by Mr. Michael Loparto and Mr. Caesar Zemme of the Navy Clothing and Textile Research Facility; Mr. Robert I. Cargill, U.S. Army Natick Laboratories; Mr. Ralph Goodwin, Wright Patterson Air Force Base; and Mr. R. G. McCormick, Marine Corps Logistics Base, who participated in the fitting operations at the Naval Training Center, Orlando, FL. The clothing office of the Naval Administration Command, Naval Training Center was also of immeasurable help in setting up and in assembling female personnel who were the subjects of this study which has since been applied to the military women of all the Services.

APPENDIX A

NAVY CLOTHING AND TEXTILE RESEARCH FACILITY
NATICK, MASSACHUSETTS 01760

FDF
FITTING DATA OF BOOT'S SAFETY ON WOMEN OF NTC,
ORLANDO, FLORIDA

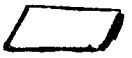
Test Subject No _____ Shoe Fitter _____

Name _____ Rank _____ Date _____

Age _____ Length of Service _____ Height _____ Weight _____

Organization _____

_____

1. Military Women's Shoe Size 

2. Fitted Sock Size _____

3. Predicted Shoe Size for Boots, Safety

   a. Machine Right Foot _____ Left Foot _____ None _____

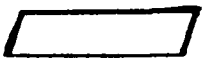
   b. Grid Right Foot _____ Left Foot _____ None _____

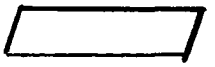
4. Shoe Fitting

   a. Initial try-on size _____

   b. Follow up try-on sizes _____, _____, _____, _____, _____

   c. Determination of Fit Fitted Boot Size

      (1) Test Subject 

      (2) Shoe Fitter 

   d. Reasons for No Fit

      (1) Test Subject _____

_____

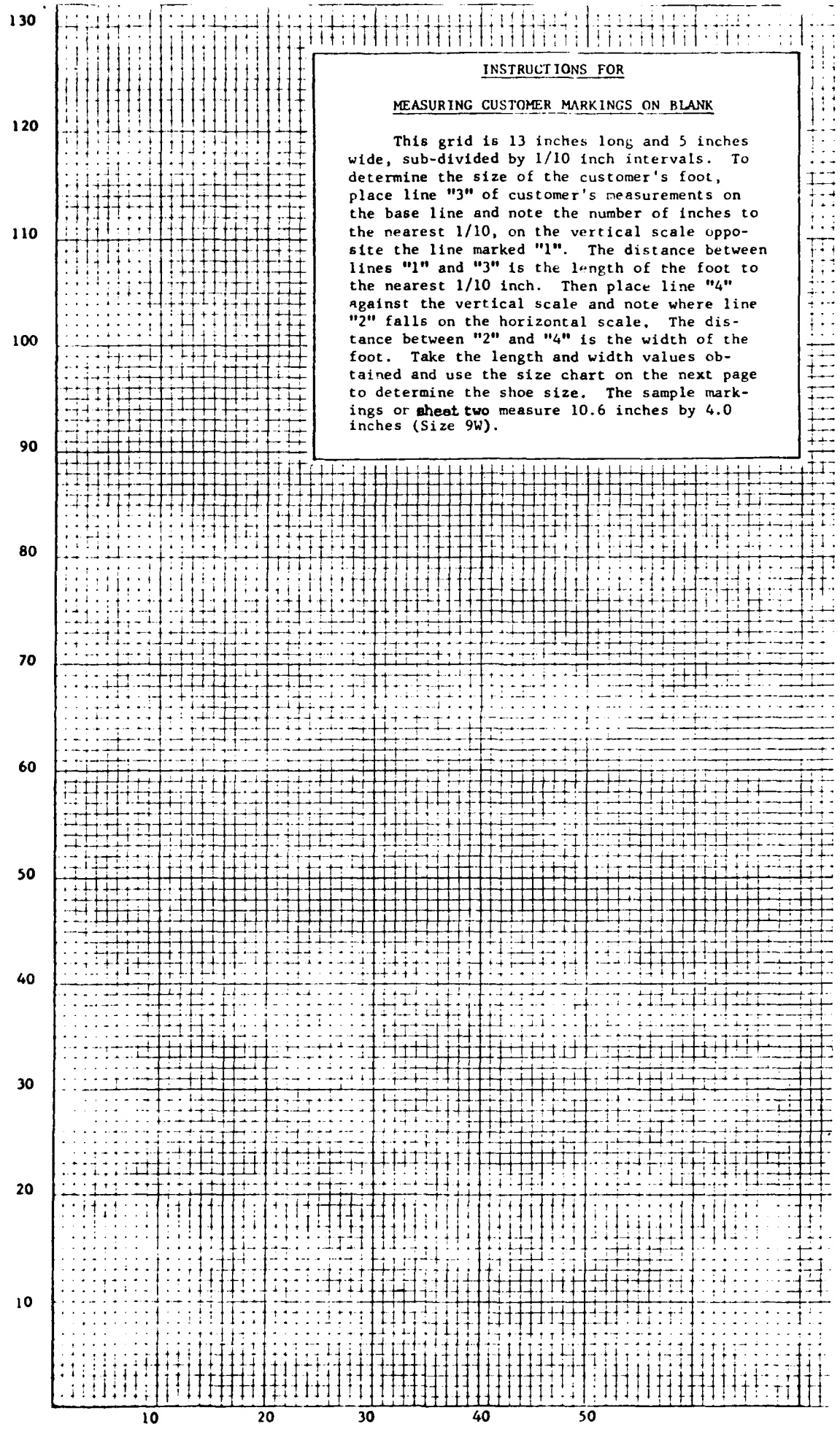
      (2) Shoe Fitter (Include information if Boot Size is not available)

_____

_____

## APPENDIX B. SIZE MEASURING GRID

Appendix B is used for supply mail order footwear built over the MIL 1 or MIL 7 shoe last. Accordingly, this grid lends itself to use in predicting the sizes of safety shoes made over the U.S. MIL 7 last. The instructions on the grid were not applicable to the fitting situations at NTC Orlando. The scale of the grid on page B-2 is about 70% of the original.




INSTRUCTIONS FOR

MEASURING CUSTOMER MARKINGS ON BLANK

This grid is 13 inches long and 5 inches wide, sub-divided by 1/10 inch intervals. To determine the size of the customer's foot, place line "3" of customer's measurements on the base line and note the number of inches to the nearest 1/10, on the vertical scale opposite the line marked "1". The distance between lines "1" and "3" is the length of the foot to the nearest 1/10 inch. Then place line "4" against the vertical scale and note where line "2" falls on the horizontal scale. The distance between "2" and "4" is the width of the foot. Take the length and width values obtained and use the size chart on the next page to determine the shoe size. The sample markings on sheet two measure 10.6 inches by 4.0 inches (Size 9W).

APPENDIX C. CHART FOR PREDICTING SIZES OF SAFETY SHOES

| Foot Length | Foot Width --- (1/10 inch) | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | Foot Length |
| 88 | 4N | | | | | | | | | | | | | | | | | | | | 88 |
| 89 | | 4N | 4N | 4R, 4W | 4XW | | | | | | | | | | | | | | | | 89 |
| 90 | | 4½N | 4½N | 4W | 4½W | | | | | | | | | | | | | | | | 90 |
| 91 | | | 5N | 4½R | 4½XW | | | | | | | | | | | | | | | | 91 |
| 92 | | | 5N, 5½N | 5R | 5W | 5XW | | | | | | | | | | | | | | | 92 |
| 93 | | | 5½N | 5½N | 5½R, 6N | 5XW | | | | | | | | | | | | | | | 93 |
| 94 | | | 6N | 6½N | 5½R, 6½N | 5½W | | | | | | | | | | | | | | | 94 |
| 95 | | | | | 6½R | 6R, 5½XW | 5½XW | | | | | | | | | | | | | | 95 |
| 96 | | | | | 7N | 6W | 6W | | | | | | | | | | | | | | 96 |
| 97 | | | | | 7N, 7½N | 6W | 6½R | 6XW, 6½W | 6½W | | | | | | | | | | | | 97 |
| 98 | | | | | | 6½R | 7R | 6½W | 6½XW | 6½XW | | | | | | | | | | | 98 |
| 99 | | | | | | 7½N | 7R | 7W | 7XW | 7XW, 7½W | | | | | | | | | | | 99 |
| 100 | | | | | | 7½N | 7½R | 7½R, 7½W | 7½W | 7XW | | | | | | | | | | | 100 |
| 101 | | | | | | 8N | 8N | 7½W | 7½XW | 7½XW | | | | | | | | | | | 101 |
| 102 | | | | | | 8½N | 8R | 8W | 8W, 8½R | 8W | | | | | | | | | | | 102 |
| 103 | | | | | | | 8R | 8½N | 8½R, 8½W | 8XW, 8½W | 8XW | | | | | | | | | | 103 |
| 104 | | | | | | | 9N | 9R | 8½W | 8½XW | 8½XW | | | | | | | | | | 104 |
| 105 | | | | | | | 9½N | 9R | 9R | 9W | 8½XW | | | | | | | | | | 105 |
| 106 | | | | | | | | 9½N | 9½R | 9W | 9W | 9XW | | | | | | | | | 106 |
| 107 | | | | | | | | 10N | 9½R | 9½W | 9½W | 9XW | | | | | | | | | 107 |
| 108 | | | | | | | | 10N | 10½N | 10R | 10R | 9½XW | | | | | | | | | 108 |
| 109 | | | | | | | | | 10½N | 10R, 10½R | 10W | 10W | 10XW | | | | | | | | 109 |
| 110 | | | | | | | | | 11N | 10½R | 10½R | 10½R | 10½W | | | | | | | | 110 |
| 111 | | | | | | | | | | 11N | 10½R, 11N | 10½W | 10½W | | | | | | | | 111 |
| 112 | | | | | | | | | | 11½N | 11R, 11½N | 11R | 10½XW | 10½XW | | | | | | | 112 |
| 113 | | | | | | | | | | 11½N | 11R | 11W | 10½XW | 11XW | | | | | | | 113 |
| 114 | | | | | | | | | | 12N | 11R | 11½R | 11½W | 11½W | | | | | | | 114 |
| 115 | | | | | | | | | | | 11½R | 11½R, 12N | 11½W | 12R | 11½XW | | | | | | 115 |
| 116 | | | | | | | | | | | 12½N | 12R | 12R | 12W | 12W | | | | | | 116 |
| 117 | | | | | | | | | | | 12½N | 12½N | 12R | 12W | 12XW | 12XW | | | | | 117 |
| 118 | | | | | | | | | | | 13N | 13N | 12½R | 12½R | 12½W | 12½W | | | | | 118 |
| 119 | | | | | | | | | | | | 12½R | 12½R | 13R | 12½W | 12½XW | | | | | 119 |
| 120 | | | | | | | | | | | | 13½N | 13R, 13N | 12½W | 13W | 13W | | | | | 120 |
| 121 | | | | | | | | | | | | | 13½N | 13½R | 13½R | 13W | 13XW | | | | 121 |
| 122 | | | | | | | | | | | | | 14N | 13½R, 14W | 13½W | 13½W | 13½W | | | | 122 |
| 123 | | | | | | | | | | | | | 14N | 14R | 14R | 14W | 13½XW | | | | 123 |
| 124 | | | | | | | | | | | | | 14½N | 14R, 14½R | 14R, 14½R | 14W | 14W | | | | 124 |
| 125 | | | | | | | | | | | | | | 14½N | 14R | 14½R | 14½W | 14XW | | | 125 |
| 126 | | | | | | | | | | | | | | 15N | 14½R | 14½R | 14½R | 14½W | 14½XW | | 126 |
| 127 | | | | | | | | | | | | | | | 15R | 15R | 15R | 15W | 14½XW | | 127 |
| 128 | | | | | | | | | | | | | | | | | 15R, 15W | 15W | 15XW | | 128 |
| 129 | | | | | | | | | | | | | | | | | | | | 15XW | 129 |
| | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | |

# APPENDIX D. INSTRUCTION ON FITTING WOMEN'S SAFETY FOOTWEAR

DEPARTMENT OF THE NAVY
NAVY FLEET MATERIAL SUPPORT OFFICE
MECHANICSBURG, PA. 17055

AREA CODE 717
790 • EXT: 3222
AUTOVON 430 • EXT.

IN REPLY REFER TO:
FMSOINST 10120.134A
9923/ELT

JAN 10 1978

FMSO INSTRUCTION 10120.134A

From: Commanding Officer

Subj: Women's Safety Footwear

Ref: (a) DSAR 4235.18/NAVSUPINST 4400.70B

Encl: (1) Guide for Fitting and Matching Standard DOD Men's Safety Footwear Sizes with Women's Dress Shoe Sizes
(2) List of Sizes and NSNs for Men's Safety Boot
(3) List of Sizes and NSNs for Men's Conductive Shoe
(4) List of Sizes and NSNs for Men's Electrical Hazards Protective Shoe

1. Purpose. To provide data and revised procedures on subject footwear.

2. Cancellation. FMSO Instruction 10120.134.

3. Scope. This instruction is applicable to all ships and shore activities having requirements for women's safety footwear.

4. General

a. There are no safety shoes or boots in the supply system designed specifically for women. The previous methods of supply were requisitioning men's electrical hazards protective shoes from Defense Personnel Support Center (DPSC) and direct purchase of women's safety shoes and conductive shoes from commercial sources. Navy Clothing and Textile Research Facility has advised that commercially available women's safety footwear does not meet the American National Standards Institute requirements; therefore, this method of supply is discontinued.

b. All safety footwear requirements for Navy women will be met by requisitioning men's safety footwear from DPSC through normal requisitioning channels. Enclosure (1), which was developed by a combined effort of all the Military Services, shows the correlation between sizes of the women's dress shoe (NSN Series 8435-00-577-5206) and the following men's safety footwear.

(1) Men's Safety Boot (NSNs listed on enclosure (2)). This item should be worn when a general purpose safety shoe for toe protection only is required. NOTE: The men's standard chukka safety shoe (NSN Series 8430-01-032-2900) will afford the same protection. Size correlation shown in enclosure (1) is applicable.

(2) Men's Conductive Shoe (NSNs listed on enclosure (3)). This item should be worn by personnel in areas having conductive floors where a static discharge could ignite or detonate sensitive explosive materials, gas mixtures or flammable vapors.

(3) Men's Electrical Hazards Protective Shoe (NSNs listed on enclosure (4)). This shoe should be worn wherever the hazard of an electrical shock exists. It is designed to insulate against shock or prevent a direct path to ground if wearer steps on or comes in contact with an energized source.

5. Action. Ships and shore activities requiring women's safety footwear will:

a. Determine needs with the aid of enclosures (1) through (4).

b. For items listed on enclosures (2), (3) and (4), submit requisitions through normal requisitioning channels.

c. For sizes not carried in the supply system and not listed in enclosures (2), (3) and (4):

(1) Submit requisitions in accordance with the special measurement procedures outlined in reference (a).

(2) Forward FMSO (9923) a three year forecast of requirements, by size, not later than 1 March 1978. If total Navy requirements for a particular size warrants centralized procurement and stocking, FMSO will initiate action to have that size available in the supply system.

R. B. ABELE
By direction

Distribution:
X-1, Col 1
X-2, Col 1
X-3, Col 1 (Less Parts I, J, and L)
X-4, Col 1 (less Parts A, C, H, J, M, N, O, P, Q, R, and U)

Internal Distribution:
F, F1, F6, F20 (99, 992, 9923 - one copy each)

FMSOINS 10120.134A
JAN 10 1978

# GUIDE FOR FITTING AND MATCHING STANDARD DOD MEN'S SAFETY FOOTWEAR SIZES WITH WOMEN'S DRESS SHOE SIZES

## INSTRUCTIONS

1. The purpose of this size guide is to enable prospective female users and organizations to requisition suitably fitting men's safety footwear from the supply system. This will be done by checking women's dress shoe sizes (column 1) being worn against corresponding men's safety footwear sizes listed as first and second choices respectively in columns two and three.

2. For example, personnel wearing women's shoe size 5½B will usually be satisfactorily fitted either by a man's 4½R, the first choice, or by 5N, the second choice, safety footwear item. If the first choice does not fit, the customer should try the second choice. If the first and second choices do not fit, nearby sizes should be tried depending on the cause as follows: when the fit is too tight, the customer should be fitted with a wider size. Accordingly, a tight 5N should be exchanged for a wider 5R. When the fit of a 5N is loose, it should be exchanged for a 4½N; if 5N is too short, it should be replaced by 5½N. Sometimes several try-ons may be necessary before a satisfactory fit is achieved.

3. To facilitate a satisfactory fit and foot comfort when wearing safety footwear, female personnel should wear thick commercial socks or standard cushion sole black socks available from the supply system under NSN 8440-00-543-7777 (small); NSN 8440-00-543-7778 (medium) and NSN 8440-00-543-7779 (large).

4. Men's safety footwear in sizes 4 to 10, including half sizes and in widths XN, N, R, and W, should fit almost the entire Military female population. It is recognized, however, that all sizes are not currently stocked because no specific requirement has been established to date by the customer. In addition, some women with very small feet, requiring men's sizes 3½ or less, will not be able to be fitted. In such rare cases, it may be necessary to invoke the special measurement procedures outlined in DSAR 4235.18/NAVSUPINST 4400.70B.

Enclosure (1)

| SIZES (WOMEN) SHOES, WOMEN MIL-S-21711 | SIZES (MEN'S) DOD SAFETY FOOTWEAR FIRST CHOICE | SIZES (MEN'S) DOD SAFETY FOOTWEAR SECOND CHOICE |
|---|---|---|
| 4½B | 4N | 4XN |
| 4½C | 4N | 4½XN |
| 5A | 4½XN | 4½N |
| 5B | 4½N | 4½XN |
| 5C | 4½N | 4R |
| 5D | 4½R | 5N |
| 5½A | 4½N | 5XN |
| 5½B | 4½R | 5N |
| 5½C | 4½R | 5N |
| 5½D | 5R | 5½N |
| 6A | 5N | 5½XN |
| 6B | 5½N | 5R |
| 6C | 5½N | 5R |
| 6D | 5R | 5½N |
| 6½A | 5R | 5½XN |
| 6½B | 5R | 5½XN |
| 6½C | 5½R | 5W |
| 6½D | 5½R | 5W |
| 7AA | 5½N | 6XN |
| 7A | 5½R | 6½N |
| 7B | 5½R | 6½N |
| 7C | 6R | 5½R |
| 7D | 6½N | 7XN |
| 7½AA | 6XN | 5½N |
| 7½A | 6½N | 7XN |
| 7½B | 6R | 6½N |
| 7½C | 6½R | 7N |
| 7½D | 6½R | 7N |
| 8AA | 7XN | 6½N |
| 8A | 7XN | 6½N |
| 8B | 7N | 6½R |
| 8C | 7½N | 8XN |
| 8D | 7½R | 7R |

Enclosure (1)

| SIZES (WOMEN) SHOES, WOMEN MIL-S-21711 | SIZES (MEN'S) DOD SAFETY FOOTWEAR FIRST CHOICE | SIZES (MEN'S) DOD SAFETY FOOTWEAR SECOND CHOICE |
|---|---|---|
| 8½AA | 7XN | 7N |
| 8½A | 7N | 7½XN |
| 8½B | 7R | 7½N |
| 8½C | 7R | 7W |
| 8½D | 7½N | 8XN |
| 9AA | 8XN | 7½N |
| 9A | 8XN | 7½N |
| 9B | 7½R | 8R |
| 9C | 7½R | 8R |
| 9D | 8N | 8R |
| 10AA | 8½XN | 8½N |
| 10A | 8½N | 9XN |
| 10B | 8½R | 9N |
| 10C | 8W | 8½R |
| 10D | 8W | 8½R |

Enclosure (1)

## BOOT, SAFETY (MEN'S)

Black leather, high blucher, steel box toe, rubber heel and sole, nonskid and nonmarking, jet fuel resistant & water resistant, 8" high, MIL-B-21408.

| SIZE | STANDARD NSN | SIZE | STANDARD NSN |
|---|---|---|---|
| 5N | 8430-00-624-2151 | 9XN | 8430-00-624-2870 |
| 5R | 2155 | 9N | 2873 |
| 5W | 2186 | 9R | 2905 |
| 5XW | 2331 | 9W | 2918 |
| | | 9XW | 2961 |
| 5½N | 2332 | | |
| 5½R | 2333 | 9½XN | 2963 |
| 5½W | 2350 | 9½N | 2964 |
| 5½XW | 2459 | 9½R | 2980 |
| | | 9½W | 2983 |
| 6N | 2643 | 9½XW | 3022 |
| 6R | 2655 | | |
| 6W | 2658 | 10XN | 3130 |
| 6XW | 2659 | 10N | 3131 |
| | | 10R | 3135 |
| 6½N | 2662 | 10W | 3187 |
| 6½R | 2674 | 10XW | 3188 |
| 6½W | 2675 | | |
| 6½XW | 2721 | 10½XN | 3192 |
| | | 10½N | 3193 |
| 7N | 2722 | 10½R | 3197 |
| 7R | 2726 | 10½W | 3198 |
| 7W | 2727 | 10½XW | 3224 |
| 7XW | 2738 | | |
| | | 11XN | 3225 |
| 7½N | 2745 | 11N | 3246 |
| 7½R | 2746 | 11R | 3249 |
| 7½W | 2751 | 11W | 3256 |
| 7½XW | 2752 | 11XW | 3287 |
| | | | |
| 8XN | 2753 | 11½XN | 3288 |
| 8N | 2755 | 11½N | 3292 |
| 8R | 2756 | 11½R | 3313 |
| 8W | 2760 | 11½W | 3315 |
| 8XW | 2764 | 11½XW | 3341 |
| | | | |
| 8½XN | 2765 | 12XN | 3342 |
| 8½N | 2777 | 12N | 3343 |
| 8½R | 2797 | 12R | 3361 |
| 8½W | 2839 | 12W | 3362 |
| 8½XW | 2843 | 12XW | 3405 |

Enclosure (2)

| SIZE | STANDARD NSN |
|---|---|
| 12½XN | 8430-00-624-3410 |
| 12½N | 3417 |
| 12½R | 3429 |
| 12½W | 3456 |
| 12½XW | 3463 |
| 13XN | 3464 |
| 13N | 3465 |
| 13R | 3477 |
| 13W | 3478 |
| 13XW | 3514 |
| 13½XN | 3526 |
| 13½N | 3535 |
| 13½R | 3555 |
| 13½W | 3566 |
| 13½XW | 3576 |
| 14XN | 3673 |
| 14N | 3688 |
| 14R | 3717 |
| 14W | 3733 |
| 14XW | 3734 |

Enclosure (2)

## SHOE, CONDUCTIVE (MEN'S)

Black leather, oxford, steel box toe, rubber heel and sole, oil resistant, MIL-S-3794

| SIZE | STANDARD NSN |
|---|---|
| 5R | 8430-00-924-9319 |
| 5W | 9329 |
| 5XW | 761-3433 |
| 5½R | 761-3434 |
| 5½W | 3443 |
| 5½XW | 3355 |
| 6R | 761-3356 |
| 6W | 924-9451 |
| 6XW | 761-8773 |
| 6½N | 761-4204 |
| 6½R | 4205 |
| 6½W | 6922 |
| 6½XW | 6956 |
| 7XN | 761-6962 |
| 7N | 924-9649 |
| 7R | 9659 |
| 7W | 761-4187 |
| 7XW | 924-9666 |
| 7½XN | 761-4720 |
| 7½N | 4767 |
| 7½R | 3600 |
| 7½W | 3445 |
| 7½XW | 3444 |
| 8XN | 925-0083 |
| 8N | 0086 |
| 8R | 0109 |
| 8W | 0112 |
| 8XW | 0186 |
| 8½XN | 925-0189 |
| 8½N | 0211 |
| 8½R | 0229 |
| 8½W | 0230 |
| 8½XW | 0339 |

| SIZE | STANDARD NSN |
|---|---|
| 9XN | 8430-00-925-0431 |
| 9N | 0453 |
| 9R | 0454 |
| 9W | 0463 |
| 9XW | 0464 |
| 9½XN | 925-0467 |
| 9½N | 0468 |
| 9½R | 761-7834 |
| 9½W | 925-0482 |
| 9½XW | 0490 |
| 10XN | 925-0503 |
| 10N | 0508 |
| 10R | 0578 |
| 10W | 0617 |
| 10XW | 0629 |
| 10½XN | 925-0635 |
| 10½N | 0637 |
| 10½R | 0759 |
| 10½W | 0808 |
| 10½XW | 0859 |
| 11XN | 925-0860 |
| 11N | 0903 |
| 11R | 0904 |
| 11W | 0948 |
| 11XW | 0951 |
| 11½XN | 925-0952 |
| 11½N | 0953 |
| 11½R | 0954 |
| 11½W | 0955 |
| 11½XW | 0956 |

Enclosure (3)

| SIZE | STANDARD NSN |
|---|---|
| 12N | 8430-00-761-7028 |
| 12R | 925-1039 |
| 12W | 1076 |
| 12XW | 1090 |
| 13N | 925-1116 |
| 13R | 1148 |
| 13W | 1228 |

Enclosure (3)

## SHOE, ELECTRICAL HAZARDS PROTECTIVE (MEN'S)

Black leather, high top, steel box toe, rubber chloroprene heel and sole, oil resistant, MIL-S-43860

| SIZE | STANDARD NSN | | SIZE | STANDARD NSN |
|---|---|---|---|---|
| 4R | 8430-00-611-8314 | * | 8N | 8430-00-611-8699 |
| 4W | 8315 | * | 8R | 8701 |
| 4XW | 8322 | * | 8W | 8706 |
| | | | 8XW | 8718 |
| 4½R | 8324 | * | | |
| 4½W | 8327 | * | 8½N | 8725 |
| 4½XW | 8329 | * | 8½R | 8727 |
| | | | 8½W | 8734 |
| 5XN | 8330 | * | 8½XW | 8736 |
| 5N | 8331 | * | | |
| 5R | 8332 | * | 9N | 8744 |
| 5W | 8334 | * | 9R | 8747 |
| 5XW | 8648 | | 9W | 8753 |
| | | | 9XW | 8755 |
| 5½XN | 8338 | * | | |
| 5½N | 8342 | * | 9½N | 8763 |
| 5½R | 8344 | * | 9½R | 8774 |
| 5½W | 8345 | * | 9½W | 8775 |
| 5½XW | 8349 | * | 9½XW | 8776 |
| 6N | 8364 | * | 10N | 8777 |
| 6R | 8366 | * | 10R | 8778 |
| 6W | 8368 | * | 10W | 8779 |
| 6XW | 8380 | * | 10XW | 8780 |
| 6½N | 8649 | | 10½N | 8781 |
| 6½R | 8655 | | 10½R | 8782 |
| 6½W | 8663 | | 10½W | 8784 |
| 6½XW | 8673 | | 10½XW | 8785 |
| 7N | 8674 | | 11N | 8786 |
| 7R | 8675 | | 11R | 8813 |
| 7W | 8676 | | 11W | 8814 |
| 7XW | 8681 | | 11XW | 8816 |
| 7½N | 8682 | | 11½N | 8817 |
| 7½R | 8684 | | 11½R | 8822 |
| 7½W | 8694 | | 11½W | 8830 |
| 7½XW | 8696 | | 11½XW | 8832 |

Enclosure (4)

| SIZE | STANDARD NSN | |
|---|---|---|
| 12N | 8430-00-611-8834 | |
| 12R | 8835 | |
| 12W | 8836 | |
| 12XW | 8837 | |
| 12½N | 8432 | * |
| 12½R | 8464 | * |
| 12½W | 8465 | * |
| 13N | 8466 | * |
| 13R | 8493 | * |
| 13W | 8509 | * |
| 13½R | 8626 | * |
| 14R | 8633 | * |
| 14W | 8641 | * |

* Navy is not a registered user, and the NSN will not appear in the NMDL; however, the item may be requisitioned from DPSC through regular requisitioning channels.

Enclosure (4)

APPENDIX E

NAVY CLOTHING AND TEXTILE RESEARCH FACILITY
NATICK, MASSACHUSETTS 01760

WT
BOOTS, SAFETY WEAR TEST

Test Subject No. _____ Shoe Fitter _____

Name _____ Rank _____ Date _____

Age _____ Length of Service _____ Height _____ Weight _____

Organization _____

_____

Military Women's Shoe Size _____ Fitted Boot Size _____

1. The fit of my boots is:

   Just right _____ Slightly loose _____ Slightly tight _____

   Much too tight _____ Much too loose _____

   If much too tight or much too loose, please explain in space

   No. 3 below.

2. As to comfort, I find these safety boots:

   Excellent _____ Good _____ Average _____

   Fair _____ Poor _____

   If poor, please explain in space No. 3 below.

3. If you have other comments, complaints or suggestions, please write them in the space below; (i.e. Boots too long, too short, too tight, too narrow) _____

   _____

   _____

   _____

_____
Signature of Subject