

APPENDIX III. SPECIFICATIONS

HELMET, STEEL, M1

The following changes shall be made in Tentative Specification  
AXS - 645 (Rev. 1) dated February 25, 1942:

Page 1, Paragraph E-2a, delete and substitute:

"The helmet shall resist penetration by a 230 grain bullet at a velocity of 775 ft. per second ~~125~~ ft. per second, normal impact, when fired from a weapon or device approved by the contracting officer."

Page 2, Paragraph E-2b, including Fig. 1, delete and substitute:

"The depth of indent resulting from the impact mentioned above shall not exceed 1-1/2 inches."

Page 3, Paragraph F-3, delete.

Page 3, Paragraph F-5, delete and substitute:

"Weighing. - Two percent of the finished helmets of the lot shall be selected by the inspector and weighed."

Add Paragraph F-9:

"Rejection. - Failure to meet any of the above tests shall be cause for rejection of the lot."

Add Paragraph F-10:

"Retests. - Lots rejected may be submitted for retest. Only the test or tests in which the lot previously failed need be repeated. The number of helmets selected for retest shall be twice that of the original test."



## UNITED STATES PATENT OFFICE

2,448,753

HEAT-TREATING AND COLD-ROLLING  
HADFIELD MANGANESE STEEL

Carl W. Weesner, Warren, Ohio, and Wallace B. Leffingwell, Sharon, Elvan R. Babylon, New Wilmington, and Homer L. Schell, Sharon, Pa., assignors to Sharon Steel Corporation, Sharon, Pa., a corporation of Pennsylvania

No Drawing. Application December 16, 1943,  
Serial No. 514,548

10 Claims. (Cl. 148-12)

1 The invention relates to the manufacture of manganese steel strips and the like, and more particularly to the manufacture of thin gauge, cold rolled, high manganese, high carbon steel strips and the like adapted to be used among other purposes for making helmets for the armed forces.

Helmet steel must be soft, ductile and have deep drawing qualities in order that helmets may be properly formed or drawn to the desired shape from high manganese steel. High manganese or "Hadfield" steel, that is, steel containing from 10% to 20% manganese and from 1.00% to 1.50% carbon as thin as .044 to .033 inch, and cold rolled and heat treated is admirably suited for such purposes. However, extreme difficulties have been encountered and considerable damaged or scrap material has been made in attempts to manufacture such material.

Some of these difficulties and what is believed to be the explanation of the causes of the same are set forth in the copending Weesner and Leffingwell applications which have matured as Patents Nos. 2,368,955 and 2,410,322. However, the inventions described in said Weesner and Leffingwell patents are directed more particularly to ways and means of reclaiming or salvaging such damaged high manganese strip material.

The present invention involves the avoidance or elimination of the conditions which apparently cause the material to be damaged during the cold rolling and heat treatment thereof. Thus, the difficulties or damage apparently are caused in part by surface embrittlement resulting from decarburization.

In our early attempts at cold rolling and heat treating Hadfield strip two conditions were found associated with low ductility—first, carbide precipitation at grain boundaries, and, second, "frosty" surface, i. e. the frosty appearance resulting from innumerable small cracks developed by the Olsen ductility cup test.

We discovered that the carbide precipitation difficulties could be controlled by a very careful control of the cooling or quenching stage of the heat treatment step.

Tests made revealed that the frosty surface was accompanied by decarburization. Samples known to be frosty and decarburized were recarburized and heat treated very carefully under controlled laboratory conditions and then tested. After the recarburizing heat treatment, the frosty condition disappeared and the ductility as determined by the Olsen cup test, was materially increased. Thus, it was finally determined that

2 the "frosty" surface embrittlement is the result of decarburization.

In most steels, lowering the carbon content tends toward softness and ductility, but Hadfield steel behaves in a contrary manner. The ductility of Hadfield steel when present is due to its austenitic composition. When the carbon content is considerably lowered, the high manganese austenite is no longer stable on cooling, but tends to decompose, probably forming a brittle mixture of epsilon and alpha iron.

Unfortunately, it is hardly possible and not practical in the commercial manufacture of thin gauge high manganese, high carbon strip steel to recarburize material which has become decarburized, in order to correct the conditions found to exist, as shown by recarburization of samples in laboratory tests; so it became absolutely essential to find some way in which the decarburization during heat treatment could be eliminated.

The normal heat treating cycle for Hadfield steels includes heating the steel to a temperature above the upper critical point, approximately 1800° F. to 1900° F. and usually about 1850° F., and then quickly cooling the same, as set forth in said Weesner and Leffingwell patents.

We have discovered that Hadfield steel responds to heat treatment extremely rapidly and that the steel is completely austenitized almost instantaneously upon being heated to a high temperature of from 1900° F. to 2000° F. and preferably from 1950° F. to 2000° F. in a furnace in which the temperature is maintained in the hottest zone at approximately 2000° F.; and these furnace and steel temperatures are materially higher than those previously used for heat treating Hadfield steels.

We have further discovered that the extent of decarburization occurring in Hadfield steel which is the cause of the difficulties, is proportional to time and that if the steel is substantially instantaneously completely austenitized by extremely rapid heating to the high temperature of from 1900° F. to 2000° F. and then immediately quenched, insufficient time elapses for any appreciable amount of decarburization to occur. It is therefore possible by heating and quenching at high speeds, that is by carefully controlling the time and temperature of heating, to hold surface decarburization of Hadfield steel to such a minimum that no harmful effects result.

We have further discovered that the surface appearance of cold rolled heat treated Hadfield steel is no reliable index as to the presence or absence of surface decarburization or embrittle-



ment. If the heat treatment is carried out in a highly oxidizing atmosphere, there is a tendency to scale and "burn" the surface of the Hadfield steel strip at the same time that the decarburization and surface embrittlement occurs. Continued heating of Hadfield steel in a non-oxidizing neutral or moderately reducing atmosphere will produce a decarburized and brittle surface without appreciable scaling or marring of the surface. Thus, a good surface does not necessarily indicate good ductility or the absence of decarburization and surface embrittlement. Continued heating in a very reducing atmosphere, however, produces very little surface decarburization.

Test samples made in the laboratory from the same material were heated for 5 minutes at 1950° F. in three different atmospheres, water quenched and tested. The first sample was heated in a highly oxidizing atmosphere and when tested had a .390 Olsen cup test value with a "frosty" condition. The sample also had heavy decarburization with a rough surface, burned and scaled, and very brittle.

The second sample was heated in a moderately reducing atmosphere. When tested it had a .390 Olsen cup test value with a "frosty" condition. The surface was heavily decarburized and brittle, but the surface appearance was smooth.

The third sample was heated in a very reducing atmosphere and when tested had a .440 Olsen cup test value with no frost. The surface condition was smooth, there was very little decarburization and the sample was ductile.

Therefore, the character of the furnace atmosphere during the heat treatment is also an important factor in addition to the control of the time and temperature of heating. Unfortunately, in mill practice it is not feasible to maintain a highly reducing atmosphere in continuously heating cold rolled Hadfield steel strip as rapidly as it is necessary to do so followed by an immediate quench. For these reasons, it is only possible as a practical matter to control the furnace atmosphere such that it is non-oxidizing, neutral or moderately reducing, which can ordinarily be readily done in the operation of fuel fired continuous heat treating furnaces by a proper control of the burners and of the fuel air ratio. When the furnace atmosphere is thus controlled, and when the heat treating is very rapidly carried out, little if any surface decarburization, burning or scaling occurs.

Accordingly, it is an object of the present invention to provide a method of manufacturing thin gauge, cold rolled, high manganese, high carbon steel strips and the like without surface decarburization or embrittlement, so that the normal ductile properties of austenitic manganese steel may be obtained.

A further object of the present invention is to provide a method of making cold rolled, heat treated, high manganese steel in accordance with strip practice cold rolled to gauges as thin as .044 to .033 inches in thickness.

Furthermore, it is an object of the present invention to provide a new method of manufacturing cold rolled, high manganese steel strips and the like by which the resulting product has a good surface appearance, extreme toughness and strength, and high ductility and drawing qualities.

And finally, it is an object of the present invention to provide a new method of making cold rolled, light gauge, high manganese strip steel

and the like more quickly and more cheaply than it has been produced previously.

These and other objects may be obtained, the stated results achieved, and the described difficulties overcome by the methods, steps, products, treatments, and discoveries which comprise the present invention, a preferred outline of the steps being set forth in the following detailed description, and which are particularly and distinctly pointed out and set forth in the claims forming part hereof.

High manganese, high carbon strip steel of the "Hadfield" type is hot rolled down to the thinnest possible gauge to which it can be rolled without damaging the strip or hot mills, which may be approximately .109 inch in thickness, and the strip is then cooled and cooled in water as rapidly as possible to prevent carbide precipitation and decomposition. This cooling step following hot rolling is a departure from usual methods which do not ordinarily include such a step in connection with the manufacture of hot rolled strip.

The hot rolled strip is then continuously heat treated to take the carbides back into solution and to render the steel fully and uniformly austenitic. The heat treatment is performed in accordance with the discoveries of the present invention by substantially instantaneously completely austenitizing the steel by extremely rapid heating to a temperature of from 1900° F. to 2000° F., preferably in the latter half of said range, followed by immediate water quenching.

Thus, the heat treatment of 17/8" x .109" and of 15/4" x .109" hot rolled "Hadfield" steel has been successfully accomplished in accordance with the present invention in a 25 foot continuous heating furnace in which a non-oxidizing, neutral or moderately reducing atmosphere is maintained, and in which the furnace temperature is maintained at or above approximately 2000° F. The effective interior length of this furnace is approximately 23 feet and the hot rolled strip having the widths and gauge stated have been run at from 9 to 12 feet per minute through the furnace. The strip reaches a temperature close to the furnace temperature of approximately 1950 to 2000° F. at a point approximately 2 feet ahead of the furnace exit opening. The strip is then water quenched as quickly as possible by passing it into a water quenching bath immediately as it leaves the furnace.

As previously pointed out, the cycle of the extremely rapid heating followed by an immediate water quench occurs so quickly that there is no opportunity for surface decarburization of the material to occur.

The strip is then pickled in an inhibited sulphuric acid pickling bath, preferably an aqueous solution of about 10% sulphuric acid by weight in water operated at a temperature of about 150° F.; and the strip is then water sprayed, washed, steam jetted and dried in a hot air drier.

We have also discovered that the pickling step is somewhat critical and particularly the pickling temperature, because "Hadfield" steel burns or pits at a higher pickling temperature and the drying step is necessary to prevent rusting and to eliminate hydrogen for preventing hydrogen embrittlement.

The strip may then be cold rolled from the nominal .109 gauge down to .075 to .080 gauge (31% to 27% reduction, or about 27% reduction) on a four stand tandem cold rolling mill. Other types of cold rolling mills, however, may be used. The above operations of heating or annealing,



quenching, pickling and cold rolling are then repeated to reduce the strip from .075 to .080 gauge down to .050 to .055 gauge; and again to reduce the strip from .050 to .055 gauge down to .044 to .048 gauge to make the finished cold rolled material; or even again to reduce the strip from .044 to .048 gauge down to .033 to .038 gauge finished material.

The first intermediate anneal after the material has been cold rolled to from .075 to .080 gauge is carried out with a strip speed through the annealing furnace described of about 12 feet per minute; the second intermediate anneal or heat treatment is carried out at a strip speed through the furnace of about 18 feet per minute, the third intermediate anneal is carried out at a strip speed of about 30 feet per minute, and the last intermediate anneal is carried out at a speed of 30 feet per minute or higher.

Thus, in each instance, the heat treatment is carried out in the shortest possible time at the fastest possible rate of heating; and the quench is performed as quickly as possible after leaving the heat treating furnace.

The heat treating operations in each instance are controlled to accomplish several results: first, to recrystallize the cold rolled structure, second, to keep the carbides in solution, and third, to prevent surface decarburization or embrittlement. The heating to the high temperature between 1900° F. and 2000° F. recrystallizes the cold rolled structure, the immediate water quench keeps the carbides in solution, and the rapidity of heating and quenching prevents decarburization. The resulting material is fully and uniformly austenitic with carbides in solution, with the cold rolled structure recrystallized, and without any objectionable decarburized surface layers.

We have discovered that if for some reason the heat treating operation is slowed down, for instance, because of some failure of equipment, or of the necessity of stopping the line for welding one coil to another, thus permitting portions of the strip to lie in the furnace, these portions will have badly decarburized surfaces and these portions must be removed. However, the material therein may be reclaimed by treatment such as described in either of the Weesner and Leffingwell companion patents referred to.

While the process and product have been described in connection with the manufacture of strip steel or stripsheets made in accordance with strip practice, the present invention is also applicable to the manufacture of other high manganese steel products such as sheet steel, in accordance with sheet practice.

Accordingly, when the term "strips" is used herein and in the appended claims, the term is intended to include the manufacture of cold rolled, high manganese steel strips, stripsheets, sheets, wire and the like.

Also, when the term "high manganese steel" is referred to herein, it means steels of the "Hadfield" type, which generally contain from 10% to 20% manganese and from 1% to 1.5% carbon, with possible additions of small percentages of other alloying elements, such as nickel and chromium, which sometimes are added to "Hadfield" steels.

Thus, the present improvements and discoveries provide for the ready and economical manufacture of high manganese steel strips cold rolled to gauges as thin as .044 to .033 inches having extremely high ductility characteristic of

fully austenitic manganese steel, and without surface decarburization or embrittlement.

Having now described the features of the invention, an embodiment of steps by which the invention may be carried out, the advantages and results attained by the invention, and the new discoveries made in connection with the treatment of and cold rolling of high manganese steel; the new and useful methods, steps, treatments, arrangements and products, are set forth in the appended claims.

We claim:

1. The method of producing strong metal sheets of hot-rolled Hadfield manganese steel, which comprises, giving the hot-rolled sheets an austenitizing treatment by heating them to about 1900° F. and water-quenching them and cold-rolling the austenitized sheets to about 27% reduction.

2. The method of making cold rolled Hadfield manganese steel strip, less than 0.109" in thickness, having a fully and uniformly austenitic structure with carbides in solution, and being free of surface decarburization and embrittlement; which comprises, completely austenitizing 0.109" thick hot rolled Hadfield manganese steel strip by heating the strip as it moves continuously through a furnace to a strip temperature of 1900° F. to 2000° F., then before sufficient time has elapsed for the occurrence of surface decarburization quickly water quenching the continuously moving strip immediately as it leaves the furnace to keep the carbides in solution, and then cold rolling the strip down to 0.075" to 0.080" thick strip.

3. The method of making cold rolled Hadfield manganese steel strip, less than 0.109" in thickness, having a fully and uniformly austenitic structure with carbides in solution, and being free of surface decarburization and embrittlement; which comprises, completely austenitizing 0.109" thick hot rolled Hadfield manganese steel strip by heating the strip as it moves continuously through a furnace to a strip temperature of 1900° F. to 2000° F., then before sufficient time has elapsed for the occurrence of surface decarburization quickly water quenching the continuously moving strip immediately as it leaves the furnace to keep the carbides in solution, then cold rolling the strip down to 0.075" to 0.080" thick strip, and then repeating the heating, quenching and cold rolling operations until the strip is reduced to 0.044" to 0.033" thick material.

4. The method of making cold rolled Hadfield manganese steel strip having a fully and uniformly austenitic structure with carbides in solution, and being free of surface decarburization and embrittlement; which comprises, completely austenitizing Hadfield manganese steel strip by extremely rapidly heating the strip as it moves continuously through a furnace to a strip temperature of 1950° F. to 2000° F., then before sufficient time has elapsed for the occurrence of surface decarburization quickly water quenching the continuously moving strip immediately as it leaves the furnace to keep the carbides in solution, and then cold rolling the strip to about 25% reduction.

5. The method of making cold rolled Hadfield manganese steel strip having a fully and uniformly austenitic structure with carbides in solution, and being free of surface decarburization and embrittlement; which comprises, completely austenitizing Hadfield manganese steel strip by extremely rapidly heating the strip as it moves



continuously through a furnace to a strip temperature of 1950° F. to 2000° F., then before sufficient time has elapsed for the occurrence of surface decarburization quickly water quenching the continuously moving strip immediately as it leaves the furnace to keep the carbides in solution, then cold rolling the strip to about 25% reduction, and repeating the heating, quenching and cold rolling operations until the strip is reduced to 0.044" to 0.033" thick material.

6. The method of making cold rolled Hadfield manganese steel strip having a fully and uniformly austenitic structure with carbides in solution, and being free of surface decarburization and embrittlement; which comprises, completely austenitizing Hadfield manganese steel strip by extremely rapidly heating the strip in a non-oxidizing atmosphere as it moves continuously through a furnace to a strip temperature of 1950° F. to 2000° F. to substantially instantaneously obtain complete austenitization of the steel at said temperature, then before sufficient time has elapsed for the occurrence of surface decarburization quickly water quenching the continuously moving strip immediately as it leaves the furnace to keep the carbides in solution, and then cold rolling the strip to about 25% reduction.

7. The method of making cold rolled Hadfield manganese steel strip having a fully and uniformly austenitic structure with carbides in solution, and being free of surface decarburization and embrittlement; which comprises, completely austenitizing Hadfield manganese steel strip by extremely rapidly heating the strip in a non-oxidizing atmosphere as it moves continuously through a furnace to a strip temperature of 1950° F. to 2000° F. to substantially instantaneously obtain complete austenitization of the steel at said temperature, then before sufficient time has elapsed for the occurrence of surface decarburization quickly water quenching the continuously moving strip immediately as it leaves the furnace to keep the carbides in solution, and then cold rolling the strip to about 25% reduction, and repeating the heating, quenching and cold rolling operations until the strip is reduced to 0.044" to 0.033" thick material.

8. The method of making cold rolled Hadfield manganese steel strip, less than 0.109" in thickness, having a fully and uniformly austenitic structure with carbides in solution, and being free of surface decarburization and embrittlement; which comprises, completely austenitizing 0.109" thick hot rolled Hadfield manganese steel strip by extremely rapidly heating the strip continuously during 21 feet of strip travel at from 9 to 12 feet per minute in a non-oxidizing atmosphere in a furnace to a strip temperature of 190° F. to 2000° F., then before sufficient time has elapsed for the occurrence of surface decarburization quickly water quenching the continuously moving strip immediately as it leaves the furnace to keep the carbides in solution, and then cold rolling the strip to 0.075" to 0.080" thick strip.

9. The method of making cold rolled Hadfield manganese steel strip having a fully and uniformly austenitic structure with carbides in solution and being free of surface decarburization and embrittlement; which comprises, hot rolling Hadfield manganese steel strip to the thinnest possible hot rolled gauge, then rapidly water cooling the strip, then completely austenitizing the steel by extremely rapidly heating the strip as it moves continuously through a furnace to a strip temperature of 1950° F. to 2000° F., then before sufficient time has elapsed for the occurrence of surface decarburization quickly water quenching the continuously moving strip immediately as it leaves the furnace to keep the carbides in solution, and then cold rolling the strip to about 25% reduction.

10. The method of making cold rolled Hadfield manganese steel strip having a fully and uniformly austenitic structure with carbides in solution and being free of surface decarburization and embrittlement; which comprises, hot rolling Hadfield manganese steel strip to the thinnest possible hot rolled gauge, then rapidly water cooling the strip, then completely austenitizing the steel by extremely rapidly heating the strip as it moves continuously through a furnace to a strip temperature of 1950° F. to 2000° F., then before sufficient time has elapsed for the occurrence of surface decarburization quickly water quenching the continuously moving strip immediately as it leaves the furnace to keep the carbides in solution, then cold rolling the strip to about 25% reduction, and then repeating the heating, quenching and cold rolling operations until the desired cold rolled gauge is obtained.

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HOMER L. SCHELL.

#### REFERENCES CITED

The following references are of record in the file of this patent:

#### UNITED STATES PATENTS

Number	Name	Date
938,893	Potter	Nov. 2, 1909
1,017,904	Potter	Feb. 20, 1912
1,344,392	Hadfield	June 22, 1920
1,462,460	Apgar	July 17, 1923
1,851,903	Hall	Mar. 29, 1932
1,929,356	Janitzky	Oct. 3, 1933
2,368,955	Weesner et al.	Feb. 6, 1945
2,378,991	Franks	June 26, 1945

#### OTHER REFERENCES

"High Manganese Austenitic Steels," reprinted from "The Iron Age" issue of Oct. 1, 1942, Electro Metallurgical Co., N. Y. C.

"Alloys of Iron and Chromium," vol. II, Kinzell and Franks, 1940, pp. 289, 438, 442, and 443.

"Metals Handbook," 1939 ed., pages 1133, 1134, 1135, and 568.



QUARTERMASTER CORPS  
TENTATIVE  
SPECIFICATION

C.Q.D. No. 65B  
2 August, 1943  
Superseding C.Q.D. No. 65A  
July 17, 1942

LINER, HELMET, M-1\*  
(Stock No. 74-L-72)

A. APPLICABLE SPECIFICATIONS

A-1. The following specifications and drawings, of the issue in effect on date of invitation for bids, shall form a part of this specification:

A-1a. Federal Specifications.-

CCC-T-191 - Textiles; General Specifications, Test Methods  
UU-P-271 - Paper; Kraft, Wrapping, Waterproofed

A-1b. U.S. Army Specifications.-

3-1 - Paints and Related Materials; General Specification for  
Inspection and tests.

57-136 - Steel, Carbon and Alloy, Sheets and Strips

A-1c. Quartermaster Corps Tentative Specifications.-

OQMG-93 - Boxes, Fibreboard, Corrugated and Solid  
OQMG-94 - Specifications for Marking Outside Shipping Containers  
by Contractors

A-1d. Tank-Automotive Center Tentative Specification.-

TAC ES-No. 680 - Protective Coating Materials; Synthetic Type

A-1e. Quartermaster Corps Drawings.-

2-1-35 - Liner, Helmet, M-1

2-1-36 - Straps, Suspension, chin, details, Liner, Helmet, M-1

B. TYPE, SIZE AND GRADE.

B-1. Type.- This specification covers one type of liner, helmet, M-1.

B-2. Size.- Shall be as shown in drawings.

B-3. Grade.- Shall be "Firsts".

C. MATERIAL AND WORKMANSHIP.

C-1. Material.-

C-1a. Liner Body.- Shall be of laminated phenolic resin impregnated fabric, of substantially uniform density, coated on its exterior with a coating conforming to requirements of Section E.

\*This is approved nomenclature.



OQMG PACKING SPECIFICATION NO. CE-1  
Revised 20 July 1943

74

B

59

Stock No.

for

BAND, LINER, HELMET, M-1, HEAD, NEW TYPE

Relative shipping data shown are approximate  
and are not a part of the specifications.

1. Overseas Packing Specification and Relative Shipping Data.

a. Specification.

- (1) Packaging and Packing. Six hundred (600) bands shall be packed for domestic shipment as specified in paragraph 2a (1) (2) and (3) except box liner may be omitted, and then overpacked either in a snug fitting nailed wood box as specified in (a) below or in a snug fitting fibreboard box as specified in (b) below.

- (a) When a nailed wood box is used for overpacking, it shall be Style 2, 2 $\frac{1}{2}$ , 3 or 4 conforming with Federal Specification NN-B-621a, except as follows:

1. Thickness of lumber used in the sides, top and bottom shall be not less than 1/2 inch.
2. Thickness of lumber used in the ends shall be not less than 3/4 inch.
3. Cleats shall be not less than 3/4 inches thick and 2-1/4 inches wide.
4. All nails, not clinched, shall be cement coated.

Before overpacking the domestic fibreboard box (Grade 4), the nailed wood box shall be lined with waterproof kraft paper conforming with Federal Specification E-UU-P-271, Type C. The paper shall be of sufficient size as to overlap at all edges not less than three (3) inches including folddown after inserting domestic fibreboard box.

- (b) When a fibreboard box is used for overpacking, it shall conform with Quartermaster Corps Tentative Specification OQMG No. 93, Style RSC, Type CF or SF, Grade 3, and constructed and closed as follows:

1. Flaps of the outer Grade 3 box shall be so located as to cover the ends of the inner Grade 4 box.
2. Flaps of the box shall be securely sealed with a water-resistant adhesive throughout the entire area of contact



TOLERANCE ON DIMENSIONS  
 NOT OTHERWISE SPECIFIED  
 DECIMAL  $\pm$  —  
 FRACTIONAL  $\pm$  1/32"  $\pm$   
 ANGULAR  $\pm$  —  
 I.D. No. 12

NOTE: A GOOD FASTENER THAT FULFILLS THE REQUIREMENTS OF THE SPECIFICATIONS MAY BE USED ON SUBMISSION OF SAMPLE TO AND APPROVAL THEREON BY THE CONTRACTING OFFICE. ALL POCKET FASTENERS SHALL BE CAPABLE OF WITHSTANDING 5000 POUNDINGS AND UPFASTENINGS WITHOUT IMPAIRMENT OF USEFULNESS.  
 STYLE SHOWN IS LIMITED CARB "SUGMA DOT FASTENER".

STEEL, ELECTRO-ZINC PLATED, DEPOSIT NOT LESS THAN .00025" THICK

FASTENER  
COMMERCIAL 16 LINE

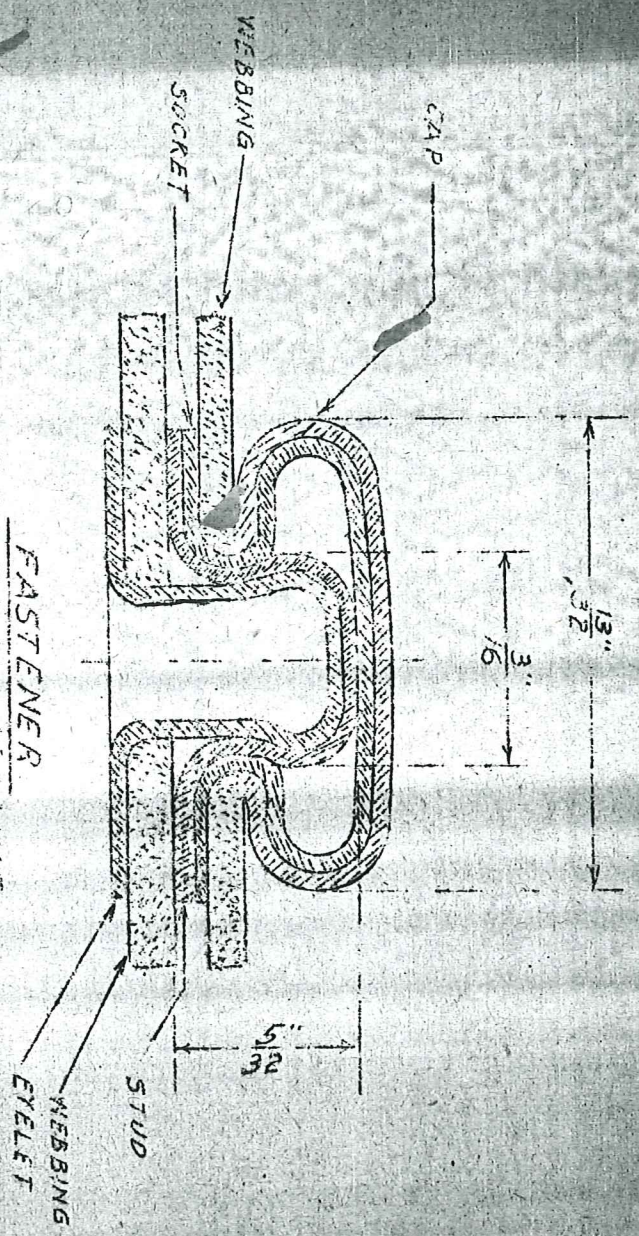


FIGURE 1



QUARTERMASTER CORPS  
TENTATIVE  
SPECIFICATION

C.Q.D. No. 64A

July 17, 1942.

Superseding C.Q.D. No. 64

June 11, 1942.

NECK-BAND, FOR LINER, HELMET, M-1

A. APPLICABLE SPECIFICATIONS.

A-1. The following specifications and drawing of the issue in effect on date of invitation for bids, shall form a part of this specification:

A-1a. Federal Specifications.

LLL-B-631 - Boxes; fiber, corrugated.

LLL-B-656 - Boxes; fiber, solid.

UU-P-271 - Paper; kraft, wrapping, waterproofed.

CCC-T-191 - Textiles; general specifications, test methods.

A-1b. United States Army Specification.

100-2 - Standard specifications for marking shipments.

A-1c. Quartermaster Corps Drawing.

2-1-36 Straps, Suspension, Chin, Details,  
Liner, Helmet, M-1.

B. TYPE, SIZES AND GRADE.

B-1. Type. - This specification covers one type of neck-band, for liner, helmet, M-1.

B-2. Sizes. - The neck-bands shall be in three sizes as shown in drawing.

B-3. Grade. - Shall be "Firsts".

C. MATERIAL AND WORKMANSHIP.

C-1. Material:

C-1a. Webbing. - Shall be made of cotton having sufficient length of staple to meet the following requirements. The cotton shall be thoroughly cleaned, carded and combed; the yarns evenly spun and twisted, and mercerized. The weave shall be two up and two down, Single Herringbone Twill, firmly and tightly woven;



Width	Maximum Weight per Linear Yard	Minimum Threads		Minimum Breaking Strength (Grab Method)	Maximum Stretch	Yarn Sizes (Combed Mercerized)	
Inches	Ounces	Full Width	Per Inch	Pounds		Percent	
		Total Warp	Filling	Warp	Filling		
1-1/8	0.40	118	30	Jaws 3" apart 200	Jaws 1/2" apart 140	3	20/2 20/4

C-1b. Color.— The color shall be Olive Drab, No. 3, vat dyed, non-toxic and shall show "good fastness" to rubbing (crocking), perspiration and water when subjected to tests as given in Federal Specification CCC-T-191.

C-1c. Fastener, Snap.— Shall conform in design, materials, and finish to Fig. 1, herein.

C-2. Substitution of Materials.—

C-2a. See Section H.

C-3. Workmanship.— The neck-band, for Liner, Helmet, M-1, shall be accurately made in conformity with drawing and specifications listed in Section A; and as specified herein. The finished article shall be clean, well made, and free from any defects which may affect appearance or serviceability.

D. GENERAL REQUIREMENTS.

D-1.— See Section E.

E. DETAIL REQUIREMENTS.

E-1. General.— All detail requirements for the manufacture of the finished article and its component parts shall be as shown by applicable drawing, and as specified herein.

E-2. Webbing.— Shall conform to the physical requirements given in Table under C-1a.

E-3. Finish of Fastener, Snap.— Shall be plated as defined in Fig. 1, herein.



E-4. Identification Stamping.— Each neck-band, assembly, shall be stamped, on the webbing side, with indelible ink, in small but legible characters, to show contract number and initials or name of contractor.

E-5. Contractor's Inspection.— The contractor shall inspect all finished articles for compliance with this specification prior to submitting them to the United States Government for final inspection.

#### F. METHODS OF SAMPLING, INSPECTION AND TESTS.

F-1. Sampling.— Samples of any material, components, etc., not furnished by the United States Government, entering into the manufacture of the article covered herein shall be selected from time to time by the Government inspector and carefully examined and tests made to determine if they are in accordance with the drawing and specifications listed in Section A.

F-2. Inspection.— Inspection may be made throughout the entire process of manufacture. The passing as satisfactory of any detail of construction or material shall not relieve the contractor of responsibility for faulty workmanship or material which may be discovered at any time prior to final acceptance. Final inspection of the finished articles shall be made either at point of production or at point of delivery designated in the contract or purchase order of procuring agency. In case of factory inspection, every facility shall be afforded inspectors by the manufacturer, for the prosecution of their work.

#### F-3. Tests.—

F-3a. Webbing.— Shall be tested in accordance with applicable requirements of Federal Specification CCC-T-191.

F-3a(1). Stretch of Webbing.— The percentage of stretch shall be the average results obtained on 5 test specimens, full width and 6 inches in length. The test specimens shall be immersed in both the acid and alkaline solutions required for fastness to perspiration and the wet specimens suspended from one end in room temperature 77°F. 45°F., and a one pound weight shall be attached to the free end of each specimen, and the specimens allowed to dry. When dry, the length of each specimen shall be measured and recorded. The stretch shall be expressed as the percentage increase in length of the five specimens.

#### G. PACKAGING, PACKING AND MARKING.

G-1. Packaging.— Twenty-five neck-bands of one size shall be tied in a bundle, one tie around center of the bundle and sufficiently tight to prevent any neck-band from slipping out of the bundle.

G-2. Packing.— Forty-eight bundles of 25 neck-bands of one size (1200 each) shall be packed four bundles wide by two bundles long by six tiers high, in a new fiberboard carton, approximately 11 inches long by 7 inches wide by 7 inches high inside measurements. The carton may be either corrugated style 1 of Federal Specification on LLL-B-631, with combined thickness of facings or less than .028 inch, with outer face not less than .012 inch, or solid fiber, Style A of Federal Specification LLL-B-636 with combined thickness of board not less than .055 inch and either board to have a bursting strength of not less than 175 pounds, with joint lapped and stitched or taped with three inch fibered tape. Prior to packing each carton shall be lined with a waterproof C.C.D. No. 64A



QUARTERMASTER CORPS  
TENTATIVE  
SPECIFICATION

C.Q.D. No. 63C

10 February 1944

Superseding C.Q.D. No. 63B

6 October 1943

BAND, LINER, HELMET, M-1, HEAD, NEW TYPE\*  
(Stock No. 74-B-59)

A. APPLICABLE SPECIFICATIONS.

A-1. The following specifications, of the issue in effect on date of invitation for bids, shall form a part of this specification:

A-1a. Federal Specifications.-

CCC-T-191 - Textiles; General Specifications, Test Methods  
V-T-276 - Thread; Cotton

A-1b. U. S. Army Specifications.-

3-1 - Paints and Related Materials, General Specifications for  
Inspection and Tests, including color card supplement  
thereto.  
57-136 - Steel, Carbon and Alloy, Sheets and Strips.

A-1c. Quartermaster Corps Tentative Specifications.-

OQMG-CE-1 - Packing Specifications, for Band, Liner, Helmet,  
M-1, Head, New Type  
OQMG-94 - Specifications for Marking Outside Shipping  
Containers by Contractors

B. TYPE AND SIZE.

B-1. Type.- This specification covers one type of head-band assembly, for use in liner, helmet, M-1, or liner, helmet (parachutists) M-1.

B-2. Size.- Shall be as shown in Figure I hereof.

C. MATERIAL AND WORKMANSHIP.

C-1. Material.-

C-1a. Webbing.- Shall be made of cotton having sufficient length of staple to meet the requirements of this specification. The cotton shall be thoroughly cleaned, carded and combed; the yarns evenly spun and twisted, and mercerized. The weave shall be two up and two down, Single Herringbone Twill, firmly and tightly woven. The webbing shall conform to requirements shown in the following table:

\*This is the approved nomenclature.



Width	Maximum Weight Per Linear Yard	Minimum Threads	Minimum Breaking Strength (Grab Method)	Maximum Stretch	Yarn Sizes (Combed Mercerized)
Inches	Ounces	Full Width	Per Inch	Pounds	Percent
		Total Warp	Filling	Warp	Filling
1-1/8	0.40	118	30	Jaws 3 inches apart	Jaws 1/2 inch apart
+ 0					
- 3/64				200	140
				3	20/2: 20/4

C-1b. Color.— The color shall be Olive Drab, No. 3, vat dyed, non-toxic and shall show "good fastness" to rubbing (crocking), perspiration and water when subjected to applicable tests in Federal Specification CCC-T-191.

C-2. Leather.— The leather shall be vegetable tanned, full grain calfskin, free from defects which may impair the leather or materially affect the cutting value of the skin or the serviceability of the headband cut therefrom. (See Par. E-3.) The leather shall yield the weight and thickness specified without splitting the hide after tanning; and shall be firm but free from bony or hard spots and shall be pliable and suitable for the purpose intended, and conform to the following requirements: (See Par. H-1b(1).)

C-2a. Tannage.— The leather shall be well beamed, bated, and vegetable tanned.

C-2b. Color.— Grain and flesh sides shall be natural color.

C-2c. Weight. Shall be not less than 1 1/2 ounces nor more than 2 1/2 ounces on a standard leather gauge, "Woburn" or equal, and shall cut into headbands averaging 2 ounces.

C-2d. Tensile Strength.— Shall be not less than 2,000 pounds per square inch of cross-section area.

C-2e. Fat Liquoring.— The leather shall be fat-liquored to contain not less than 6 percent pure oils on the bone dry weight.

C-2f. Water Resistance.— The leather shall not be permanently affected nor lose its flexibility when wet with cold water and air dried. (See Section F.)

C-2g. Ash.— The leather shall contain no fillers and no salts unessential to its quality, nor an ash content of more than 2 percent.

C-2h. Acidity.— The pH shall not be lower than 3.00 or more than 5.00.

C-2i. Elongation.— The ultimate elongation shall be not less than 25 percent nor more than 45 percent when tested on a specimen taken parallel to the backbone.



C-2j. Tear Test.-- The stitch tear resistance of the leather shall be not less than 600 when tested in accordance with Par. E-4b(5).

C-2k. Cracking.-- Leather shall not crack on the grain side when folded through 180 degrees.

C-2l. Finish.-- The leather shall be finished on the grain side with a bright natural water-resistant finish. The flesh side shall be retained in the natural tannage and snuffed to a smooth surface.

C-3. Thread, Cotton.-- Shall be No. 24/4, conforming to requirements for Type I, 1 A 3, of Federal Specification V-T-276 and be vat dyed Olive Drab, Shade Q of U. S. Army Standard Color Card and shall show "good fastness" to rubbing (crocking), perspiration, or water when subjected to tests, for such requirement in Federal Specification CCC-T-191.

C-4. Buckle, Bar and Clips.-- Shall conform in designs and materials as shown in Figure II heretof. Finish shall conform to requirements of Par's E-5a and E-5b.

C-5. Substitution of Materials.--

C-5a. See Section H.

C-6. Workmanship.-- The band, liner, helmet, M-1, head, new type, assemblies shall be accurately made in conformity with Figures I and II, and specifications listed in Section A; and as specified herein. The finished article shall be close well made, and free from any defects which may affect appearance or serviceability.

#### D. GENERAL REQUIREMENTS.

D-1. Samples for Approval.-- Before production is commenced, unless otherwise specified in invitation for bids, 5 finished band, liner, helmet, M-1, head, new type, assemblies, shall be submitted to the contracting office for approval.

#### E. DETAIL REQUIREMENTS.

E-1. General.-- All detail requirements for the manufacture of the finished article and its component parts shall be as shown in Figures I and II, and as specified herein.

E-2. Webbing.-- Shall conform to requirements of Par. C-1a. Shall be cut to length, the ends pinked and cemented as shown in Figure I.

E-3. Leather Band.-- Shall be cut from leather specified in Par. C-2 and shall be free from defects which may affect its serviceability. The grain side of the band shall be commercially clear. Slight surface or open scratches, or grain cuts to a minor degree, slight iron or salt stains will be permitted. Grain cracks will not be acceptable. The flesh side of a band shall be free from loose flesh except to a minor degree, adjacent to the ends. Slight flesh cuts or scratches will be permitted. Deep wrinkles, excessively soft spots or exceedingly loose sponge or flanky leather shall not be acceptable. The cleaning up of excessive stains or oil spots will be permissible if done in a manner that shall not affect the strength of the leather.



E-4. Stitching.- The leather shall be stitched to the webbing using not less than 12 nor more than 14 stitches per inch. The webbing shall be stitched to the buckle with a box stitch. All stitching shall be lock-stitch (stitch Type 301) and as shown in Figure I.

E-5. Finish on Buckle and Clip.-

E-5a. Buckle.- The buckle shall be finished with a chemically deposited oxidized finish (bluish black), the oxidizing finish being of the following formula and methods of application:

Formula -

Copper carbonate	- - - - -	1 pound
Ammonium hydroxide (commercial)	- - - - -	1 quart
Water	- - - - -	3 quarts

Method of application -

Thoroughly clean article to be finished by any satisfactory commercial method. Add the water after the copper carbonate and the ammonia have been thoroughly mixed. Use at a temperature of 175° F., and immerse the work until the color is obtained (usually from 1/2 to 1 minute). There must be excess copper carbonate.

E-5b. Clips.- The fabricated steel clips shall be thoroughly cleaned with an approved type of cleaner as used in best commercial practice and washed to remove all traces of grease, oil, dirt, scale, rust and foreign matter. The articles shall then be given an electro-plated zinc coating. The thickness of the zinc coating shall be not less than 0.00025 inch thick and free from porosity and cracks. After zinc plating and in order to provide a satisfactory base for enamel, all clips shall be given a uniformly satisfactory phosphate coating or chemical pre-treatment (Bonderizing, Parkerizing, or equivalent), which shall further serve as a rust inhibitor and aid corrosion resistance, and provide a toothed surface to aid adhesion of the enamel coat.

E-5c. Urea Formaldehyde Baking Coating.- The clips, after being prepared as required by Par. E-5b shall be finished with a urea formaldehyde baking coating intended for use on zinc coated steel articles, which shall be applied to the prepared clips in such acceptable manner that when baked on in accordance with recommendation of the manufacturer, maximum properties will be obtained. There shall be no peeling, cracking, blushing, checking, wrinkling or blistering under the test described in Par. F-4d for finished clips. (See Par. H-2.)

E-5c(1). Color and Luster.- Shall be an Olive Drab, No. 319, lusterless, conforming to Color Card Supplement to U. S. Army Specification No. 3-1.

E-6. Forming and Assembly.- The head-band, assembly, shall be so constructed that it shall fit any suspension hammock, when properly installed, and be comfortable to the wearer.

E-7. Identification Stamping.- Each head-band, assembly, shall be stamped, on the webbing side, with indelible ink, in small but legible characters, to show the contract number and initials or name of the contractor.



## METHODS OF SAMPLING, INSPECTION AND TESTS.

F-1. Sampling.- Samples of any material, components, etc., not furnished by the United States Government, entering into the manufacture of the article covered herein shall be selected from time to time by the Government inspector, and carefully examined and tests made to determine if they are in accordance with the drawing and specifications listed in Section A.

F-2. Inspection.- Inspection may be made throughout the entire process of manufacture. The passing as satisfactory of any detail of construction or material shall not relieve the contractor of responsibility for faulty workmanship or material which may be discovered at any time prior to final acceptance. Final inspection of the finished articles shall be made either at point of production or at point of delivery designated in the contract or purchase order of procuring agency. In case of factory inspection, every facility shall be afforded inspectors by the manufacturer for the prosecution of their work.

F-3. Contractor's Inspection.- The contractor shall inspect all finished articles for compliance with this specification prior to submitting them to the United States Government for final inspection.

### F-4. Tests.-

F-4a. Thread and Webbing.- Shall be tested in accordance with applicable requirements of Federal Specification CCC-T-191.

F-4a(1). Stretch of Webbing.- The percentage of stretch shall be the average results obtained on 5 test specimens, full width and 6 inches in length. The test specimens shall be immersed in both the acid and alkaline solutions required for fastness to perspiration and the wet specimens suspended from one end, in room temperature 77°F.  $\pm$  5°F., and a one-pound weight shall be attached to the free end, full width, of each specimen, and the specimens allowed to dry. When dry, the length of each specimen shall be measured and recorded. The stretch shall be expressed as the percentage increase in length of the 5 specimens.

### F-4b. Leather.-

F-4b(1). Thickness.- Shall be determined by a "Burn" leather gauge, or equivalent.

F-4b(2). Tensile Strength.- Breaking strength in pounds shall be determined on any suitable tension testing apparatus having an accuracy of 1-1/2 percent within the range of 200 to 800 pounds. The speed of the moving head of the machine shall be 9 inches  $\pm$  2 inches per minute when running free. Dumb-bell-shaped specimens shall be cut with a steel die. The specimens shall have an over-all length of 6 inches and a maximum width at the shanks of 1-1/4 inches. The neck shall be not less than 1/4 inch wide and shall be of uniform width for 2-1/2 inches, or 1-1/4 inches on each side of center. The shanks shall be connected to the neck by fillets of double curvature, the curvature next to the shank being of 1 inch radius; that next to the neck being 7/8 inch radius. The die cut test specimens shall be measured for thickness at three places spaced equidistant along the neck. The gauge used shall have a foot 1/4 inch diameter, and shall apply a load of 2 pounds. A minimum of 3 measurements shall be used in computing the cross-section area of the specimen. The tensile strength, in pounds per square inch shall be computed for each specimen and the minimum and the average for all specimens recorded.



F-4b(3). Elongation.-- Dumb-bell-shaped specimens as described under F-4b(2) shall be used. Gauge marks 2 inches  $\pm 0.01$  inch apart shall be stamped on each specimen, the mark centered on the specimen and made by a method that will not injure the leather. The specimen shall be tested in testing apparatus as used for tensile strength. The gauge marks shall be measured by means of dividers and a steel scale to the nearest fiftieth of an inch. The thickness of the specimen shall be measured as in F-4b(2) above, and the load required to produce a stress of 2,500 pounds per square inch shall be computed. When the indicator on the machine shows that the load has reached this computed amount, the distance between the gauge shall again be measured immediately. The distance between the gauge marks, minus the original distance, divided by the original distance, multiplied by 100, is the percent of elongation or stretch. The elongation shall be computed for each specimen, and the average of all recorded.

F-4b(4). Water Resistance.-- Sample specimens not less than 1 inch wide by 6 inches long shall be immersed in water at room temperature,  $77^{\circ}\text{F.} \pm 5^{\circ}\text{F.}$ , for 24 hours, removed and suspended in air at room temperature to air-dry after which the specimens shall show no evidence of having been permanently affected nor loss of flexibility.

F-4b(5). Tear Test.-- Punch 2 small holes in the test specimen not larger than to admit a soft wire of from 0.025 to 0.050 inch in diameter. Place the holes  $1/4$  inch apart and  $1/4$  inch from the edge of the specimen. Loop the wire through 2 holes and measure the load required to pull the wire through the leather by placing the specimen in one jaw of a suitable testing machine and the two ends of the wire in the other jaw. The load in pounds, divided by the thickness of the leather of the specimen, in inches, shall give a minimum of 600 when the pull on the specimen is applied in the direction parallel to the backbone.

F-4b(6). Ash.-- Ignite 5 grams of leather to a constant weight in a muffle furnace at  $1112^{\circ}\text{F.} \pm 75^{\circ}\text{F.}$  Cool in desiccator, weigh, and report as percentage of ash.

F-4b(7). Acidity, pH.-- Weigh 5 grams of leather into a chemically resistant glass flask, add 100 ml of distilled water and stopper flask tightly. Agitate mixture well immediately and allow to stand for not less than 4 hours, nor more than 18 hours. Agitate mixture, allow to settle 10 minutes, and determine pH of decanted extract with a glass electrode at room temperature,  $77^{\circ}\text{F.} \pm 5^{\circ}\text{F.}$

F-4c. Finished Buckles.-- Shall be a bluish black color throughout.

F-4d. Finished Clips.--

F-4d(1). Cold Water Resistance.-- Immerse two or more finished clips in distilled water,  $75^{\circ} - 80^{\circ}\text{F.}$ , for 24 hours. There shall be no wrinkling or blistering visible to the eye immediately upon removal of the specimens from the water. The test specimens shall be allowed to air-dry for 24 hours after removal from the water, after which they shall be indistinguishable from duplicate parts not subjected to the test.

F-4d(2). Boiling Water Resistance.-- Immerse two or more finished clips for 15 minutes, in distilled water, maintained at  $212^{\circ}\text{F.}$  There shall be no wrinkling or blistering visible to the eye immediately upon removal of the specimens from the water. The test specimens shall be allowed to air-dry for 24 hours, after which they shall be indistinguishable from duplicate parts not subjected to the test.



F-4d(3). Petroleum Solvent Resistance.- Immerse two or more finished clips in petroleum solvent for 16 hours at 77° - 80° F. The petroleum solvent shall have a 60° straight aniline point and a boiling range of 150° to 250° F. There shall be no wrinkling or blistering visible to the eye immediately upon removal of the specimens from the petroleum solvent. The coating shall be no more than slightly affected when examined two hours after removal from petroleum solvent. The test specimens shall be allowed to air-dry for 24 hours, after which they shall be indistinguishable from duplicate parts not subjected to the test.

F-4d(4). Saturated Steam.- There shall be no softening, change in appearance or adhesion of the urea formaldehyde coating on test specimens after exposure to saturated steam at 17 pounds of pressure per square inch (253° F.) for 30 minutes in an autoclave.

F-4d(5). Resistance to 20% Salt Spray Solution.- There shall be no change in appearance of the urea formaldehyde coating and no red rust on finished clips subjected to a 20% salt spray solution for 50 hours. A slight amount of white corrosion will be allowed on edges or teeth of clips. The test specimens shall have been air-dried for at least 7 days after baking prior to testing. The salt spray test shall be in accordance with requirements of U. S. Army Specification No. 3-1, except that finished clips shall be tested and a 20% salt spray shall be used. (See Par. H-3.)

#### G. PACKAGING, PACKING AND MARKING.

G-1. Unless otherwise specified in invitation for bids, contract or order, all bands, liner, helmet, M-1, head, new type, shall be packaged and packed in accordance with requirements of OQIG Specification No. CE-1 for bands, liner, helmet, M-1, head, new type (Stock No. 74-B-59).

G-2. Marking.- Unless otherwise specified in invitation for bids, contract or order, under which shipment is made, each shipping container shall be plainly marked in accordance with requirements of OQIG Specification No. 94.

#### H. NOTES.

##### H-1. Substitute Materials.-

H-1a. In the event of an emergency, and subject to the approval of the contracting officer, substitution of materials will be permitted as follows:

When such substitutions are permitted, the extent of the substitution shall be as indicated in invitation for bids.

##### H-1b. Substitution for Calfskin.-

H-1b(1). When in the opinion of the contracting officer, there is insufficient supply of calfskin available, whole kip skins or kip sides may be substituted, providing the requirements herein for calfskin are complied with.

##### H-1c. Substitution for Webbing.-

H-1c(1). When in the opinion of the contracting officer, Double or Triple



Herringbone Twill webbing is available or can be obtained more rapidly, either or both will be acceptable, providing the webbing otherwise conforms to requirements herein. In the event it becomes difficult to obtain "Combed Mercerized Yarn", then webbing manufactured with "Carded Mercerized Yarn" in the warp only, will be considered, provided such webbing shall conform to physical requirements in Par. C-1a.

H-2. Substitute Finish on Clips.- Requirements of Par's E-5 to E-5c(1) inclusive may be disregarded if so desired, and the following alternate finish substituted on clips only:

- a. Fabricated steel clips shall be Bonderized or Parkerized and then organically coated as follows:
  - (1) Two coats of phenol formaldehyde (applied by centrifuge) and baked on at 250° F., for fifteen minutes.
  - (2) One coat of zinc chromate impregnated with phenol formaldehyde (applied by centrifuge) and baked for fifteen minutes at 250° F.
  - (3) One coat of clear phenol formaldehyde (applied by centrifuge) and baked at 300° F., for thirty minutes.
- b. Color shall be an Olive Drab. However, the above finish will show considerable luster and thereby vary slightly from the lusterless olive drab.
- c. All finished clips shall withstand all tests in Par's. F-4c to F-4c(5) inclusive.

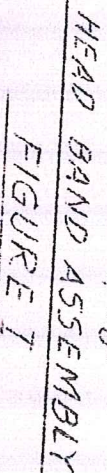
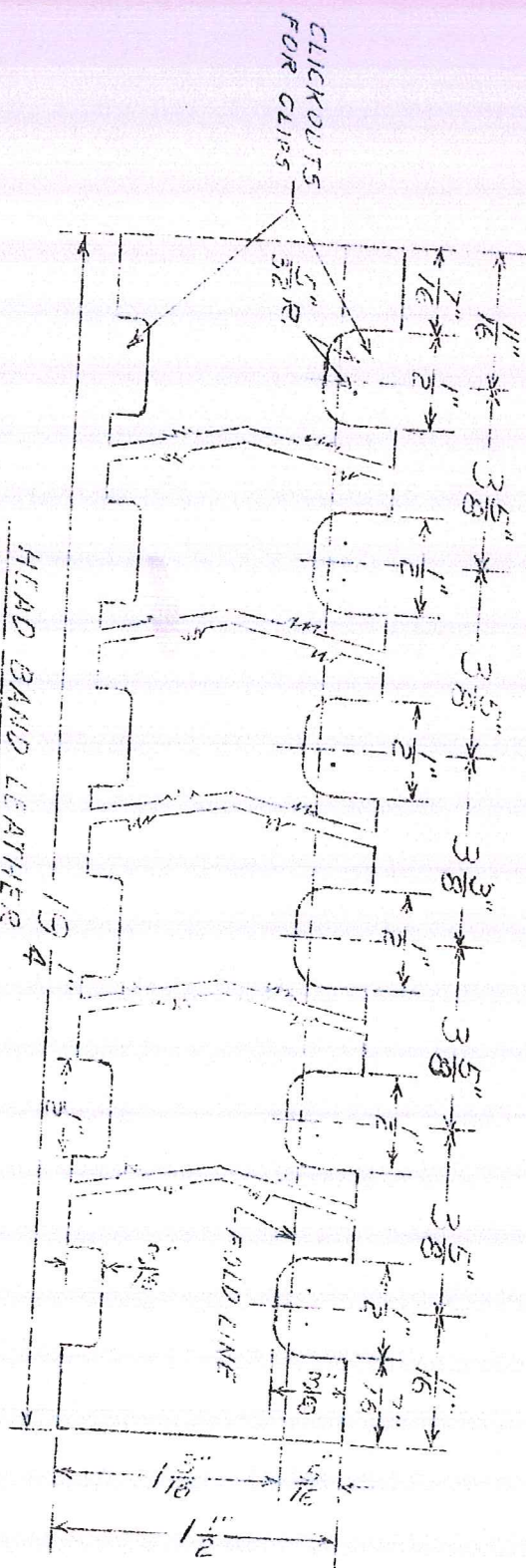
H-3. The salt spray method as described in U. S. Army Specification No. 3-1, is the method described in A S T M Specification B 117-39T.

NOTICE.- When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data, is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use or sell any patented invention that may in any way be related thereto.

NOTE:- Unless otherwise specified in invitation to bid or purchase order, copies of this specification may be obtained at the following point:

Chicago Quartermaster Depot  
1812 West Pershing Road  
Chicago 9, Illinois







**QQ-B-611a**

**AMENDMENT-1**

**MAY 27, 1944**

**SUPERSEDING**

**AMENDMENT-3**

**March 13, 1943**

**FEDERAL STANDARD STOCK CATALOG**

**Section IV**

**(Part 5)**

**FEDERAL SPECIFICATION**

**FOR**

**BRASS, COMMERCIAL: BARS, PLATES, RODS,  
SHAPES, SHEETS, AND STRIPS**

This amendment was approved on the above date by the Director of Procurement, for the use of all departments and establishments of the Government, and shall become effective not later than Aug. 1, 1944. It may be put into effect, however, at any earlier date after promulgation.

The following changes shall be made in Federal Specification QQ-B-611a, dated 27 April 1938:

Page 1:

Sec. B. Delete section in its entirety and substitute:

**B. COMPOSITIONS AND FORMS.**

B-1. This specification covers commercial brass in the following forms and compositions:

**Rods:**

- Composition A, for forging.
- Composition B, soft and half-hard, free-cutting.
- Composition D, free-cutting.

**Bars:**

- Composition A, for forging.
- Composition B, free-cutting.
- Composition D, free-cutting.

**Shapes:**

- Composition A, for forging.
- Composition B, soft, free-cutting.
- Composition C, various tempers.
- Composition D, free-cutting.



**QQ-B-611a**

**APRIL 27, 1938**

**SUPERSEDING  
Fed. Spec. QQ-B-611  
March 1, 1932**

**FEDERAL STANDARD STOCK CATALOG**

**Section IV**

**(Part 5)**

**FEDERAL SPECIFICATION**

**FOR**

**BRASS, COMMERCIAL; BARS, PLATES, RODS,  
SHAPES, SHEETS, AND STRIPS**

This specification was approved on the above date by the Director of Procurement, for the use of all departments and establishments of the Government, and shall become effective not later than December 15, 1933. It may be put into effect, however, at any earlier date after promulgation.

**A. APPLICABLE FEDERAL SPECIFICATION.**

**A-1.** The following Federal Specification, of the issue in effect on date of invitation for bids, shall form a part of this specification:  
QQ-M-151—Metals; General Specification for Inspection of.

**B. COMPOSITIONS AND FORMS.**

**B-1.** This specification covers commercial brass in the following forms and compositions:

Rods and bars:

Composition A, for forging.

Composition B, soft and half-hard, free-cutting.

Composition D, soft and half-hard, free-cutting.

Shapes:

Composition A, for forging.

Composition B, soft and half-hard, free-cutting.

Composition C, various tempers.

Composition D, various tempers.

Plates, sheets, and strips:

Composition C, various tempers.

Composition D, various tempers.

Composition E, various tempers.



**U. S. ARMY  
SPECIFICATION**

**No. 6-185C**

**OCTOBER 1, 1941**

**SUPERSEDING**

**No. 6-185B**

**APRIL 22, 1939**

**No. 16109-A**

**August 15, 1940**

**WEBBING, COTTON, NATURAL, OR IN COLORS**

**A. APPLICABLE SPECIFICATIONS.**

A-1. The following specifications of the issue in effect on date of invitation for bids, shall form a part of this specification:

A-1a. Federal specification:

CCC-T-191—Textiles; General Specifications, Test Methods.

A-1b. U. S. Army specifications:

19-60—Paper; Kraft, Duplex, Waterproof, Flat, and Creped.

23-54—Box and crate for Domestic Shipment, Air Corps Supplies and Equipment.

100-2—Standard Specifications for Marking Shipments.

**B. TYPES AND GRADES.**

B-1. *Type*.—Webbing, cotton, natural, or in colors, shall be of the following types as specified:

Type I—Lightweight.

Type II—Mediumweight (hard texture).

Type IIa—Mediumweight (soft texture).

Type IIb—Medium heavyweight.

Type III—Heavyweight.

Type IV—Extra heavyweight.

Type V—Special use.

Type VI—Air Corps.

B-2. *Grade*.—Shall be "Firsts."

**C. MATERIAL AND WORKMANSHIP.**

C-1. *Material*.—The cotton used in the manufacture of this webbing shall have sufficient length of staple to meet the requirements of this specification. The cotton shall be thoroughly cleaned and carded (combed yarns acceptable), the yarns evenly spun and twisted.

C-2. *Workmanship*.—The webbing shall be evenly constructed, firmly and tightly woven, and free from any defects affecting appearance or serviceability.

**D. GENERAL REQUIREMENTS.**

D-1. See section E.

**E. DETAIL REQUIREMENTS.**

E-1. *Color*.—The color of the webbing shall be as specified in the invitation for bids, natural, bleached, or in colors. If the webbing is dyed, it shall be yarn dyed (except types I and IIa which may be piece-dyed) and shall show "fair fastness" to light, weather, and laundering. The stuffer warp may be undyed. The use of sulphur colors is prohibited.



**QQ-M-151a**

**NOVEMBER 27, 1936**

**SUPERSEDING**  
Fed. Spec. QQ-M-151  
June 28, 1932

**FEDERAL STANDARD STOCK CATALOG**

**Section IV**

(Part 5)

**FEDERAL SPECIFICATION**

**FOR**

**METALS; GENERAL SPECIFICATION  
FOR INSPECTION OF**

This specification was approved by the Director of Procurement for the use of all departments and establishments of the Government, and shall become effective not later than November 1, 1937. It may be put into effect, however, at any earlier date after promulgation.

**I. SCOPE.**

1. This specification covers requirements which are common to all detail specifications for metals unless specifically excepted in the detail specification. It does not describe the material or article but provides means for determining whether the material or article conforms to the detail requirements. Individual requirements for the material or article are given in the detail specification.

**II. APPLICATION.**

**2. Application.—**

2a. This specification shall form a part of each Federal specification and each specification issued by any department of the United States Government when reference is made thereto in the detail specification or contract.

2b. For administrative reasons Navy Department purchases will be made under the issue in effect on date of invitation for bids of Navy Department General Specifications for Inspection of Material, Appendix II (Metals).

3. *Precedence.*—Should any conflicts exist between the requirements of the contract, the drawings, the detail specification, or this specification, the requirements of the contract, the drawings, the detail specification, and this specification, shall prevail in the order named.

**III. DUTIES AND RESPONSIBILITIES OF THE CONTRACTOR.**

4. *Subcontracts.*—The contractor shall be responsible for compliance with all the requirements of the contract, drawings, and specifications, whether the material is manufactured by him or a subcontractor.



U. S. ARMY  
SPECIFICATION

No. 6-185C  
October 1, 1941  
Amendment No. 1.  
August 1, 1942.

WEBBING, COTTON, NATURAL OR IN COLORS.

1. Section E of this specification is changed as follows:-

a. Table I, Type V Webbing -

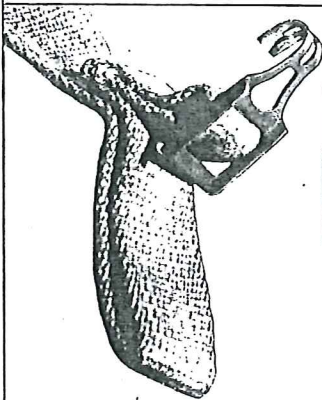
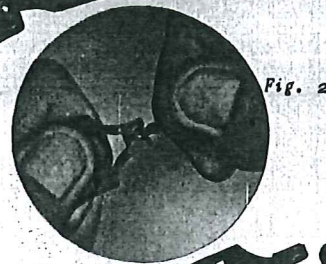
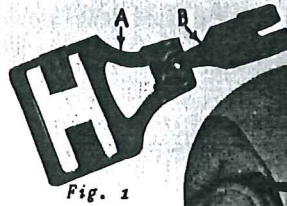
In column "Filling" for 2-1/4 inch webbing only,  
delete figure "30" and substitute figure "28".



**CHIN STRAP RELEASE, T1  
(For Helmet, M1)**

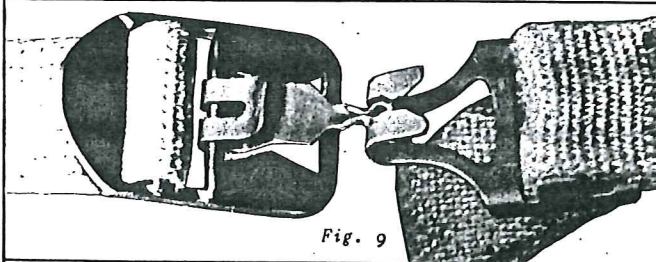
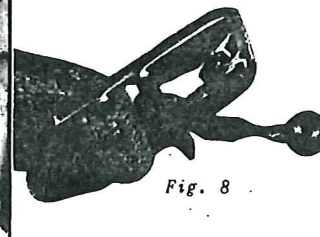
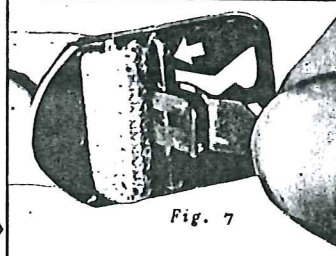
*This release is designed to prevent injury to the wearer's neck, by the chin strap due to forces on the helmet from concussion or sudden impact.*

Separate spring hook (A) from ball tongue (B) by grasping each part firmly and pulling apart (Figs. 2 and 3).



Spread old hook prongs (Fig. 4), work loose and then pull out of strap loop. If no tools are available, spread hook by using edge of helmet. Insert new hook in same position. Open ends only are inserted in loop, (Figs. 5 and 6). Remove no other parts from strap.

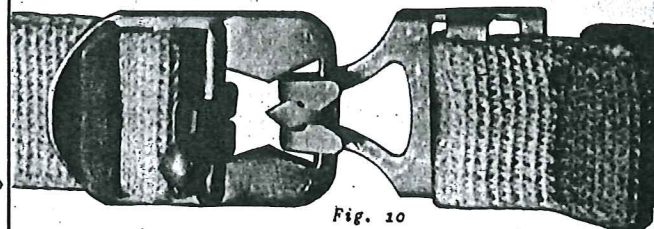
Grasp ball tongue at the ball end, insert in buckle opening (Fig. 7), and pull upward so that it hooks around cross bar (arrow). Ball tongue should rest on outside of buckle (Fig. 8).



To set chin strap in automatic release position, insert ball tongue into hook slot and pull tight (Fig. 9).

After assembly of release to chin strap, engage and pull apart ten times to insure smooth operation.

**WARNING** - When helmet is being worn **DO NOT** fasten strap by hooking spring onto buckle. **CONCUSSION WILL NOT RELEASE CHIN STRAP IN THIS POSITION** (Fig. 10).





QUARTERMASTER CORPS  
TENTATIVE  
SPECIFICATION

C.Q.D. No. 66  
July 17, 1942

LINER, HELMET, (PARACHUTISTS) M-1

A. APPLICABLE SPECIFICATIONS.

A-1. The following specifications and drawings, of the issue in effect on date of invitation for bids, shall form a part of this specification:

A-1a. Federal Specifications.-

KK-L-271 - Leather; Strap, Black and Russet  
KK-S-416 - Skins; Chamois  
V-T-276 - Thread; Cotton  
CCC-T-191- Textiles; General Specifications, Test Methods  
LLL-B-631- Boxes; Fiber, Corrugated  
LLL-B-636- Boxes; Fiber, Solid  
UU-P-271 - Paper; Kraft, Wrapping, Waterproofed.

A-1b. U. S. Army Specifications.-

100-2 - Standard Specifications for Marking Shipments  
51-136 - Steel, Carbon and Alloy, Sheets and Strips

A-1c. Quartermaster Corps Drawings.-

2-1-35 - Liner, Helmet, M-1  
2-1-36 - Straps, Suspension, chin, details,  
Liner, Helmet, M-1  
2-1-37 - Strap, Chin, Parachutists, Details and Assembly,  
Liner, Helmet, M-1

B. TYPE, SIZE AND GRADE.

B-1. Type.-- This specification covers one type of liner, helmet,  
(parachutists) M-1.

B-2. Size.-- Shall be as shown in drawings.

B-3. Grade.-- Shall be "Firsts".

C. MATERIAL AND WORKMANSHIP.

C-1. Material:-

C-1a. Liner Body.-- Shall be of laminated phenolic resin impregnated fabric, of substantially uniform density, coated on its exterior with a coating conforming to requirements of Section E.

C-1b. Findings.-- See drawings and Section E.



C-1c. Leathers.-

C-1c(1). Leather, Calf.- The calf leather for 1/2 inch adjustable chin strap shall be full-grained calf skin, free from brands, cuts, grub holes, open scratches, deep wrinkles, and other defects which may impair the appearance or serviceability. The leather shall yield the weight and thickness specified on drawings without splitting the hide, and shall be soft, pliable, and suitable for the purpose intended, and conform to the requirements in Section E.

C-1c(1)a. Tannage.- The leather shall be well beamed, bated, and vegetable tanned.

C-1c(1)b. Color.- Grain side shall be Army russet.

C-1c(1)c. Tensile Strength.- Shall be not less than 3,000 pounds and an average of not less than 3,500 per square inch of cross-section area.

C-1c(1)d. Fat Liquefying.- The leather shall be fat-liquored to contain not less than 6 percent pure oils on the bone dry weight.

C-1c(1)e. Water Resistance.- The leather shall not be permanently affected nor lose its flexibility when wet with cold water and air dried.

C-1c(1)f. Ash.- The leather shall contain no fillers and no salts unessential to its quality, nor an ash content of more than 2 percent.

C-1c(1)g. Acidity.- The pH shall not be lower than 3.00 or more than 5.

C-1c(1)h. Elongation.- The ultimate elongation shall be not less than 25 percent nor more than 40 percent when tested on a specimen taken parallel to the backbone.

C-1c(1)i. Tear Test.- The stitch tear resistance of the leather shall be not less than 800 when tested, in accordance with paragraph F-3k(8).

C-1c(1)j. Cracking.- Leather shall not crack on the grain when folded through 180 degrees.

C-1c(1)k. Finish.- The leather shall be finished on the grain side with a bright water resistant finish. The flesh side shall be retained in the natural tannage and snuffed to a smooth surface.

C-1c(2). Leather, Strap.- The strap leather for moulded chin strap shall be vegetable tanned, conforming to Grade A, Classes II and III of Federal Specification KK-L-271.

C-1c(2)a. Finish.- Shall be full grain, and may be slightly snuffed and finished with a bright water resistant finish. The flesh side shall be natural tannage and free from loose fibers and flesh so as to make an adequate base for a secure bond with the chamois lining.

C-1c(2)b. Color.- Grain side shall be Army russet.



C-1c(3). Skins, Chamois.-- The lining for concave portion of the leather chin straps shall be chamois tanned, conforming to requirements of Federal Specification KK-S-416.

C-1c(3)a. Weight.-- The weight of the finished chamois liner, shall be not less than 1-1/2 and not more than 2 ounces (Woburn gage, or equivalent).

C-2. Webbings.-- Shall be made of cotton having sufficient length of staple to meet requirements of this specification. The cotton shall be thoroughly cleaned, carded and combed; the yarns evenly spun and twisted. The webbings shall be evenly constructed, firmly and tightly woven and free from defects.

C-2a. 5/8 inch Webbing.-- Shall be medium weight, hard texture, plain weave with two warp threads weaving as one, except at the selvages there shall be three warp threads weaving singly, and conform to requirements of Table I:

TABLE I,  
MEDIUM WEIGHT, HARD TEXTURE

Width	Minimum Weight Per Linear Yard	Minimum Threads Per Inch	Minimum Breaking Strength (Grab Method)	Yarn Sizes (Combed Mercerized)	
Inches	Ounces	Filling	Pounds		
5/8	0.40	14	Full Width	Warp	Filling
			Jaws 3 inches apart 200	10/5	10/5

C-2b. 1-1/8 inch Webbing.-- The weave shall be two up and two down, Single Herringbone Twill, mercerized, and shall conform to requirements of Table II.

TABLE II,  
SINGLE HERRINGBONE TWILL

Width	Maximum Weight Per Linear Yard	Minimum Threads		Minimum Breaking Strength (Grab Method)	Maximum Stretch	Yarn Sizes (Combed Mercerized)	
Inches	Ounces	Full Width	Per. Inch	Pounds	Percent		
1-1/8	0.40	Total Warp	Filling	Warp Filling	3	Warp	Filling
		118	30	Jaws 3 inches apart 200 Jaws 1 1/2 inch apart 140		20/2	20/4



C-2c. Color.- The color of all webbing shall be Olive Drab, No. 3, vat dyed, and shall show "good fastness" to rubbing (crocking), perspiration, and water when subjected to tests as given in Federal Specification CCC-T-191.

C-3. Thread.- The sewing thread shall be of a color to match the webbing on which used, and shall be 20/4 cotton thread, conforming to requirements of Type 1, 1A3 of Federal Specification V-T-276, and show "good fastness" to rubbing (crocking), perspiration, and water when subjected to tests as given in Federal Specification CCC-T-191.

C-4. Lace, Shoe.- Shall be tubular, lisle twist, mercerized yarn, and have a breaking strength of not less than 120 pounds per lace, single strand method. Ends shall be cemented with waterproof, non-toxic, material to prevent raveling.

C-4a. Color.- Shall conform to par. C-2c.

C-5. Metal Components.- Shall conform in design, materials and finishes shown in drawing listed in Section A. Finishes shall also conform to requirements in Sections E and F.

C-5a. Urea Formaldehyde Baking Coating.- See Paragraphs E-22b and F-3m.

C-5b. Fasteners, Snap.- The snap fastener component parts utilized on neck-band suspension shall conform to Figure 1, incorporated herein. The bottom and socket components utilized on liner body shall conform to drawing No. 2-1-37.

C-6. Substitution of Materials:-

C-6a. See Section H.

C-7. Workmanship.- The liner, helmet, (parachutists) M-1, shall be made in conformity with drawing listed in Section A, and this specification; shall be clean, well finished, and free from any defects which may affect appearance or serviceability.

C-7a. Eyelets, Rivets and Studs.- Shall be firmly set down and peened, or rolled in such manner that there shall be no looseness between liner body, eyelets, rivets, studs, or assembled parts after assembly; nor shall these components be set so tightly as to crush the structure of the liner body.

#### D. GENERAL REQUIREMENTS.

D-1. This specification covers the manufacture of a helmet liner body (parachutists) together with a web hammock suspension assembly, neck-band suspension assembly, 1/2 inch chin strap assembly and moulded chin strap and webbing assembly, all as shown on applicable drawings, all of which shall be properly installed in the liner body (parachutists). Although the drawings contain details of a web and leather head-band and a web-neck-band, these two component parts are not to be included with the helmet, liner, (parachutists) M-1, unless otherwise specified in invitation for bids.



E-11. Moisture Sorption and Dimensional Stability of Liner Body.-

E-11a. Uncoated Liner Body.- An uncoated liner body shall not increase in weight more than 5 percent and the mean diameter and mean thickness shall not increase more than 0.5 percent and 0.002 inch, respectively, when immersed in water for 24 hours at 77°F. ~~140°F.~~, when removed from the water and dried in a forced draft oven at 140°F. ~~150°F.~~, for 24 hours, the decrease in weight from wet weight shall not exceed 6 percent and decrease in mean diameter and mean thickness of the body shall not exceed 0.5 percent and 0.002 inch, respectively. Testing of the uncoated liner body shall take place not less than 8 hours after removal from mold and shall be exactly as it comes from the mold, except for removal of flash from and application of approved protective coating finish to the exposed edge.

E-11b. Coated Liner Body.- A coated liner body shall not increase in weight more than 5 percent when immersed in water for 24 hours at 77°F. ~~140°F.~~ There shall be no peeling, cracking, blushing, checking, blistering, or other failure of surface coating when examined 4 hours after removal from water. The liner body shall be dried in a forced draft oven at 140°F. ~~140°F.~~, for 24 hours and the decrease in weight from wet weight shall not exceed 6 percent.

E-12 Ball Test.-

E-12a. Uncoated Liner Body.- An uncoated liner body without suspension shall withstand impact force of an 8 pound iron ball of approximately 3.9 inch diameter, dropped on its top at a distance of 22-1/2 inches, or 15 foot pounds impact. Deflection on impact shall not exceed more than 1.25 inches. The permanent deformation shall not exceed more than 0.1 inch. There shall be no fabric break, splintering or delamination on impact. The 8 pound iron ball shall be dropped again on its top at a distance of 30 inches or 20 foot pounds impact. There shall be no fabric break, splintering or delamination of the liner body, but the surface may be dented.

E-12b. Coated Liner Body.- A coated liner body tested as described in par. E-12a shall show no flaking, cracking, peeling, checking, blistering, loss of adhesion or other failure of coating.

E-13. Resistance to Delousing Treatment.-

E-13a. Uncoated Liner Body.- Shall withstand saturated steam at 17 pounds per square inch, (253°F.), for 30 minutes without substantial change in dimensions, physical characteristics, and appearance which would affect the serviceability of the liner body.

E-13b. Coated Liner Body.- A coated liner body tested as in E-13a shall show no flaking, cracking, peeling, checking, blistering, loss of adhesion or other failure of the coating, one-half hour after removal from the autoclave. There shall be no tackiness of surface immediately upon removal from autoclave.



E-14. Flammability.- The phenolic resin impregnated fabric shall consist of either non-flammable or slow burning material. The rate of burning shall not exceed 4 inches per minute.

E-15. Flexibility.- There shall be no breaking, cracking, delamination of the liner body when subjected to the flexing test described under Section F-3f.

E-16. Weather Resistance.- A cut section of the coated liner body shall be subjected to a recognized standard weather test for a period of time comparable to one year's Florida sun exposure. At the end of that time there shall be no blushing, cracking, checking, blistering, peeling, loss of adhesion or other failure of surface disregarding edge effect. The fading of color shall be slight.

E-17. Ballistics Impact Resistance.- The liner body shall be placed inside a standard helmet, steel, (parachutists) M-1, body, with full suspension installed in liner and shall be mounted on a wooden head. A .45 caliber pistol with regular Army ball type ammunition shall be fired at the steel helmet, one normal to the helmet at the right temporal, one normal to the helmet at the left temporal, and one normal to the helmet at the occipital region thereof. The velocity of impact shall be approximately 790 feet per second. There shall be considerable indentation of the steel, but no penetration. If there is penetration, test shall be reconducted with another steel helmet. The liner body shall show only fracture within areas of impact with no fragmentation in any instance. If fabric is torn, there shall be no loose particles. There shall be no flaking off of interior finish in this test.

E-18. Suspension Impact Test.- See par. F-3c.

E-19. Chin Straps.- The liner, helmet, (parachutists) M-1, shall be fitted with two chin straps, one 1/2 inch adjustable leather chin strap, and one moulded leather chin strap with webbing assembly. The leathers in the chin straps shall conform to requirements in Section C.

E-19a. 1/2 Inch Adjustable Chin Strap.- The 1/2 inch adjustable leather chin strap assembly shall conform to drawing 2-1-36.

E-19b. Forming Moulded Chin Strap.- The strap leather shall be die cut to shape and pressed to form a permanent cupped depression therein, and the holes for buckle tongue, cleanly punched in each end as shown in drawing 2-1-37. The chamois lining shall be firmly attached to the concave flesh side of the formed leather with a waterproof non-toxic adhesive and held under pressure until the adhesive is set so as to insure a tight bond between the two pieces.

E-19c. Edging and Finishing.- All edging, finishing, etc., of the two leather chin straps shall be done in an accurate, neat, and workmanlike manner.

E-20. Suspension Assembly and Neck-band Suspension.- The liner body shall be fitted with a hammock suspension assembly and a neck-band suspension as shown in applicable drawing.



E-21. Webbings.- Shall conform to requirements of Section C.

E-21a. Perforations for Buckle-Tongue and Rivets.- The instrument or tool used to perforate holes in the webbing through which the tongue of the buckle or the rivets are inserted shall have a round tapered point to prevent intentional cutting of threads in the webbing.

E-21b. Stitching.- The 5/8 inch webbing strips, after insertion of buckle, shall be secured at points indicated on drawing, with a 5/8 inch webbing stay stitched on, as shown in drawing, with a single lock stitch (stitch type 301) using not less than 10 nor more than 12 stitches per inch.

E-22. Finish of Steel Hardware Components.- All steel hardware component parts shall be plated, treated and/or coated as defined in applicable drawings, to provide consistent and maximum abrasion and corrosion resistant properties and provide required final color.

E-22a. Preparation of Articles for Coating.- The fabricated steel components (except garter stud and snap fasteners) after being zinc plated shall be given a uniform Bonderizing, Parkerizing or equivalent rust inhibitor treatment to provide a satisfactory resistance to corrosion or rust and provide a suitable base for urea formaldehyde baking coating, (see Section F).

E-22b. Urea Formaldehyde Baking Coating for Hardware.- Shall be a baking coating intended for use on zinc coated steel articles and when applied to prepared hardware items, and baked on, in accordance with recommendations of the manufacturer the maximum properties will be obtained, and there shall be no peeling, cracking, blushing, checking, wrinkling or blistering under the tests prescribed in sections E and F, for uncoated and/or coated assembled liner body. The urea formaldehyde coating shall further conform to requirements of tests for finished hardware articles in section F.

E-22c. Color and Luster.- Shall be an Olive Drab, lusterless, conforming to a standard color chip which shall be supplied by the contracting officer.

E-23. Identification Stamping.- Each liner body shall be identified with a "Molded In" mark at top of interior of crown showing manufacturer's symbol and mold cavity number. The area of the identification mark shall be not more than that of a 5/8 inch square.

E-24. Contractor's Inspection.- The contractor shall inspect all finished articles for compliance with this specification prior to submitting them to the United States Government for final inspection.

#### F. METHODS OF SAMPLING, INSPECTION AND TESTS.

F-1. Sampling.- Samples of any material, components, etc., not furnished by the United States Government, entering into the manufacture of the article covered herein, shall be selected from time to time by the Government inspector, and carefully examined and tests made to determine if they are in accordance with this specification (see Section H).



F-2. Inspection.- Inspection may be made throughout the entire process of manufacture. The passing as satisfactory of any detail of construction or materials shall not relieve the contractor of responsibility for faulty workmanship or materials which may be discovered at any time prior to final acceptance. Final inspection of the finished articles shall be made either at point of production or at point of delivery designated in the contract or purchase order of procuring agency. In case of factory inspection, every facility shall be afforded inspectors by the manufacturer for the prosecution of their work.

F-3. Tests.-

F-3a. Moisture Sorption and Dimensional Stability.- The changes in weight, mean diameter, and mean thickness of the liner body as a result of immersing in water for 24 hours at 77°F. ± 4°F., are found by taking the difference in measurements made before and after the water immersion period. The mean diameter is obtained by averaging two measurements which are made at right angles to each other and approximately one inch from the edge. The mean thickness is obtained by averaging four measurements which are made at regularly spaced positions along the base of the liner body and approximately 3/4 inch from the edge. The liner body after the water immersion test, shall be placed in an oven at 77°F. ± 4°F. for 24 hours and the changes in weight, mean diameter, and mean thickness determined. The percentage changes from the initial state to the wet state and from the wet state to the oven-dried state shall be calculated using the initial measurements as the base. The liner body shall be conditioned for 48 hours at 77°F. ± 4°F., and 50 percent ± 2 percent relative humidity before this test is made.

F-3b. Ball Impact Strength.- This test shall be made on a liner body which has been subjected to the water immersion and drying cycle described in F-3a above. The ball impact test shall be made by dropping an 8 pound iron ball, approximately 3.9 inches in diameter, on top of the liner body at 77°F. ± 4°F. The liner body shall be placed on a contoured block so that it rests evenly along the entire edge. The ball shall be released by burning the cord which is used to suspend the ball above the liner body or by any other suitable method. The distance of drop is measured from the bottom of the ball to the top of the liner. The deflection on impact shall be measured by putting inside the liner body an apparatus which consists of a greased metal rod in a close-fitting metal tube mounted in a holder with top of rod set 1-1/4 inches below crown. If the impact forces the rod further down into the tube, the liner body shall be reported as a failure.

F-3c. Suspension Impact Test.- A liner, helmet, (parachutists) M-1, within a helmet, steel, M-1 body, shall be mounted on a tapered Tyrolean Style head block, 7-1/4 head size, in a position similar to that when on a man's head. A clearance of 1-1/4 inches between liner body and block shall be determined by putting a 25 pound weight on the liner and measurements made by means of a rod inserted in a hole drilled in the center core of the wooden block. The liner shall withstand impact of an 8 pound iron ball, approximately 3.9 inches in diameter, dropped vertically to the center of the crown (highest point of liner) from a height of 5 feet, from the bottom of the ball to the top of the liner, without breakage or failure of suspension tapes, rivets, stays or suspension shoe lace.



**F-3d. Thickness of Crown.-** The mean thickness of that portion of the liner body enclosed by a circle of 2 inch radius, and whose center is at the top of crown, shall be measured.

**F-3e. Flammability.-** The specimens for this test shall be cut from the liner body with the long dimension parallel to the brim, between 1 and 2 inches from the brim, and from that part of the liner body which will permit a sample with the least curvature. The specimens shall be 6 inches by 0.5 inch by the thickness of the liner body material and shall be conditioned at  $77^{\circ}\text{F.} \pm 4^{\circ}\text{F.}$ , and 50 percent ~~42~~ percent relative humidity for 24 hours before testing. The test shall be conducted in a location protected from air currents. The test specimen shall be clamped in a support at one end with the longitudinal axis of the strip horizontal and the transverse axis inclined at 45 degrees to the horizontal. Lines shall be marked on the sample at distances of 1 and 4 inches from the free end. An alcohol lamp or gas burner with a flame 0.5 to 0.75 inch in height shall be placed under the free end of the strip adjusted so that the flame tip is just in contact with the sample. At the end of 50 seconds, the flame shall be removed and the sample allowed to burn. A stop watch shall be started when the flame reaches the 1-inch mark and the time observed when the flame reaches the 4-inch mark. In case the fabric does not continue burning to reach the 1-inch mark after a second ignition, the sample shall be reported as self-extinguishing.

**F-3f. Flexing Test.-** A  $3/8$  inch by 6 inch iron rod shall be mounted in a vertical position in a sleeve holder clamped to a ring stand which shall be fastened firmly to a work bench. One side of the liner body shall be clamped between the base of the stand and the lower end of the rod. The rod shall be within the liner body on the short diameter, clamped approximately 1 inch from the brim or edge. Another rod shall be mounted so that the end is  $1/2$  inch above the top side of the liner body. Then by hand the upper side of the liner body shall be flexed between the ends of the 2 rods so as to obtain 6 complete cycles in 5 seconds. No cracks or other fracture shall be apparent in the liner body when it is subjected to the 6 flexing cycles.

**F-3g. Shape.-** Liner bodies selected at random from the total produced in each 8 hour shift shall be tried for a proper fit in sample "A", standard helmet, (parachutists) steel, M-1 body and shall be inserted with reasonable hand force into sample "B", steel helmet body supplied by the contracting officer. At least one liner body from each mould in production on a shift shall be so tested. At the discretion of the inspector, a liner may be selected from any lot or lots, submerged in water  $75-80^{\circ}\text{F.}$ , for 48 hours, air dried, and tested for shape as above.

**F-3h. Rejection.-** Failure of any samples to comply with the requirements set forth in any of the above tests shall be cause for rejection of the lot, of which the samples tested are representative, except that components or finished units which are rejected individually, may be conditioned and resubmitted for inspection and test. Rejected lots may be conditioned and resubmitted only with the written approval of the contracting officer. Retest may be allowed as follows:



F-3h(1). Retest.- Failure in any test or malfunctioning of any part shall cause for retest of twice the number of the original test specimens from the lot. Failure of any specimen in the retest shall be cause for rejection of the lot.

F-3i. Thread and Webbing.- Shall be tested in accordance with applicable requirements of Federal Specification CCC-T-191.

F-3j. Stretch of Webbing.- The percentage of stretch shall be the average results obtained on 5 test specimens, full width and 6 inches in length. The test specimens shall be immersed in both the acid and alkaline solutions required for fastness to perspiration and the wet specimens suspended from one end in room temperature 77°F. to 85°F., and a one pound weight shall be attached to the free end of each specimen, and the specimens allowed to dry. When dry, the length of each specimen shall be measured and recorded. The stretch shall be expressed as the percentage increase in length of the five specimens.

F-3k. Leathers.-

F-3k(1). Strap Leather.- See Federal Specification KK-L-271.

F-3k(2). Chamois Leather.- See Federal Specification KK-S-416.

F-3k(3). Calfskin Leather.-

F-3k(4). Thickness.- Shall be determined by a Woburn leather gage, or equivalent.

F-3k(5). Tensile Strength.- Breaking strength in pounds shall be determined on any suitable tension testing apparatus having an accuracy of 1-1/2 percent within the range of 200 to 800 pounds. The speed of the moving head of the machine shall be 9 inches to 12 inches per minute when running free. Dumb-bell-shaped specimens shall be cut, with a steel die. The specimens shall have an over-all length of 6 inches and a maximum width at the shanks of 1-1/4 inches. The neck shall be not less than 1/4 inch wide and shall be of uniform width for 2-1/2 inches, or 1-1/4 inches on each side of center. The shanks shall be connected to the neck by fillets of double curvature, the curvature next to the shank being of 1 inch radius; that next to neck being 7/8 inch radius. The die cut test specimens shall be measured for thickness at three places spaced equidistant along the neck. The gauge used shall have a foot 1/4 inch diameter, and shall apply a load of 2 pounds. A minimum of 3 measurements shall be used in computing the cross-section area of the specimen. The tensile strength in pounds per square inch shall be computed for each specimen and the minimum and the average for all specimens recorded.

F-3k(6). Elongation.- Dumb-bell-shaped specimens as described under F-3k(5) shall be used. Gauge marks 2 inches to 0.01 inch apart shall be stamped on each specimen, the mark centered on the specimen and made by a method that will not injure the leather. The specimen shall be tested in testing apparatus as used for tensile strength. The gauge marks shall be measured by means of dividers and a steel scale to the nearest fiftieth of an inch. The thickness of the specimen shall be measured as in F-3k(4) above, and the load required to produce a stress of 2,500 pounds per square inch shall be computed. When the indicator on the machine shows that the load has reached this computed amount, the distance between the gauge marks shall again be measured immediately. The distance between



the gauge marks, minus the original distance, divided by the original distance, multiplied by 100, is the percent of elongation or stretch. The elongation shall be computed for each specimen, and the average of all recorded.

F-3k(7). Water Resistance.- Sample specimens not less than 1 inch wide by 6 inches long shall be immersed in water at room temperature  $77^{\circ}\text{F.} \pm 5^{\circ}\text{F.}$ , for 24 hours, removed and suspended in air at room temperature to air-dry after which the specimens shall show no evidence of having been permanently affected nor loss of flexibility.

F-3k(8). Tear Test.- Punch 2 small holes in the test specimens not larger than to admit a soft wire of from .025 to .050 inch in diameter. Place the holes  $1/4$  inch apart and  $1/4$  inch from the edge of the specimen. Loop the wire through 2 holes and measure the load required to pull the wire through the leather by placing the specimen in one jaw of a suitable testing machine and the two ends of the wire in the other jaw. The load, in pounds, divided by the thickness of the leather of the specimen, in inches, shall give a minimum of 800 when the pull on the specimen is applied in the direction parallel to the backbone.

F-3k(9). Ash.- Ignite 5 grams of leather to a constant weight in a muffle furnace at  $1112^{\circ}\text{F.} \pm 75^{\circ}\text{F.}$  Cool in desiccator, weigh; and report as percentage of ash.

F-3k(10). Acidity, pH.- Weigh 5 grams of leather into a chemically resistant glass flask, add 100 ml of distilled water and stopper flask tightly. Agitate mixture well immediately and allow to stand for not less than 4 hours, nor more than 18 hours. Agitate mixture well, allow to settle 10 minutes, and determine pH of decanted extract with a glass electrode at room temperature  $77^{\circ}\text{F.} \pm 5^{\circ}\text{F.}$

F-3m. Finished Hardware Articles.-

F-3m(1). Saturated Steam.- There shall be no change in appearance or adhesion of the urea formaldehyde coating after exposure to saturated steam, as prescribed for in paragraphs E-13a, E-13b.

F-3m(2). Salt Spray.- There shall be no change in appearance of urea formaldehyde coating and no rusting when finished articles of hardware are subjected to a 20 percent salt spray solution for 150 hours. The test specimens shall have been air dried for at least 7 days after baking prior to testing.

F-3m(3). N/10 Hydrochloric Acid.- There shall be no rusting or visible effect on the urea formaldehyde coating, after a 72 hour immersion test.

F-3m(4). N/10 Sodium Hydroxide.- There shall be no rusting or visible effect on the urea formaldehyde coating after a 72 hour immersion test.

F-3m(5). 0.1% Available Chlorine Solution.- There shall be no rusting or visible effect on the urea formaldehyde coating after a 72 hour immersion.

F-3m(6). Cold Water Resistance.- Immerse finished hardware components in distilled water at  $75-80^{\circ}\text{F.}$ , for 24 hours. When removed from the water there shall be no wrinkling or blistering visible. The test specimens shall be allowed to air dry for 24 hours after removal from the water, and the coating shall be no more than slightly effected when examined.



F-3m(7). Boiling Water Resistance.- Immerse finished hardware components in distilled water, maintained at 212°F., for 15 minutes. There shall be no wrinkling or blistering visible to the eye immediately upon removal of the parts from the water. The coating shall be no more than slightly effected when examined 2 hours after removal from the water. The test specimens shall be allowed to air dry for 24 hours after which they shall be indistinguishable from duplicate parts not subjected to the test.

F-3m(8). Petroleum Solvent Resistance.- Immerse finished hardware components in petroleum solvent of 60°C. straight aniline point, and 150-250°F. boiling range, at room temperature (77°-80°F) for 16 hours. There shall be no wrinkling or blistering visible to the eye immediately upon removal of the parts from the petroleum solvent. The coating shall be no more than slightly effected when examined 2 hours after removal from the petroleum solvent. The test specimens shall be allowed to air dry 24 hours after which they shall be indistinguishable from duplicate parts not subjected to the test.

#### G. PACKAGING, PACKING, AND MARKING.

G-1. Packaging.- Liners, helmet, (parachutists) M-1, complete with hammock suspension, neck-band suspension, 1/2 inch chin strap and moulded chin strap assemblies attached therein, shall be packaged in nested stacks of 5 each, with moulded chin strap in crown, and with a paper separator between each two adjacent liners, helmet; the separators shall be 17 inch diameter circles, slotted at 90° intervals around circumferences in order that they will fold to conform to shape of liner, helmet when used. The separators may be of indented chipboard, sulphate or sulphito (Shocksorb, Waffleboard or Trunk wrapper or similar) heavy wrapping paper, calipering .016 inch thick prior to indenting and/or showing a weight not less than 135 pounds, basis 24 by 36 inches - 500 sheets, after indenting.

G-2. Packing.- Thirty liner bodies, 6 stacks of 5 each packaged as in G-1 above, shall be packed, 3 stacks long by 2 stacks wide, in a new (special) fiber-board box constructed in accordance with the following requirements:

G-2a. Fiberbox Construction.-The box may be either corrugated, Style 1, "A or B-flute", of Federal Specification LLL-B-631, with combined thickness of facings not less than .028 inch, with outer face not less than .012 inch thick; or solid fiberboard, Style A, of Federal Specification LLL-B-636, with combined thickness of board not less than .055 inch; with breaking strength of either board not less than 175 pounds. The box shall consist of a one-piece body, slotted and scored to form a body having four flaps for closing each of the two opposite open faces (top and bottom), the two outer flaps to overlap and come within 1 inch of each side edge, with body joint along one of the four corner edges and lapped on inside and stitched with metal wire fasteners, treated to resist rust (see strength of joints Section F of box specifications). Taped joints will not be permitted. The box shall have a separate "inner liner" inserted therein to cover the ends and sides of the box; the inner liner shall be of double-wall corrugated board either "A or B-flute" or a combination of the two, with combined thickness of facing not less than .032 inch, or the inner liner may be made by stitching two pieces of double-faced corrugated board one "A-flute" .012 and .009 inch and one "B-flute" or "C-flute" .012 and .009 inch having not less than 40 corrugations per foot, and a breaking strength of not less than 200 pounds; stitches to be spaced not less than 8 inches apart and 2 inches from edges, the liner may have a lapped and stitched joint at one corner or shall be butt-jointed at center



of one side and taped entire length of joint. The box shall be approximately 32-1/4 inches long by 17-3/4 inches wide by 14-1/8 inches high, inside measurements (inside of liner), and the 6 cells formed by the partitions shall each be 10-3/4 inches long by 8-3/4 inches wide by 14-1/8 inches high, inside measurements.

G-2b. Lining Paper.- Prior to insertion of corrugated partitions, or packing of liner, helmet, each box shall be lined with a water-proofed, kraft, case liner bag or wrapping paper, conforming to Type C of Federal Specification UU-P-271; the bag may be either a one-piece satchel bottom style or a two-piece 4-way style. In either style of bag, all edges shall over-lap not less than 3 inches; when individual pieces of paper are used for lining, the pieces shall be of such size as to over-lap at all edges not less than 3 inches, including fold-down over top of partitions.

G-2c. Closing.- In closing the boxes the bottom flaps shall be stitched shut with metal fasteners, treated to resist rust, spaced not less than 2-1/2 inches apart lengthwise direction. The top flaps shall be effectively sealed with 3 inch, 60 pound, gummed kraft paper tape firmly affixed to and covering all exposed seams and with 3 additional strips at right angles to and spaced equidistantly along junction edge of box and top flap.

G-3. Marking.- Unless otherwise specified in invitation for bids, contract, or order, each shipping container shall be plainly marked on one end, in characters not less than 3/4 inch high, to show Government stock number, description of article, specification number, quantity contained therein, as defined in the contract or order, under which shipment is made, followed by the initials of the procuring office, date of contract or order, and name of contractor, and unless otherwise specified, marked in accordance with U. S. Army Specification No. 100-2.

#### H. NOTES.

H-1. Before production is commenced, unless otherwise specified in invitation for bids, not less than 20 finished liners, helmet, (parachutists) M-1, complete with hammock suspension, neck-band suspension, and chin strap assemblies, and not less than 20 uncoated liner bodies, all representative of what is proposed to be furnished, shall be submitted to the contracting officer for examination, tests and approval.

H-2. Before production is commenced, the contracting officer shall supply a standard helmet, steel, (parachutists) M-1 body, designated as sample "A", also a standard helmet, steel, (parachutists) M-1 body, selected for minimum size, designated as sample "B". These helmets are to be used as standards in tests as indicated in paragraphs E-2 and F-3g.

H-3. In the event of an emergency and subject to the approval of the contracting officer, substitution of materials will be permitted as follows:

When such substitutions are permitted, the extent of the substitution shall be as indicated in invitation for bids.

#### H-3a. Substitution for Calfskin.

H-3a(1). When, in the opinion of the contracting officer, there is insufficient supply of calfskin available, whole kips up to 21 feet over-all may be substituted. In the event there is neither a sufficient supply of calfskin nor kips available, then extreme sides, not to exceed 21-3/4 feet, may be substituted, providing the requirements herein for calfskin are complied with.



H-3b. Substitution for Webbing.-

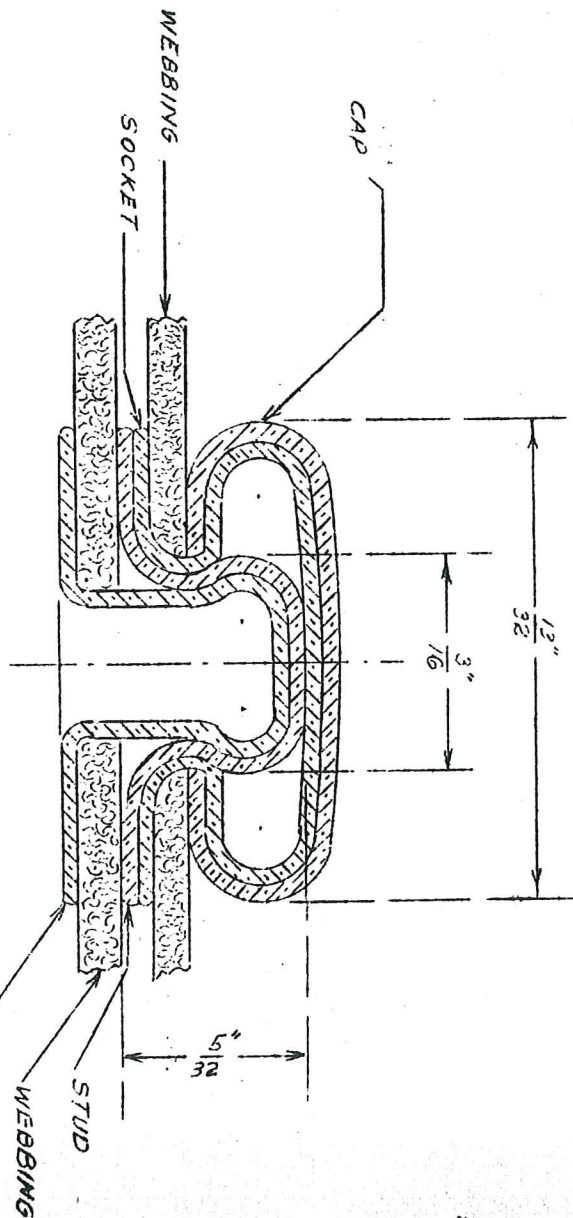
H-3b(1). In the event that Double or Triple Herringbone Twill webbing is available or can be obtained more readily, either or both will be acceptable, providing the webbing otherwise conforms to requirements herein.

NOTICE: When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever; and the fact that the Government may have formulated, furnished or in any way supplied the said drawings, specifications or other data, is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation or conveying any rights or permission to manufacture, use or sell any patented invention that may in any way be related thereto.

NOTE.- Unless otherwise specified in invitation to bid or purchase order, copies of this specification may be obtained at the following point:

Chicago Quartermaster Depot, 1819 West Pershing Road, Chicago, Ill.





STEEL, ELECTRO-ZINC-PLATED, DEPOSIT NOT LESS THAN .00025" THICK.

NOTE:- A GOOD FASTENER THAT FULFILLS THE REQUIREMENTS OF THE SPECIFICATIONS MAY BE USED ON SUBMISSION OF SAMPLE TO AND APPROVAL THEREOF BY THE CONTRACTING OFFICER. ALL POCKET FASTENERS SHALL BE CAPABLE OF WITHSTANDING 5000 FASTENINGS AND UNFASTENINGS WITHOUT IMPAIRMENT OF USEFULNESS.

STYLE SHOWN IS UNITED CARR "SEGMA DOT FASTENER".

TOLERANCE ON DIMENSIONS  
NOT OTHERWISE SPECIFIED:-

DECIMAL I -  
FRACTIONAL  $\frac{1}{32}$ "  
ANGULAR I

FIGURE 1.

SCALE  $\frac{1}{2}$



QUARTERMASTER CORPS  
TENTATIVE  
SPECIFICATION

C.O.D. No. 205  
22 June 1944  
AMENDMENT - 1  
2 October 1944

STRAP, CHIN, WEBBING, LINER, M-1 PARACHUTIST'S  
(STOCK NO. 74-S-336-350)

The following changes shall be made in Quartermaster Corps Tentative Specification C.O.D. No. 205, dated 22 June 1944:

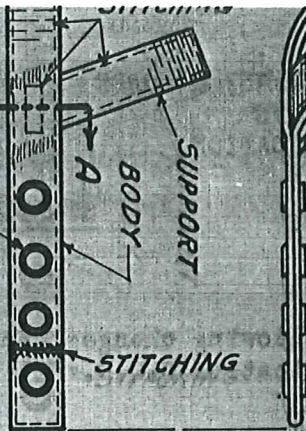
Page 2:

Paragraph R-2. Delete in entirety and substitute:

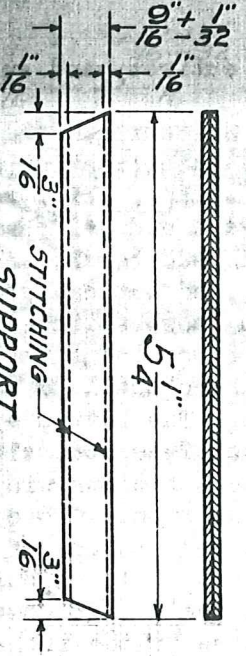
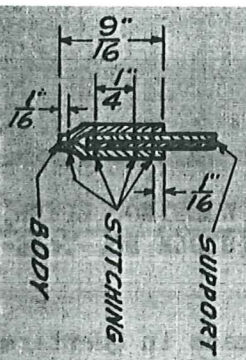
R-2. Stitches, Seams and Stitching. All seams and stitch types are those described in Federal Specification DDD-S-751. The body and support components of the straps, chin, webbing, shall be machine stitched with seam Type SSA-1 and stitch Type 301 and 7 to 8 stitches to the inch. Sufficient thread tension shall be maintained to insure that the threads, both top and bottom, are embedded in the material and that there shall be no loose stitches. When stitching along a seam of a body or a support component is not a continuous thread from end to end, the stitching shall be back-stitched at start and finish to prevent unraveling. The butted ends of the body component shall be secured with stitch Type 304, staggered across the center line of the butted joint to a minimum width of 1/4 inch and with not less than 36 stitches to the inch. The ends of the support component shall be reinforced in the body by one of the three methods shown in drawing OC-6. The box stitch shall be stitch Type 301 with 7 to 8 stitches to the inch. Alternate A if used, shall be stitch Type 304 with a minimum of 36 stitches to the inch with both ends back-stitched to prevent unraveling. Alternate B if used, shall be 1/2 inch to 5/8 inch bar-tacks with a minimum of 21 stitches.

Drawing OC-6.- Shall be discarded and drawing OC-6, Revision 1, dated 8-30-44 on the reverse side hereof shall be compiled with.

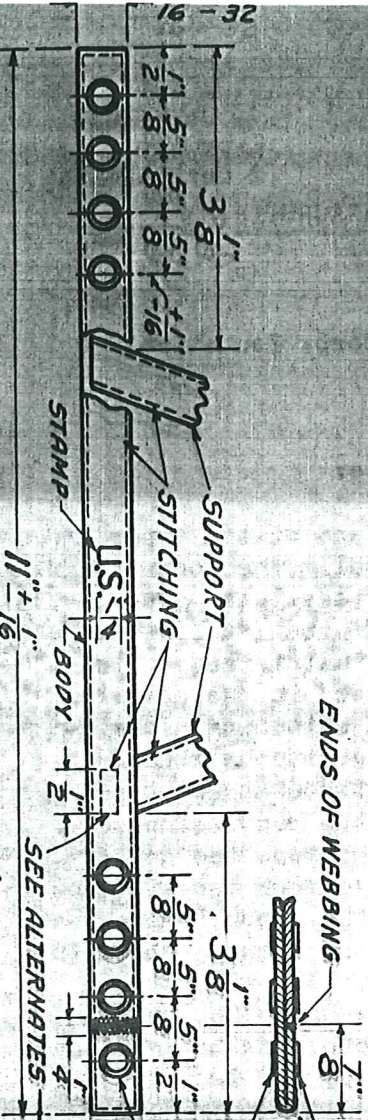
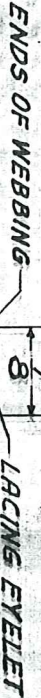




SECTION A-A



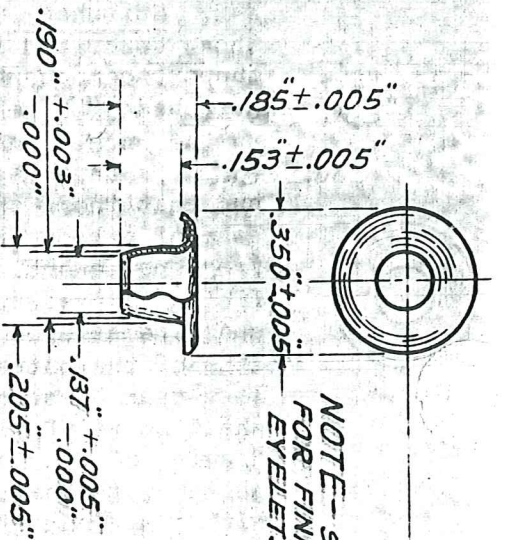
1-REQ'D. (WEBBING)



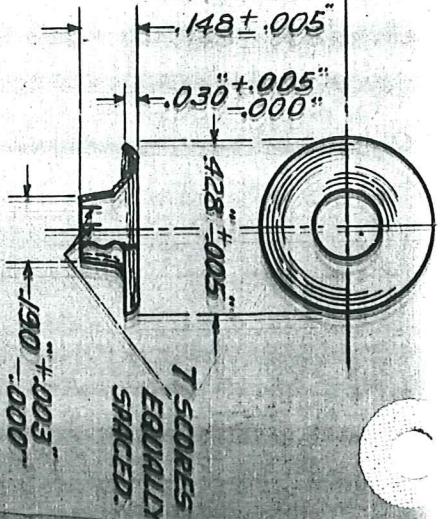
BODY (SHOWING SUPPORT ATTACHED)

1-REAR'D. (WEBBING.)

STRAP. CHIN. WEBBING. PARACHUTIST'S.

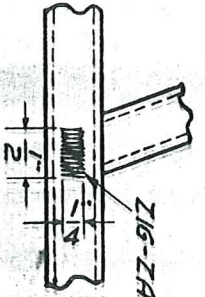


NOTE--SEE SPECS  
FOR FINISH ON  
EYELETS & WASHERS.

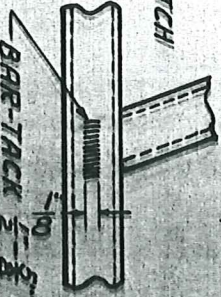


7 SCORES  
EQUALLY  
SPACED:

WASHER, EYELET, LACING.  
BRASS, WT. 0.510 LBS. PER 1000, A



## ZIG-ZAG STITCH



BARE-TACK  $\frac{1}{2}$ - $\frac{3}{8}$

ALTERNATE "A"

ALTERNATE B:

CHILD ENDS of WEBBING.  
ADD. ALTERNATES "A" & "B"

REV	SYM.	FROM	TO	DATE
1				8-30-44

6-6-6



TREATMENT AND FINISH

PHYSICAL PROPERTIES

JULY 1, 1941

REVISIONS

4182643

Y F  
T L  
EL 2  
RED  
BR  
ROCK  
SCL

**BODY, CHIN STRAP, LONG**

OLIVE-DRAB COTTON WEBBING

60/100 OZ. PER YD. 14. LONG

TYPE IIA

ITCH Z ROW

B170329A



8 1/2

3 1/4 + 1/2

5 1/10 + 1/8

3 1/10 + 1/8

CLIP-A139648

BUCKLE-A139646  
OR BUCKLE-A139646A

STRAP, CHIN, HELMET, LONG, ASSEMBLY

DRG. PERTAINS TO

D39081 HELMET,

STEEL, MI.

WITHOUT LINING

D39085 HELMET,

STEEL, MI.

WITH LINING

TOLERANCE ON DIMENSIONS  
NOT OTHERWISE SPECIFIED  
DECIMAL  $\pm .01$   
FRACTIONAL  $\pm 1/16$   
ANGULAR  $\pm$

DRAFTSMAN	TRACER	LD G. DRAFTSMAN
K.A.H.	V.D.V.	
CHECKED	CHIEF DRAFTSMAN	

SUBMITTED

*Henry J. Katz*  
CAPT. U.S. ARMY

APPROVED BY ORDER OF THE CHIEF  
OF ORDNANCE

*W. Moore*  
MAJ. GEN. U.S.A.

RETRACED FROM  
OLD VELLUM WITHOUT  
CHANGE 11-6-43

B170329A



A192228

JULY 1, 1941

REVISIONS

42 8-26-43

DRG. PERTAINS TO

D39081 HELMET, STEEL

MI. WITHOUT

LINING

D39085 HELMET, STEEL

MI. WITH LINING

TOLERANCE ON DIMENSIONS  
NOT OTHERWISE SPECIFIED  
DECIMAL —  $\frac{1}{32}$   
FRACTIONAL —  
ANGULAR —

DRAFTSMAN K.A.H.	TRACER VDV.	LDG DRAFTSMAN
CHECKER	CHIEF DRAFTSMAN	

SUBMITTED:

*Henry J. Katz*  
HEADQUARTERS DEPT. OF ORDNANCE

APPROVED BY ORDER OF THE CHIEF OF ORDNANCE

*W. T. Moore*  
MAJ. GEN. DEPT. U.S.A.

ORDNANCE DEPT. U.S.A.

MADE AT ROCK ISLAND ARSENAL

PHYSICAL PROPERTIES

Y.P.	RED	SCL.
T.S.	BR	
E.L.2	ROCK	

# **BODY, HELMET CHIN STRAP, SHORT**

OLIVE-DRAB COTTON WEBBING

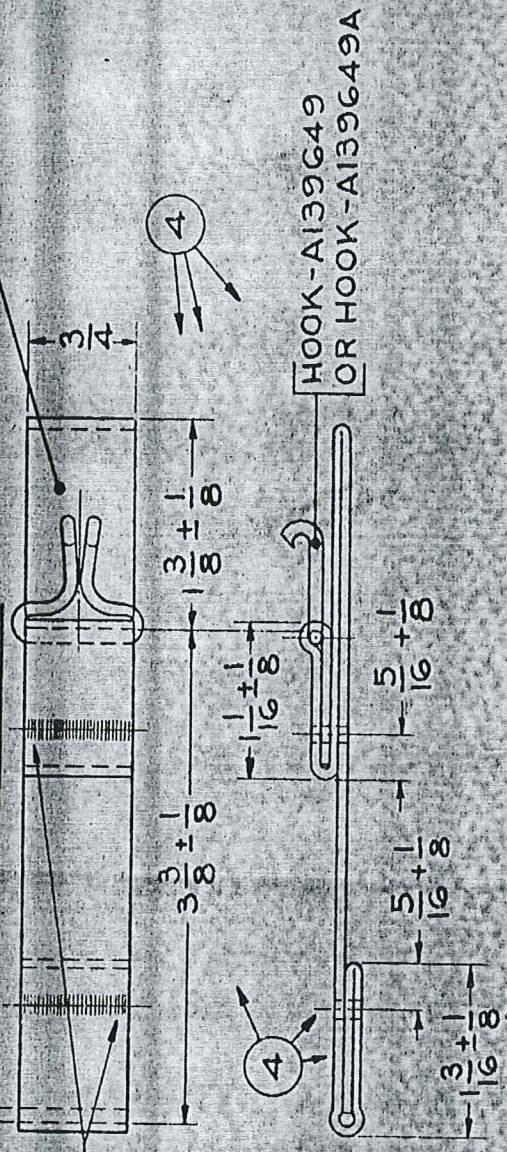
A192228A

60/100 OZ. PER YD. II 3/8 LONG

TYPE IIA

.109 DIA.

STITCH  
Z ROWS



# **STRAP, CHIN, HELMET, SHORT, ASSY.**

RETRACED FROM OLD  
VELLUM WITHOUT  
CHANGE 12-22-43

REFERS TO McCORD  
RAD. & MFG. CO.  
DRG. H-11013

SCALE 1

A192228