## PEDERAL SPECIPICATION

RULES, MEASURING


#### Abstract

This specification is approved by the Comissioner, Federal Supply Service, General Services Administration, for the use of all federal agencies.


## 1. SCOPE AND CLASSIEICATION

1.l Scope. This specification covers rules used for English, metric, or a combination of English and metric measurement.

1. 2. Federal specification coverage. Federal specifications do not include all varietios of the commodity as indicated by the titic of the specification or which are comercialiy available, but are intended to cover only those generally used by the Pederal Government.
1.2 Classification.
1.2.1 Types, classes, and styles. The rules covered by this specification shall be of tie following types, classes, and styles, as specified (see 6.1):

Type I. Caliper.
Type II. Carpenters' folding.
Type IIt. Multiple folding.
Class 1. Wood.
Style 1. Standard duty, inside reading.
Style 2. Standard duty, outside reading.
Style 3. Heavy duty, outiside reading, with extension slide. Class 2. Steel.
Class 3. Aluminum.
Type IV. Stecl, machinists'. Class 1. Rigid. Class 2. Flexible.
Type VI. Glaziers. Class 1. Plain cap. Class 2. Hook cap.
Type VII. Blacksmiths'.
Type vilt. Key seat.
Type IX. Hook.
Type $X$. Circumference.
Type XI. Shrinkage.
Type XII. Aluminum, one piece.

## 2. APPLICABLE DOCUMENTS

2.1 Specifications and standards. The following specification, of the issues in effect on the date of invitation for bids, or request for proposal, form a part of this specification to the extent specified herein:

## Federal Specification:

ppp-p-40 - Packaging and Packing of Hand Tools
(Activities outside the Federal Government may obtain coples of Rederal Specifications, and Standards os outilned under General Information in the index of federal Specifications and Standards. The index, which includes cumulative monthly supplements as issued, is for sale on a subscifiption basis by the General Services Administration, Spocifications Unit (WPSIS), 7 th and $D$ Street SW, Washington, DC 20407.)

GGG-R-791G
(Single copies of this specification and other Eederal Specifications required by activities outside the Federal Government for bidding purposes are available without charge from Business Service Centers at the General Services Administration Regional offices in Boston, New York, Washington, DC, Atlanta, Chicago, Kansas City, Mo., Fort Worth, Denver, San Francisco, Los Angeles, and Seattle, WA.)
(Federal Government activities may obtain copies of Federal Specifications, Standards, and Comercial Item Descriptions and the Index of Eederal Specifications and Standards from established distribution points in their agencies.)

## Military Standard:

MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.
(Copies of Military Specifications and Standards required by contractors in connection with specific procurement functions should be obtained from Naval publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.)

## 3. REQUIREMENTS

3.l Illustrations. The illustrations shown herein are descriptive, not restrictive, and are not intended to preclude the purchase of rules which are otherwise in accordance with this specification.
3.2 Graduation lines. Graduation lines shall be of a uniform and readily distinguishable width and shall be straight, permanent, and free from discontinuities and ragged edges and shall appear in a distinctive manner so as to be readily legible under all service conditions. Graduation lines representing equal fractional aliquots of any scale, in descending order, shall be of equal theight and readily distinguishable by the relative height from graduation lines representing other fractional aliquots. The maximum variation in width between like types of graduations and in the individual graduation shall be such that the maximum width shall not exceed the minimum width by more than 35 percent of the minimum width. Graduations shall extend to the reading edqe of the rule.
3. 3 Figures. Figures shall be clear, permanent, free from ragged edges and breaks and shall appear in a distinctive manner so as to be readily legible under all service conditions. Figures and graduations shall resist easy removal by scraping. All rules, except types $I$ and $I I$, shall read from left to right. Types I and Il rules shall read from right to left. When specified (see 6.l), type III rules shall read from right to left.
3.4 Marking. Each rule shall be marked in a plain and permanent manner with the country of origin and the manufacturer's name or with a trademark of such known character that the source of manufacture may be readily determined.
3.5 Type I, caliper rule. One fold (leg) of the rule shall be grooved and provided with a substantial sliding, flush-fitting caliper made of brass.
3.5.1 Construction. The folds shall be of seasoned boxwood, unless maple, beech or birch is specified (see 6.1). The free ends of the end folds shall be bound with brass, securely fastened by means of rivets passing through the folds and binding members. The middle joint of the rule shall be either of the "square joint" or "arch joint" type, at the option of the contractor, and shall have two flanges (wings) for each fold covering the faces of the fold at the ends. The middle joint shall be brass and shall be secured to the ends of the folds with neatly headed rivets which pass through the folds and joint members. The width of the folds of any one rule shall be uniform.
3.5.2 Graduations and figures. The caliper slide shall have one face subdivid~ ed for at least 5 inches to sixteenths or thirty-seconds of an inch and the opposite face to thirty-seconds of an inch with both faces reading from right to left Erom inside caliper hook. The four edges of the rule shall be respectively subdivided to eighths, tenths, twelfths, and sixteenths of an inch, except that the eight-inch graduations may be on the edge of only one fold, at the option of the contractor. The sixteenth-inch graduations shall be continuous over the joint. One corner of each graduated edge of each face shall be marked to show the smallest. fractional subdivision to which it is graduated. All inch graduations shall be marked with the proper figures.
3.5.3 Accuracy. The scale error of any graduated edge shall not exceed plus or ainus $1 / 64$ inch between any two groduations, 3 inches apart including the total length of the graduated edge.
3.5.4 Pinish. The wood folds ahall have a protective coating suitable fot preventing absorption of moisture. Calipers, end bindings, foints, and other bindings shall be of bright finished brass.
3.5.5 Type $I$ rules shall conform to the requirements of table ind shall be similar to figure 1.


PIGURE 1. Type 1 , caliper tule.
TABLE I. Type I, caliper ruie.

| Size | $\begin{aligned} & \text { Number of } \\ & \text { folds } \end{aligned}$ | Joint | location | Width folded $\pm 1 / 16$ inch | ```Length unfolded (excluding head)``` | Graduated length of caliper slide (minimum) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  | Inches | Inches | Inches |
| 1-foot | 2 | 6-in. | division | 1-3/8 | 12 | 5 |

3. 6 Type II, carpenters folding rules. Type it rules ohall read from right to left.
3.6.1 Construction. The folds shall be of sessoned boxwood, unless maple, beech or birch is specified (see 6.1). The free ends of the end folds shall be bound with brass, securely fastened by means of rivets passing through the folds and binding members. The middle joint of the rule ahall be either of the square joint" or "arch joint" type, at the option of the contractor, and shall have two flanges (wings) for each fold covering the faces of the folds at the ends. Intermediate joints shall be of the middle plate" type and shall have two plates for each fold, set flush with the top and bottom edge surfaces of the folds at the ends. The middle and intermediate joints shall be brass and shall be secured to the ends of the folds with neatiy headed rivets or cut pins which shall pass through the folds and joint members. The width of the folds of any one rule shall be uniform.

### 3.6.2 Graduations.

3.6.2.1 Two-foot size. Unless othervise specified (seo 6.1). the 2-foot size shall have the two edges of the rule respectively gubdivided to eighths and sixteenths of an inch, one odge of one face subdivided to eighths of an inch and one edge of the opposite face subdivided to sixteenths of an inch. The subdivision on at least one edge of each face shall be continuous over all jointg. Ali inch graduationa, except on joints and texminal end, on one face shali be marked with the proper figures.
3.6.2.2 Three-foot size. The 3 -foot site tule shall have one edge of one face subdivided to eighths of an inch and one odge of the opposite face subdivided to sixteenths of an inch. The subdivision ahall be continuous on one face over all joints. All inch graduations except on joints and terminal end shall be marked with the proper figures.

GGG-R-791G
3.6.3 Accuracy. The scale ercor of any graduated edge shall not exceed plus or minus $1 / 32$ inch between any two graduations 3 inches apart including its total length of graduated edge.
3.6.4 Einish. The finish shall conform to the requirements of 3.5 .4.
3.6.5 Carpenters' rules shall conform to the requirements shown in table II for the size specified (see 6.1) and shall be similar to figure 2.


FIGURE 2. TYpe II, carpenters' folding rule.
TABLE II. TYpe II, carpenters' folding rule.

| Size | Number of folds | Joint location | Width folded $\pm 1 / 16$ inch | ```Length unfolded (excluding head)``` |
| :---: | :---: | :---: | :---: | :---: |
|  |  |  | Inches | Inches |
| 2-foot | 4 | 6-, 12-, and <br> 18-inch divisions | 1 | 24 |
| 3-FOOR | 4 | 9-, $18-$, and 27-inch divisions | 1 | 36 |

3.7 Type III, multiple-folding rule. Type III rules shall be similar to figure


FIGURE 3. Type III, multiple-folding rule, class 1 wood, class 2 steel, and class 3 aluminum.
3.7.1 Class 1 , wood. Unless otherwise specified (see 6.1), class 1 rules shall be of 6 -foot length, plus or minus $3 / 32$ inch. The width of the rule shall be $5 / 8 \pm$ 1/64 inch.
3.7.1.1 Construction. The rule shall be multiple folding, having joints. with metal joint plates and durable spring terpered inner springs every 6 inches along its length between ends. Folds shall be of seasoned hard maple, beech or birch. The jofnts shall be of brass, phosphor bronze, coppernickel-zinc alloy; or steel properly plated with brass, nickel, or similar material. The joints shall be securely fastened to the folds, and shall be constructed in such a manner to maintain the tolerance of accuracy specified in 3.7.1.3, when tested as specified in 4.4.2. When tested, as specified in 4.4.2, the rule shall hold rigid in the extended position when supported edgewise between the third and fourth jointa from either end, and shall not stretch more than $1 / 16$ inch from its original length when tested as specified in 4.4.2. The joints shall be permanently secured to the folds in such a manner that the folda will not loosen, weaken, or slip. The two extreme ends of the rule shall be provided with permanentiy secured tips of the
same material as the joint plates, or aluminum arranged to prevent end-spliting and permit readability of end graduations. Each fold shall have two strike plates, one at each jointed end, arranged to prevent any contact between faces of odjacent folds, except that the first and last folds shall have a single strike plate at their joints. Strike plates shall be of the same material as the joint plates, except that brass strike plates may be furnished with plated steel joint plates, and shall be either independent members or part of the joint assembly. The metal joint plates and strike plates shall be free of hazardous sharp edges and burrs. Unless otherwise specified (see 6.1), the rule shall be either with or without a folding end hook, at the option of the contractor. The end hook, if any, shall be of substantial construction with hinge rivet passing through the fold, and arranged so as to extend $3 / 8$ inch from the edge when unfolded and have the zero reading ot the inside of the hook.

### 3.7.1.2 Graduations.

3.7.2.2.2 Unless otherwise specified (sec 6.l), subdivisions on each face of the rules shall be to sixteenths of an inch. Pither one edge or both edges of each face shall be subdivided. At the option of the manufacturer, figures on each face shall read either consecutively in inches over the total length of the rule, or consecutively in inches through the first eleven inches with the remaining length reading consecutively in inches on one edge and fcet and inches on the other edge. Figures on one face shall read in odirection opposite those on the other face. Figures shall be horizontal-reading, that is, the figures shall be upright when the rule is horizontal, unless vertical-reading figures are specified (see 6.1). Gradustions and figures shall be impressed into the surface of the folds, visible to the naked eye.
3.7.1.2.2 if enginecrs' (surveyors' or roadbuilders') rules are specified (see 6.1), the rules shall be subdivided to hundredths of a foot on one face and to sixteenths of an inch on the opposite face, with each foot on each face marked to findicate the number of feet. Each tenth-foot graduation line of the hundredthsfoot scale shall extend the full width of the rule ond shall be marked to indicate to both feet and tenths of foot, except that nine-tenths of the first foot of the rule shall be marked to indicate tenths of a foot only and each numbered foot shall be followed by the letter "P". Esch inch graduation line of the sixteanthe-inch scale shall extend the full width of the rule and shall be marked to indicate both feet and inches, except that the first 11 inches of the rule shall be marked to indicate inches only and each numbered foot shall be followed by the letter "p".
3.7.1.2.3 Special graduations and figures. when apecified (see 6.1), special graduations and Eigures, such as the comblnation metric and English or other subdivisions, shall be provided on the rule. The graduations and figures, or specially marked or subdivided rules shall be as specified in the contract or order.
3.7.1.3 Accuracy. The scale error of any graduated edge at any 2 -foot interval (span) shall be not more thon $1 / 32$ inch.
3.7.1.4 Pinish. The rules shall have on enamel or lacquer finish, and shall be either yellow or white. The ends of the folds, excapt under the metal end cap of the first and last fold shall be smooth and coated with a contrasting colored enamel or lacquer to preclude the absorption of moisture.
3.7.1.5 Style $1_{\text {, }}$ standard duty, inside reading. The folds of style rules shall be at least 0.095 inch in finished thicknoas, before enamelifing or lacquering. The style 1 rule shall be of the inaide reading type, that io, the numbering of figures shall commence on the inside of the folds.
3.7.1.6 Style 2 , standard duty, outside reading. The folda of atyle 2 rules shall be at least 0.095 Inch in finished thickness, before onamelling or lacquering. The style 2 rule shall be of the outside reading type, that is, the numbering of figure shall commence on the outside of the folds.
3.7.1.7 Style 3, heavy duty, outside reading, with extension alide. The folds of style 3 rule shall be at least 0.120 inch in finished thlckness, belore enamelling or lacquering. The style 3 rule shall be of outside reading type, that is, the numbering of figures shall commence on the outside of the folds. The overall length of each joint shall be at least $1-1 / 2$ inches. The joints shall be of brass,
phosphor-bronze, copper-nickel-zinc alloy, or steel plated with brass, nickel or similar materisl. The rule shall be equipped with a brass, aluminum, or plated steel slide for taking inside measurements. The ends of the folds shall be square and shall terminate on the even inch marks. The slide shall be graduated and numbered for a distance of 6 inches, or more. The graduations shall be in 1/16inch increments. The numbering shall be in inches. The slide shall run under friction. The slide shall travel 6 inches and stop(s) shall be, provided to retain the slide in the first fold and to stop the slide in the closed and extended positions. A stud or button-type head approximately $1 / 2$ inch in diameter by $1 / 16$ inch high shall be provided, beyond the 6 -inch number on the slide, for adjustment of the slide by the operator's finger.
3.7.2 Class 2, steel. Class 2 rules shall be made from high-grade carbon steel, hardened and spring tempered. It shall be required that any $2-f o o t$ span of the rule be bent into a complete circle without showing any permanent set or damage to the joints.
3.7.2.1. Construction. The rules shall be multiple folding having joints every 6 inches along their length between ends. The joints shall be formed by means of a 1/8-inch diameter rivet joining the ends of two sections and fitted at each end with a washer $1 / 64$-inch thick with $1 / 4$-inch outside diameter. Joints shall lock into position by means of two drawn spots in each end of each section except ends, drawn in such manner as to form a lug on one side of the section and a matching recess on the other side. When sections are aligned, the lugs on one section shall fit snugly into the recesses in the other section, thereby holding the rule in rigid alignment. Rules shall hold rigid in the extended position when supported edgewise between the third and fourth joints from the end of 6-foot rules and between the first joint and end of 3 -foot rules. The diametrical play at each joint shall not result in a total lengthwise movement of more than 0.020 inch for 3-foot rules and 0.040 inch for 6 -foot rules.
3.7.2.2 Sizes. As specified (see 6.1), the rule lengths shall be $3-f o o t+1 / 64$ inch or $6-\mathrm{foOt}+1 / 32$ inch. The rule width shall be $3 / 4 \pm 1 / 32$ inch and the thickness shall be 1732 inch $\pm 10$ percent.
3.7.2.3 Graduations and figures. Graduation lines shall be of uniform width. Graduations and figures shall be machine cut or acid etched after machine dividing to a depth of $0.003 \pm 0.001$ inch. One edge of both faces of the rules shall be subdivided into sixteenths of an inch. Inch graduation lines shall extend fully to both edges and fiqures shall read consecutively, in inches, over the total length of the rule, from left to right, on both faces. Opposite faces shall be numbered from opposite ends. Figures shall be horizontal reading, that is, figures shall be upright when rule is in horizontal position.
3.7.2.4 Accuracy. The scale error in any 1 inch interval shall not exceed 0.006 inch and in any 3 -foot interval shall not exceed $1 / 32$ inch.
3.7.2.5 Einish. The rules shall have a smooth natural ground surface, finished to minimize reflections, and shall be coated with an oil or grease compound suitable for prevention of corrosion.
3.7.3 Class 3 , aluminum. Class 3 rules shall be made from high-grade aluminum alloy.
3.7.3.1 Construction. The rule shall be multiple folding, having joints every 6. inches along its length between ends. The joints shall be made of brass or brass plated male and female plates securely fastened to the rule sections and joined by a corrosion-resistant rivet and washer. Rules shall hold rigid in the extended position when supported edgewise between the third and fourth joints from either end and shall not stretch more than $1 / 16$ inch from its original length. The joints shall be free of hazardous sharp edges and burrs. Joint plates shall mate in such manner as to hold the rule sections in alignment when open or closed. When specified (see 6.1), rules shall be fitted with a folding brass hook. The hook shall be of substantial construction with a brass hinge rivet passing through the section and shall be arranged so as to extend $3 / 8$ inch from the edge of the rule when opened. zero reading shall be at inside of open hook.
3.7.3.2 Sizes. Rule lengths shall be 6 -foot $+1 / 16$ inch. The rule width shall be $9 / 16 \pm 1 / \overline{16}$ inch and the thickness shall be $1 / \mathrm{T} 6$ inch $\pm 10$ percent.
3.7.3.3 Graduations and figures. Graduation lines shall be of uniform width and depth. Graduation lines and figures shall be fllied with durable black material. One edge of both faces of the rules shall be subdivided to sixteenths of an inch. Pigures on each face shall read consecutively in inches over the total length of the rule with figures of one face reading in the opposite direction from those on the opposite face. Figures shall be horizontal reading that is, figures shall be upright when rule is horizontal, unless vertlcal reading figures are specified (see 6.1), figures shall be dither inside or outaide reading, the numberIng shall comence on either the inside or outside faces of the end sections. When specified (see 6.1), the rules shall be subdivided into one-hundredths of a foot on one face and to sixteenths of an inch on the opposite face. Each foot graduation on both faces ahali be marked to indicate the number of foat. On the face graduated in one-hundredths of a foot the tenth foot graduations within each foot shall be numbered 1 to 9 , inclusive, and on the face graduated in aixteenths of an inch, the inch graduations within each foot shall be numbered 1 to ll, inclusive.
3.7.3.4 Accuracy. The scale error in any 2-foot interval (span) shall be not moze than $1 / 32$ jnch.

### 3.7.3.5 pinish. The surface finish shall be natural dull aluminum.

### 3.8 Type iV, steel rules.

3.8.1 Class 1, rigid. Class 1 rule graduations shall be machine cut or acid etched, and shall be graduated as specified herein for each class. The width of the graduations shall be uniform for each scale betwoen 0.004 and 0.010 inch uide, the width of the graduation shall be less than the space between graduations. The depth of all graduations and figures shall be from 0.002 to 0.005 inch and all the graduations shall extend to and be perpendicular to the edge. One corner of each graduated edge shall be marked to show the smallest subdivision to which it is graduated. Inch graduations ahall be suitably marked. Unless otherwise specified (see 6.1), except for rules having number 1, 10 , and 12 graduations, subdivisions shall be numbered as follows: Thirty-seconds of an inch shall be numbered every 4th division, 4, 8, 12, 16, 20, 14, and 20. Sixty-fourths of an inch shall be numbered every 8 th division, $8,16,24,32,40,48$, and 56 . Tenths, fiftieths and hundredths of an inch shall be numbered every loth of an inch, 1, 2, 3, 4, 5, 6, 7, 8, and 9. Numbering shall not be required for elghths and aixteenthe of an inch. Standard graduation combinations shall be used. As specified in 3.b.l.2 and 3.8.2.1, selections may be made for class 1 rules and class 2 rules from the standard graduations listed in table III.
table itt. steel rule graduations.

| No. |  |  |  |
| :---: | :---: | :---: | :---: |
| 1 | One face | One edge: One edge: | 10ths, 20ths, 50ths, l00ths <br> 12ths, 24ths, 4Bths |
|  | Other face | One edge: One edge: | 16ths, 32nds, 64ths 14ths, 28ths |
| 2 | One face | One edge: One edge: | loths, 20ths, 50ths, l00ths l2ths, 24ths, 48ths |
|  | Other face | One edge: One edge: | 16the, 32nds, 64 the Bthe of an inch |
| 3 | One face | One edge: <br> One edge: | 32nds of an inch 64ths of an inch |
|  | Other face | One edge: One edge: | loths of an Inch 50ths of an inch |

TABCE III. Steel rule graduations. (Continued)


8

TABCE III. Steel zule graduations. (Continued)

| No. |  |  |  |
| :---: | :---: | :---: | :---: |
| M-2 | One face | Both edges: | Millimeters |
|  | Other face | One edge: | Millimeters |
|  |  | One edge: | 1/2 millimeters |
| ME-1 | One face | One edge: One edge: | 1/2 millimeters 64ths of an inch |
|  | Other face | Not graduat |  |
| ME-2 | One face | One edge: One edge: | Millimeters 64ths of an inch |
|  | Other face | One edge: One edge: | 1/2 millimeters <br> 32nds of an inch |

3.日.1.1 Construction. The cule shall be in one piece, without joints, shall be made of tool or stainless steel, and properly hardened, tempered, ground, and finished to minimize reflections. The opposite faces and the opposite longitudinal edge surface shall be ground parallel (ace 3.B.1.3.2); the opposite transverse edge surfaces shall be slmilarly ground, ot right angles to the faces and longitudinal edge surfaces.
3.e.1.2 Graduations and flqures. Unless otherwise specified (see 6.1), rules shali carry number i graduations specified in 3.8 .1 and table III. When specified, rules shall carry one of the following gradustions:

```
Number 6-2
    6, 12, 18, 24, 36, and 48-inch lengths.
```

Number 7:
1, 2, 3, 4, 6, 9, 12, 18, 24, 36, and 48-inch langthe.
Number M-2:
5, $10,15,20,30,50$, and 100 centloeter lengths.
Number ME-2:
5, $10,15,20,30,50$, and 100 centimeter lengths.

### 3.8.1.3 Accuracy.

3.8.1.3.1 Tolerances. The overall length of rules 6 inchea and under shall not vary by more than plus 0.004 or minus 0.002 inch; the overall length of rules 9- to 18-inch lengths, inclusive, shall not vary more than plus 0.005 or minus 0.010 inch; the overall length of 24 - and $36-1$ nch rules shall not vary more than plus 0.007 or minus 0.012 inch. The scale error from either and of the rule to the nearest $1 / 2$ inch graduation shall not exceed plus or minus 0.005 inch. The scale error per foot or fraction thereof shall not exceed plus or winus 0.005 inch between any two graduations, nonaccumulative.
3.8.1.3.2 Parallelism. The out-of-parallel error of opponite edges shall not exceed 0.0024 inch. The out-of-parallel ector of opposite facos shall not exceed 0.003 inch up to 18 -inch lengthe; rules over 18 -inch length ahall not exceed 0.002 inch per foot.
3.8.1.3.3 Squareness of ends. The out-of-square error 190 degree angle between end and edge) shall not exceed plus or minus 5 minutes.
3.8.1.3.4 Straightness. The straightness of any edge for each 12 inches or froction thereof shall not vary more than plus or minus 0.001 inch.
3.8.1.4 Pinish. Rules shall have a chrome plated, natural ground or dull satin (nonglare) finish. Edges shall be ground, and may be with or without plating. Rule graduations and figures shall be furnished with black fill. Rules shall have a coating of oil or grease suitable for preventing corrosion in storage.
3.8.1.5 Class 1 rules shall conform to the requirements shown in table IV for the length specified (see 6.1), and shall be similar to figure 4. When specified (see 6.1), class 1 rules shall be furnished with positive or sliding hook.


FIGURE 4. Type IV, steel rule; class l, rigid; class 2, flexible; type XI shrinkage; and type XII aluminum.
table IV. Type IV, class 1 , steel, rigid.

| Length |  | Width |  | Thickness |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Minimum | Maximum | Minimum | Maximum |
| Inches | Centimeters | Inches | Inches | Inch | Inch |
| 1 | - | 0.450 | 0.510 | 0.040 | 0.051 |
| 2 | 5 | . 450 | . 510 | . 040 | . 051 |
| 3 | -- | . 450 | . 565 | . 040 | . 051 |
| 4 | 10 | . 550 | . 625 | . 040 | . 051 |
| 6 | 15 | . 700 | . 760 | . 040 | . 051 |
| 9 | 20 | . 820 | . 880 | . 040 | . 051 |
| 12 | 30 | . 940 | 1.005 | . 040 | . 051 |
| 18 | 50 | 1.120 | 1.255 | . 040 | . 051 |
| 24 | -- | 1.120 | 1.255 | . 040 | . 051 |
| 36 | 100 | 1.120 | 1.255 | . 040 | . 051 |
| 48 | --- | 1.120 | 1.255 | . 040 | . 051 |

3.8.2 Class 2 , flexible. Type IV, class 2 rules shall be the same as specified in 3.8.1.1, with the exception that the rule shall be fully flexible.
3.8.2.1 Graduations and figures. Unless otherwise specified (see 6.1), all rules shall carry number 10 graduations specified in 3.8 .1 and table III. When specified, rules shall carry one of the following graduations:

Number:

3.8.2.2 Accuracy. The requirements shall be as specified in 3.8.1.3. Class 2 rules shall conform to the requirements shown in table $v$ for the length specified (see 6.1), and shall be similar to figure 4.

TABLE V. Type IV, class 2 , atoel cule, flexible.

| Length |  | Width |  | Thickness |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Minimum | Max Imum | Minimum | Maximum |
| Inches | $\frac{\text { Centimetars }}{--}$ | $\frac{\text { Inchas }}{0.450}$ | $\frac{\text { Inches }}{0.500}$ | $\frac{\text { Inch }}{0.010}$ | $\frac{\text { Inch }}{0.016}$ |
| 2 | -- | . 450 | . 500 | . 010 | . 016 |
| 3 | -- | . 450 | . 500 | . 010 | . 016 |
| 4 | 10 | . 450 | . 500 | . 010 | . 016 |
| 6 | 15 | . 450 | . 500 | . 010 | . 016 |
| 9 | 20 | . 450 | . 500 | . 010 | . 016 |
| 12 | 30 | . 450 | . 500 | . 010 | . 016 |
| 18 | 50 | . 675 | . 750 | . 016 | . 021 |
| 24 | -- | . 675 | . 750 | . 016 | . 021 |
| 36 | -- | . 675 | . 750 | . 016 | . 021 |
| 48 | -- | . 675 | . 750 | . 016 | . 021 |

3.8.2.3 Pinish. The finish shall be in accordance with 3.8.1.4.
3.9. Type VI, glazier's rule.
3.9.1 Material. Rules shall be made of close-grained, thoroughly seasoned, sound wood.
3.9.2 Straightness. Rules shall be straight to the extent that neither warpage nor edge chamber ahall exceed $1 / 32$ inch in any 1 foot nor $1 / 8$ inch in any 6 feet, under normal atmoapheric conditions.
3.9.3 Finish. Wood surfaces shall be smoothly and evenly machined and ohall be sealed against moisture. Surfaces of brass caps shall be polished. soth wood and brass surfaces shall be coated with a transparent, abraion and moiature-resistant material.
-3.9.4 Accuracy. When used under normal atmospheric conditions, the scale error shall not excead $1 / 64$ inch in any $2-f o o t$ interval, $1 / 32$ inch in any 6 foot interval; or $5 / 64$ inch in any 12 feet.

## 3.9 .5 class 1 , plaín cap.

3.9.5.1 Construction. Rules shall be constructed from one piece of wood fitted at each end With solid brass caps. Caps shall be not less than $1 / 4-1 n c h$ wide and rule ends shall be tenoned so that cap and rule surfaces are flush. Caps shall be attached by means of countersunk brass rivets.
3.9.5.2 Sizes. The cules shall conform to the dimensions shown in table vi for the size specified (see 6.1).
table Vi. Type VI, class 1 , glaziers' rule, plain cap.

| Rule length | Length tolorance, plus or minus | Width; plus or minus 5 percent | Thickness, plus or minus 10 percent |
| :---: | :---: | :---: | :---: |
| Inchen | Inch | Incher | Inch |
| 36 | 1/64 | 2 | 1/4 |
| 48 | 1/32 | 2 | 1/4 |
| 60 | 1/32 | 2-1/2 | 1/4 |
| 72 | 1/32 | 2-1/2 | 1/4 |
| 84 | 3/64 | 3 | 1/4 |

3.9.5.3 Graduationa, Graduation lines shall be of uniform width and depth and shall be filled with o durable black material. Both edges of one face and one edge of the opposite cace shall be subdivided to oighths of an inch and shall be numbered in consecutive inches over the length of the rule. The remaining edge shall be subdivided to $1 / 4$ foot and shall have each foot graduation numbered to indicate the number of feet. The $1 / 4$ foot graduations, within each foot, ahall be numbered 3. 6, and 9 to indicate inches. Rules shall read from left to right on both faces with figures on one face reading in opposite direction from those on opposite face.
3.9.5.4 Class 1 rules shall be similar to figure 5.


FIGURE 5. Type VI, class l, glaziers' rule, plain cap.

### 3.9.6 Class 2 , hook cap.

3.9.6.1 Construction. The rules shall be made from one piece of wood, fitted on one end with a brass cap not less than $1 / 4$ inch wide, and at the other end with two brass plates, extending not less than $1-1 / 4$ inches from the rule end. One of the plates shall carry a head extending in one direction to form a substantial hook that shall extend $3 / B$ inch from the face of the rule. The other plate (plain) shall be fitted to the face of the rule opposite the hook and the plates and rule jointed by means of countersunk brass rivets. The rule ends shall be tenoned so that cap and plates are flush with the rule faces.
3.9.6.2 Sizes. The rules shall conform to the dimensions shown in table vil for the size specified (see 6.1).

TABLE VII. Type VI, class 2, glaziers' rule, hook cap.

| Rule length | ```Length tolerance, plus or minus``` | Width, plus or minus 5 percent | Thickness, plus or minus 10 percent |
| :---: | :---: | :---: | :---: |
| Inches | Inch | Inches | Inch |
| 36 | 1/64 | 2 | 5/16 |
| 48 | 1/32 | 2 | 5/16 |
| 60 | 1/32 | 2-1/2 | 3/8 |
| 72 | 1/32 | 2-1/2 | 3/8 |
| 84 | 3/64 | 3 | 3/8 |
| 96 | 3/64 | 3 | 3/8 |
| 108 | 1/16 | 3 | 3/8 |
| 120 | 1/16 | 3 | 3/8 |
| 144 | 5/64 | 3 | 3/8 |

[^0]3.10.1 Construction. The rule shall consist of two steel folds $3 / 4 \pm 1 / 16$ inch wide, and $0.032+0.005$ Inch thick. The two folds shall be riveted Fogether to form, when opened, a 24 -inch rule. The rule shall be the stop-joint type capable of holding the two folds in atraight line.
3.10.2 Graduations. Opposite sides of the rulc shall read from the reverse ends. One side of the rule shall be graduated in sixteenths of an inch and the opposite side in eighths of an inch. The graduated lines and figures shall be sunken, black, and easy to read.
3.10.3 Accuracy. The scale error on either graduated edge shall not exceed plus or minus $1 / 64$ Inch between any two graduations, including its total length of graduated edge.
3.10.4 Finish. The rules shall havo a smooth natural surface, finished to minimize ceflections, and shall be coated with oil or grease compound suitable for prevention of corrosion.

### 3.10.5 Type VII zules shall be similar to figure 7.



PIGURE 7. Type VII, blacksmiths' rule.

### 3.11 Type VIII, key-beat cule.

3.11.1 Construction. Unless otheruise specified (see 6.1), the rules shall be of one-piece construction (without clamps) or two-piece construction (with clamps). at the option of the contractor. One-piece rules shall be made from aingle piece of tool steel. shall represent a true right angle in section fmeasuring approximately 7/16-by 11/16-inch overall) and both outer edges shall be beveled and graduated in thicty-seconds of an inch. Two-piece rules shall consist essentially of one plain gtraightedge and one type iv, class ligid steel rule (conforming to the requirements of 3.日.1 to 3.8.1.3.2, inclusivo, 3.8.1.3.4 and 3.8.1.4), and when specified (seo 6.1), one graduated auxiliary straightedge. The plain straightedge shall be fitted with two clamps suitable for properly clamping either the steel rule or the auxiliary straightedge to form a box square. The clamps shall be provided with suitable thumbscows. The auxiliary straightedge, when furnished, shall be graduated in thirty-seconds and sixty-fourtha of an inch, and all figures and graduations shall conform to the applicable requirements of 3.8 .

### 3.11.2 Accuracy.

3.11.2.1 Lengths. The nominal overall length shall be cither 6 or 9 inches as specified (see 6.1). If no overall length is specified, the 6-inch length shall be furnished. The overall length shall vary not more than plus 0.004 or minus 0.002 inch. The scale error taken at the half-inch graduation from each end shall not exceed a tolerance of plus or minus 0.002 inch. The scale error between two graduations shall not exceed plus or minus 0.002 inch, nonaccumilative.
3.11.2.2 Squareness of ends. The out-of-gquare orror ahall not excecd plus or minus 1 minuta (either the 90 degree angle between end and edge of one-piece rules, or end and edge of any of the three straightedges on tuo piece rules, or the box square formed by clamping the plain straightedge to either of the two graduated straightedges).
3.11.2.3 Finish. Unless otherwise specified (seo 6.1), key-seat rules shall have a smooth natural ground surface, finished to minimize reflections, and ahall have an oil or grease coating suitable for preventing corroaion in storage without adversely affecting the material coated.

### 3.11 .3 Type Vill rules shall be similar to figure 8.



## TWO-PIECE CONSTRUCTION

FIGURE B, Type VIII, key-seat rule.
3.12 Type ix, hook rule (narrow). Type ix hook rule (narrow) shall be designed for taking measurements through holes and for setting calipers.
3.12.1 Construction. The rule shall be of tool steel, $3 / 16$ inch wide by $3 / 64$ inch thick plus or minus 10 percent, or when specified (see 6.1 ) $3 / 8$ inch wide, by 3/64 inch thick, plus or minus 10 percent, properly hardened, and spring tempered, ground and finished to minimize reflection. Opposite faces and opposite longitudinal edges shall be ground parallel. Transverse edges, the end-surface of the hook, the inside edge of the hook stop, and longitudinal edges shall be at right angles to the faces. Overall length, including the hook, shall not exceed 6-5/32 inches.
3.12.2. Hook. The hook shall be either the fixed or sliding type as specified, and shall be of hardened steel attached to the end of the rule. Removable hooks shall be provided with an eccentric stud clamping device for locking hook in position. The hook shall extend beyond the graduated edge of the rule approximately $1 / 8$ inch so as to provide a stop, the inside edge of which shall be flush with the end of the rule. The inside edge of the stop shall be beveled so as to provide a surface width not more than the thickness of the rule.
3.12.3 Graduation and figures. One edge of one face of the rule shall be machine-subdivided to thirty-seconds of an inch, and one edge of the opposite face shall be machine-subdivided to sixty-fourths of an inch, width and depth of graduations shall be in accordance with 3.8.1. Graduations shall be machine cut or acid etched. All inch graduations shall be marked with the proper figures which shall be arranged for reading the rule from the hook end. One corner of each face shall be permanently marked to show the smallest fractional subdivision to which it is graduated.

### 3.12 .4 Accuracy.

3.12.4.1 Length. The length of the rule as measured from the inside edge of the hook shall be 6 inches, plus 0.004 inch or minus 0.002 inch. The scale error from either end of the rule to the nearest half-inch graduation shall not exceed a tolerance of plus or minus 0.002 inch. The scale error between any two graduations shall not exceed plus or minus 0.002 inch, nonaccumulative.
3.12.4.2 Parallelism. The out-of-parallel error of opposite faces and opposite edge surfaces shall not exceed 0.003 inch.
3.12.4.3 Squareness of ends. The out-of-square error ( 90 degree angle between end and edge) shall not exceed plus or minus 5 minutes.
3.12.4.4 Straightness. The straightness of any edge shall not vary more than 0.0005 inch.
3.12.5 Finish. Unless otherwise specified (see 6.1) the rule shall have a smooth natural ground surface, finished to minimize reflection, and shall have a coating of an oil or grease compound suitable for preventing corrosion in storage without affecting the material coated. When specified (see 6.1), a nonreflecting chrome finish shall be furnished with black filled graduations and figures.
3.12.6 Type ix rules shall be similar to figure 9.

## 

PIGURE 9. Type 1 X , hook rule.
3.13 Type $X_{\text {, }}$ circumference rule. Type $X$ circumference rules shall be made of high-grade carbon stecl, hardened and apring tempered.
3.13.1 Construction. Rules shall be made from one piece of steel and shall have a $1 / 4-\sqrt{\text { nch hole centrally located }}$ in the first inch.
3.13.1.1 Sizes. As specified (sce 6.1), rules shall be furnished in 3-foot or 4-foot lengths plus or minus $1 / 64$ inch. The rule width shall be $1-1 / 4 \pm 1 / 32$ inch and the thickness shall be $1 / 16$ inch $\pm 10$ percent.
3.13.1.2 Graduations and markings. Graduation lines shall be of uniform vidth and graduations and markings shall be in accordance with 3.8.1. The top edge of the graduated face shall be subdivided to sixteenths of an inch and numbered in consecutive inches. The bottom edge of this face ahall be subdivided to eighths of circumference inches and numbered in consecutive circumference inches. Pigures on both edges shall read from left to right with beginning of measurement (zero) located at the end of the rule where hole is punched. The circumference, for any diameter, is read on the bottom edge opposite the diameter measurement on the top edge. The opposite face of the rule shall carry tables for laying out sheet metal measures for both liquid and dry measure and for laying out both flat top and plithed top cans. This face shall also carry cubic content date and mensuration formulas. All markings shall be etched to same depth ad graduations and figures on measuring face.
3.13.1.3 Accuracy. The gradustion error shall not exceed 0.006 inch in any 1 inch, 0.008 inch in any 1 foot, nor 0.012 inch in any 2 feet. The scale error between any two graduations shall not exceed plus or minus 0.004 inch per foot, nonaccumulative.
3.13.1.4 Pinish. The rules shall have a smooth natural ground surface, finished to minimizo reflections, and shall be coated with an olif or grease compound sultable for prevantion of corrosion.
3.13.1.5 Type $X$ zules shall be similar to figure 10.


Pigure 10. Type $x$ elrcumference rule.

### 3.14. Type $X$. ahrinkage rule.

3.14.1 Construction. Construction shall conform to 3.8.1.1.
3.14.2 Graduations and Eigures. Unless otherwise specified (see 6.1), all rules shall carry No. graduations specified in table III. When specified, rules shall carry No. 6-2 graduations specified in table ili. Using either graduations, divisions ahali be expanded and overall length oxtended to allow for ghrinkage of

GGG-R-791G
hot metals. As specified (see 6.1), shrinkage allowance for each 1 foot (12 inches) shall be $1 / 16,1 / 12,1 / 10,3 / 32,1 / 8,9 / 64,5 / 32,3 / 16,1 / 4,5 / 16,3 / 8,7 / 16$, or $1 / 2$ inch.
3.14.3 Accuracy. Accuracy shall conform to the requirements of 3.8.1.3 through 3.8.1.3.4.
3.14.4 Finish. Finish shall conform to 3.8.1.1.
3.14.5 Type XI shrinkage rules shall conform to the requirements shown in table VIII for length specified (see 6.1), and shall be similar to figure 4.

TABLE VIII. Type $X I$, shrinkage rule.

|  | Width |  | Thickness |  |
| :---: | :---: | :---: | :---: | :---: |
| Length | Minimum | Maximum | Minimum | Maximum |
| Inches | 6 | $\frac{\text { Inch }}{}$ | $\frac{\text { Inches }}{3 / 4}$ | 0.031 |
| $11 / 16$ | $15 / 16$ | 1 | 0.052 |  |
| 24 | $15 / 16$ | $1-1 / 4$ | .041 | .068 |

3.15. Type XII, one piece aluminum rules.
3.15.1 Construction. The rules shall be of one piece, without joints; shall be made of tempered aluminum finished to minimize reflection and shall have a $1 / 4$ inch hole centrally located at one end. Graduations and figures shall be printed black, with a durable baking ink.
3.15.2 Graduations and figures. Unless otherwise specified (see 6.1), rules shall be graduated on one side only with one edge reading in lifths of an inch and the other edge in eighths of an inch. Each inch graduation shall be suitably numbered with the numbering of each edge starting at opposite ends of the rule. One corner of each graduated edge shall be marked to show the smallest subdivision to which it is graduated.
3.15.3 Accuracy. Error in graduation shall not exceed plus or minus 0.008 inch in 12 inches or under; $1 / 64$ inch in any 36 inches, or $1 / 32$ in 96 inches.
3.15.4 Parallelism. Out-of-parallel error of opposite edge shall not exceed 0.003 inch per foot.
3.15.5 Squareness of ends. The out-of-square error ( 90 degree angle between end and edge) shall not exceed 10 minutes.
3.15.6 Type XII rules shall conform to table IX for length specified and shall be similar to figure 4.

TABLE IX. Type XII, one piece, aluminum rules.

| Length | Width |  | Thickness |  |
| :---: | :---: | :---: | :---: | :---: |
|  | Minimum | Maximum | Minimum | Maximum |
| Inches | Inch | $27 / 32$ | $\frac{\text { Inches }}{1-1 / 16}$ | $\frac{\text { Inch }}{}$ |
| 12 | $1-1 / 16$ | $1-3 / 16$ | .035 | $\frac{\text { Inch }}{0.045}$ |
| 18 | $1-3 / 16$ | $2-1 / 16$ | .035 | .045 |
| 24 | $1-11 / 16$ | $2-1 / 16$ | .060 | .085 |
| 36 | $1-15 / 16$ | $2-1 / 16$ | .075 | .085 |
| 48 | $1-15 / 16$ | $2-1 / 16$ | .075 | .130 |
| 72 | $1-15 / 16$ | $2-1 / 16$ | .097 | .130 |
| 96 |  |  | .097 | .130 |

3.16 Workmanship. Workmanship shall be first class throughout. Rules shall be free from defects which may affect their serviceability or durability. Steel rules and all steel component members of rules shall be free from rust.

## 4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection. Unless otherwise specified in the contract or purchase order, the contractor is cesponsible for all inspection requirements as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein unless disapproved by the Government. The Government reserves the right to porform any of the inspections set forth in the specification where such inspections are decmed necessary to assure that supplies and services conform to prescribed requirements.
4.1.1 Inspection of materials and components. In accordance with 4.1, the supplier is rosponsible for inauring that materials and components used were manufactured, tested, and inspected in accordance with the requirements of this specification.
4. 2 Sampling procedures. Sampling procodures shall be in accordance with MIL-STD-105. Data for sampling shall be as stated in table $X$.
table $x$. Sampling data.

| Category | Sample unit | Inspection level | Acceptable quality. level | AQL expressed in terms of | Referonce |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Visual examination | 1 0a. | 1 | 2.5 | Defects per hundred units | 4.3.1 |
| Dimensiona! examination | 1 ea. | S-3 | 1.5 | Defects per hundred units | 4.3.2 |
| Testing | 10. | $5-4$ | 1.5 | Datects per hundred unlts | 4.4 |
| Preparation for delivery | One conta | S-2 | 4.0 | Defects per hundred units | 4.5 |

4.3 Examination.
4.3.1 Visual examination. Each sample unit shall be examined for any nonconformance In design, material, finish, coating, construction, vorkmanship, and marking. Defects are listed in table XI.
table xi. Classification of defectb.

| Categories | Defects |
| :---: | :---: |
| Pinish | Indication of corrosion. <br> Not smooth, not clean, not free from burys, slivers or other detrimental dofects. |
| Material - Not fabricated from material specified. |  |
| Design | Not type, closs, and stylo specified. |
| Construction and workmanship | Cracks, splits, deap pits, fractured, bent, warped, or crimped. <br> Loose rivets; rivets not furnished with washers. Joints stick, bind, or ore excossively loose. <br> Graduations or figures missing, illegible, not uniform not readily distinguishable, not atraight, discontinuities, ragged edges, or not graduated as specified. <br> Different fractional aliquots not distingulahable by their relative helght. <br> Missing, incorrect, not legible. |

4.3.2 Dimensional examination. Each sample unit shall be oxamined for any nonconformance with dimensional requirements.
4.4 Testing. Each sample unit shall be tested in occordance with 4.4.1, 4.4.2, 4.4.3.1.4.4.3.2, and 4.4.3.3.
4.4.1 Scale accuracy (all types). Graduated scales for linear measurement shall be tested for compliance with the accuracy requirements specified for the individual type and class. These tests shall be made with suitable master rules, instruments, or laboratory apparatus of known accuracy. Tests for types IV, VII, IX, X, XI, and XII metal rules shall be conducted at 68 degrees F., measurements at other temperatures shall be adjusted to values corresponding to the standard temperature of 68 degrees $F$. The error in any test measurement for accuracy shall not exceed the permissible accuracy error specified herein.
4.4.2 Durability of construction of folding joints (type IIl, class 1 rules). Each folding joint. of each rule under test shall be swiveled through an arc of at least. 90 degrees ( 45 degrees each side of the locking position of the joint) for 5,000 complete cycles. A complete cycle shall consist of a forward and backward movement through the locking position. Oiling of the joint at the beginning and at the midpoint of the 5,000 cycles will be acceptable. The rule shall then be suspended from one end and a 5 -pound weight attached to the other end for a period of 1 minute. After the above tests, the sample rule shall be inspected to determine conformance with the requirements of 3.7.1.1 and 3.7.1.3.
4.4.3 Parallelism, squareness of ends, and straightness ftypes IV, VIII, IX, XI, and XII rules).
4.4.3.1 Parallelism. Types IV, VIII, IX, XI, and XII rules shall be tested for compliance with the requirements of parallelism by means of a micrometer, or by a method of equal or greater precision.
4.4.3.2 Squareness of ends. Types IV, IX, XI, and XII rules shall be tested for compliance with the requirements for squareness of ends by means of a precision surface plate and precision square and feelers or by method of equal or greater precision.
4.4.3.3 Straightness. Types IV, VIII, IX, XI, and XII rules shall be tested for compliance with the requirements for straightness by means of a precision surface plate and feelers, or by method of equal or greater precision.
4.4.3.4 Looseness of joints, type III, classes 2 and 3. The rule shall be suspended from one end and a 5-pound weight attached to the other end for a period of 1 minute to determine conformance with 3.7 .2 .1 and 3.7.2.4, or 3.7.3.1 and 3.7.3.4, as applicable.
4.5 Inspection of preparation for delivery. An inspection shall be made to determine that the preservation, packaging, packing, and marking comply with the requirements of PPP-P-40.

## 5. preparation for delivery

5.1 Preservation, packaging, packing, and marking, Preservation, packaging, packing, and marking shall be in accordance with PPP-P-40.

## 6. NOTES

6.1 Ordering data. Purchasers should select the preferred options permitted herein and include the following information in procurement documents:
(a) Title, number, and date of this specification.
(b) Type, class, and style, as applicable, of rule required (see 1.2).
(c) Whether right to left reading rules are required (see 3.3 ).
(d) If maple, beech or birch is required for types I and II rules (see 3.5.1 and 3.6.1)
(e) If special graduations or other subdivisions or figures are required, combination decimal metric or English rules (see 3.6.2.1, 3.7.1.2.1, 3.7.1.2.3, 3.8.2.1, 3.14.2, and 3.15.2.
(f) If special length is required (see 3.7.1 and 3.7.2.2).
(g) If folding end hook is required (see 3.7.1.1 and 3.7.3.1).
(h) If vertical reading figures are required (see 3.7.1.2.1 and 3.7.3.3).
(i) If a specific style of numbering of figures is required (see 3.7.1.2, 3.7.3.3, 3.8.1, and table III).

```
    (j) If engineers' (surveyors' or roadbuilders') rules are required (see
        3.7.1.2.2).
    (k) If special numbering for subdivisions is required (see 3.8.1).
    (1) Kind of special finish, if required (see 3.11.2.3 and 3.12.5), or if chrome
        finish is requiced (sec 3.12.5).
    (m) Size required (see 3.7.2.2, 3.8.1.S, 3.8.2.2, 3.9.5.2, 3.9.6.2, 3.11.2.1,
        3.13.1.1, 3.14.5, 3.15.6, and tables It and IV to (X, inclusive).
    (n) If positive or sliding hook is required (sce 3.8.1.5 and 3.12.2).
    (0) If other than one- or two-piece construction is required (see 3.11.1).
    (p) If auxiliary straight edge is required (see 3.11.1).
    (q) If 3/8-inch width is required (sce 3.12.1).
    (r) Shrinkage allowance (see 3.14.2).
```

MILITARY INTERESTS:

## Custodian:

Ait Porce - 99

## Review activity:


[^0]:    3.9.6.3 Graduations. Graduation lines shall be of uniform width and depth and shall be filled with a durable black material. Both edges of both faces shall be subdivided to eighths of an inch and numbered consecutively in inches. Rules shall read from length to right with opposite face measuring in opposite directions. The inside, or hook, face shall have beginning of measurement (zero) at the capped end, reading (left to right) toward the hook. The outside face (opposite hook) shali have beginning of measurement (zero) opposite the inside of the hook, reading (left to right) away from the hook.

    ### 3.9.6.4 Class 2 rules shall be similar to figure 6.

    

    FIGURE 6. Type VI, class 2, glaziers' rule, hook cap.
    3.10 Type VII, blacksmiths' rule. Type VII rules shall read from left to right.

