



SURFACE VEHICLE STANDARD

SAE**J1268 MAY2010**Issued 1980-06
Revised 2010-05

Superseding J1268 MAY1995

Hardenability Bands for Carbon and Alloy H Steels

RATIONALE

Page 2, Section 2.2.1 Corrected ASTM A 304 title to Carbon and Alloy”

Table 2: Corrected Mo Content from 0.80/.15 to 0.08/.15 grades H4118, H63106, H94151, H94171, H94301.

Table 2 Note 1 Deleted Reference to Table 4 which is up for review and not approved but left reference to SAE J409.

5. Page 5 Deleted SAE J418 because SAE cancelled it and replaced with equivalent ASTM E 112.

6.5 Paragraph 6 Page 6 Corrected typo, changed shall to shallow.

7. Page 6 Deleted reference to AISI Steel Products Manual because it is no longer published.

Corrections to tables and images as follows: jominy values in SAE J1268 were compared with ASTM A 304-05.

Page 11 1045H: Add missing values for J18, 20, 22, 24 and equivalent metric table and complete graphs.

Page 12 1522H: Add missing values for J8, 9, 10, 12 and equivalent metric table and complete graphs.

Page 13 1524H: Add missing values for J16 and equivalent metric table and complete graphs.

Page 14 1526H: Add missing values for J14, 16, 18 and equivalent metric table and complete graphs.

Page 15 1541H: Add missing values for J18, 20, 22, 24 and equivalent metric table and complete graphs.

Page 20 15B37H: Add missing values for J32 and equivalent metric table and complete graphs.

Page 39, Figure 32: % Mo is incorrect. Change from 0.15/0.35 to 0.15/0.25.

Page 62, Figure 55: Normalize temperature is wrong for metric jominy, change from 870 °C to 900 °C. Austenitize temperature is wrong for metric jominy, change from 845 °C to 870 °C.

Page 76, Figure 69: Typo in Figure text at very bottom of page, change from H8627H to 8627H.

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1. SCOPE

All carbon and alloy H-band steels are shown, along with their corresponding minimum and maximum hardenability limits, for which sufficient hardenability data have been established and for grades which use the standard end-quench test. As hardenability data are accumulated for other grades, this SAE Standard will be revised to include such grades.

2. REFERENCES

2.1 Applicable Publications

The following publications form a part of the specification to the extent specified herein. Unless otherwise indicated the latest revision of SAE publications shall apply.

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

SAE J403	Chemical Compositions of SAE Carbon Steels
SAE J404	Chemical Compositions of SAE Alloy Steels
SAE J406	Methods of Determining Hardenability of Steels
SAE J409	Product Analysis—Permissible Variations from Specified Chemical Analysis of a Heat or Cast of Steel
SAE J418	Grain Size Determination of Steels
SAE J1868	Restricted Hardenability Bands for Selected Alloy Steels

2.2 Related Publications

The following publications are provided for information purposes only and are not a required part of this document.

2.2.1 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM A 304	Steel Bars, Carbon and Alloy, Subject to End-Quench Hardenability Requirements
ASTM E 112	Standard Test Methods for Determining Average Grain Size

3. CHEMICAL COMPOSITION LIMITS

To permit steel producers the necessary latitude to meet the standard hardenability limits, the chemical composition limits of these steels have been broadened somewhat from those limits applicable to the same grades when specified by chemical composition only (SAE J403 and SAE J404). These broader limits permit adjustments in manufacturing ranges of composition to compensate for individual plant melting procedures which might otherwise influence the levels and widths of the bands. The modifications have not been great enough to influence the general characteristics of the original compositions of the series under consideration.

The chemical composition limits for electric furnace, open hearth, and BOF steels are outlined in Tables 1 and 2 of this document and are subject to the permissible variations for product analysis outlined in Tables 1 and 3 of SAE J409.

TABLE 1 - CARBON AND CARBON BORON H STEEL
(ladle chemical composition, weight %, for elements shown;
see Figures 3 to 16 for respective H-bands)

UNS No.	SAE Steel No.	C	Mn	Si	P,max ⁽¹⁾	S,max ⁽¹⁾
H10380	1038H	0.34/0.43	0.50/1.00	0.15/0.35	0.030	0.050
H10450	1045H	0.42/0.51	0.50/1.00	0.15/0.35	0.030	0.050
H15220	1522H	0.17/0.25	1.00/1.50	0.15/0.35	0.030	0.050
H15240	1524H	0.18/0.26	1.21/1.75	0.15/0.35	0.030	0.050
H15260	1526H	0.21/0.30	1.00/1.50	0.15/0.35	0.030	0.050
H15410	1541H	0.35/0.45	1.25/1.75	0.15/0.35	0.030	0.050
H15211	15B21H ⁽²⁾	0.17/0.24	0.70/1.20	0.15/0.35	0.030	0.050
H15281	15B28H ⁽²⁾	0.25/0.34	1.00/1.50	0.15/0.35	0.030	0.050
H15301	15B30H ⁽²⁾	0.27/0.35	0.70/1.20	0.15/0.35	0.030	0.050
H15351	15B35H ⁽²⁾	0.31/0.39	0.70/1.20	0.15/0.35	0.030	0.050
H15371	15B37H ⁽²⁾	0.30/0.39	1.00/1.50	0.15/0.35	0.030	0.050
H15411	15B41H ⁽²⁾	0.35/0.45	1.25/1.75	0.15/0.35	0.030	0.050
H15481	15B48H ⁽²⁾	0.43/0.53	1.00/1.50	0.15/0.35	0.030	0.050
H15261	15B62H ⁽²⁾	0.54/0.67	1.00/1.50	0.40/0.60	0.030	0.050

1. If electric furnace practice is specified or required, the limits for phosphorus and sulfur are 0.025%, respectively, and the prefix E is added to the SAE number, for example, E1038H.
2. These steels contain 0.0005 to 0.003% boron.

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TABLE 2⁽¹⁾ - STANDARD ALLOY H STEEL COMPOSITIONS
 (ladle chemical composition, weight %, for elements shown⁽²⁾⁽³⁾
 see Figures 17 to 88 for respective H-bands)

UNS No.	SAE Steel No.	C	Mn	Si	Ni	Cr	Mo	V
H13300	1330H	0.27/0.33	1.45/2.05	0.15/0.35	—	—	—	—
H13350	1335H	0.32/0.38	1.45/2.05	0.15/0.35	—	—	—	—
H13400	1340H	0.37/0.44	1.45/2.05	0.15/0.35	—	—	—	—
H13450	1345H	0.42/0.49	1.45/2.05	0.15/0.35	—	—	—	—
H40270	4027H	0.24/0.30	0.60/1.00	0.15/0.35	—	—	0.20/0.30	—
H40280 ⁽⁴⁾	4028H ⁽⁴⁾	0.24/0.30	0.60/1.00	0.15/0.35	—	—	0.20/0.30	—
H40320	4032H	0.29/0.35	0.60/1.00	0.15/0.35	—	—	0.20/0.30	—
H40370	4037H	0.34/0.41	0.60/1.00	0.15/0.35	—	—	0.20/0.30	—
H40420	4042H	0.39/0.46	0.60/1.00	0.15/0.35	—	—	0.20/0.30	—
H40470	4047H	0.44/0.51	0.60/1.00	0.15/0.35	—	—	0.20/0.30	—
H41180	4118H	0.17/0.23	0.60/1.00	0.15/0.35	—	0.30/0.70	0.08/0.15	—
H41200	4120H	0.18/0.23	0.90/1.20	0.15/0.35	—	0.40/0.60	0.13/0.20	—
H41300	4130H	0.27/0.33	0.30/0.70	0.15/0.35	—	0.75/1.20	0.15/0.25	—
H41350	4135H	0.32/0.38	0.60/1.00	0.15/0.35	—	0.75/1.20	0.15/0.25	—
H41370	4137H	0.34/0.41	0.60/1.00	0.15/0.35	—	0.75/1.20	0.15/0.25	—
H41400	4140H	0.37/0.44	0.65/1.00	0.15/0.35	—	0.75/1.20	0.15/0.25	—
H41420	4142H	0.39/0.46	0.65/1.10	0.15/0.35	—	0.75/1.20	0.15/0.25	—
H41450	4145H	0.42/0.49	0.65/1.10	0.15/0.35	—	0.75/1.20	0.15/0.25	—
H41470	4147H	0.44/0.51	0.65/1.10	0.15/0.35	—	0.75/1.20	0.15/0.25	—
H41500	4150H	0.47/0.54	0.65/1.10	0.15/0.35	—	0.75/1.20	0.15/0.25	—
H41610	4161H	0.55/0.65	0.65/1.10	0.15/0.35	—	0.65/0.95	0.25/0.35	—
H43200	4320H	0.17/0.23	0.40/0.70	0.15/0.35	1.55/2.00	0.35/0.65	0.20/0.30	—
H43400	4340H	0.37/0.44	0.55/0.90	0.15/0.35	1.55/2.00	0.65/0.95	0.20/0.30	—
H43406 ⁽⁵⁾	E4340H ⁽⁵⁾	0.37/0.44	0.60/0.95	0.15/0.35	1.55/2.00	0.65/0.95	0.20/0.30	—
H46200	4620H	0.17/0.23	0.35/0.75	0.15/0.35	1.55/2.00	—	0.20/0.30	—
H47180	4718H	0.15/0.21	0.60/0.95	0.15/0.35	0.85/1.25	0.30/0.60	0.30/0.40	—
H47200	4720H	0.17/0.23	0.45/0.75	0.15/0.35	0.85/1.25	0.30/0.60	0.15/0.25	—
H48150	4815H	0.12/0.18	0.30/0.70	0.15/0.35	3.20/3.80	—	0.20/0.30	—
H48170	4817H	0.14/0.20	0.30/0.70	0.15/0.35	3.20/3.80	—	0.20/0.30	—
H48200	4820H	0.17/0.23	0.40/0.80	0.15/0.35	3.20/3.80	—	0.20/0.30	—
H50401 ⁽⁶⁾	50B40H ⁽⁶⁾	0.37/0.44	0.65/1.10	0.15/0.35	—	0.30/0.70	—	—
H50441 ⁽⁶⁾	50B44H ⁽⁶⁾	0.42/0.49	0.65/1.10	0.15/0.35	—	0.30/0.70	—	—
H50460	5046H	0.43/0.50	0.65/1.10	0.15/0.35	—	0.13/0.43	—	—
H50461 ⁽⁶⁾	50B46H ⁽⁶⁾	0.43/0.50	0.65/1.10	0.15/0.35	—	0.13/0.43	—	—
H50501 ⁽⁶⁾	50B50H ⁽⁶⁾	0.47/0.54	0.65/1.10	0.15/0.35	—	0.30/0.70	—	—
H50601 ⁽⁶⁾	50B60H ⁽⁶⁾	0.55/0.65	0.65/1.10	0.15/0.35	—	0.30/0.70	—	—

TABLE 2⁽¹⁾ - STANDARD ALLOY H STEEL COMPOSITIONS
 (ladle chemical composition, weight %, for elements shown⁽²⁾⁽³⁾)
 see Figures 17 to 88 for respective H-bands) (Continued)

UNS No.	SAE Steel No.	C	Mn	Si	Ni	Cr	Mo	V
H51200	5120H	0.17/0.23	0.60/1.00	0.15/0.35	—	0.60/1.00	—	—
H51300	5130H	0.27/0.33	0.60/1.00	0.15/0.35	—	0.75/1.20	—	—
H51320	5132H	0.29/0.35	0.50/0.90	0.15/0.35	—	0.65/1.10	—	—
H51350	5135H	0.32/0.38	0.50/0.90	0.15/0.35	—	0.70/1.15	—	—
H51400	5140H	0.37/0.44	0.60/1.00	0.15/0.35	—	0.60/1.00	—	—
H51470	5147H	0.45/0.52	0.60/1.05	0.15/0.35	—	0.80/1.25	—	—
H51500	5150H	0.47/0.54	0.60/1.00	0.15/0.35	—	0.60/1.00	—	—
H51550	5155H	0.50/0.60	0.60/1.00	0.15/0.35	—	0.60/1.00	—	—
H51600	5160H	0.55/0.65	0.65/1.10	0.15/0.35	—	0.60/1.00	—	—
H51601 ⁽⁶⁾	51B60H ⁽⁶⁾	0.55/0.65	0.65/1.10	0.15/0.35	—	0.60/1.00	—	—
H61180	6118H	0.15/0.21	0.40/0.80	0.15/0.35	—	0.40/0.80	—	0.10/0.15
H61500	6150H	0.47/0.54	0.60/1.00	0.15/0.35	—	0.75-1.20	—	0.15 min
H81451 ⁽⁶⁾	81B45H ⁽⁶⁾	0.42/0.49	0.70/1.05	0.15/0.35	0.15/0.45	0.30/0.60	0.08/0.15	—
H86170	8617H	0.14/0.20	0.60/0.95	0.15/0.35	0.35/0.75	0.35/0.65	0.15/0.25	—
H86200	8620H	0.17/0.23	0.60/0.95	0.15/0.35	0.35/0.75	0.35/0.65	0.15/0.25	—
H86220	8622H	0.19/0.25	0.60/0.95	0.15/0.35	0.35/0.75	0.35/0.65	0.15/0.25	—
H86250	8625H	0.22/0.28	0.60/0.95	0.15/0.35	0.35/0.75	0.35/0.65	0.15/0.25	—
H86270	8627H	0.24/0.30	0.60/0.95	0.15/0.35	0.35/0.75	0.35/0.65	0.15/0.25	—
H86300	8630H	0.27/0.33	0.60/0.95	0.15/0.35	0.35/0.75	0.35/0.65	0.15/0.25	—
H86301 ⁽⁶⁾	86B30H ⁽⁶⁾	0.27/0.33	0.60/0.95	0.15/0.35	0.35/0.75	0.35/0.65	0.15/0.25	—
H86370	8637H	0.34/0.41	0.70/1.05	0.15/0.35	0.35/0.75	0.35/0.65	0.15/0.25	—
H86400	8640H	0.37/0.44	0.70/1.05	0.15/0.35	0.35/0.75	0.35/0.65	0.15/0.25	—
H86420	8642H	0.39/0.46	0.70/1.05	0.15/0.35	0.35/0.75	0.35/0.65	0.15/0.25	—
H86450	8645H	0.42/0.49	0.70/1.05	0.15/0.35	0.35/0.75	0.35/0.65	0.15/0.25	—
H86451 ⁽⁶⁾	86B45H ⁽⁶⁾	0.42/0.49	0.70/1.05	0.15/0.35	0.35/0.75	0.35/0.65	0.15/0.25	—
H86500	8650H	0.47/0.54	0.70/1.05	0.15/0.35	0.35/0.75	0.35/0.65	0.15/0.25	—
H86550	8655H	0.50/0.60	0.70/1.05	0.15/0.35	0.35/0.75	0.35/0.65	0.15/0.25	—
H86600	8660H	0.55/0.65	0.70/1.05	0.15/0.35	0.35/0.75	0.35/0.65	0.15/0.25	—
H87200	8720H	0.17/0.23	0.60/0.95	0.15/0.35	0.35/0.75	0.35/0.65	0.20/0.30	—
H87400	8740H	0.37/0.44	0.70/1.05	0.15/0.35	0.35/0.75	0.35/0.65	0.20/0.30	—
H88220	8822H	0.19/0.25	0.70/1.05	0.15/0.35	0.35/0.75	0.35/0.65	0.30/0.40	—
H92590	9259H	0.56/0.64	0.65/1.10	0.70/1.20	—	0.45/0.65	—	—
H92600	9260H	0.55/0.65	0.65/1.10	1.70/2.20	—	—	—	—
H93106 ⁽⁵⁾	E9310H ⁽⁵⁾	0.07/0.13	0.40/0.70	0.15/0.35	2.95/3.55	1.00/1.45	0.08/0.15	—

TABLE 2⁽¹⁾ - STANDARD ALLOY H STEEL COMPOSITIONS
(ladle chemical composition, weight %, for elements shown⁽²⁾⁽³⁾
see Figures 17 to 88 for respective H-bands) (Continued)

UNS No.	SAE Steel No.	C	Mn	Si	Ni	Cr	Mo	V
H94151 ⁽⁶⁾	94B15H ⁽⁶⁾	0.12/0.18	0.70/1.05	0.15/0.35	0.25/0.65	0.25/0.55	0.08/0.15	—
H94171 ⁽⁶⁾	94B17H ⁽⁶⁾	0.14/0.20	0.70/1.05	0.15/0.35	0.25/0.65	0.25/0.55	0.08/0.15	—
H94301 ⁽⁶⁾	94B30H ⁽⁶⁾	0.27/0.33	0.70/1.05	0.15/0.35	0.25/0.65	0.25/0.55	0.08/0.15	—

1. The ranges and limits on this table apply only to material not exceeding 0.13 m² (200 in²) in cross-sectional area, 460 mm (18 in) in width, or 4.5 tonne (10 000 lb) per piece in weight. Ranges and limits are subject to the permissible variations for product analysis shown in SAE J409.
2. Small quantities of certain elements may be found in alloy steel which are not specified or required. These elements are considered incidental and acceptable to the following maximum amounts: copper to 0.35%, nickel to 0.25%, chromium to 0.20%, and molybdenum to 0.06%.
3. For open hearth and basic oxygen steels maximum sulfur content is 0.040% and maximum phosphorus content is 0.030%. Maximum phosphorus and sulfur in basic electric furnace steels are 0.025% each.
4. Sulfur content range is 0.035/0.050%.
5. Electric furnace steel.
6. These steels contain 0.0005 to 0.003% boron.

4. IDENTIFICATION

As a means of identifying steels specified to hardenability band limits, the suffix letter "H" has been added to the conventional series number. In the Unified Numbering System (UNS), the "H" appears as a prefix. It is important the steel consumers use this letter in specification requirements, as there is no other means of determining when hardenability band limits apply. When the letter is used, all conditions pertaining to chemical composition limits, restrictions, testing techniques, and so forth, as outlined herein apply.

5. GRAIN SIZE

The H-band limits set forth are intended to apply to steels exhibiting austenitic grain size ASTM No. 5 or finer (see ASTM E 112). In cases where coarse grain steel is desired, the hardenability limits shall be a matter of agreement between the producer and the consumer.

6. USE OF HARDENABILITY LIMITS

H-band limits are shown graphically and are so depicted for convenience in estimating the hardness value obtainable at the various locations on the end quench test specimen and for quick comparisons of the various H grades.

The values of Diameter of Rounds, with Same As-Quenched Hardness shown above each H-band, are approximate and were selected from the ranges appearing in Figure 7 of SAE J406.

It should be noted that hardenability limits are presented graphically in both U.S. customary units and metric (SI) units. The metric hardenability bands were prepared by careful conversion from existing bands in U.S. customary units.

In either case, for specification purposes, the tabulated values of Rockwell C hardness (HRC) are used. Values below 20 HRC are not specified because such values are not as accurate.

Two points from the tabulated values are commonly designated according to method A, B, C, D, or E, which are defined in the following paragraphs. Those various methods are illustrated graphically in Figures 1 and 2. Note that nearest whole integers of distance and hardness are to be used, not fractions.

6.1 Method A

The minimum and maximum hardness values at any desired distance. This method is illustrated in Figures 1 and 2 as points A-A.

6.2 Method B

The minimum and maximum distance at which any desired hardness value occurs. This method is illustrated in Figures 1 and 2 as points B-B. If the desired hardness does not fall on an exact mm (or sixteenth of an inch) position, the minimum distance selected should be the nearest mm (or sixteenth of an inch) position toward the quenched end and the maximum should be the nearest mm (or sixteenth of an inch) position away from the quenched end.

6.3 Method C

Two maximum hardness values at two desired distances, illustrated in Figures 1 and 2 as points C-C.

6.4 Method D

Two minimum hardness values at two desired distances, illustrated in Figures 1 and 2 as points D-D.

6.5 Method E

Any minimum hardness plus any maximum hardness, illustrated in Figures 1 and 2 as points E-E.

When hardenability is specified according to one of the aforementioned methods, the balance of the hardenability band is not applicable.

In cases when it is considered desirable, the maximum and minimum limits at a distance of 1.5 mm (1/16 in) from the quenched end can be specified in addition to the other two points as previously described in methods A to E, inclusive.

When the full h-band is specified, the hardenability can be reported by listing hardness values for 1.5, 3, 5, 7, 9, 11, 13, 15, 20, 25, 30, 35, 40, 45, and 50 mm from the quenched end of the test specimen. In the case of the test specimen made to U.S. customary units, hardness values would be reported for each 1/6 to 16/16 in and 1/8 in increments from there to 32/16 in.

It is customary to accept a tolerance of two points HRC for a 5mm or 3/16 in portion of the curve, except at the 1.5 mm or 1/6 in position. This tolerance is necessary because curves for individual heats may vary somewhat in shape from the standard band limits and thus deviate slightly at one or more positions in the full length of the curves.

For shallow hardening carbon H steels, distances from the quenched end may be reported by listing hardness values for 1 mm or 1/32 in intervals near the quenched end, as described more fully in SAE J406.

Acceptance testing shall be performed in accordance with SAE J406.

7. GENERAL

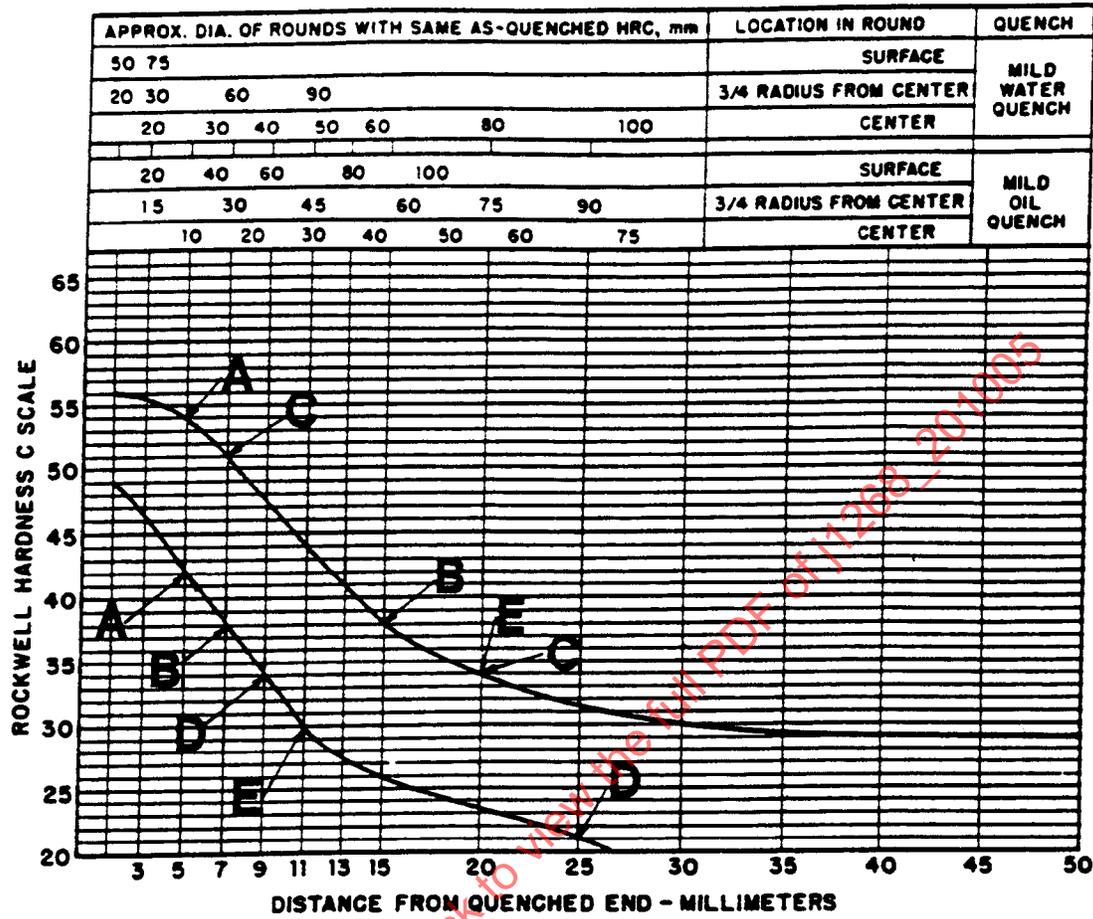
Some of the steels in this document can be specified to more restricted hardenability ranges, as presented in SAE J1868.

8. NOTES

8.1 Marginal Indicia

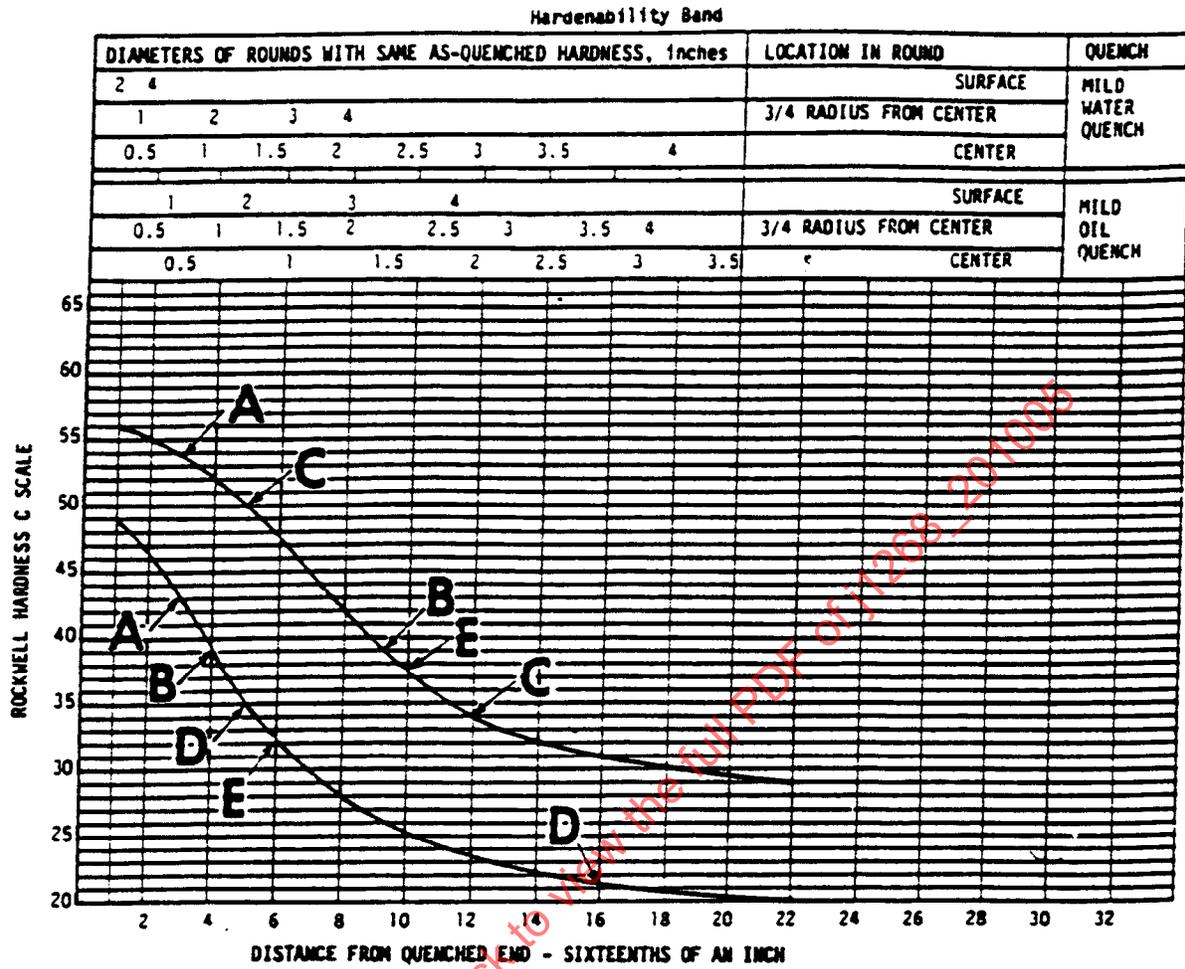
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Hardenability Band



Method	Example
A Minimum and maximum hardness values at a designated distance	A-A 42 to 54 HRC at J 5 mm
B A hardness value at minimum and maximum distance	B-B 38 HRC at J 7 mm min 38 HRC at J 15 mm max
C Two maximum hardness values at two designated distances	C-C 51 HRC at J 7 mm max 34 HRC at J 20 mm max
D Two minimum hardness values at two distances	D-D 34 HRC at J 9 mm min 21 HRC at J 25 mm min
E Any minimum hardness plus any maximum hardness	E-E 30 HRC at J 11 mm min 34 HRC at J 20 mm max

FIGURE 1 - EXAMPLES ILLUSTRATING ALTERNATE METHODS OF SPECIFYING HARDENABILITY REQUIREMENTS IN METRIC (SI) UNITS



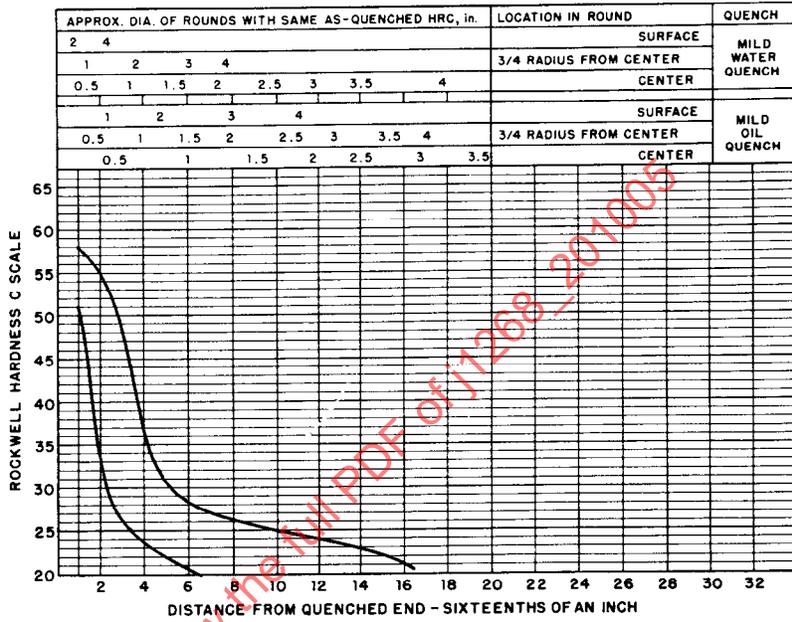
Method	Example
A Minimum and maximum hardness values at a designated distance	A-A 43 to 54 HRC at J 3/16
B A hardness value at minimum and maximum distances	B-B 39 HRC at J 4/16 min 39 HRC at J 9/16 max
C Two maximum hardness values at two designated distances	C-C 50 HRC at J 5/16 max 34 HRC at J 12/16 max
D Two minimum hardness values at two distances	D-D 35 HRC at J 5/16 min 21 HRC at J 16/16 min
E Any minimum hardness plus any maximum hardness	E-E 32 HRC at J 6/16 min 37 HRC at J 10/16 max

FIGURE 2 - EXAMPLES ILLUSTRATING ALTERNATE METHODS OF SPECIFYING HARDENABILITY REQUIREMENTS IN U.S. CUSTOMARY UNITS

HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	58	51
1.5	56	42
2	55	34
2.5	53	29
3	49	26
3.5	43	24
4	37	23
4.5	33	22
5	30	22
5.5	29	21
6	28	21
6.5	27	20
7	27	--
7.5	26	--
8	26	--
9	25	--
10	25	--
12	24	--
14	23	--
16	21	--
HEAT TREATING TEMPERATURES		
*NORMALIZE	1600 °F	
AUSTENITIZE	1550 °F	
*For forged or rolled specimens only		

UNS H10380 HARDENABILITY BAND SAE 1038H

% C	% Mn	% Si	% Ni	% Cr	% Mo	
0.34/0.43	0.50/1.00	0.15/0.35				



HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE MILLIMETERS	HRC	
	MAX.	MIN.
1.5	58	51
3	56	37
5	49	25
7	33	22
9	29	20
11	27	--
13	26	--
15	25	--
20	24	--
25	22	--
30	--	--
35	--	--
40		
45		
50		
HEAT TREATING TEMPERATURES		
*NORMALIZE	870 °C	
AUSTENITIZE	845 °C	
*For forged or rolled specimens only		

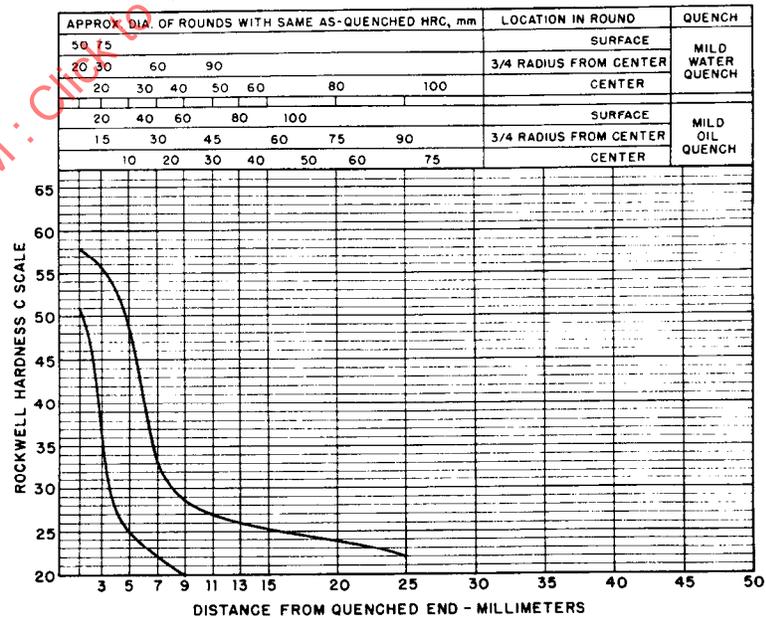


FIGURE 3 - UNS H10380 - HARDENABILITY BAND - SAE 1038H

HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	62	55
1.5	61	52
2	59	42
2.5	56	34
3	52	31
3.5	46	29
4	38	28
4.5	34	27
5	33	26
5.5	32	26
6	32	25
6.5	31	25
7	31	25
7.5	30	24
8	30	24
9	29	23
10	29	22
12	28	21
14	27	20
16	26	--
18	25	--
20	23	--
22	22	--
24	21	--
HEAT TREATING TEMPERATURES		
*NORMALIZE	1600 °F	
AUSTENITIZE	1550 °F	
*For forged or rolled specimens only		

UNS H10450 **HARDENABILITY BAND** SAE 1045H

%C	%Mn	%Si	%Ni	%Cr	%Mo
0.42/0.51	0.50/1.00	0.15/0.35			

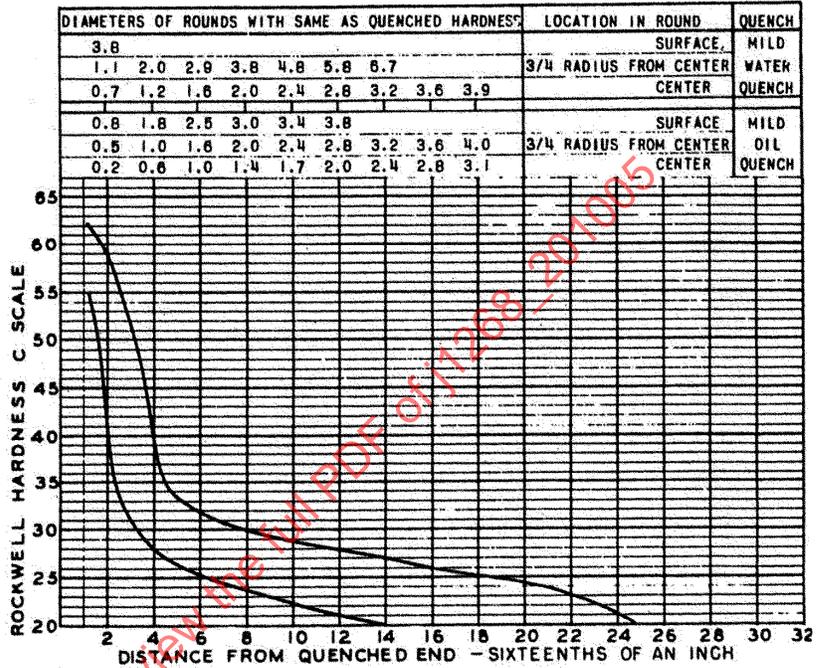


FIGURE 4 - UNS H10450 - HARDENABILITY BAND - SAE 1045H

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HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	50	41
1.5	48	41
2	47	32
2.5	46	27
3	45	22
3.5	42	21
4	39	20
4.5	37	--
5	34	--
5.5	32	--
6	30	--
6.5	28	--
7	27	--
7.5	--	--
8	25	--
9	23	--
10	22	--
12	20	--
14	--	--
16	--	--
HEAT TREATING TEMPERATURES		
*NORMALIZE	1700 °F	
AUSTENITIZE	1700 °F	
*For forged or rolled specimens only		

UNS H15220 **HARDENABILITY BAND** SAE 1522H

%C	%Mn	%Si	%Ni	%Cr	%Mo
0.17/0.25	1.00/1.50	0.15/0.35			

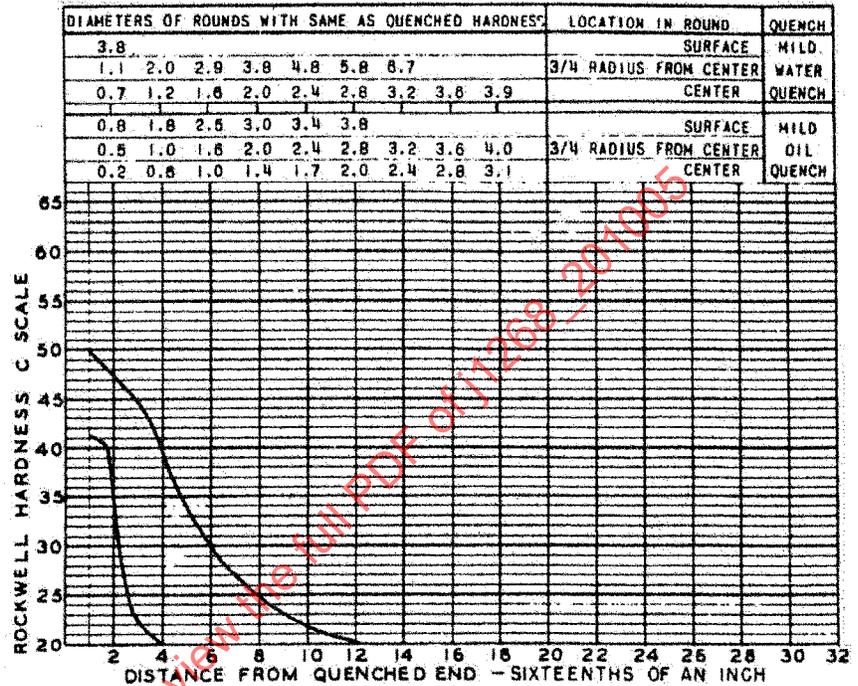


FIGURE 5 - UNS H15220 - HARDENABILITY BAND - SAE 1522H

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HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	51	42
1.5	49	42
2	48	38
2.5	47	34
3	45	29
3.5	43	25
4	39	22
4.5	38	20
5	35	--
5.5	34	--
6	32	--
6.5	30	--
7	29	--
7.5	28	--
8	27	--
9	26	--
10	25	--
12	23	--
14	22	--
16	20	--
26		
28		
30		
32		
HEAT TREATING TEMPERATURES		
*NORMALIZE	1650 °F	
AUSTENITIZE	1600 °F	
*For forged or rolled specimens only		

UNS H15240 **HARDENABILITY BAND** SAE 1524H

%C	%Mn	%Si	%Ni	%Cr	%Mo	
0.18/0.26	1.25/1.75	0.15/0.35				

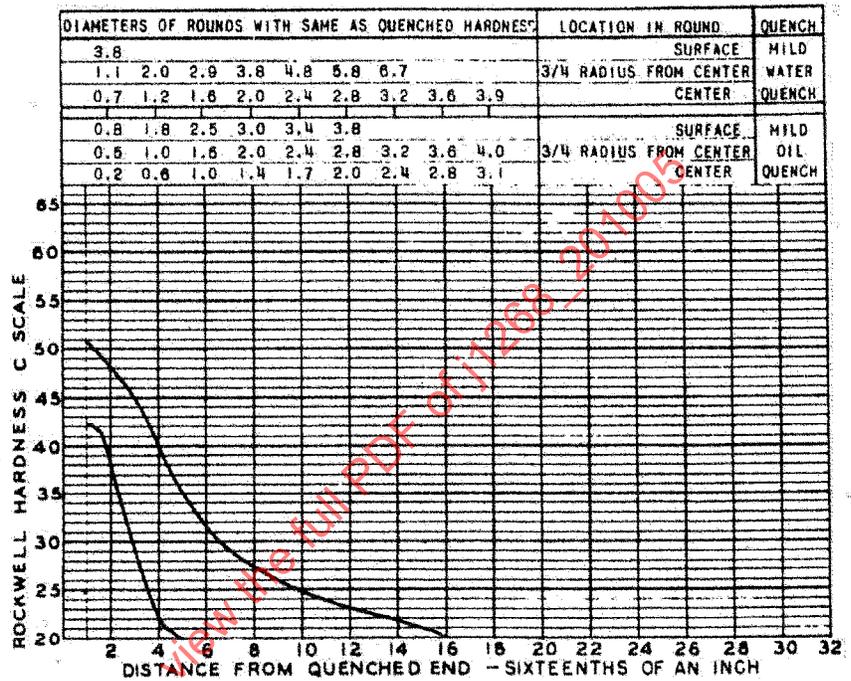


FIGURE 6 - UNS H15240 - HARDENABILITY BAND - SAE 1524H

HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	53	44
1.5	50	42
2	49	38
2.5	47	33
3	46	26
3.5	42	25
4	39	21
4.5	37	20
5	33	--
5.5	31	--
6	30	--
6.5	28	--
7	27	--
7.5	26	--
8	26	--
9	24	--
10	24	--
12	23	--
14	22	--
16	21	--
18	20	--
HEAT TREATING TEMPERATURES		
*NORMALIZE	1650 °F	
AUSTENITIZE	1600 °F	
*For forged or rolled specimens only		

UNS H15260 **HARDENABILITY BAND** SAE 1526H

%C	%Mn	%Si	%Ni	%Cr	%Mo	
0.21/0.30	1.00/1.50	0.15/0.35				

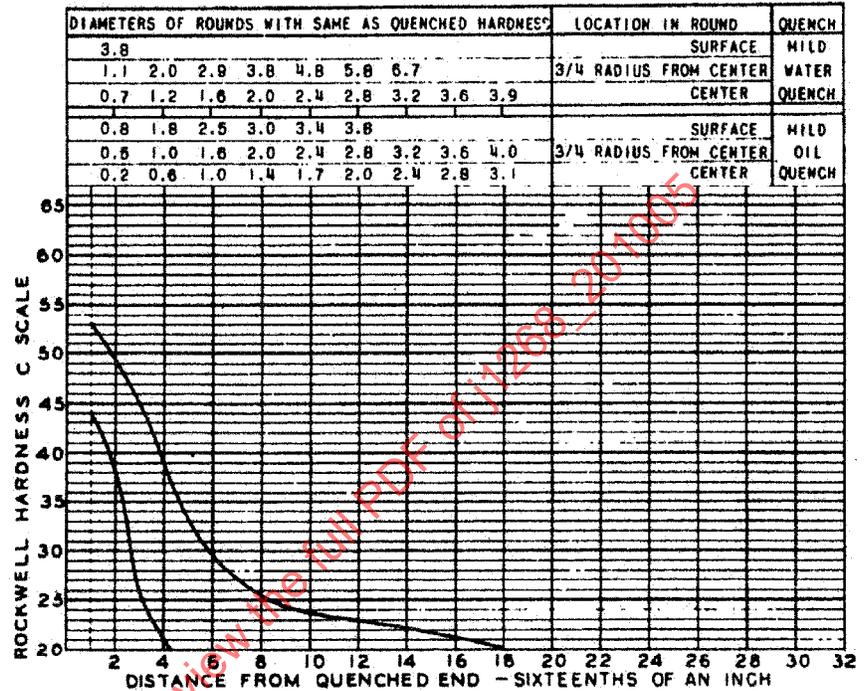


FIGURE 7 - UNS H15260 - HARDENABILITY BAND - SAE 1526H

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HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	60	53
1.5	59	52
2	59	50
2.5	58	47
3	57	44
3.5	56	41
4	55	38
4.5	53	35
5	52	32
5.5	50	29
6	48	27
6.5	46	26
7	44	25
7.5	41	24
8	39	23
9	35	23
10	33	22
12	32	21
14	31	20
16	30	--
18	30	--
20	29	--
22	28	--
24	26	--

HEAT TREATING TEMPERATURES	
*NORMALIZE	1600 °F
AUSTENITIZE	1550 °F

*For forged or rolled specimens only

UNS H15410 **HARDENABILITY BAND** SAE 1541H

%C	%Mn	%Si	%Ni	%Cr	%Mo
0.35/0.45	1.25/1.75	0.15/0.35			

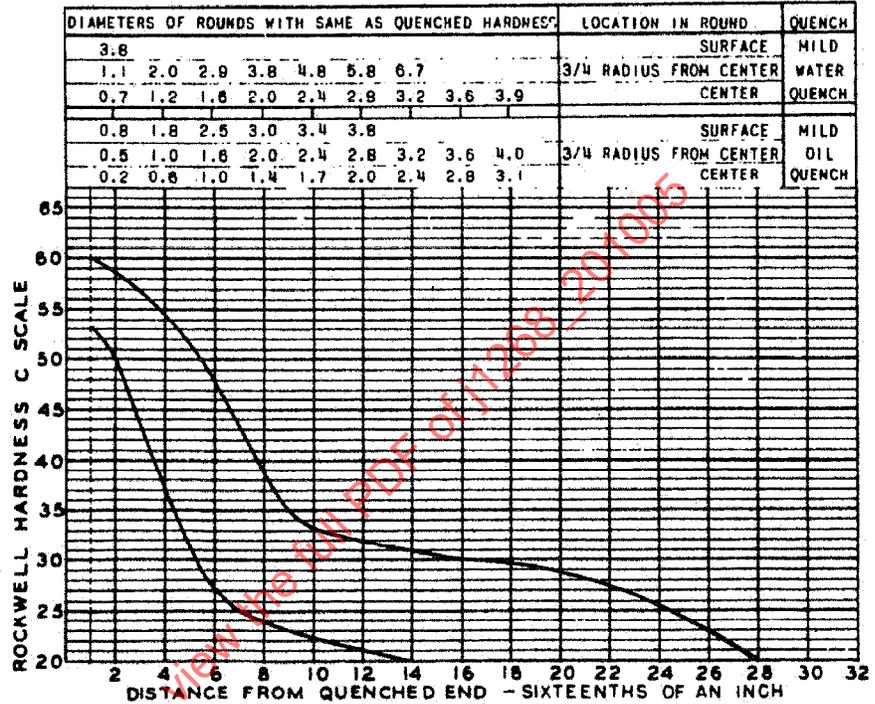
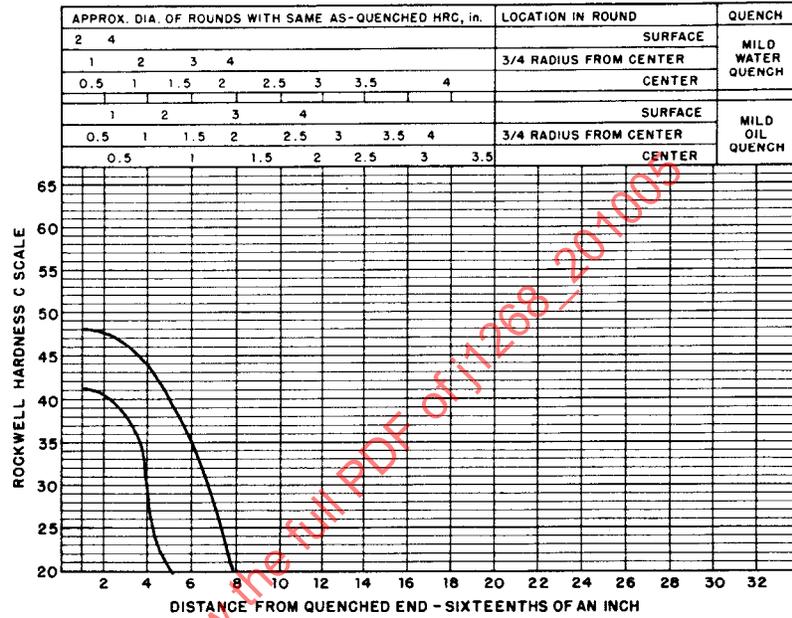


FIGURE 8 - UNS H15410 - HARDENABILITY BAND - SAE 1541H

HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	48	41
1.5	48	41
2	47	40
2.5	47	39
3	46	38
3.5	45	36
4	44	30
4.5	42	23
5	40	20
5.5	38	--
6	35	--
6.5	32	--
7	27	--
7.5	22	--
8	20	--
9	--	--
10		
12		
14		
16		
HEAT TREATING TEMPERATURES		
*NORMALIZE	1700 °F	
AUSTENITIZE	1700 °F	
*For forged or rolled specimens only		

UNS H15211 **HARDENABILITY BAND** SAE 15B21H

%C	%Mn	%Si	%Ni	%Cr	%Mo	%B
0.17/0.24	0.70/1.20	0.15/0.35	--	--	--	0.0005/0.003



HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE MILLIMETERS	HRC	
	MAX.	MIN.
1.5	48	41
3	48	40
5	46	36
7	43	27
9	38	--
11	30	--
13	--	--
15	--	--
20		
25		
30		
35		
40		
45		
50		
HEAT TREATING TEMPERATURES		
*NORMALIZE	925 °C	
AUSTENITIZE	925 °C	
*For forged or rolled specimens only		

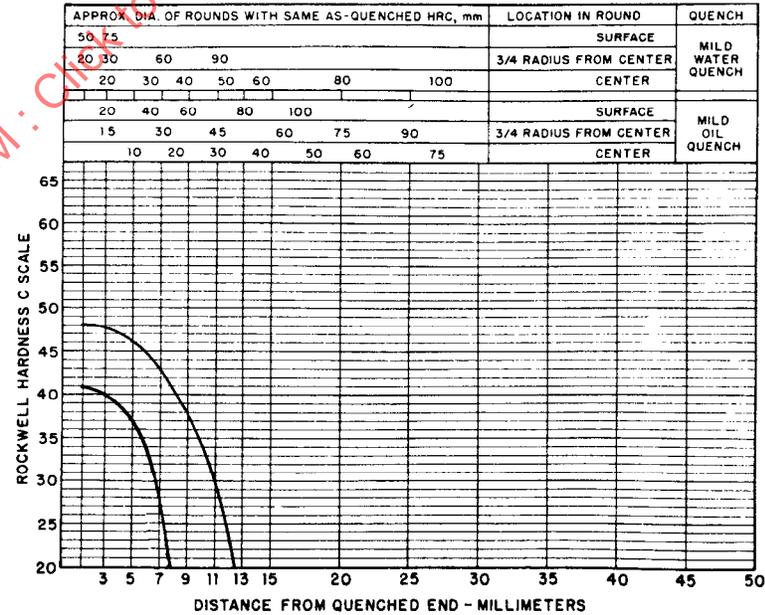


FIGURE 9 - UNS H15211 - HARDENABILITY BAND - SAE 15B21H

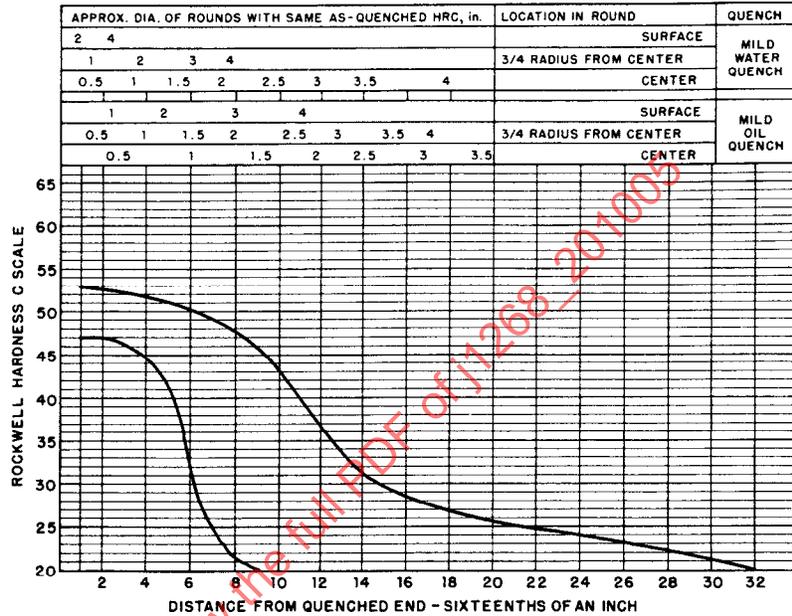
HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	53	47
2	53	47
3	52	46
4	51	45
5	51	42
6	50	32
7	49	25
8	48	21
9	46	20
10	43	--
11	40	--
12	37	--
13	34	--
14	31	--
15	30	--
16	29	--
18	27	--
20	25	--
22	25	--
24	24	--
26	23	--
28	22	--
30	21	--
32	20	--

HEAT TREATING TEMPERATURES	
*NORMALIZE	1650 °F
AUSTENITIZE	1600 °F

*For forged or rolled specimens only

UNS H15281 **HARDENABILITY BAND** SAE 15B28H

% C	% Mn	% Si	% Ni	% Cr	% Mo	% B
0.25/0.34	1.00/1.50	0.15/0.35	--	--	--	0.0005/0.003



HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE MILLIMETERS	HRC	
	MAX.	MIN.
1.5	53	47
3	53	47
5	53	46
7	52	43
9	51	35
11	50	24
13	48	21
15	45	20
20	35	--
25	29	--
30	26	--
35	25	--
40	24	--
45	23	--
50	20	--

HEAT TREATING TEMPERATURES	
*NORMALIZE	900 °C
AUSTENITIZE	870 °C

*For forged or rolled specimens only

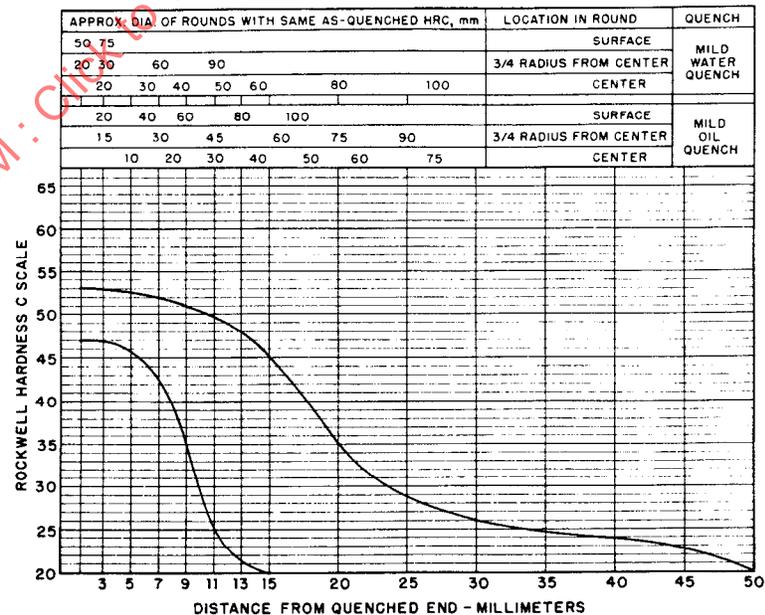


FIGURE 10 - UNS H15281 - HARDENABILITY BAND - SAE 15B28H

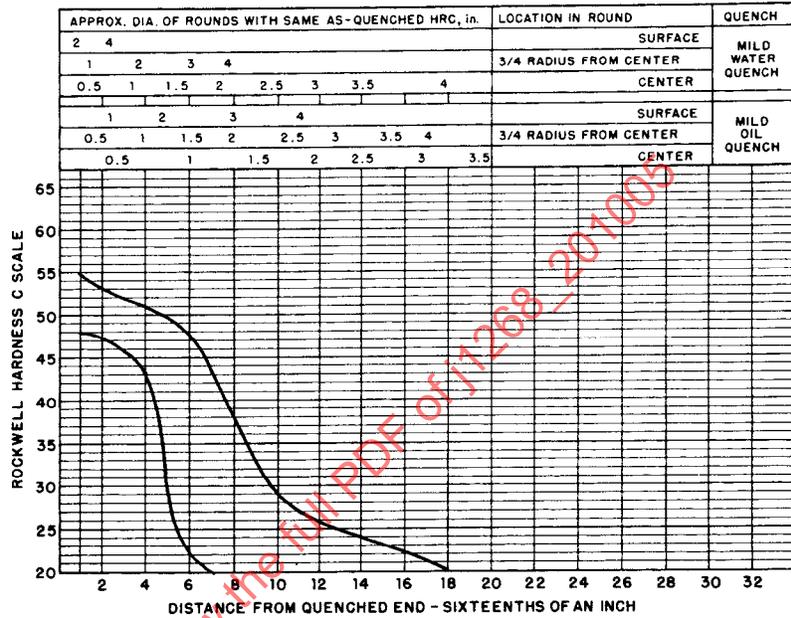
HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	55	48
2	53	47
3	52	46
4	51	44
5	50	32
6	48	22
7	43	20
8	38	--
9	33	--
10	29	--
11	27	--
12	26	--
13	25	--
14	24	--
15	23	--
16	22	--
18	20	--
20	--	--
22	--	--
24	--	--
26	--	--
28	--	--
30	--	--
32	--	--

HEAT TREATING TEMPERATURES	
*NORMALIZE	1650 °F
AUSTENITIZE	1600 °F

*For forged or rolled specimens only

UNS H15301 **HARDENABILITY BAND** SAE 15B30H

%C	%Mn	%Si	%Ni	%Cr	%Mo	%B
0.27/0.35	0.70/1.20	0.15/0.35	--	--	--	0.0005/0.003



HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE MILLIMETERS	HRC	
	MAX.	MIN.
1.5	55	48
3	53	47
5	52	46
7	51	39
9	49	25
11	44	20
13	37	--
15	31	--
20	26	--
25	22	--
30	20	--
35	--	--
40	--	--
45	--	--
50	--	--

HEAT TREATING TEMPERATURES	
*NORMALIZE	900 °C
AUSTENITIZE	870 °C

*For forged or rolled specimens only

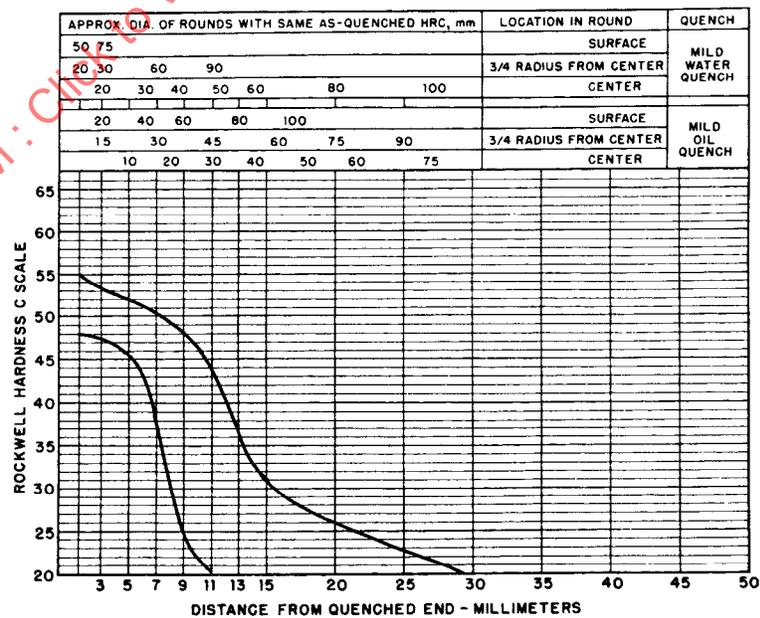


FIGURE 11 - UNS H15301 - HARDENABILITY BAND - SAE 15B30H

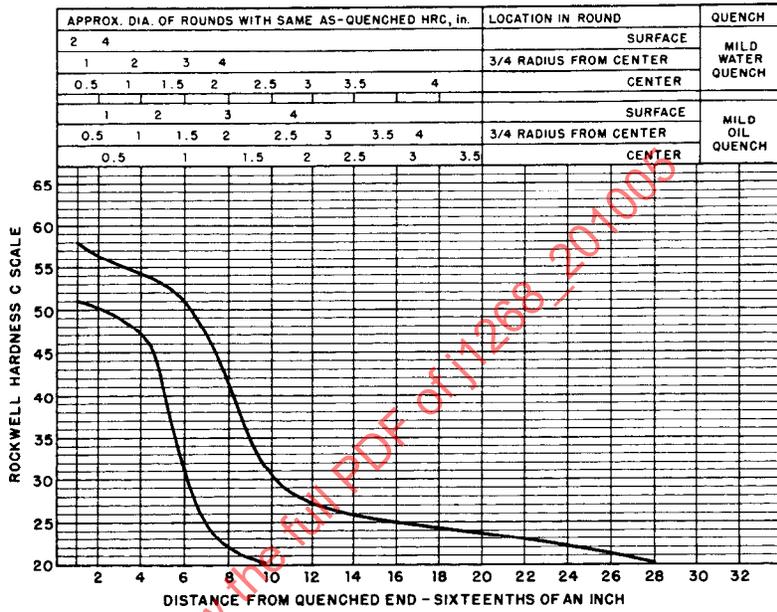
HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	58	51
2	56	50
3	55	49
4	54	48
5	53	39
6	51	28
7	47	24
8	41	22
9	--	--
10	30	20
11	--	--
12	27	--
13	--	--
14	26	--
15	--	--
16	25	--
18	--	--
20	24	--
22	--	--
24	22	--
26	--	--
28	20	--
30	--	--
32	--	--

HEAT TREATING TEMPERATURES	
*NORMALIZE	1600 °F
AUSTENITIZE	1550 °F

*For forged or rolled specimens only

UNS H15351 **HARDENABILITY BAND** SAE 15B35H

%C	%Mn	%Si	%Ni	%Cr	%Mo	%B
0.31/0.39	0.70/1.20	0.15/0.35	--	--	--	0.0005/0.003



HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE MILLIMETERS	HRC	
	MAX.	MIN.
1.5	58	51
3	56	50
5	55	49
7	54	45
9	52	32
11	47	24
13	39	21
15	32	20
20	27	--
25	25	--
30	24	--
35	23	--
40	22	--
45	20	--
50	--	--

HEAT TREATING TEMPERATURES	
*NORMALIZE	870 °C
AUSTENITIZE	845 °C

*For forged or rolled specimens only

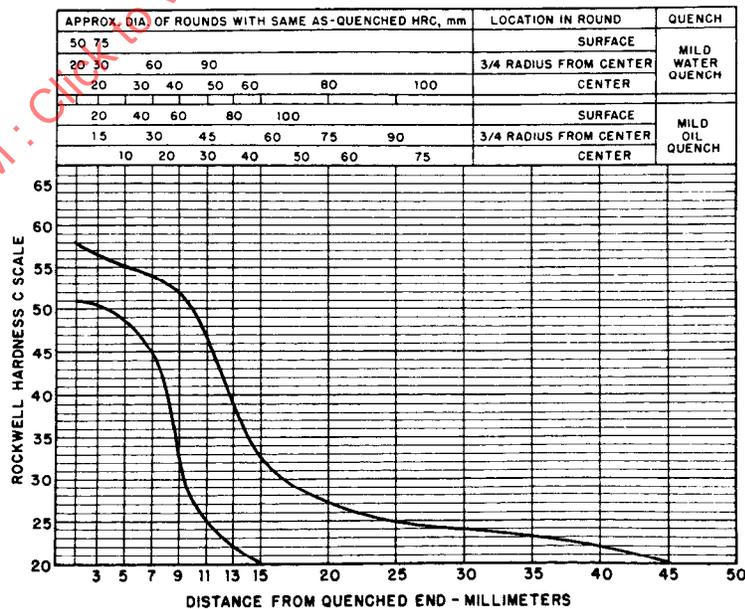


FIGURE 12 - UNS H15351 - HARDENABILITY BAND - SAE 15B35H

HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	58	50
2	56	50
3	55	49
4	54	48
5	53	43
6	52	37
7	51	33
8	50	26
9	--	--
10	45	22
11	--	--
12	40	21
13	--	--
14	33	20
15	--	--
16	29	--
18	--	--
20	27	--
22	--	--
24	25	--
26	--	--
28	23	--
30	--	--
32	21	--

HEAT TREATING TEMPERATURES	
*NORMALIZE	1600°F
AUSTENITIZE	1550°F

*For forged or rolled specimens only

UNS H15371 **HARDENABILITY BAND** SAE 15B37H

%C	%Mn	%Si	%Ni	%Cr	%Mo	%B
0.30/0.39	1.00/1.50	0.15/0.35	--	--	--	0.0005/0.003

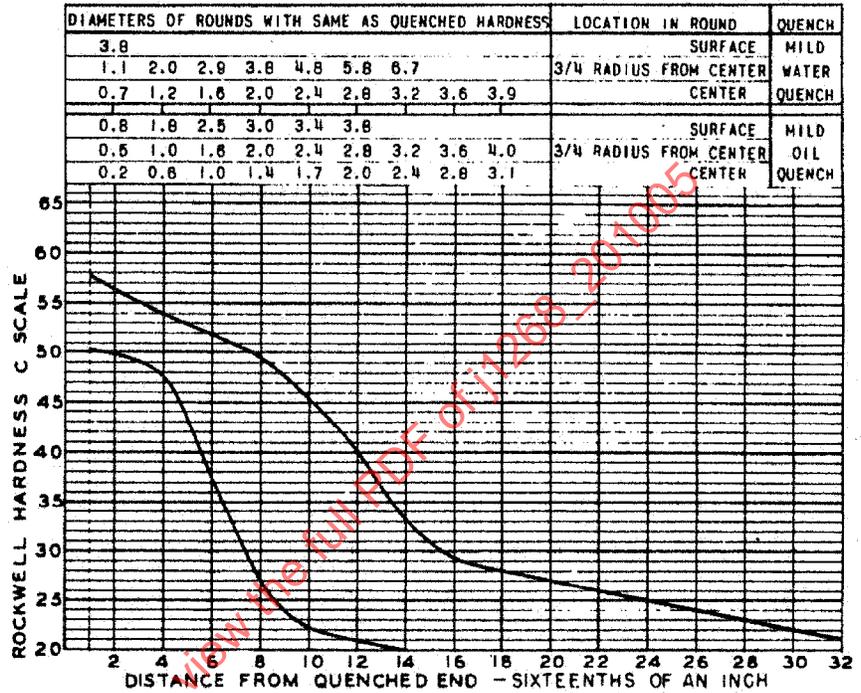


FIGURE 13 - UNS H15371 - HARDENABILITY BAND - SAE 15B37H

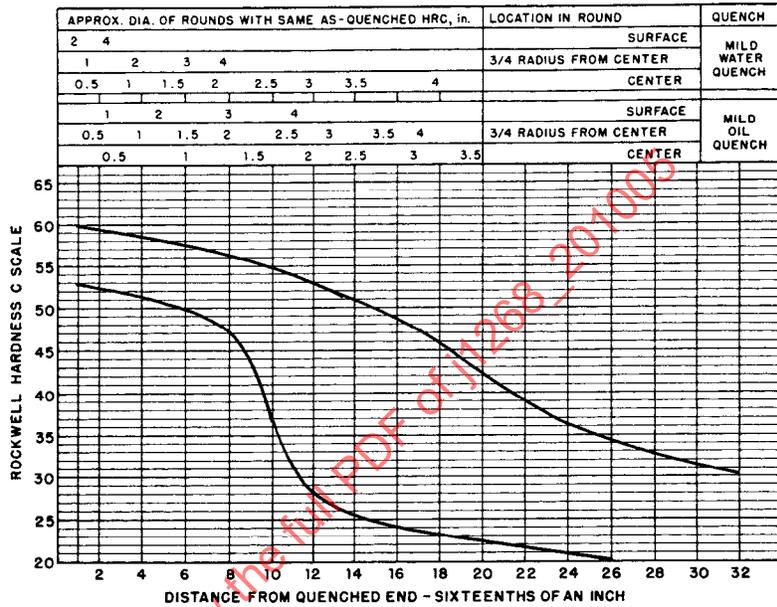
HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	60	53
2	59	52
3	59	52
4	58	51
5	58	51
6	57	50
7	57	49
8	56	48
9	55	44
10	55	37
11	54	32
12	53	28
13	52	26
14	51	25
15	50	25
16	49	24
18	46	23
20	42	22
22	39	21
24	36	21
26	34	20
28	33	--
30	31	--
32	31	--

HEAT TREATING TEMPERATURES	
*NORMALIZE	1600 °F
AUSTENITIZE	1550 °F

*For forged or rolled specimens only

UNS H15411 **HARDENABILITY BAND** SAE 15B41H

%C	%Mn	%Si	%Ni	%Cr	%Mo	%B
0.35/0.45	1.25/1.75	0.15/0.35	--	--	--	0.0005/0.003



HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE MILLIMETERS	HRC	
	MAX.	MIN.
1.5	60	53
3	60	52
5	59	52
7	58	51
9	58	50
11	57	49
13	56	47
15	55	41
20	53	26
25	50	24
30	45	23
35	39	21
40	35	20
45	32	--
50	31	--

HEAT TREATING TEMPERATURES	
*NORMALIZE	870 °C
AUSTENITIZE	845 °C

*For forged or rolled specimens only

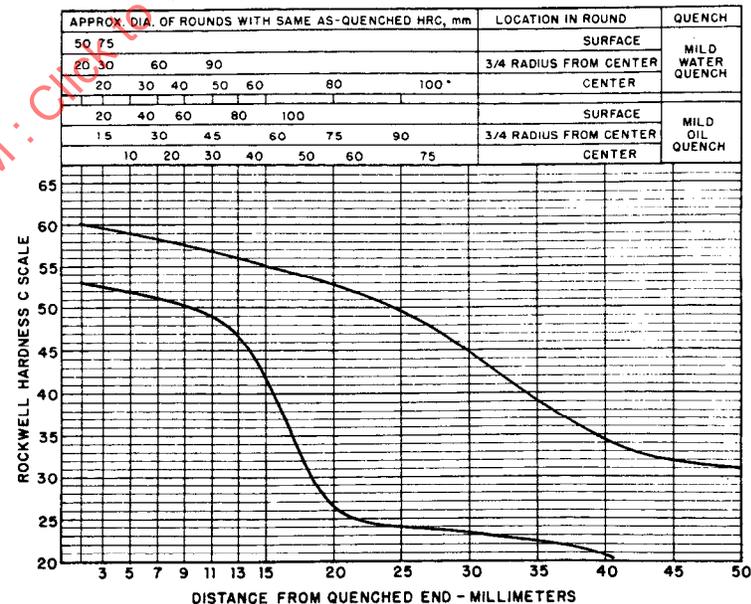


FIGURE 14 - UNS H15411 - HARDENABILITY BAND - SAE 15B41H

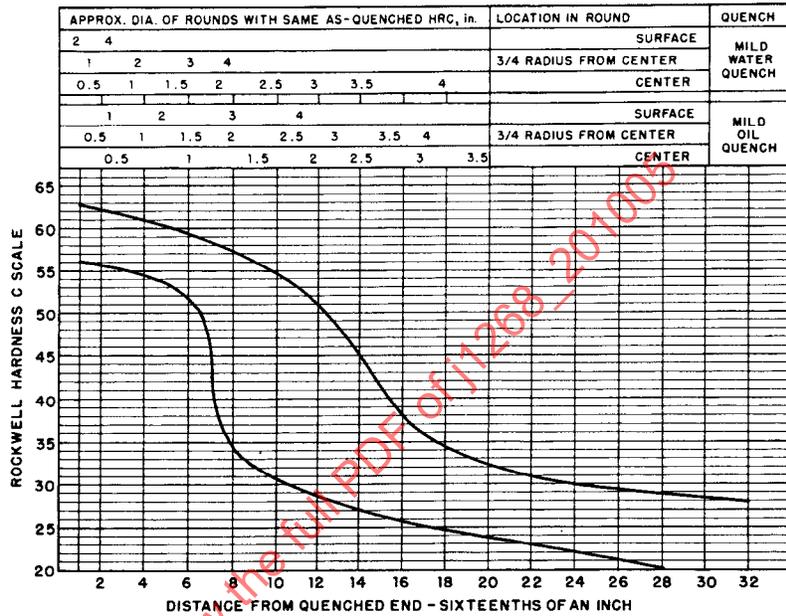
HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	63	56
2	62	56
3	62	55
4	61	54
5	60	53
6	59	52
7	58	42
8	57	34
9	56	31
10	55	30
11	53	29
12	51	28
13	48	27
14	45	27
15	41	26
16	38	26
18	34	25
20	32	24
22	31	23
24	30	22
26	29	21
28	29	20
30	28	--
32	28	--

HEAT TREATING TEMPERATURES	
*NORMALIZE	1600 °F
AUSTENITIZE	1550 °F

*For forged or rolled specimens only

UNS H15481 **HARDENABILITY BAND** SAE 15B48H

% C	% Mn	% Si	% Ni	% Cr	% Mo	% B
0.43/0.53	1.00/1.50	0.15/0.35	--	--	--	0.0005/0.003



HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE MILLIMETERS	HRC	
	MAX.	MIN.
1.5	63	56
3	63	55
5	62	55
7	61	54
9	60	53
11	59	45
13	57	33
15	56	30
20	49	27
25	39	25
30	33	24
35	31	23
40	30	22
45	29	--
50	28	--

HEAT TREATING TEMPERATURES	
*NORMALIZE	870 °C
AUSTENITIZE	845 °C

*For forged or rolled specimens only

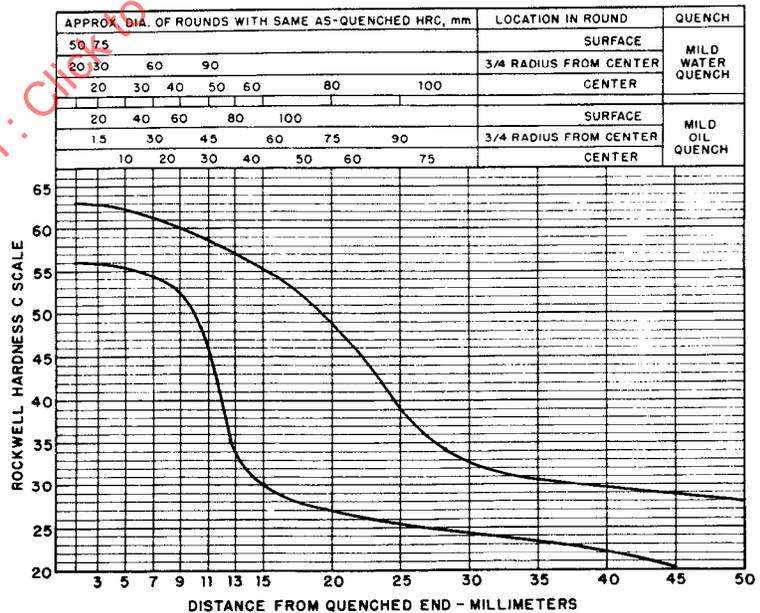


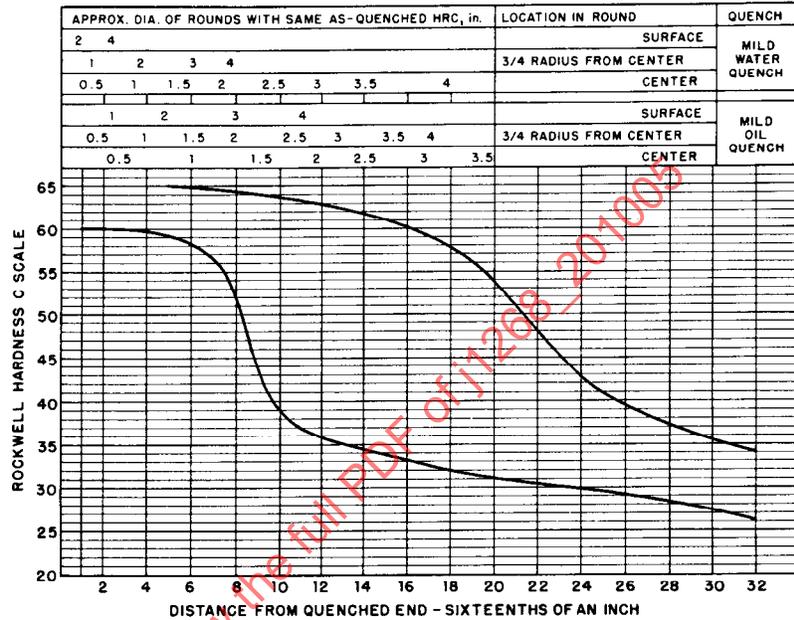
FIGURE 15 - UNS H15481 - HARDENABILITY BAND - SAE 15B48H

HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	--	60
2	--	60
3	--	60
4	--	60
5	65	59
6	65	58
7	64	57
8	64	52
9	64	43
10	63	39
11	63	37
12	63	35
13	62	35
14	62	34
15	61	33
16	60	33
18	58	32
20	54	31
22	48	30
24	43	30
26	40	29
28	37	28
30	35	27
32	34	26

HEAT TREATING TEMPERATURES	
*NORMALIZE	1600 °F
AUSTENITIZE	1550 °F

*For forged or rolled specimens only

UNS H15621 HARDENABILITY BAND SAE 15B62H						
%C	%Mn	%Si	%Ni	%Cr	%Mo	%B
0.54/0.67	1.00/1.50	0.40/0.60	--	--	--	0.0005/0.003



HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE MILLIMETERS	HRC	
	MAX.	MIN.
1.5	--	60
3	--	60
5	65	60
7	65	59
9	65	58
11	65	56
13	64	50
15	64	42
20	63	34
25	60	32
30	56	31
35	48	30
40	42	29
45	37	27
50	34	26

HEAT TREATING TEMPERATURES	
*NORMALIZE	870 °C
AUSTENITIZE	845 °C

*For forged or rolled specimens only

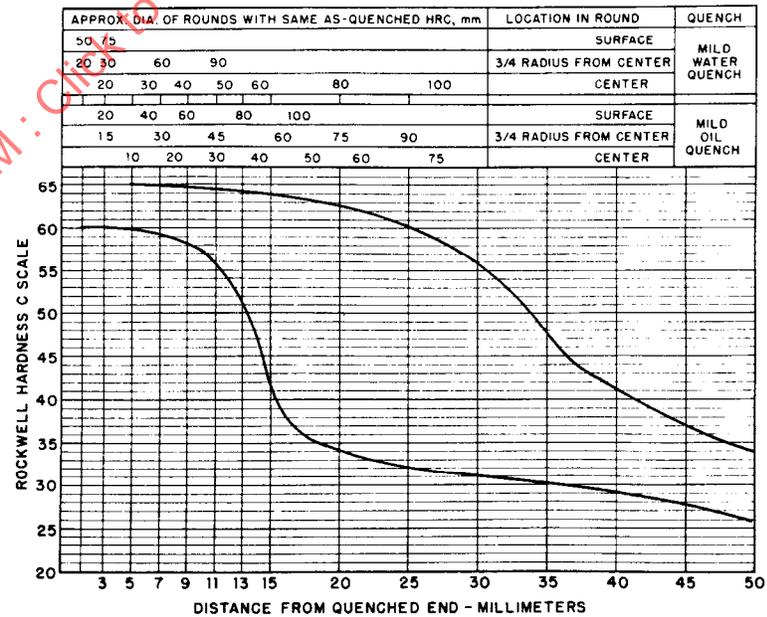


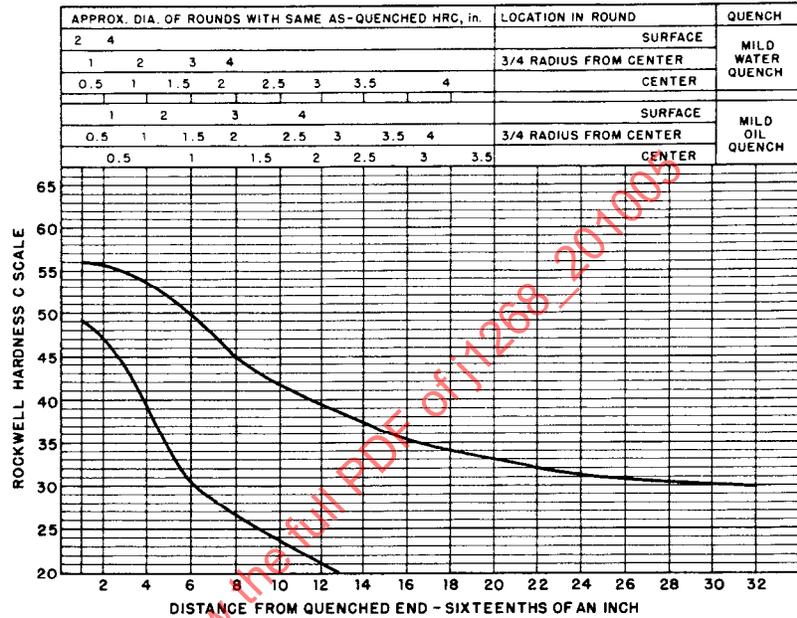
FIGURE 16 - UNS H15621 - HARDENABILITY BAND - SAE 15B62H

HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	56	49
2	56	47
3	55	44
4	53	40
5	52	35
6	50	31
7	48	28
8	45	26
9	43	25
10	42	23
11	40	22
12	39	21
13	38	20
14	37	--
15	36	--
16	35	--
18	34	--
20	33	--
22	32	--
24	31	--
26	31	--
28	31	--
30	30	--
32	30	--

HEAT TREATING TEMPERATURES
 *NORMALIZE 1650 °F
 AUSTENITIZE 1600 °F
 *For forged or rolled specimens only

UNS H13300 **HARDENABILITY BAND** SAE 1330H

%C	%Mn	%Si	%Ni	%Cr	%Mo
0.27/0.33	1.45/2.05	0.15/0.35			



HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE MILLIMETERS	HRC	
	MAX.	MIN.
1.5	56	49
3	56	47
5	55	44
7	53	38
9	51	32
11	48	28
13	45	25
15	43	24
20	39	20
25	35	--
30	33	--
35	32	--
40	31	--
45	31	--
50	30	--

HEAT TREATING TEMPERATURES
 *NORMALIZE 900 °C
 AUSTENITIZE 870 °C
 *For forged or rolled specimens only

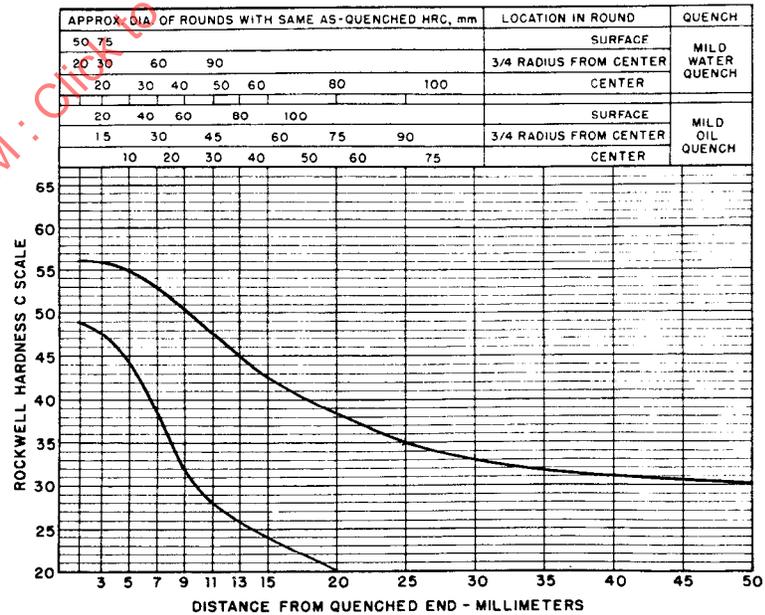


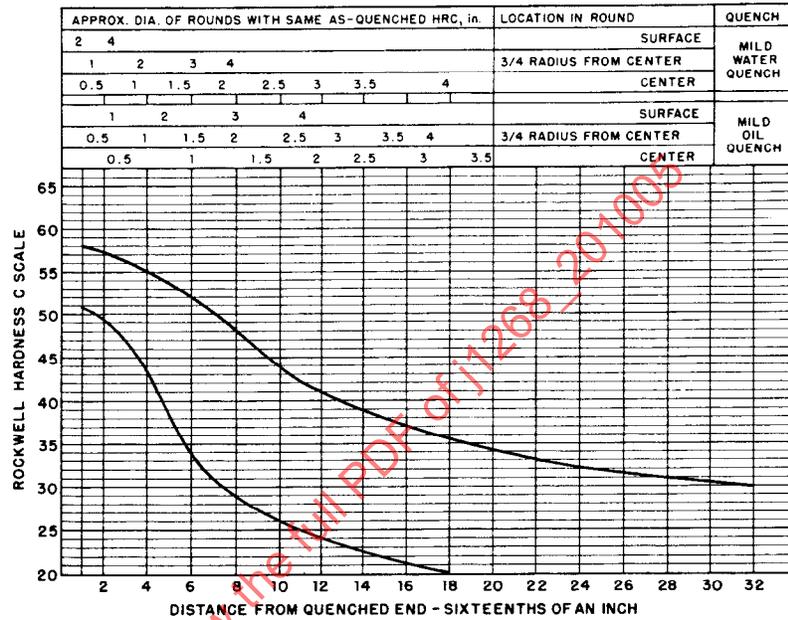
FIGURE 17 - UNS H13300 - HARDENABILITY BAND - SAE 1330H

HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	58	51
2	57	49
3	56	47
4	55	44
5	54	38
6	52	34
7	50	31
8	48	29
9	46	27
10	44	26
11	42	25
12	41	24
13	40	23
14	39	22
15	38	22
16	37	21
18	35	20
20	34	--
22	33	--
24	32	--
26	31	--
28	31	--
30	30	--
32	30	--

HEAT TREATING TEMPERATURES	
*NORMALIZE	1600°F
AUSTENITIZE	1550°F
*For forged or rolled specimens only	

UNS H13350 **HARDENABILITY BAND** SAE 1335H

%C	%Mn	%Si	%Ni	%Cr	%Mo
0.32/0.38	1.45/2.05	0.15/0.35			



HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE MILLIMETERS	HRC	
	MAX.	MIN.
1.5	58	51
3	58	49
5	57	46
7	55	42
9	53	36
11	50	31
13	47	28
15	45	27
20	41	23
25	37	21
30	35	--
35	33	--
40	32	--
45	31	--
50	30	--

HEAT TREATING TEMPERATURES	
*NORMALIZE	870 °C
AUSTENITIZE	845 °C
*For forged or rolled specimens only	

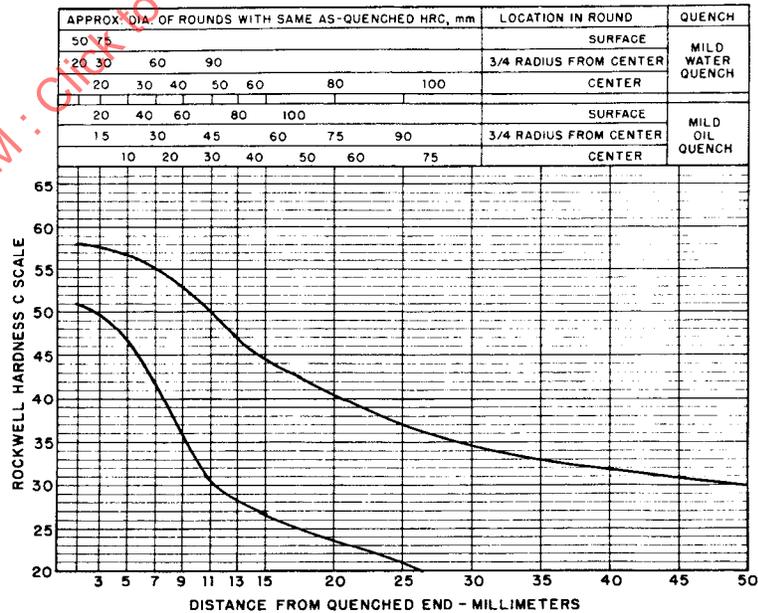


FIGURE 18 - UNS H13350 - HARDENABILITY BAND - SAE 1335H

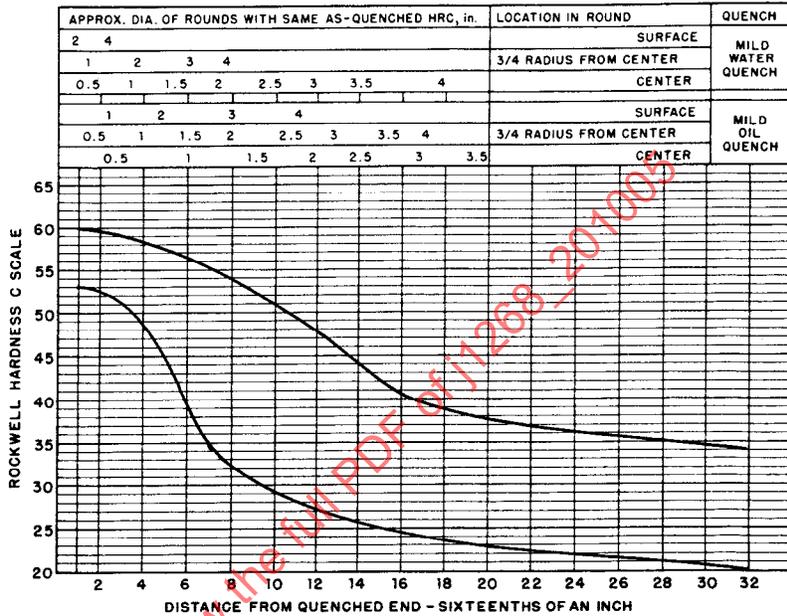
HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	60	53
2	60	52
3	59	51
4	58	49
5	57	46
6	56	40
7	55	35
8	54	33
9	52	31
10	51	29
11	50	28
12	48	27
13	46	26
14	44	25
15	42	25
16	41	24
18	39	23
20	38	23
22	37	22
24	36	22
26	35	21
28	35	21
30	34	20
32	34	20

HEAT TREATING TEMPERATURES	
*NORMALIZE	1600 °F
AUSTENITIZE	1550 °F

*For forged or rolled specimens only

UNS H13400 **HARDENABILITY BAND** SAE 1340H

%C	%Mn	%Si	%Ni	%Cr	%Mo
0.37/0.44	1.45/2.05	0.15/0.35			



HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE MILLIMETERS	HRC	
	MAX.	MIN.
1.5	60	53
3	60	52
5	59	50
7	58	48
9	57	42
11	56	36
13	54	32
15	52	30
20	47	26
25	41	24
30	39	23
35	37	22
40	36	21
45	35	20
50	34	20

HEAT TREATING TEMPERATURES	
*NORMALIZE	870 °C
AUSTENITIZE	845 °C

*For forged or rolled specimens only

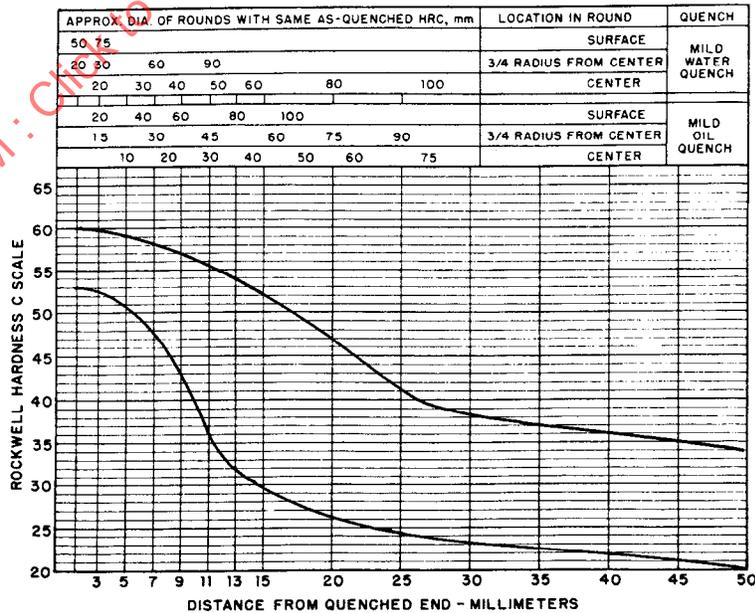


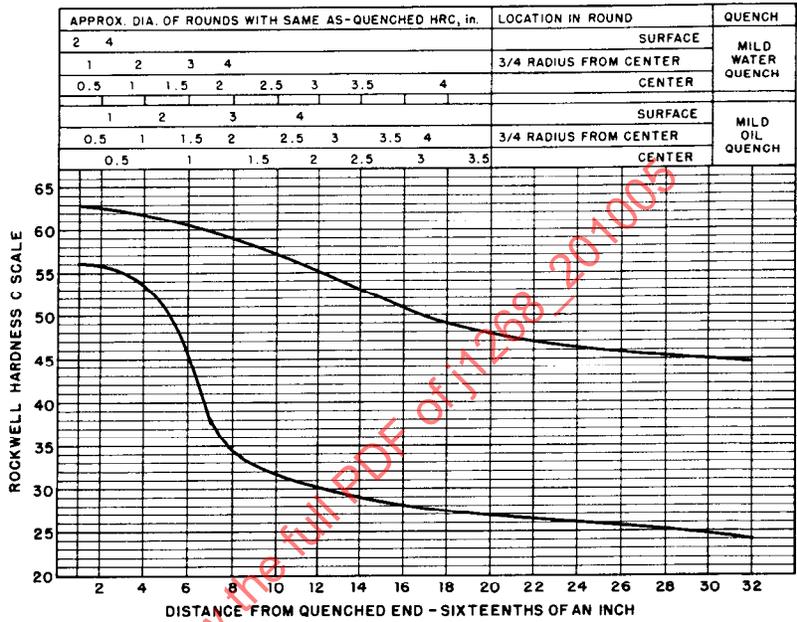
FIGURE 19 - UNS H13400 - HARDENABILITY BAND - SAE 1340H

HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	63	56
2	63	56
3	62	55
4	61	54
5	61	51
6	60	44
7	60	38
8	59	35
9	58	33
10	57	32
11	56	31
12	55	30
13	54	29
14	53	29
15	52	28
16	51	28
18	49	27
20	48	27
22	47	26
24	46	26
26	45	25
28	45	25
30	45	24
32	45	24

HEAT TREATING TEMPERATURES	
*NORMALIZE	1600 °F
AUSTENITIZE	1550 °F

*For forged or rolled specimens only

UNS H13450 HARDENABILITY BAND SAE 1345H						
% C	% Mn	% Si	% Ni	% Cr	% Mo	
0.42/0.49	1.45/2.05	0.15/0.35				



HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE MILLIMETERS	HRC	
	MAX.	MIN.
1.5	63	56
3	63	56
5	63	54
7	62	52
9	61	46
11	60	38
13	59	35
15	58	31
20	55	29
25	51	27
30	48	26
35	47	25
40	46	24
45	45	24
50	45	24

HEAT TREATING TEMPERATURES	
*NORMALIZE	870 °C
AUSTENITIZE	845 °C

*For forged or rolled specimens only

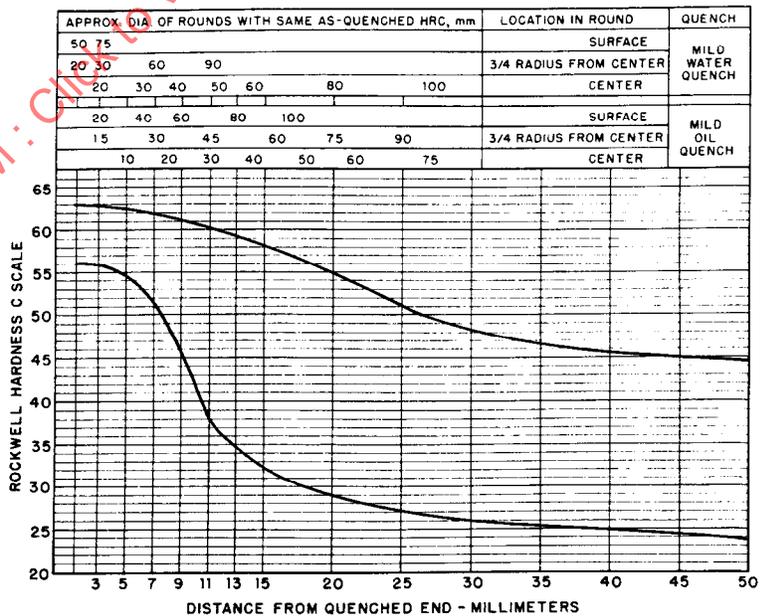


FIGURE 20 - UNS H13450 - HARDENABILITY BAND - SAE 1345H

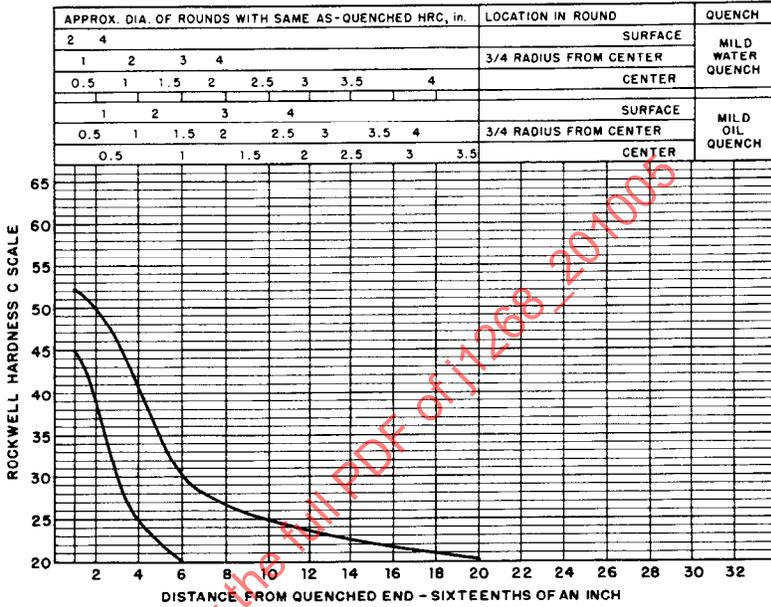
HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	52	45
2	50	40
3	46	31
4	40	25
5	34	22
6	30	20
7	28	--
8	26	--
9	25	--
10	25	--
11	24	--
12	23	--
13	23	--
14	22	--
15	22	--
16	21	--
18	21	--
20	20	--
22	--	--
24	--	--
26		
28		
30		
32		

HEAT TREATING TEMPERATURES
 *NORMALIZE 1650 °F
 AUSTENITIZE 1600 °F
 *For forged or rolled specimens only

UNS H40270 SAE 4027H
 UNS H40280 SAE 4028H

HARDENABILITY BAND						
%C	%Mn	%Si	%Ni	%Cr	%Mo	
0.24/0.30	0.60/1.00	0.15/0.35	--	--	0.20/0.30	

* sulfur content 0.035/0.050



HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE MILLIMETERS	HRC	
	MAX.	MIN.
1.5	52	45
3	50	40
5	45	30
7	38	24
9	31	21
11	28	--
13	26	--
15	25	--
20	23	--
25	22	--
30	21	--
35	--	--
40		
45		
50		

HEAT TREATING TEMPERATURES
 *NORMALIZE 900 °C
 AUSTENITIZE 870 °C
 *For forged or rolled specimens only

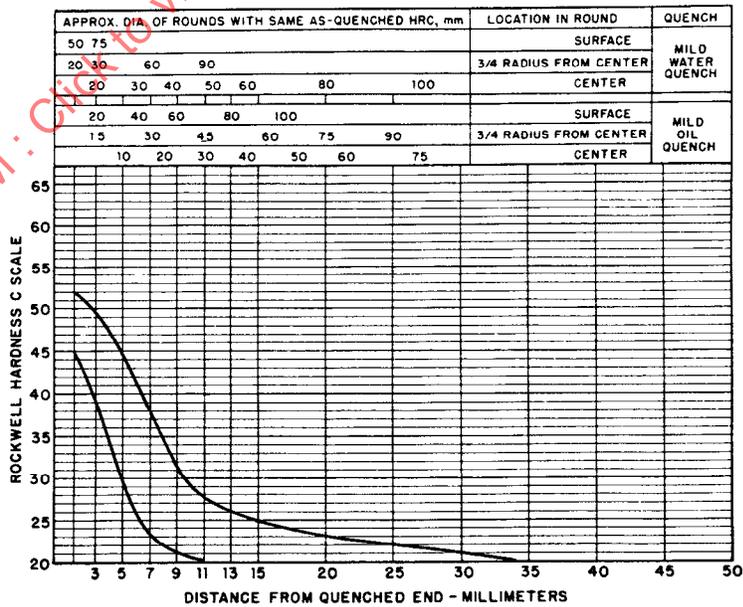


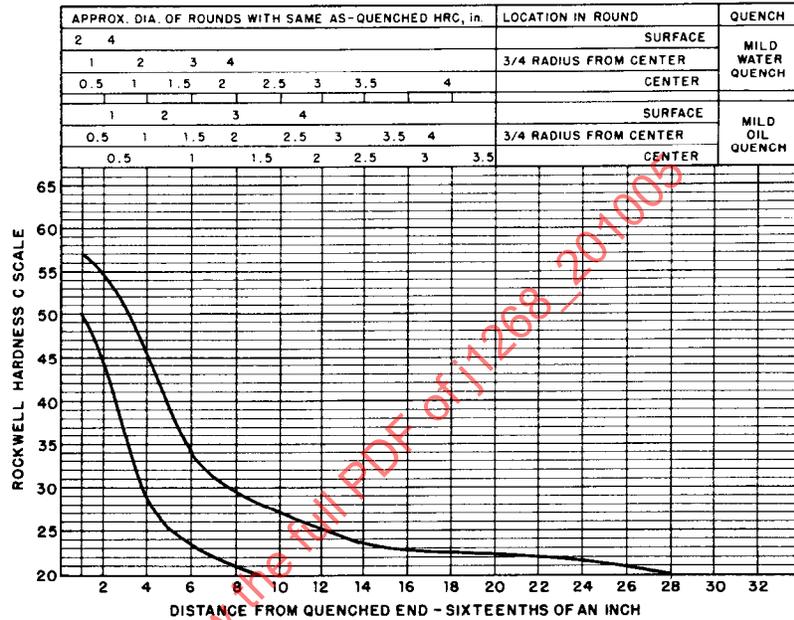
FIGURE 21 - UNS H40270 - HARDENABILITY BAND - SAE 4027H
 UNS H40280 - HARDENABILITY BAND - SAE 4028H*

HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	57	50
2	54	45
3	51	36
4	46	29
5	39	25
6	34	23
7	31	22
8	29	21
9	28	20
10	26	--
11	26	--
12	25	--
13	24	--
14	24	--
15	23	--
16	23	--
18	23	--
20	22	--
22	22	--
24	21	--
26	21	--
28	20	--
30	--	--
32	--	--

HEAT TREATING TEMPERATURES	
*NORMALIZE	1650 °F
AUSTENITIZE	1600 °F
*For forged or rolled specimens only	

UNS H40320 **HARDENABILITY BAND** SAE 4032H

%C	%Mn	%Si	%Ni	%Cr	%Mo
0.29/0.35	0.60/1.00	0.15/0.35	--	--	0.20/0.30



HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE MILLIMETERS	HRC	
	MAX.	MIN.
1.5	57	50
3	55	46
5	51	34
7	44	27
9	36	24
11	32	22
13	29	20
15	27	--
20	24	--
25	23	--
30	23	--
35	22	--
40	21	--
45	20	--
50	--	--

HEAT TREATING TEMPERATURES	
*NORMALIZE	900 °C
AUSTENITIZE	870 °C
*For forged or rolled specimens only	

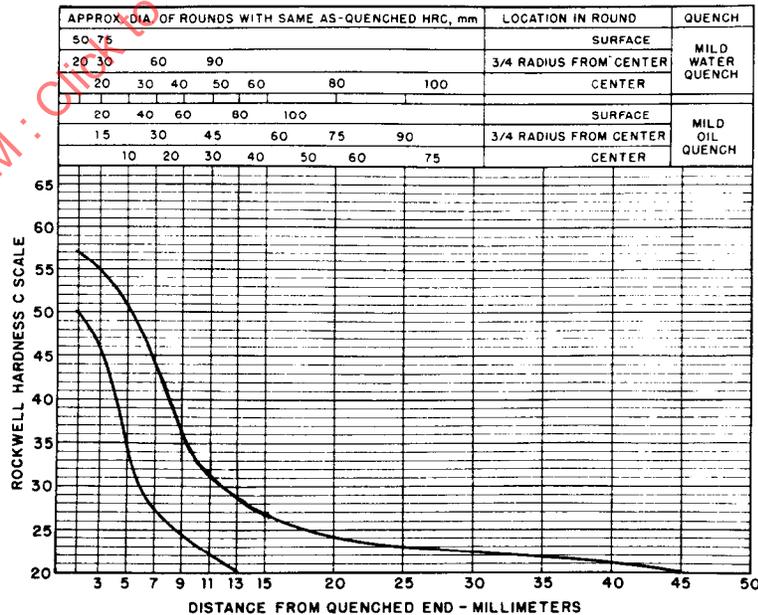


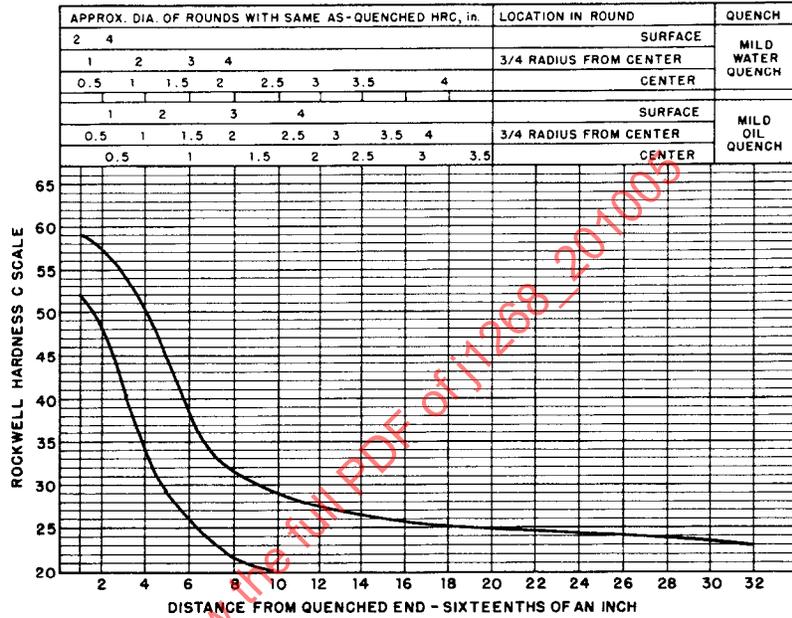
FIGURE 22 - UNS H40320 - HARDENABILITY BAND - SAE 4032H

HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	59	52
2	57	49
3	54	42
4	51	35
5	45	30
6	38	26
7	34	23
8	32	22
9	30	21
10	29	20
11	28	--
12	27	--
13	26	--
14	26	--
15	26	--
16	25	--
18	25	--
20	25	--
22	25	--
24	24	--
26	24	--
28	24	--
30	23	--
32	23	--

HEAT TREATING TEMPERATURES	
*NORMALIZE	1600 °F
AUSTENITIZE	1550 °F
*For forged or rolled specimens only	

UNS H40370 **HARDENABILITY BAND** SAE 4037H

%C	%Mn	%Si	%Ni	%Cr	%Mo
0.34/0.41	0.60/1.00	0.15/0.35	--	--	0.20/0.30



HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE MILLIMETERS	HRC	
	MAX.	MIN.
1.5	59	52
3	57	50
5	54	42
7	49	32
9	41	27
11	35	24
13	32	21
15	30	20
20	27	--
25	26	--
30	25	--
35	25	--
40	25	--
45	24	--
50	23	--

HEAT TREATING TEMPERATURES	
*NORMALIZE	870 °C
AUSTENITIZE	845 °C
*For forged or rolled specimens only	

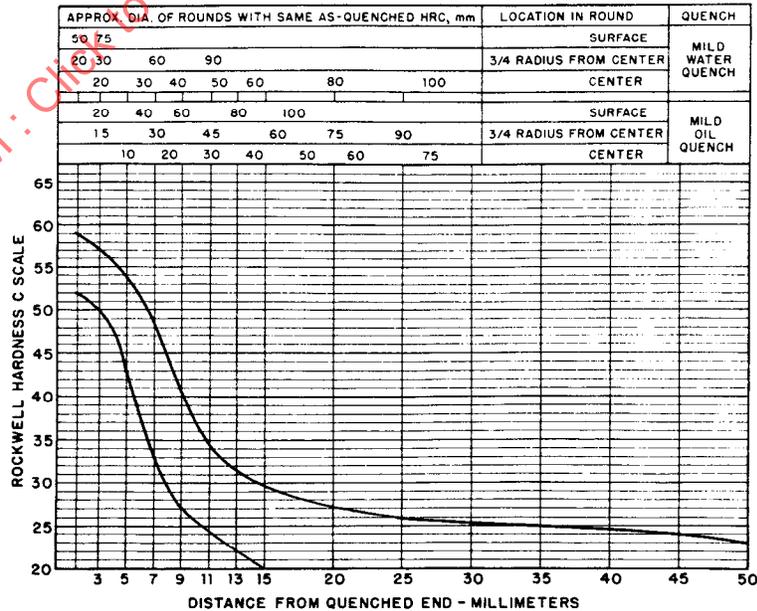


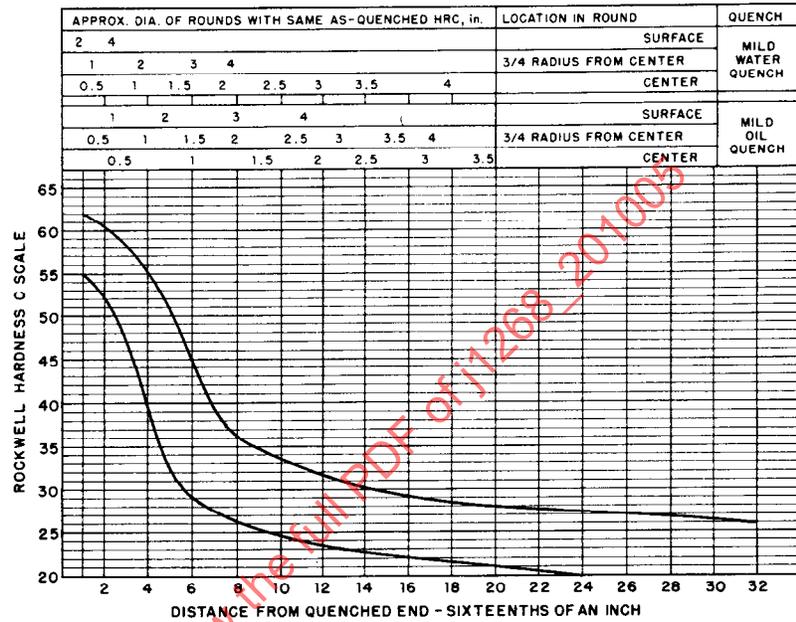
FIGURE 23 - UNS H40370 - HARDENABILITY BAND - SAE 4037H

HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	62	55
2	60	52
3	58	48
4	55	40
5	50	33
6	45	29
7	39	27
8	36	26
9	34	25
10	33	24
11	32	24
12	31	23
13	30	23
14	30	23
15	29	22
16	29	22
18	28	22
20	28	21
22	28	20
24	27	20
26	27	--
28	27	--
30	26	--
32	26	--

HEAT TREATING TEMPERATURES	
*NORMALIZE	1600 °F
AUSTENITIZE	1550 °F
*For forged or rolled specimens only	

UNS H40420 **HARDENABILITY BAND** SAE 4042H

%C	%Mn	%Si	%Ni	%Cr	%Mo
0.39/0.46	0.60/1.00	0.15/0.35	--	--	0.20/0.30



HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE MILLIMETERS	HRC	
	MAX.	MIN.
1.5	62	55
3	61	53
5	58	47
7	54	36
9	48	30
11	40	27
13	36	25
15	33	24
20	31	23
25	29	22
30	28	21
35	28	20
40	27	--
45	27	--
50	26	--

HEAT TREATING TEMPERATURES	
*NORMALIZE	870 °C
AUSTENITIZE	845 °C
*For forged or rolled specimens only	

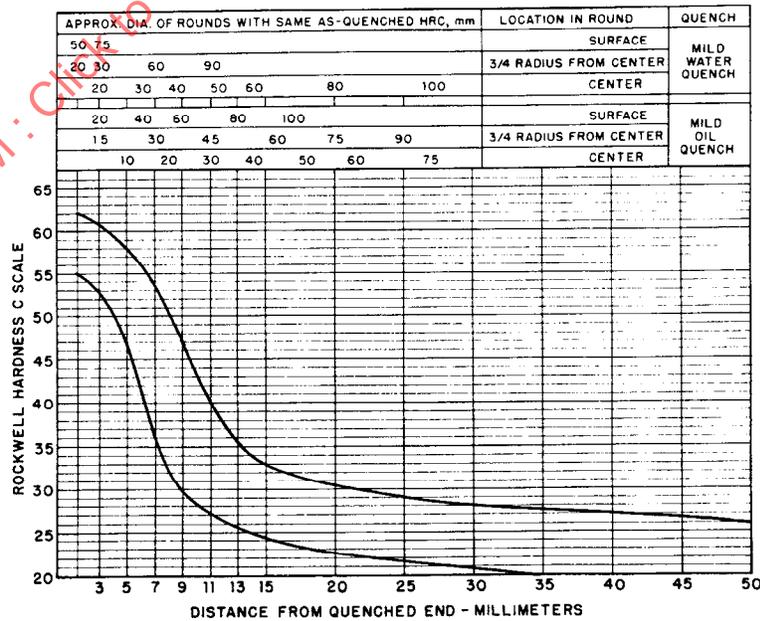


FIGURE 24 - UNS H40420 - HARDENABILITY BAND - SAE 4042H

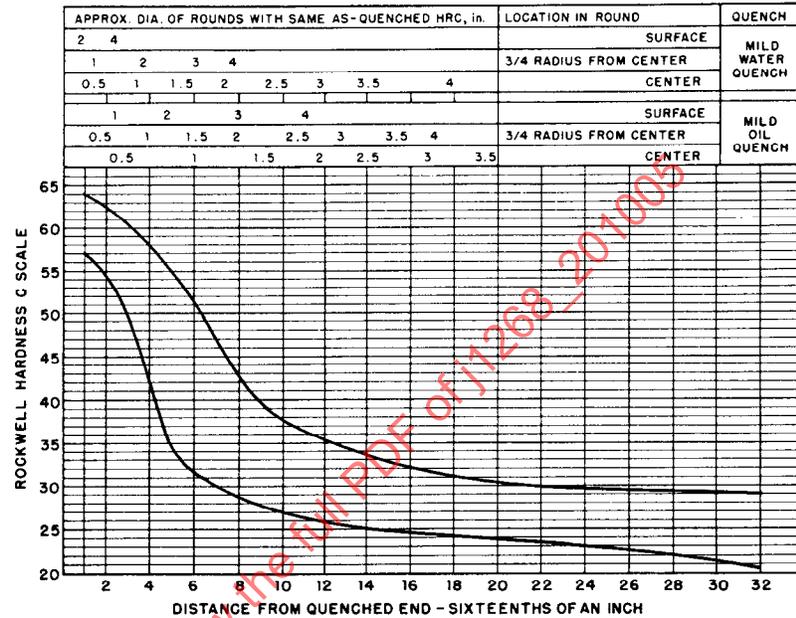
HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	64	57
2	62	55
3	60	50
4	58	42
5	55	35
6	52	32
7	47	30
8	43	28
9	40	28
10	38	27
11	37	26
12	35	26
13	34	25
14	33	25
15	33	25
16	32	25
18	31	24
20	30	24
22	30	23
24	30	23
26	30	22
28	29	22
30	29	21
32	29	21

HEAT TREATING TEMPERATURES	
*NORMALIZE	1600 °F
AUSTENITIZE	1550 °F

*For forged or rolled specimens only

UNS H40470 **HARDENABILITY BAND** SAE 4047H

%C	%Mn	%Si	%Ni	%Cr	%Mo
0.44/0.51	0.60/1.00	0.15/0.35	--	--	0.20/0.30



HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE MILLIMETERS	HRC	
	MAX.	MIN.
1.5	64	57
3	63	55
5	60	49
7	57	39
9	53	33
11	48	30
13	43	28
15	39	27
20	34	25
25	33	24
30	31	24
35	30	23
40	30	23
45	29	22
50	29	21

HEAT TREATING TEMPERATURES	
*NORMALIZE	870 °C
AUSTENITIZE	845 °C

*For forged or rolled specimens only

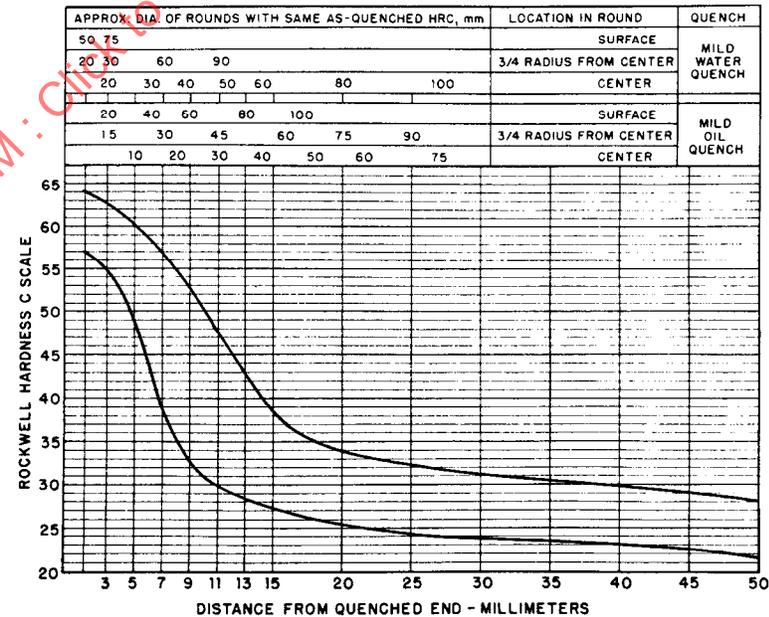


FIGURE 25 - UNS H40470 - HARDENABILITY BAND - SAE 4047H

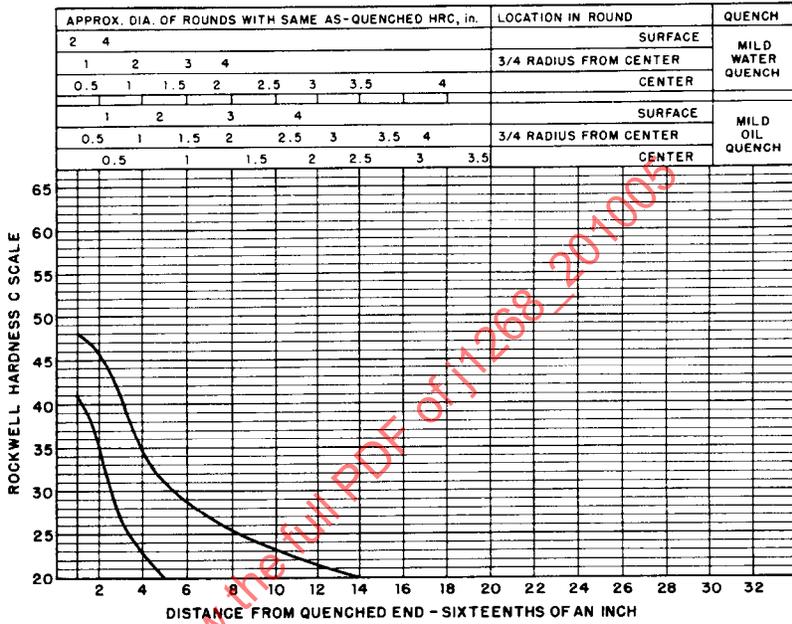
HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	48	41
2	46	36
3	41	27
4	35	23
5	31	20
6	28	--
7	27	--
8	26	--
9	24	--
10	23	--
11	22	--
12	21	--
13	21	--
14	20	--
15	--	--
16	--	--
18		
20		
22		
24		
26		
28		
30		
32		

HEAT TREATING TEMPERATURES	
*NORMALIZE	1700 °F
AUSTENITIZE	1700 °F

*For forged or rolled specimens only

UNS H41180 **HARDENABILITY BAND** SAE 4118H

%C	%Mn	%Si	%Ni	%Cr	%Mo
0.17/0.23	0.60/1.00	0.15/0.35	--	0.30/0.70	0.08/0.15



HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE MILLIMETERS	HRC	
	MAX.	MIN.
1.5	48	41
3	46	37
5	40	27
7	34	22
9	29	--
11	27	--
13	25	--
15	24	--
20	21	--
25	--	--
30		
35		
40		
45		
50		

HEAT TREATING TEMPERATURES	
*NORMALIZE	925 °C
AUSTENITIZE	925 °C

*For forged or rolled specimens only

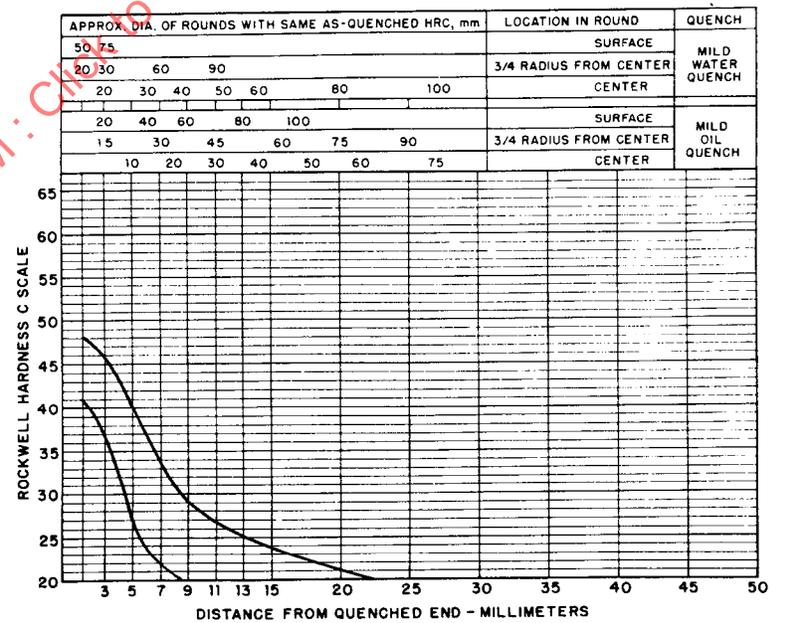


FIGURE 26 - UNS H41180 - HARDENABILITY BAND - SAE 4118H

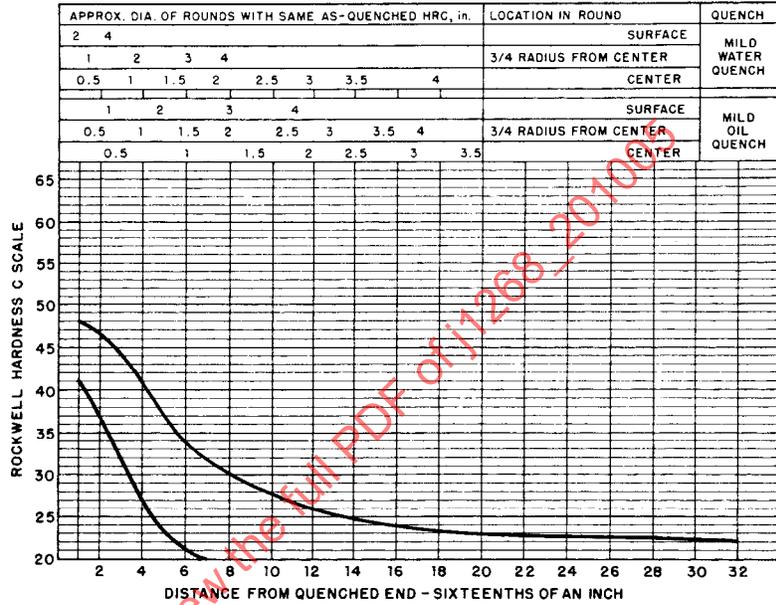
HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	48	41
2	47	37
3	44	32
4	41	27
5	37	23
6	34	21
7	32	--
8	30	--
9	29	--
10	28	--
11	27	--
12	26	--
13	25	--
14	25	--
15	24	--
16	24	--
18	23	--
20	23	--
22	23	--
24	23	--
26	23	--
28	22	--
30	22	--
32	22	--

HEAT TREATING TEMPERATURES	
*NORMALIZE	1700 °F
AUSTENITIZE	1700 °F

*For forged or rolled specimens only

UNS H41200 **HARDENABILITY BAND** SAE 4120H

%C	%Mn	%Si	%Ni	%Cr	%Mo
0.18/0.23	0.90/1.20	0.15/0.35	--	0.40/0.60	0.13/0.20



HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE MILLIMETERS	HRC	
	MAX.	MIN.
1.5	48	41
3	47	37
5	44	31
7	40	25
9	35	22
11	33	20
13	30	--
15	29	--
20	26	--
25	24	--
30	23	--
35	23	--
40	23	--
45	22	--
50	22	--

HEAT TREATING TEMPERATURES	
*NORMALIZE	925 °C
AUSTENITIZE	925 °C

*For forged or rolled specimens only

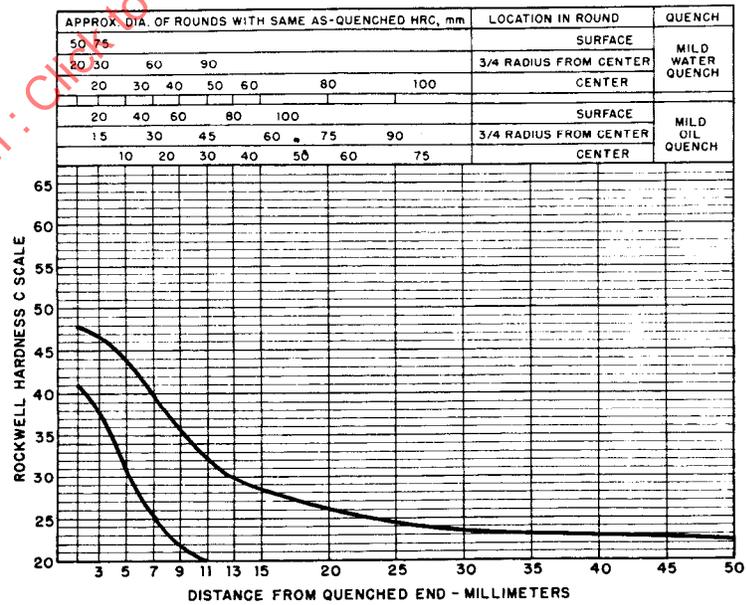


FIGURE 27 - UNS H41200 - HARDENABILITY BAND - SAE 4120H

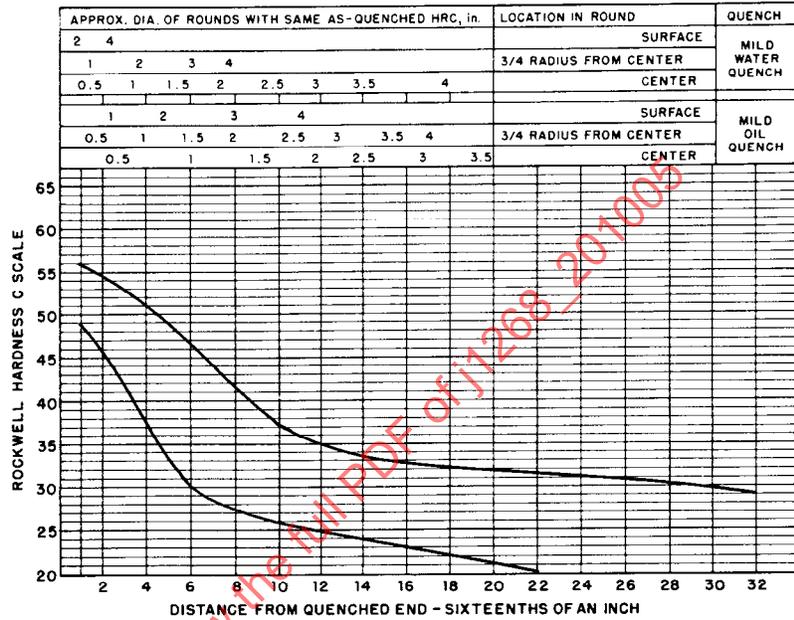
HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	56	49
2	55	46
3	53	42
4	51	38
5	49	34
6	47	31
7	44	29
8	42	27
9	40	26
10	38	26
11	36	25
12	35	25
13	34	24
14	34	24
15	33	23
16	33	23
18	32	22
20	32	21
22	32	20
24	31	--
26	31	--
28	30	--
30	30	--
32	29	--

HEAT TREATING TEMPERATURES	
*NORMALIZE	1650 °F
AUSTENITIZE	1600 °F

*For forged or rolled specimens only

UNS H41300 **HARDENABILITY BAND** SAE 4130H

%C	%Mn	%Si	%Ni	%Cr	%Mo
0.27/0.33	0.30/0.70	0.15/0.35	--	0.75/1.20	0.15/0.25



HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE MILLIMETERS	HRC	
	MAX.	MIN.
1.5	56	49
3	55	46
5	53	40
7	51	36
9	48	32
11	44	28
13	41	26
15	39	25
20	34	24
25	33	23
30	33	22
35	32	20
40	31	--
45	31	--
50	30	--

HEAT TREATING TEMPERATURES	
*NORMALIZE	900 °C
AUSTENITIZE	870 °C

*For forged or rolled specimens only

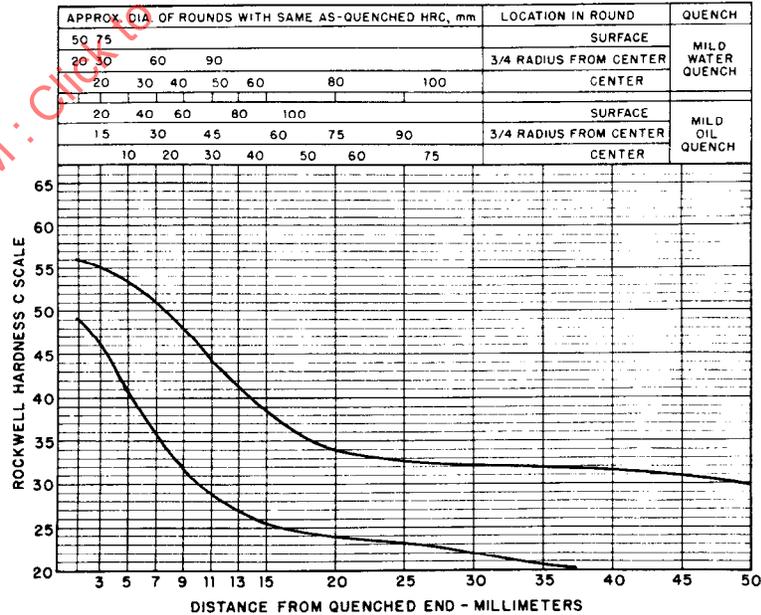


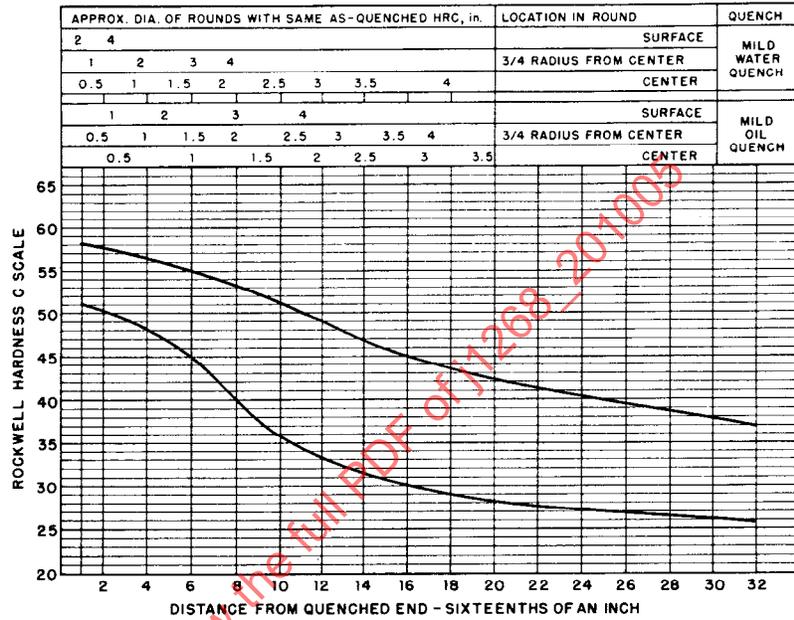
FIGURE 28 - UNS H41300 - HARDENABILITY BAND - SAE 4130H

HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	58	51
2	58	50
3	57	49
4	56	48
5	56	47
6	55	45
7	54	42
8	53	40
9	52	38
10	51	36
11	50	34
12	49	33
13	48	32
14	47	31
15	46	30
16	45	30
18	44	29
20	42	28
22	41	27
24	40	27
26	39	27
28	38	26
30	38	26
32	37	26

HEAT TREATING TEMPERATURES	
*NORMALIZE	1600 °F
AUSTENITIZE	1550 °F

*For forged or rolled specimens only

UNS H41350 HARDENABILITY BAND SAE 4135H						
%C	%Mn	%Si	%Ni	%Cr	%Mo	
0.32/0.38	0.60/1.00	0.15/0.35	--	0.75/1.20	0.15/0.25	



HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE MILLIMETERS	HRC	
	MAX.	MIN.
1.5	58	51
3	58	50
5	57	49
7	56	48
9	56	46
11	55	42
13	53	39
15	52	37
20	49	32
25	45	30
30	43	28
35	41	27
40	40	27
45	39	26
50	37	26

HEAT TREATING TEMPERATURES	
*NORMALIZE	870 °C
AUSTENITIZE	845 °C

*For forged or rolled specimens only

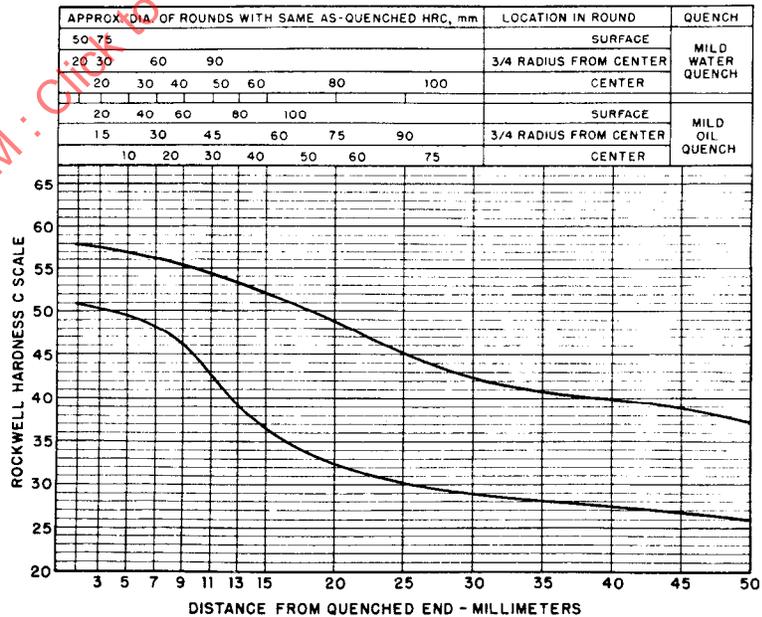


FIGURE 29 - UNS H41350 - HARDENABILITY BAND - SAE 4135H

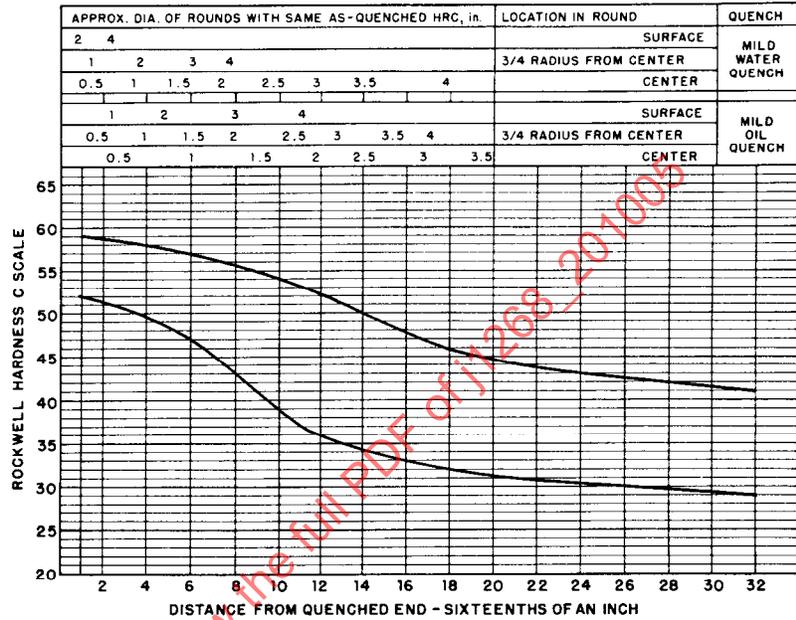
HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	59	52
2	59	51
3	58	50
4	58	49
5	57	49
6	57	48
7	56	45
8	55	43
9	55	40
10	54	39
11	53	37
12	52	36
13	51	35
14	50	34
15	49	33
16	48	33
18	46	32
20	45	31
22	44	30
24	43	30
26	42	30
28	42	29
30	41	29
32	41	29

HEAT TREATING TEMPERATURES	
*NORMALIZE	1600 °F
AUSTENITIZE	1550 °F

* For forged or rolled specimens only

UNS H41370 **HARDENABILITY BAND** SAE 4137H

% C	% Mn	% Si	% Ni	% Cr	% Mo
0.34/0.41	0.60/1.00	0.15/0.35	--	0.75/1.20	0.15/0.25



HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE MILLIMETERS	HRC	
	MAX.	MIN.
1.5	59	52
3	59	51
5	58	50
7	58	49
9	57	48
11	56	45
13	55	42
15	55	39
20	52	35
25	48	33
30	46	31
35	44	30
40	43	29
45	42	29
50	41	29

HEAT TREATING TEMPERATURES	
*NORMALIZE	870 °C
AUSTENITIZE	845 °C

* For forged or rolled specimens only

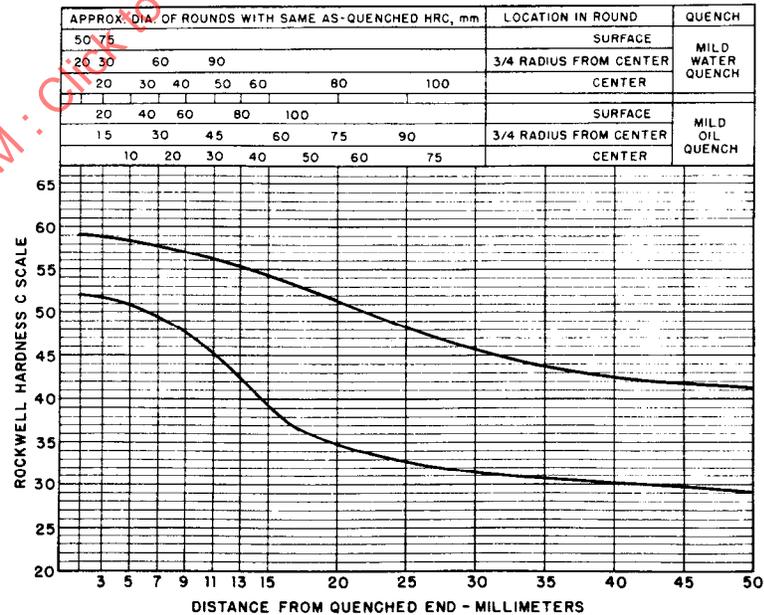
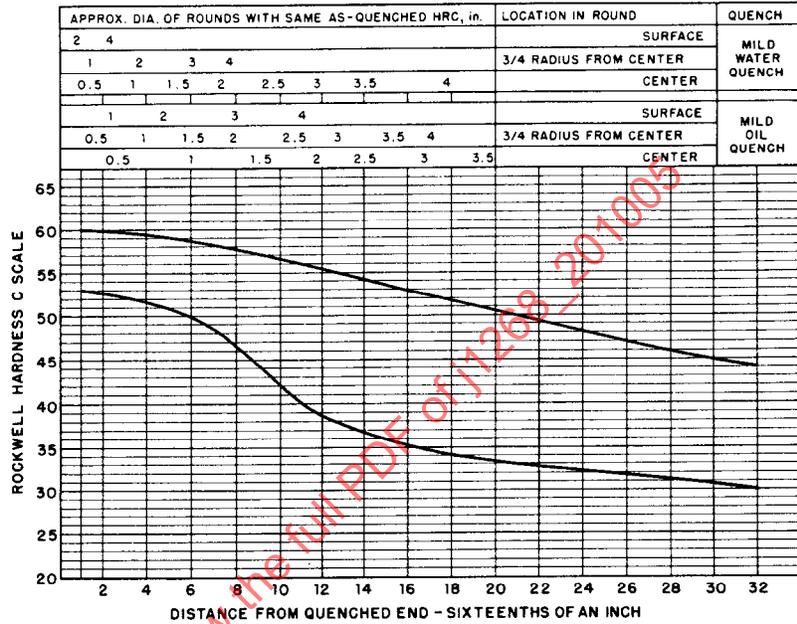


FIGURE 30 - UNS 41370 - HARDENABILITY BAND - SAE 4137H

HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	60	53
2	60	53
3	60	52
4	59	51
5	59	51
6	58	50
7	58	48
8	57	47
9	57	44
10	56	42
11	56	40
12	55	39
13	55	38
14	54	37
15	54	36
16	53	35
18	52	34
20	51	33
22	49	33
24	48	32
26	47	32
28	46	31
30	45	31
32	44	30

HEAT TREATING TEMPERATURES	
*NORMALIZE	1600 °F
AUSTENITIZE	1550 °F
*For forged or rolled specimens only	

UNS H41400 HARDENABILITY BAND SAE 4140H						
%C	%Mn	%Si	%Ni	%Cr	%Mo	
0.37/0.44	0.65/1.10	0.15/0.35	--	0.75/1.20	0.15/0.25	



HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE MILLIMETERS	HRC	
	MAX.	MIN.
1.5	60	53
3	60	52
5	60	52
7	59	51
9	59	50
11	58	48
13	57	46
15	57	43
20	55	38
25	53	35
30	51	33
35	49	32
40	48	32
45	46	31
50	45	30

HEAT TREATING TEMPERATURES	
*NORMALIZE	870 °C
AUSTENITIZE	845 °C
*For forged or rolled specimens only	

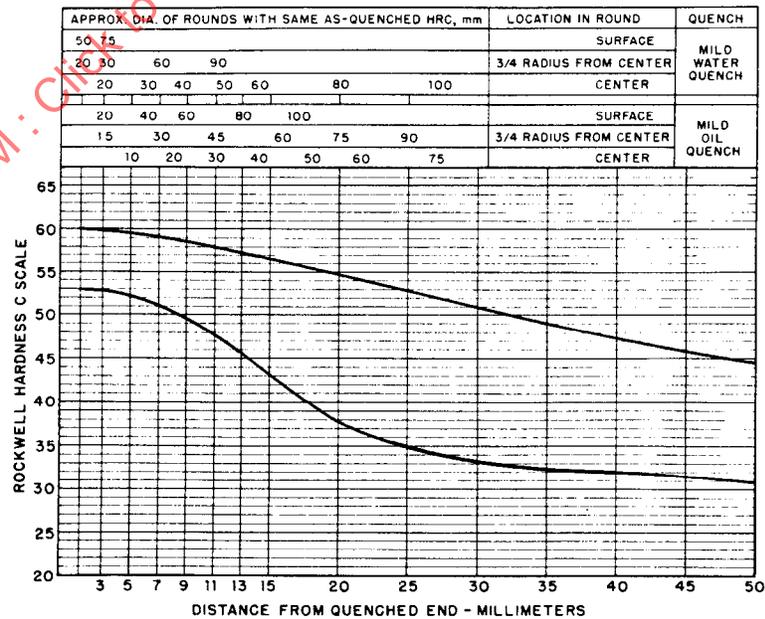


FIGURE 31 - UNS H41400 - HARDENABILITY BAND - 4140H

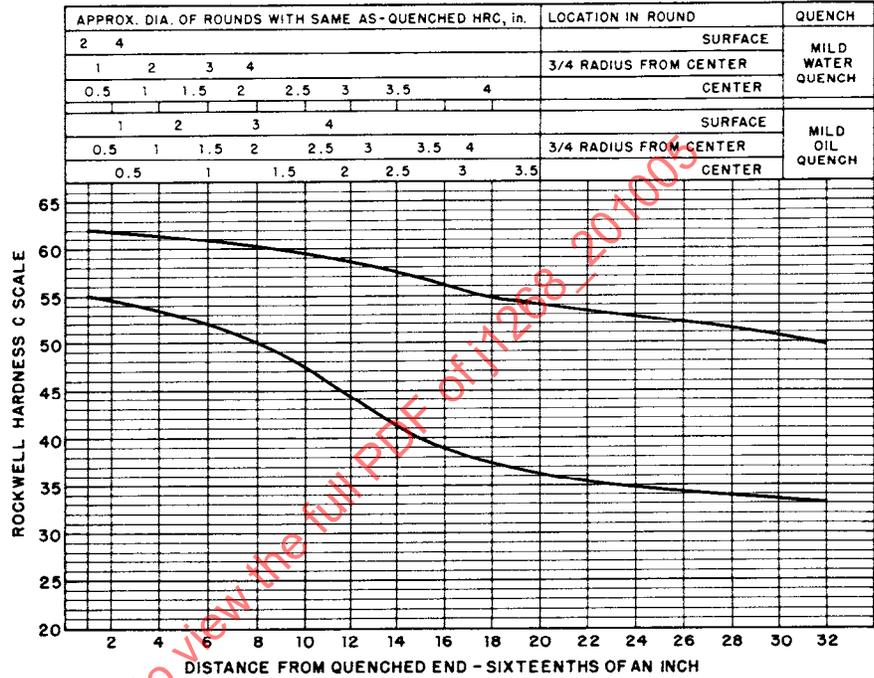
HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	62	55
2	62	55
3	62	54
4	61	53
5	61	53
6	61	52
7	60	51
8	60	50
9	60	49
10	59	47
11	59	46
12	58	44
13	58	42
14	57	41
15	57	40
16	56	39
18	55	37
20	54	36
22	53	35
24	53	34
26	52	34
28	51	34
30	51	33
32	50	33

HEAT TREATING TEMPERATURES	
*NORMALIZE	1600 °F
AUSTENITIZE	1550 °F

*For forged or rolled specimens only

UNS H41420 **HARDENABILITY BAND** SAE 4142H

%C	%Mn	%Si	%Ni	%Cr	%Mo
0.39/0.46	0.65/1.10	0.15/0.35	--	0.75/1.20	0.15/0.25



HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE MILLIMETERS	HRC	
	MAX.	MIN.
1.5	62	55
3	62	54
5	62	54
7	62	53
9	61	52
11	61	51
13	60	49
15	60	48
20	58	43
25	56	39
30	55	36
35	53	35
40	52	34
45	51	33
50	50	33

HEAT TREATING TEMPERATURES	
*NORMALIZE	870 °C
AUSTENITIZE	845 °C

*For forged or rolled specimens only

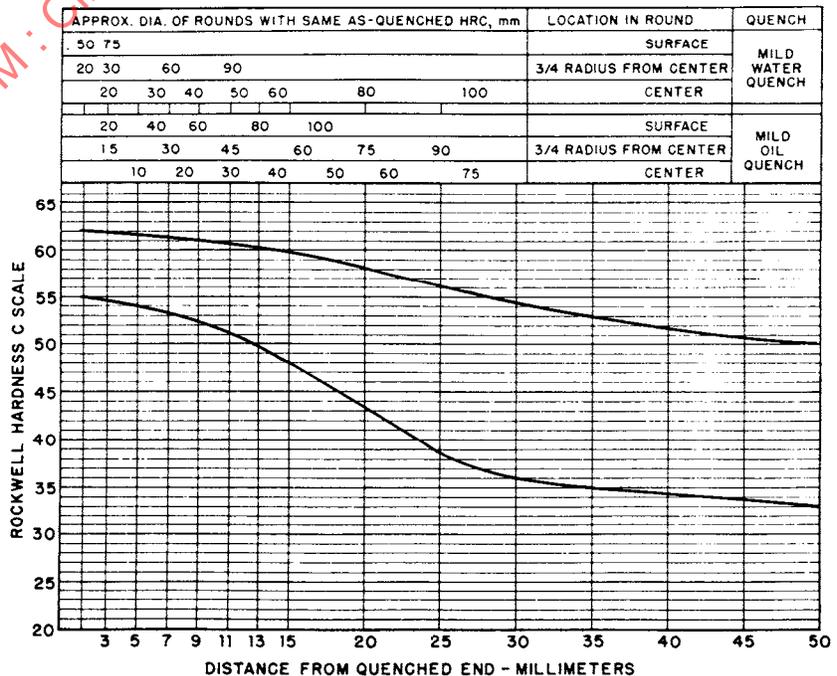


FIGURE 32 - UNS H41420 - HARDENABILITY BAND - SAE 4142H

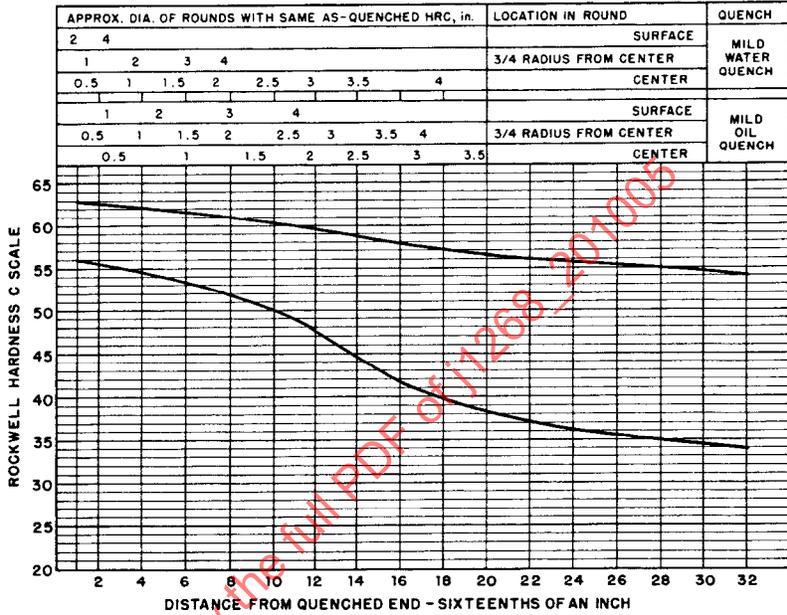
HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	63	56
2	63	55
3	62	55
4	62	54
5	62	53
6	61	53
7	61	52
8	61	52
9	60	51
10	60	50
11	60	49
12	59	48
13	59	46
14	59	45
15	58	43
16	58	42
18	57	40
20	57	38
22	56	37
24	55	36
26	55	35
28	55	35
30	55	34
32	54	34

HEAT TREATING TEMPERATURES	
*NORMALIZE	1600 °F
AUSTENITIZE	1550 °F

*For forged or rolled specimens only

UNS H41450 **HARDENABILITY BAND** SAE 4145H

%C	%Mn	%Si	%Ni	%Cr	%Mo
0.42/0.49	0.65/1.10	0.15/0.35	--	0.75/1.20	0.15/0.25



HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE MILLIMETERS	HRC	
	MAX.	MIN.
1.5	63	56
3	63	55
5	63	55
7	62	54
9	62	53
11	61	52
13	61	51
15	60	50
20	59	47
25	58	42
30	57	39
35	56	37
40	55	35
45	55	34
50	55	34

HEAT TREATING TEMPERATURES	
*NORMALIZE	870 °C
AUSTENITIZE	845 °C

*For forged or rolled specimens only

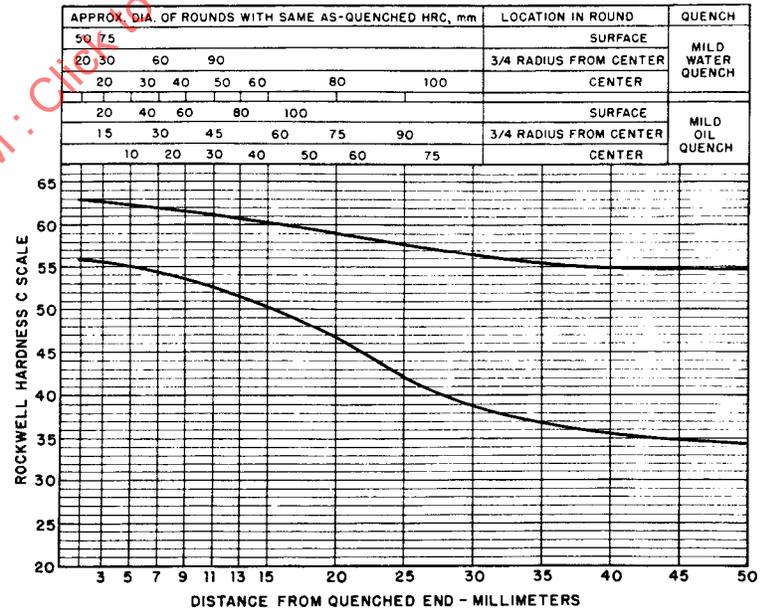


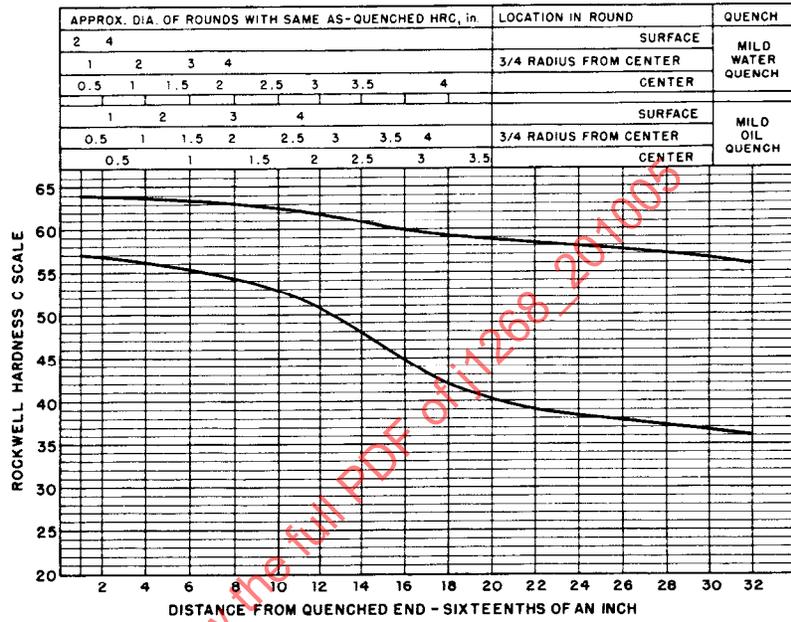
FIGURE 33 - UNS H41450 - HARDENABILITY BAND - SAE 4145H

HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	64	57
2	64	57
3	64	56
4	64	56
5	63	55
6	63	55
7	63	55
8	63	54
9	63	54
10	62	53
11	62	52
12	62	51
13	61	49
14	61	48
15	60	46
16	60	45
18	59	42
20	59	40
22	58	39
24	57	38
26	57	37
28	57	37
30	56	37
32	56	36

HEAT TREATING TEMPERATURES	
*NORMALIZE	1600 °F
AUSTENITIZE	1550 °F
* For forged or rolled specimens only	

UNS H41470 **HARDENABILITY BAND** SAE 4147H

%C	%Mn	%Si	%Ni	%Cr	%Mo
0.44/0.51	0.65/1.10	0.15/0.35	---	0.75/1.20	0.15/0.25



HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE MILLIMETERS	HRC	
	MAX.	MIN.
1.5	64	57
3	64	57
5	64	56
7	64	55
9	63	55
11	63	55
13	63	54
15	63	53
20	62	50
25	60	45
30	59	42
35	58	39
40	57	37
45	57	36
50	56	36

HEAT TREATING TEMPERATURES	
*NORMALIZE	870 °C
AUSTENITIZE	845 °C
* For forged or rolled specimens only	

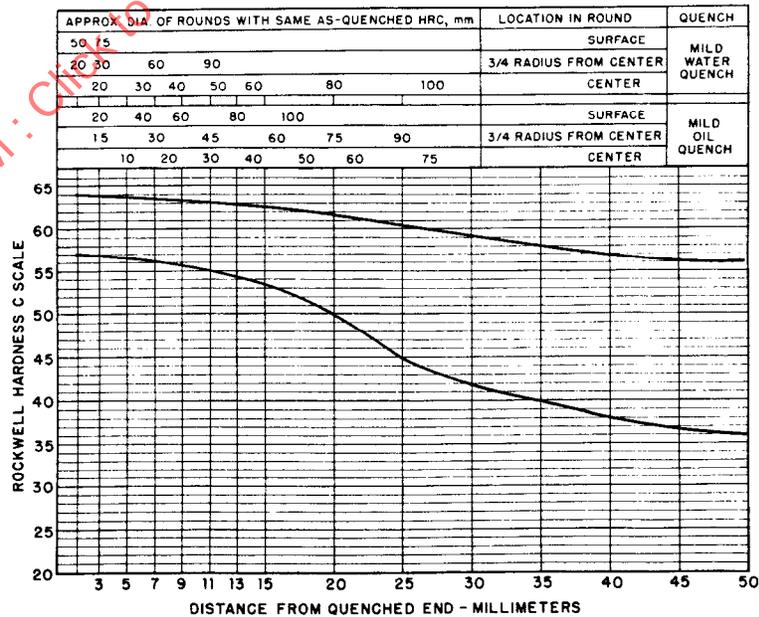


FIGURE 34 - UNS H41470 - HARDENABILITY BAND - SAE 4147H

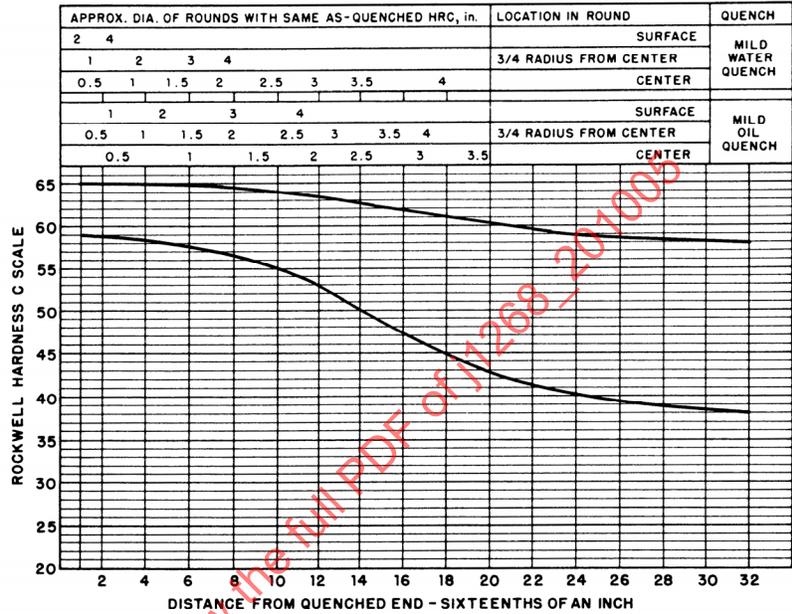
HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	65	59
2	65	59
3	65	59
4	65	58
5	65	58
6	65	57
7	65	57
8	64	56
9	64	56
10	64	55
11	64	54
12	63	53
13	63	51
14	62	50
15	62	48
16	62	47
18	61	45
20	60	43
22	59	41
24	59	40
26	58	39
28	58	38
30	58	38
32	58	38

HEAT TREATING TEMPERATURES	
*NORMALIZE	1600 °F
AUSTENITIZE	1550 °F

*For forged or rolled specimens only

UNS H41500 **HARDENABILITY BAND** SAE 4150H

%C	%Mn	%Si	%Ni	%Cr	%Mo
0.47/0.54	0.65/1.10	0.15/0.35	--	0.75/1.20	0.15/0.25



HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE MILLIMETERS	HRC	
	MAX.	MIN.
1.5	65	59
3	65	59
5	65	58
7	65	58
9	65	57
11	65	57
13	65	56
15	64	55
20	63	51
25	62	47
30	61	44
35	60	41
40	59	39
45	58	38
50	58	38

HEAT TREATING TEMPERATURES	
*NORMALIZE	870 °C
AUSTENITIZE	845 °C

*For forged or rolled specimens only

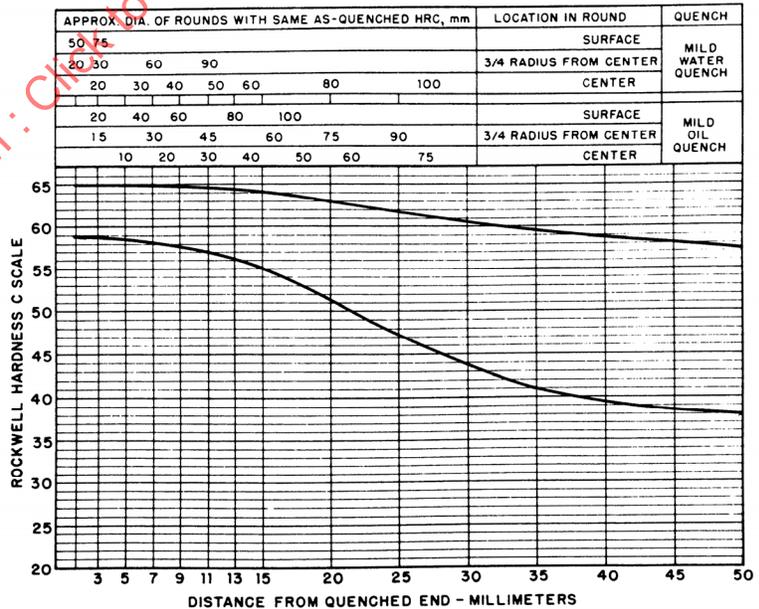


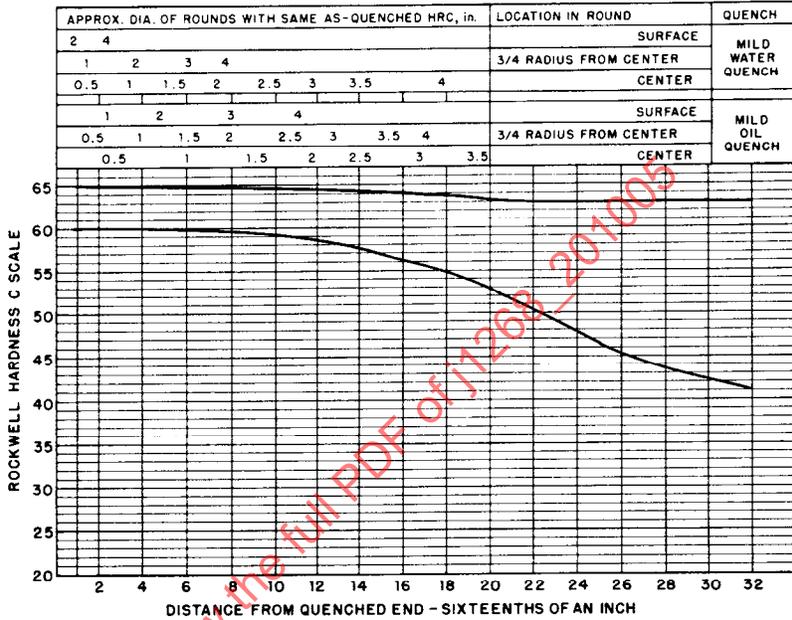
FIGURE 35 - UNS H41500 - HARDENABILITY BAND - SAE 4150H

HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	65	60
2	65	60
3	65	60
4	65	60
5	65	60
6	65	60
7	65	60
8	65	60
9	65	59
10	65	59
11	65	59
12	64	59
13	64	58
14	64	58
15	64	57
16	64	56
18	64	55
20	63	53
22	63	50
24	63	48
26	63	45
28	63	43
30	63	42
32	63	41

HEAT TREATING TEMPERATURES
 *NORMALIZE 1600 °F
 AUSTENITIZE 1550 °F
 *For forged or rolled specimens only

UNS H41610 **HARDENABILITY BAND** SAE 4161H

%C	%Mn	%Si	%Ni	%Cr	%Mo
0.55/0.65	0.65/1.10	0.15/0.35	--	0.65/0.95	0.25/0.35



HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE MILLIMETERS	HRC	
	MAX.	MIN.
1.5	65	60
3	65	60
5	65	60
7	65	60
9	65	60
11	65	60
13	65	60
15	65	60
20	65	58
25	64	56
30	63	53
35	63	50
40	63	46
45	63	43
50	63	41

HEAT TREATING TEMPERATURES
 *NORMALIZE 870 °C
 AUSTENITIZE 845 °C
 *For forged or rolled specimens only

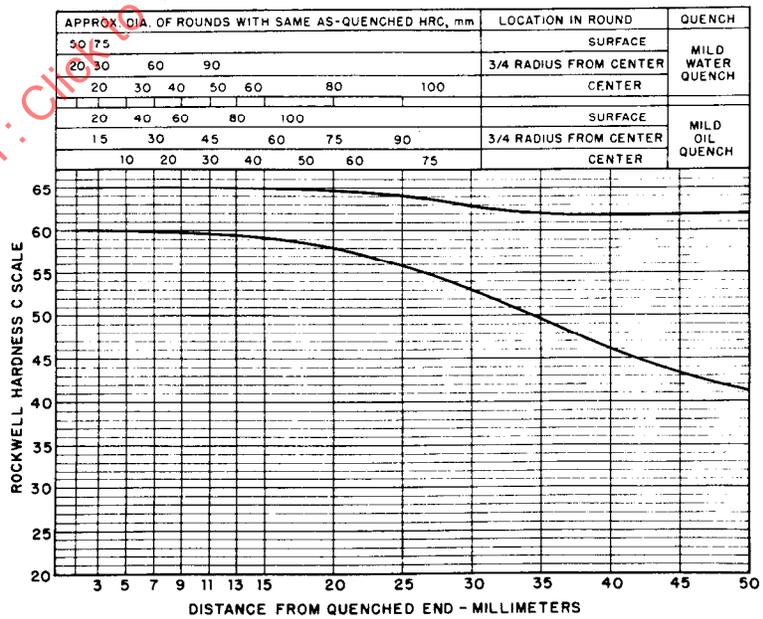


FIGURE 36 - UNS H41610 - HARDENABILITY BAND - SAE 4161H

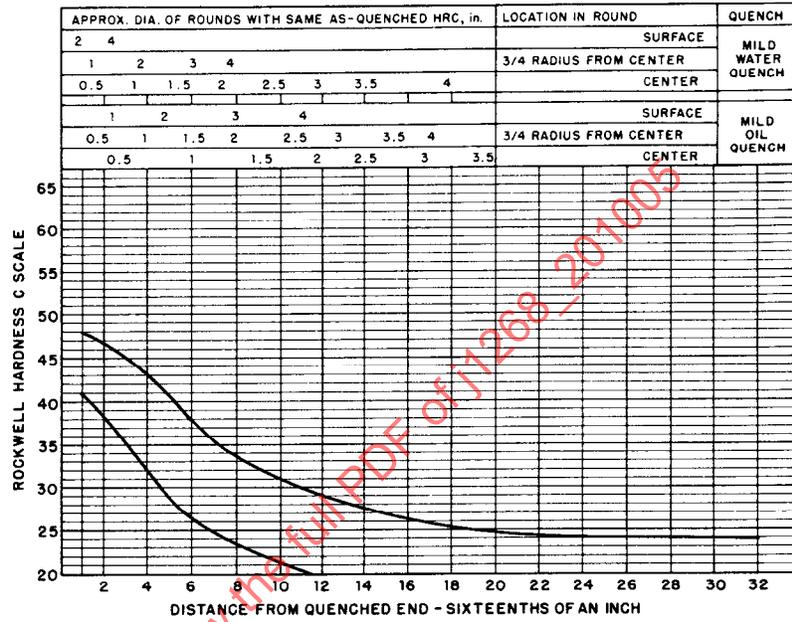
HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	48	41
2	47	38
3	45	35
4	43	32
5	41	29
6	38	27
7	36	25
8	34	23
9	33	22
10	31	21
11	30	20
12	29	20
13	28	--
14	27	--
15	27	--
16	26	--
18	25	--
20	25	--
22	24	--
24	24	--
26	24	--
28	24	--
30	24	--
32	24	--

HEAT TREATING TEMPERATURES	
*NORMALIZE	1700 °F
AUSTENITIZE	1700 °F

*For forged or rolled specimens only

UNS H43200 **HARDENABILITY BAND** SAE 4320H

%C	%Mn	%Si	%Ni	%Cr	%Mo
0.17/0.23	0.40/0.70	0.15/0.35	1.55 /2.00	0.35/0.65	0.20/0.30



HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE MILLIMETERS	HRC	
	MAX.	MIN.
1.5	48	41
3	47	39
5	45	35
7	42	30
9	39	27
11	36	25
13	34	23
15	32	22
20	28	--
25	26	--
30	25	--
35	25	--
40	24	--
45	24	--
50	24	--

HEAT TREATING TEMPERATURES	
*NORMALIZE	925 °C
AUSTENITIZE	925 °C

*For forged or rolled specimens only

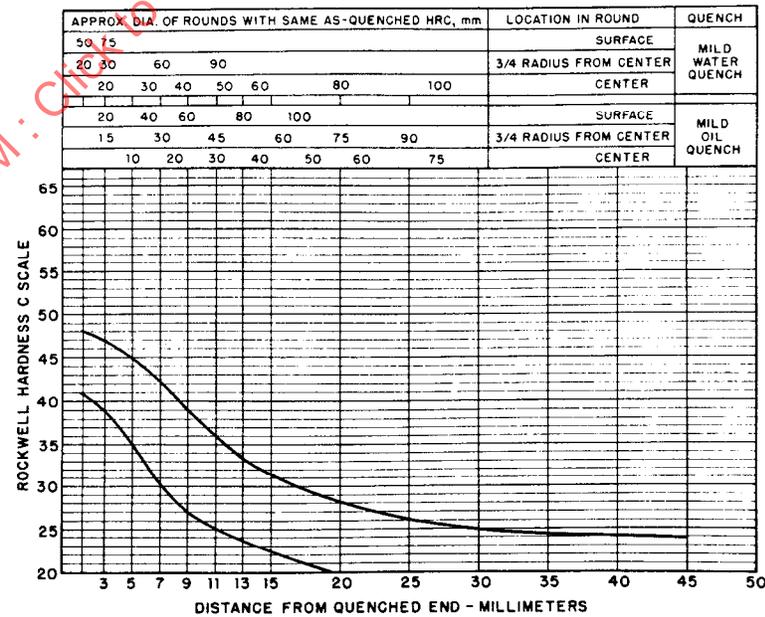


FIGURE 37 - UNS H43200 - HARDENABILITY BAND - SAE 4320H

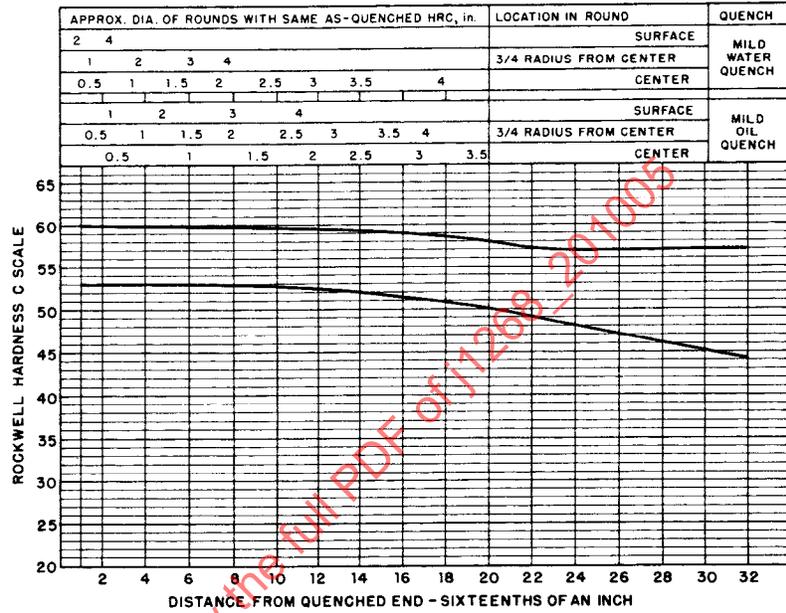
HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	60	53
2	60	53
3	60	53
4	60	53
5	60	53
6	60	53
7	60	53
8	60	53
9	60	53
10	60	53
11	60	53
12	60	52
13	60	52
14	59	52
15	59	52
16	59	51
18	58	51
20	58	50
22	58	49
24	57	48
26	57	47
28	57	46
30	57	45
32	57	44

HEAT TREATING TEMPERATURES	
*NORMALIZE	1600 °F
AUSTENITIZE	1550 °F

*For forged or rolled specimens only

UNS H43406 **HARDENABILITY BAND** SAE E4340H

%C	%Mn	%Si	%Ni	%Cr	%Mo
0.37/0.44	0.60/0.95	0.15/0.35	1.55/2.00	0.65/0.95	0.20/0.30



HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE MILLIMETERS	HRC	
	MAX.	MIN.
1.5	60	53
3	60	53
5	60	53
7	60	53
9	60	53
11	60	53
13	60	53
15	60	53
20	60	52
25	59	51
30	58	50
35	58	49
40	57	47
45	57	46
50	57	44

HEAT TREATING TEMPERATURES	
*NORMALIZE	870 °C
AUSTENITIZE	845 °C

*For forged or rolled specimens only

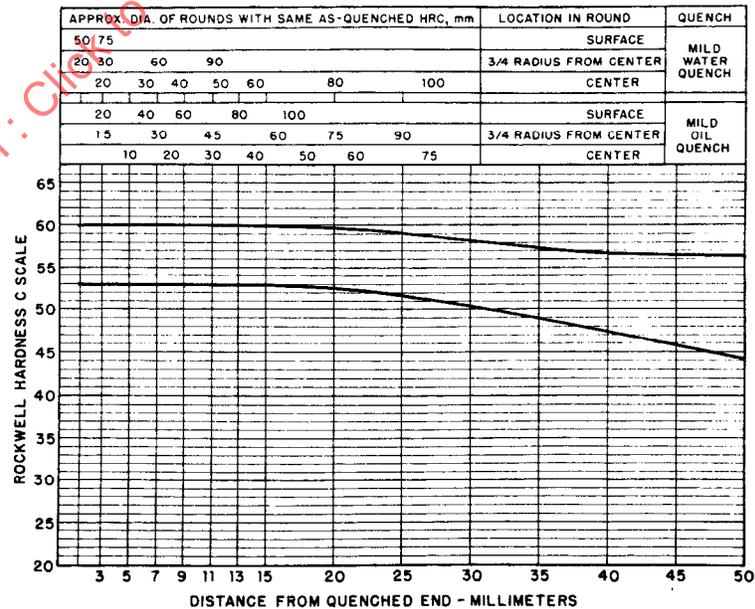


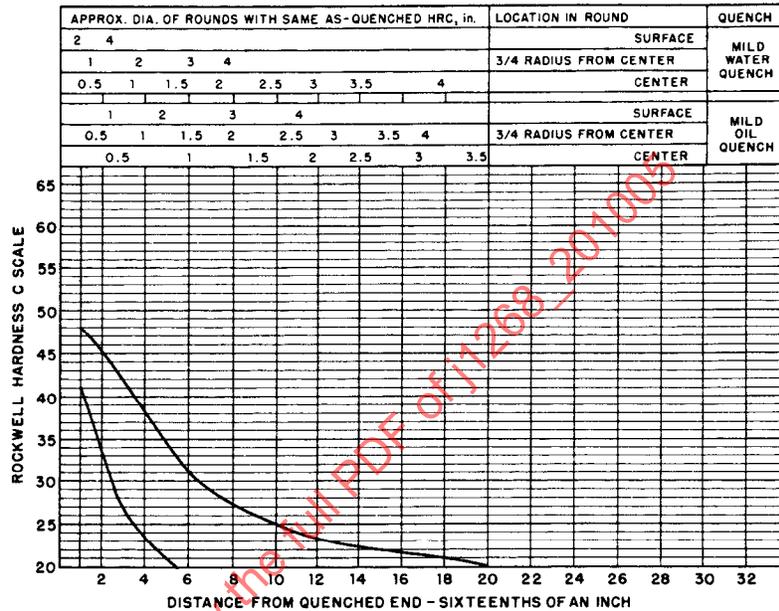
FIGURE 39 - UNS H43406 - HARDENABILITY BAND - SAE E4340H

HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	48	41
2	45	35
3	42	27
4	39	24
5	34	21
6	31	--
7	29	--
8	27	--
9	26	--
10	25	--
11	24	--
12	23	--
13	22	--
14	22	--
15	22	--
16	21	--
18	21	--
20	20	--
22	--	--
24	--	--
26		
28		
30		
32		

HEAT TREATING TEMPERATURES
 *NORMALIZE 1700 °F
 AUSTENITIZE 1700 °F
 *For forged or rolled specimens only

UNS H46200 **HARDENABILITY BAND** SAE 4620H

%C	%Mn	%Si	%Ni	%Cr	%Mo
0.17/0.23	0.35/0.75	0.15/0.35	1.55/2.00	--	0.20/0.30



HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE MILLIMETERS	HRC	
	MAX.	MIN.
1.5	48	41
3	46	37
5	42	28
7	37	23
9	33	--
11	30	--
13	27	--
15	26	--
20	23	--
25	22	--
30	21	--
35	--	--
40		
45		
50		

HEAT TREATING TEMPERATURES
 *NORMALIZE 925 °C
 AUSTENITIZE 925 °C
 *For forged or rolled specimens only

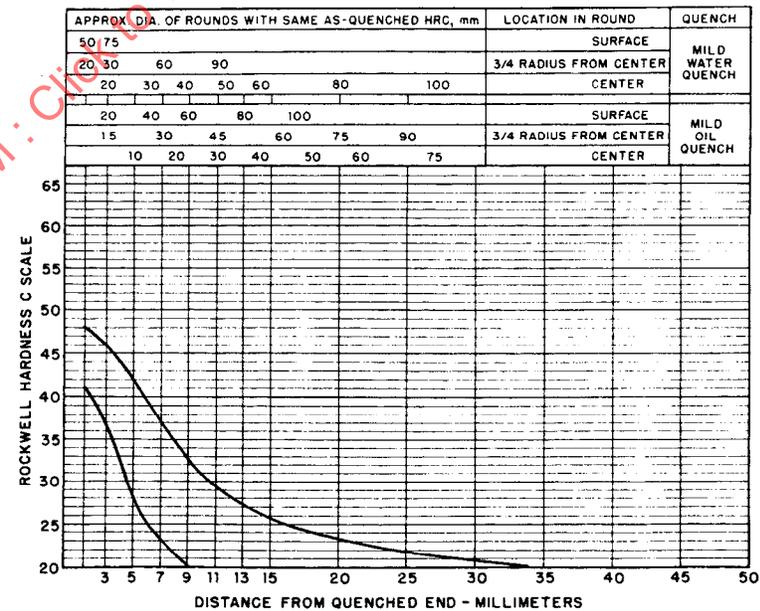


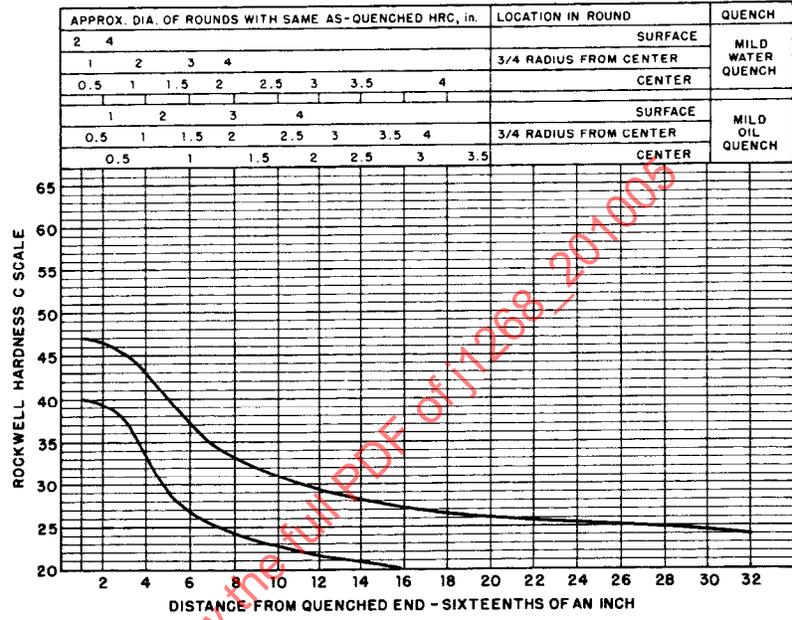
FIGURE 40 - UNS H46200 - HARDENABILITY BAND - SAE 4620H

HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	47	40
2	47	40
3	45	38
4	43	33
5	40	29
6	37	27
7	35	25
8	33	24
9	32	23
10	31	22
11	30	22
12	29	21
13	29	21
14	28	21
15	27	20
16	27	20
18	27	--
20	26	--
22	26	--
24	25	--
26	25	--
28	24	--
30	24	--
32	24	--

HEAT TREATING TEMPERATURES
 *NORMALIZE 1700 °F
 AUSTENITIZE 1700 °F
 *For forged or rolled specimens only

UNS H47180 **HARDENABILITY BAND** SAE 4718H

%C	%Mn	%Si	%Ni	%Cr	%Mo
0.15/0.21	0.60/0.95	0.15/0.35	0.85/1.25	0.30/0.60	0.30/0.40



HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE MILLIMETERS	HRC	
	MAX.	MIN.
1.5	47	40
3	47	40
5	45	37
7	42	31
9	38	28
11	35	25
13	33	23
15	32	22
20	29	21
25	27	20
30	26	--
35	26	--
40	25	--
45	25	--
50	24	--

HEAT TREATING TEMPERATURES
 *NORMALIZE 925 °C
 AUSTENITIZE 925 °C
 *For forged or rolled specimens only

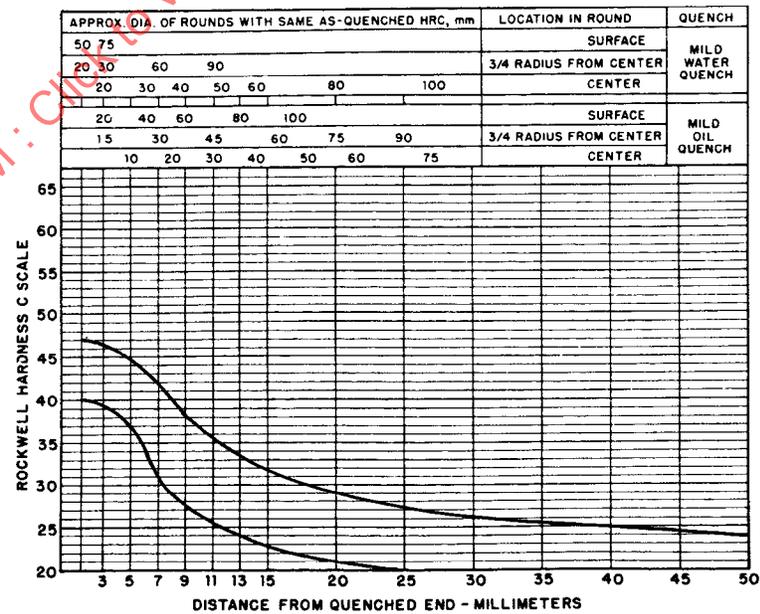


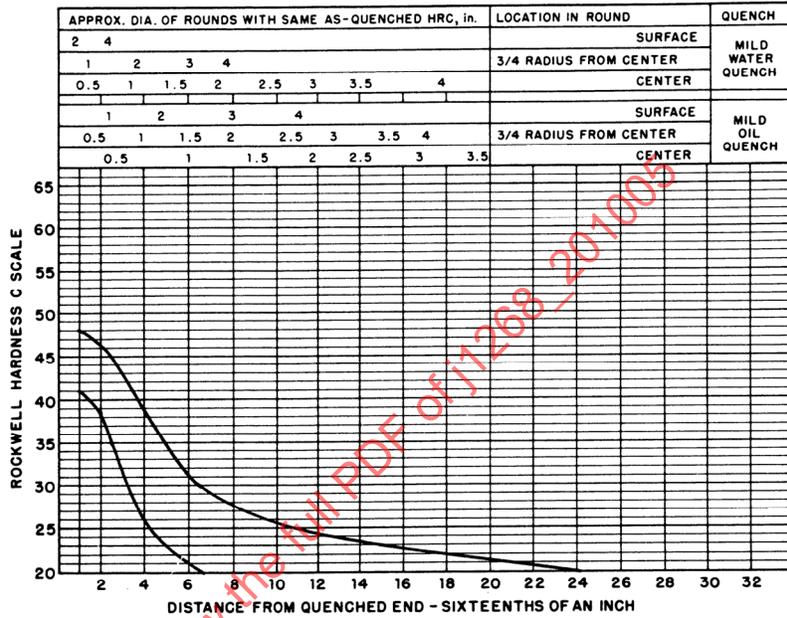
FIGURE 41 - UNS H47180 - HARDENABILITY BAND - SAE 4718H

HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	48	41
2	47	39
3	43	31
4	39	27
5	35	23
6	32	21
7	29	--
8	28	--
9	27	--
10	26	--
11	25	--
12	24	--
13	24	--
14	23	--
15	23	--
16	22	--
18	21	--
20	21	--
22	21	--
24	20	--
26	--	--
28	--	--
30	--	--
32	--	--

HEAT TREATING TEMPERATURES
 *NORMALIZE 1700 °F
 AUSTENITIZE 1700 °F
 *For forged or rolled specimens only

UNS H47200 **HARDENABILITY BAND** SAE 4720H

%C	%Mn	%Si	%Ni	%Cr	%Mo
0.17/0.23	0.45/0.75	0.15/0.35	0.85/1.25	0.30/0.60	0.15/0.25



HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE MILLIMETERS	HRC	
	MAX.	MIN.
1.5	48	41
3	47	39
5	43	30
7	38	25
9	33	22
11	30	20
13	28	--
15	27	--
20	24	--
25	23	--
30	22	--
35	21	--
40	20	--
45	--	--
50	--	--

HEAT TREATING TEMPERATURES
 *NORMALIZE 925 °C
 AUSTENITIZE 925 °C
 *For forged or rolled specimens only

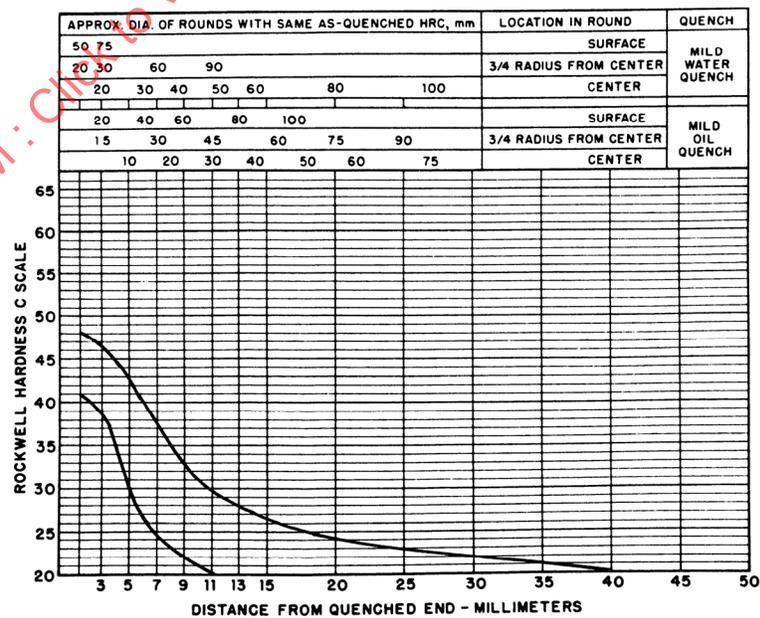


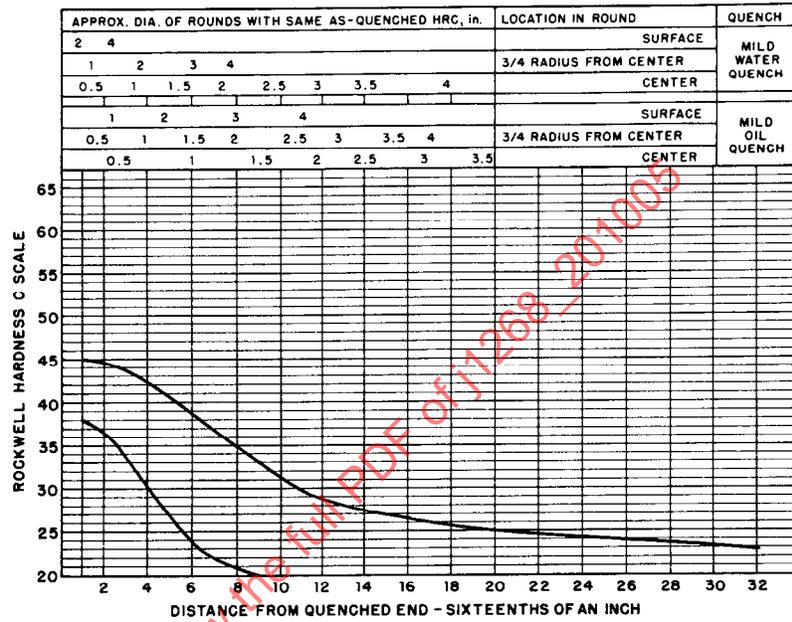
FIGURE 42 - UNS H47200 - HARDENABILITY BAND - SAE 4720H

HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	45	38
2	44	37
3	44	34
4	42	30
5	41	27
6	39	24
7	37	22
8	35	21
9	33	20
10	31	--
11	30	--
12	29	--
13	28	--
14	28	--
15	27	--
16	27	--
18	26	--
20	25	--
22	24	--
24	24	--
26	24	--
28	23	--
30	23	--
32	23	--

HEAT TREATING TEMPERATURES
 *NORMALIZE 1700 °F
 AUSTENITIZE 1550 °F
 *For forged or rolled specimens only

UNS H48150 **HARDENABILITY BAND** SAE 4815H

%C	%Mn	%Si	%Ni	%Cr	%Mo
0.12/0.18	0.30/0.70	0.15/0.35	3.20/3.80	--	0.20/0.30



HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE MILLIMETERS	HRC	
	MAX.	MIN.
1.5	45	38
3	45	36
5	44	33
7	42	28
9	40	25
11	37	22
13	35	20
15	32	--
20	29	--
25	27	--
30	26	--
35	25	--
40	24	--
45	24	--
50	23	--

HEAT TREATING TEMPERATURES
 *NORMALIZE 925 °C
 AUSTENITIZE 845 °C
 *For forged or rolled specimens only

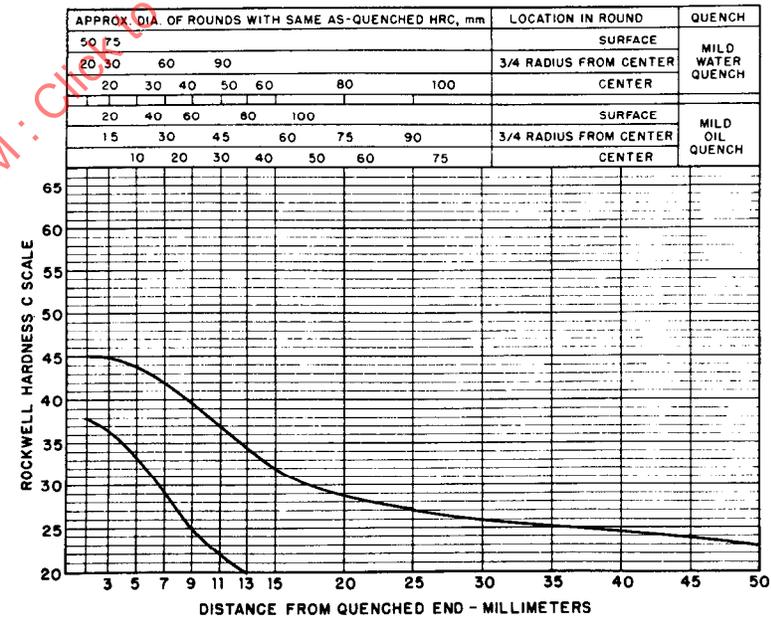


FIGURE 43 - UNS H48150 - HARDENABILITY BAND - SAE 4815H

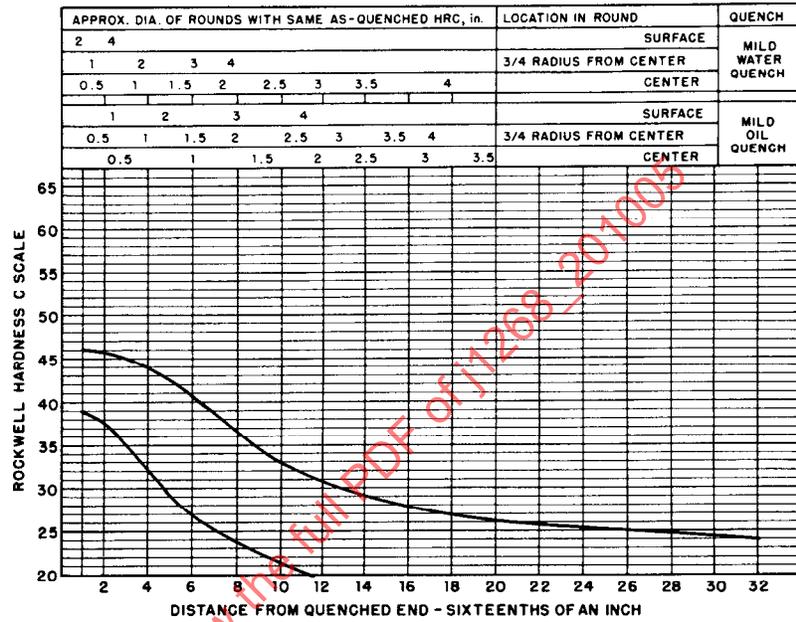
HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	46	39
2	46	38
3	45	35
4	44	32
5	42	29
6	41	27
7	39	25
8	37	23
9	35	22
10	33	21
11	32	20
12	31	20
13	30	--
14	29	--
15	28	--
16	28	--
18	27	--
20	26	--
22	25	--
24	25	--
26	25	--
28	25	--
30	24	--
32	24	--

HEAT TREATING TEMPERATURES	
*NORMALIZE	1700 °F
AUSTENITIZE	1550 °F

* For forged or rolled specimens only

UNS H48170 **HARDENABILITY BAND** SAE 4817H

%C	%Mn	%Si	%Ni	%Cr	%Mo
0.14/0.20	0.30/0.70	0.15/0.35	3.20/3.80	--	0.20/0.30



HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE MILLIMETERS	HRC	
	MAX.	MIN.
1.5	46	39
3	46	38
5	45	35
7	44	31
9	42	28
11	39	25
13	37	23
15	34	21
20	31	--
25	28	--
30	27	--
35	26	--
40	25	--
45	25	--
50	25	--

HEAT TREATING TEMPERATURES	
*NORMALIZE	925 °C
AUSTENITIZE	845 °C

* For forged or rolled specimens only

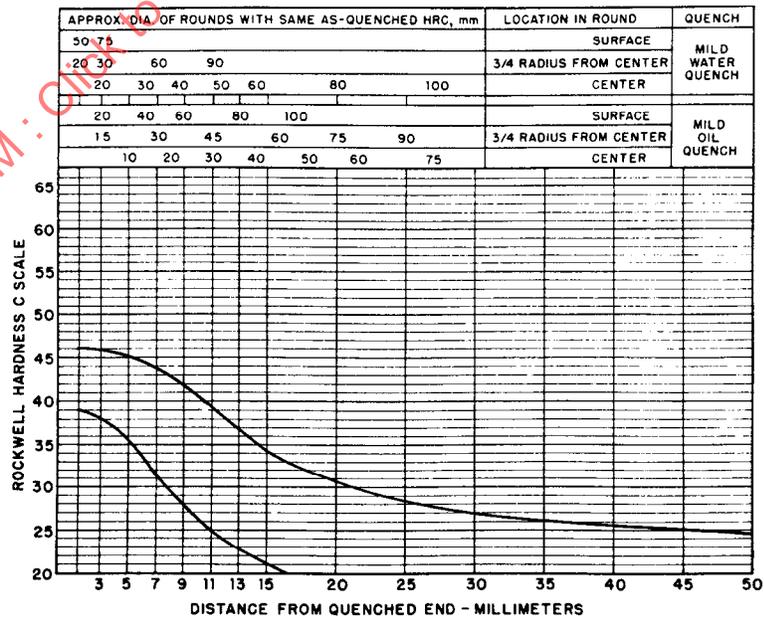


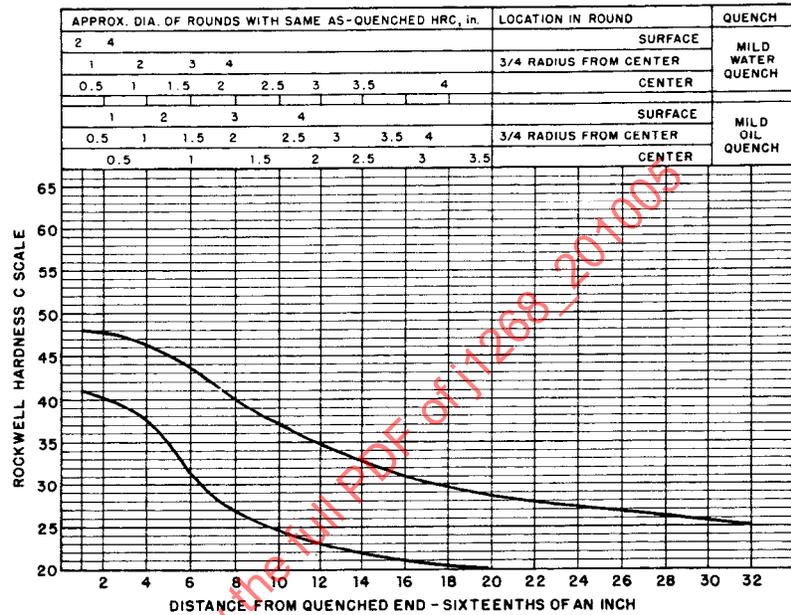
FIGURE 44 - UNS H48170 - HARDENABILITY BAND - SAE 4817H

HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	48	41
2	48	40
3	47	39
4	46	38
5	45	34
6	43	31
7	42	29
8	40	27
9	39	26
10	37	25
11	36	24
12	35	23
13	34	22
14	33	22
15	32	21
16	31	21
18	29	20
20	28	20
22	28	--
24	27	--
26	27	--
28	26	--
30	26	--
32	25	--

HEAT TREATING TEMPERATURES		
*NORMALIZE	1700°F	
AUSTENITIZE	1550°F	
*For forged or rolled specimens only		

UNS H48200 **HARDENABILITY BAND** SAE 4820H

%C	%Mn	%Si	%Ni	%Cr	%Mo
0.17/0.23	0.40/0.80	0.15/0.35	3.20/3.80	--	0.20/0.30



HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE MILLIMETERS	HRC	
	MAX.	MIN.
1.5	48	41
3	48	40
5	48	39
7	46	36
9	45	32
11	43	29
13	40	27
15	39	25
20	35	22
25	32	21
30	29	20
35	28	--
40	27	--
45	26	--
50	26	--

HEAT TREATING TEMPERATURES		
*NORMALIZE	925 °C	
AUSTENITIZE	845 °C	
*For forged or rolled specimens only		

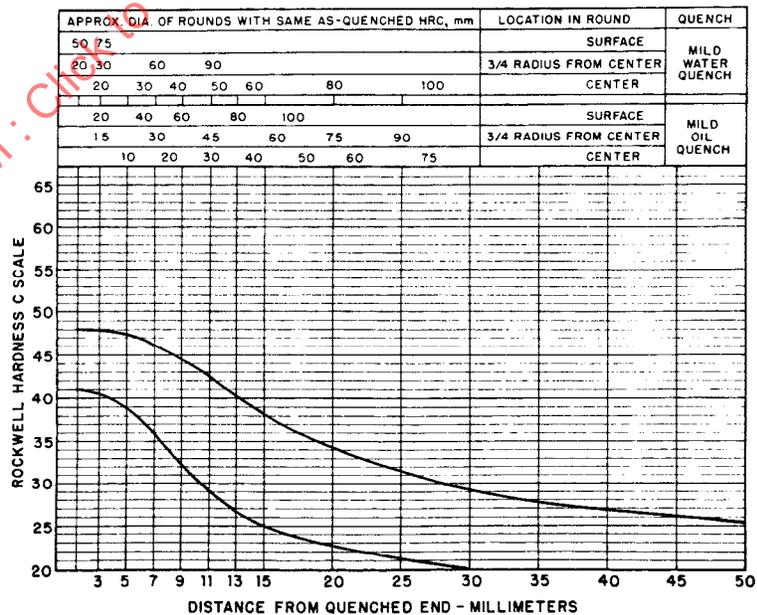


FIGURE 45 - UNS H48200 - HARDENABILITY BAND - SAE 4820H

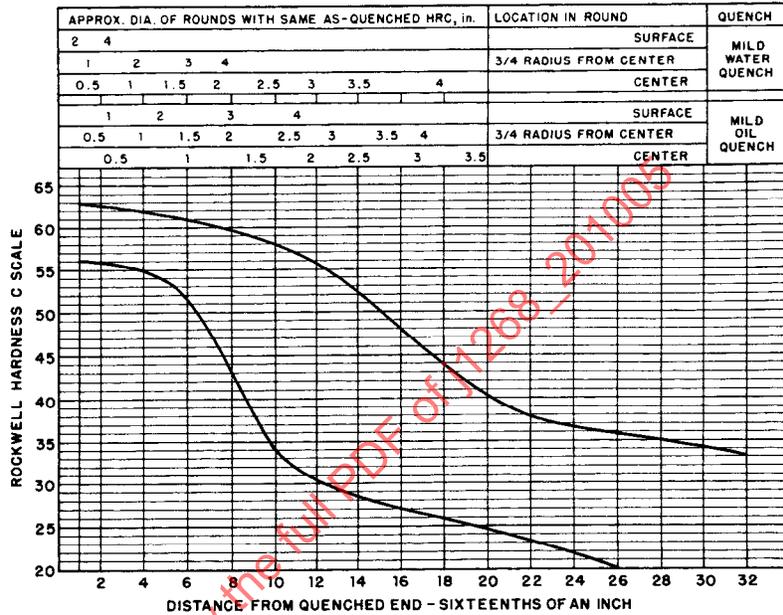
HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	63	56
2	63	56
3	62	55
4	62	55
5	61	54
6	61	52
7	60	48
8	60	43
9	59	38
10	58	34
11	57	31
12	56	30
13	54	29
14	52	29
15	50	28
16	48	27
18	44	26
20	40	24
22	38	23
24	37	21
26	36	20
28	35	--
30	34	--
32	33	--

HEAT TREATING TEMPERATURES	
*NORMALIZE	1600 °F
AUSTENITIZE	1550 °F

*For forged or rolled specimens only

UNS H50441 **HARDENABILITY BAND** SAE 50B44H

%C	%Mn	%Si	%Ni	%Cr	%Mo	%B
0.42/0.49	0.65/1.10	0.15/0.35	--	0.30/0.70	--	0.0005/0.003



HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE MILLIMETERS	HRC	
	MAX.	MIN.
1.5	63	56
3	63	56
5	62	55
7	62	54
9	61	52
11	61	49
13	60	42
15	59	36
20	55	30
25	49	27
30	42	25
35	38	23
40	37	21
45	35	--
50	34	--

HEAT TREATING TEMPERATURES	
*NORMALIZE	870 °C
AUSTENITIZE	845 °C

*For forged or rolled specimens only

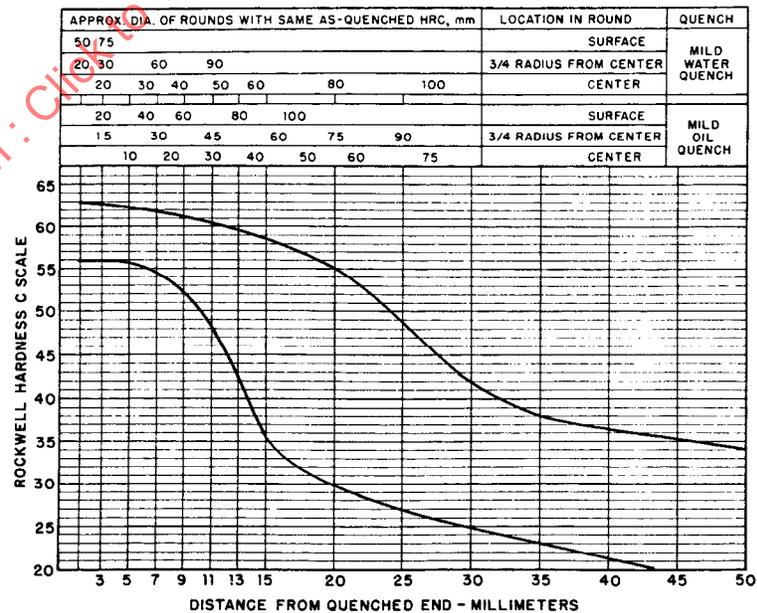


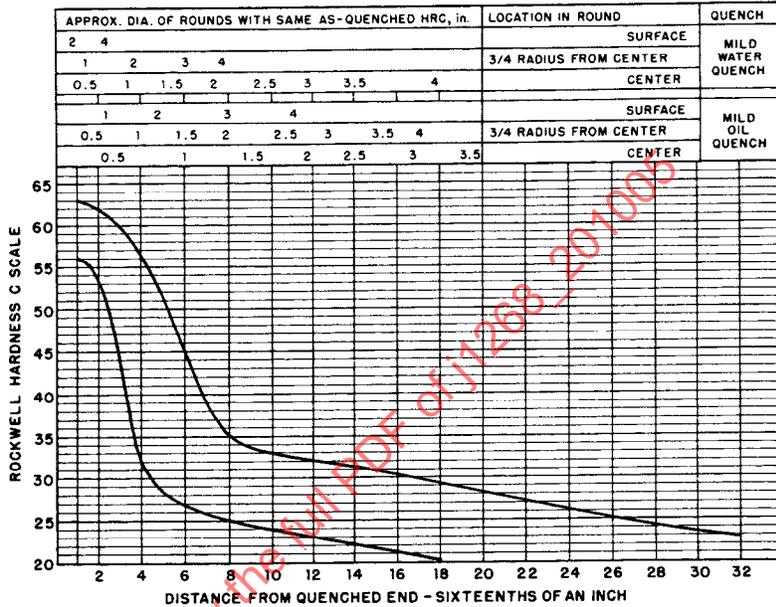
FIGURE 47 - UNS H50441 - HARDENABILITY BAND - SAE 50B44H

HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	63	56
2	62	55
3	60	45
4	56	32
5	52	28
6	46	27
7	39	26
8	35	25
9	34	24
10	33	24
11	33	23
12	32	23
13	32	22
14	31	22
15	31	21
16	30	21
18	29	20
20	28	--
22	27	--
24	26	--
26	25	--
28	24	--
30	23	--
32	23	--

HEAT TREATING TEMPERATURES
 *NORMALIZE 1600 *F
 AUSTENITIZE 1550 *F
 *For forged or rolled specimens only

UNS H50460 **HARDENABILITY BAND** SAE 5046H

%C	%Mn	%Si	%Ni	%Cr	%Mo
0.43/0.50	0.65/1.10	0.15/0.35	--	0.13/0.43	--



HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE MILLIMETERS	HRC	
	MAX.	MIN.
1.5	63	56
3	62	54
5	59	40
7	54	30
9	48	27
11	39	26
13	35	25
15	34	25
20	32	22
25	30	20
30	29	--
35	27	--
40	26	--
45	24	--
50	23	--

HEAT TREATING TEMPERATURES
 *NORMALIZE 870 °C
 AUSTENITIZE 845 °C
 *For forged or rolled specimens only

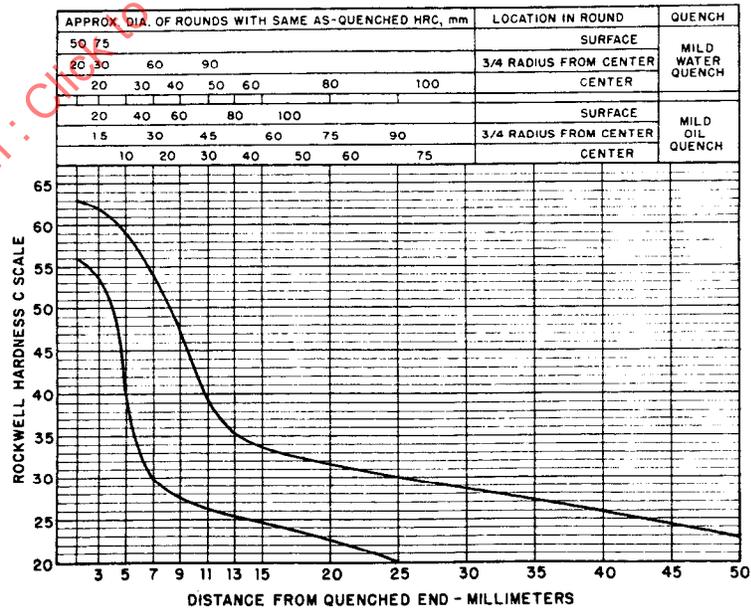


FIGURE 48 - UNS H50460 - HARDENABILITY BAND - SAE 5046H

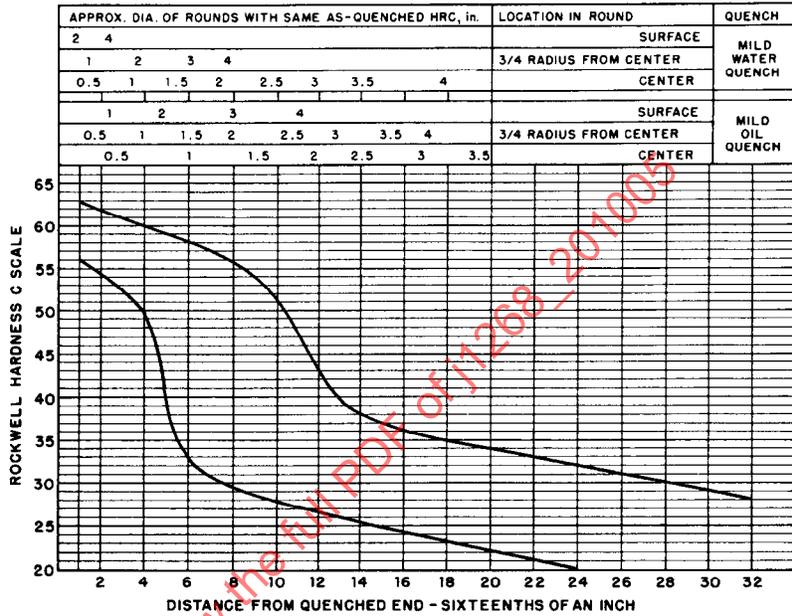
HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	63	56
2	62	54
3	61	52
4	60	50
5	59	41
6	58	32
7	57	31
8	56	30
9	54	29
10	51	28
11	47	27
12	43	26
13	40	26
14	38	25
15	37	25
16	36	24
18	35	23
20	34	22
22	33	21
24	32	20
26	31	--
28	30	--
30	29	--
32	28	--

HEAT TREATING TEMPERATURES	
*NORMALIZE	~ 1600 °F
AUSTENITIZE	1550 °F

*For forged or rolled specimens only

UNS H50461 **HARDENABILITY BAND** SAE 50B46H

%C	%Mn	%Si	%Ni	%Cr	%Mo	%B
0.43/0.50	0.65/1.10	0.15/0.35	--	0.13/0.43	--	0.0005/0.003



HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE MILLIMETERS	HRC	
	MAX.	MIN.
1.5	63	56
3	62	55
5	61	53
7	60	47
9	59	35
11	58	31
13	56	29
15	53	28
20	42	26
25	37	24
30	35	22
35	34	21
40	32	--
45	31	--
50	29	--

HEAT TREATING TEMPERATURES	
*NORMALIZE	870 °C
AUSTENITIZE	845 °C

*For forged or rolled specimens only

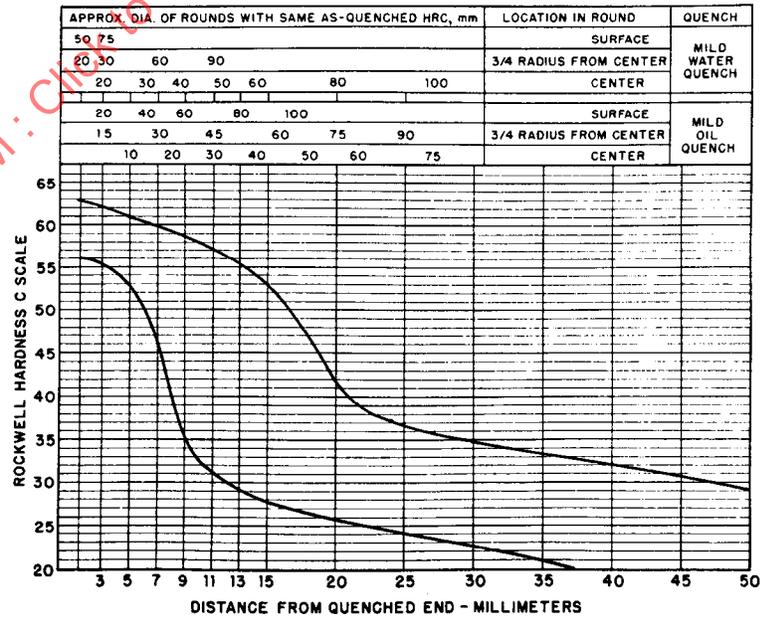


FIGURE 49 - UNS H50461 - HARDENABILITY BAND - SAE 50B46H

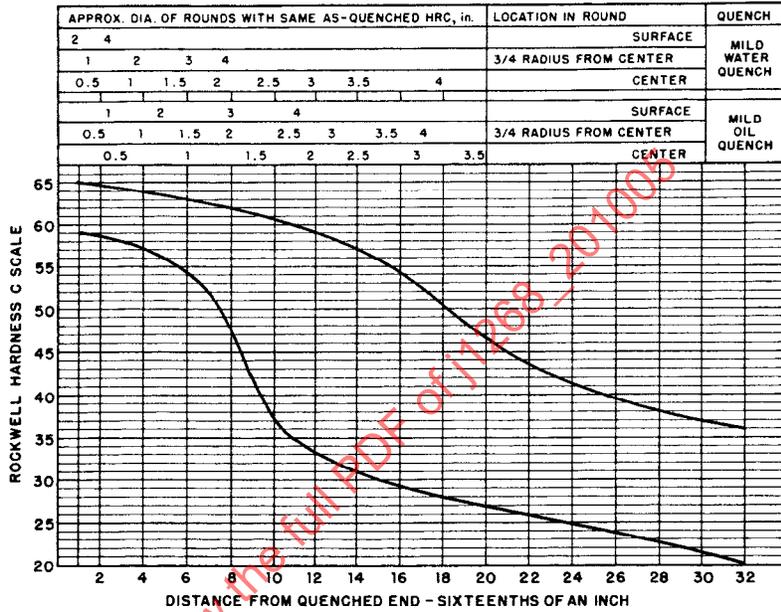
HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	65	59
2	65	59
3	64	58
4	64	57
5	63	56
6	63	55
7	62	52
8	62	47
9	61	42
10	60	37
11	60	35
12	59	33
13	58	32
14	57	31
15	56	30
16	54	29
18	50	28
20	47	27
22	44	26
24	41	25
26	39	24
28	38	22
30	37	21
32	36	20

HEAT TREATING TEMPERATURES	
*NORMALIZE	1600 °F
AUSTENITIZE	1550 °F

*For forged or rolled specimens only

UNS H50501 **HARDENABILITY BAND** SAE 50B50H

%C	%Mn	%Si	%Ni	%Cr	%Mo	%B
0.47/0.54	0.65/1.10	0.15/0.35	--	0.30/0.70	--	0.0005/0.003



HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE MILLIMETERS	HRC	
	MAX.	MIN.
1.5	65	59
3	65	59
5	65	58
7	64	57
9	63	55
11	63	52
13	62	46
15	61	39
20	59	32
25	54	29
30	49	27
35	44	26
40	40	24
45	38	22
50	37	20

HEAT TREATING TEMPERATURES	
*NORMALIZE	870 °C
AUSTENITIZE	845 °C

*For forged or rolled specimens only

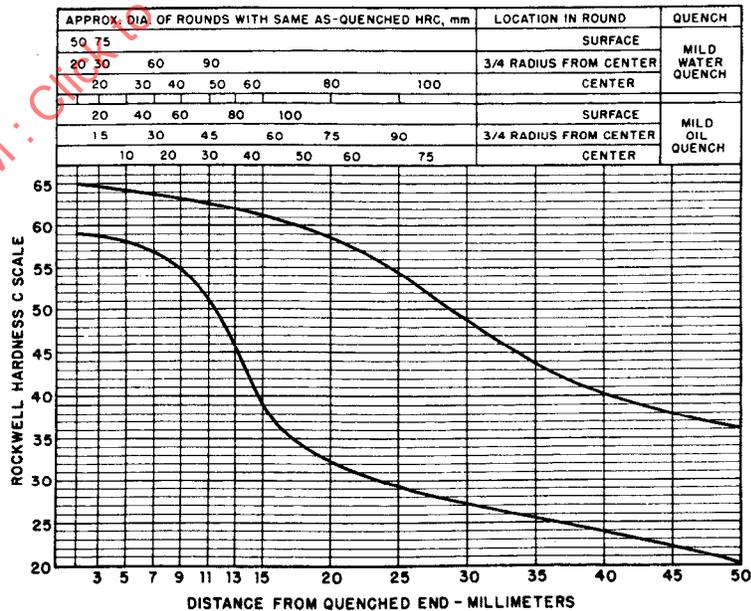


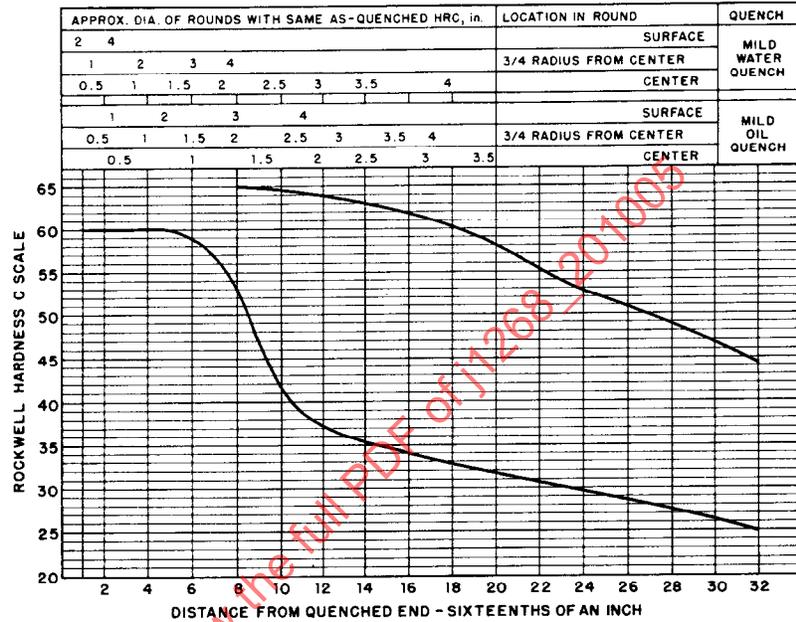
FIGURE 50 - UNS H50501 - HARDENABILITY BAND - SAE 50B50H

HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	--	60
2	--	60
3	--	60
4	--	60
5	--	60
6	--	59
7	--	57
8	65	53
9	65	47
10	64	42
11	64	39
12	64	37
13	63	36
14	63	35
15	63	34
16	62	34
18	60	33
20	58	31
22	55	30
24	53	29
26	51	28
28	49	27
30	47	26
32	44	25

HEAT TREATING TEMPERATURES	
*NORMALIZE	1600 °F
AUSTENITIZE	1550 °F
*For forged or rolled specimens only	

UNS H50601 **HARDENABILITY BAND** SAE 50B60H

% C	% Mn	% Si	% Ni	% Cr	% Mo	% B
0.55/0.65	0.65/1.10	0.15/0.35	--	0.30/0.70	--	0.0005/0.003



HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE MILLIMETERS	HRC	
	MAX.	MIN.
1.5	--	60
3	--	60
5	--	60
7	--	60
9	--	59
11	--	57
13	65	51
15	64	44
20	63	36
25	62	34
30	59	32
35	56	30
40	52	28
45	48	27
50	45	25

HEAT TREATING TEMPERATURES	
*NORMALIZE	870 °C
AUSTENITIZE	845 °C
*For forged or rolled specimens only	

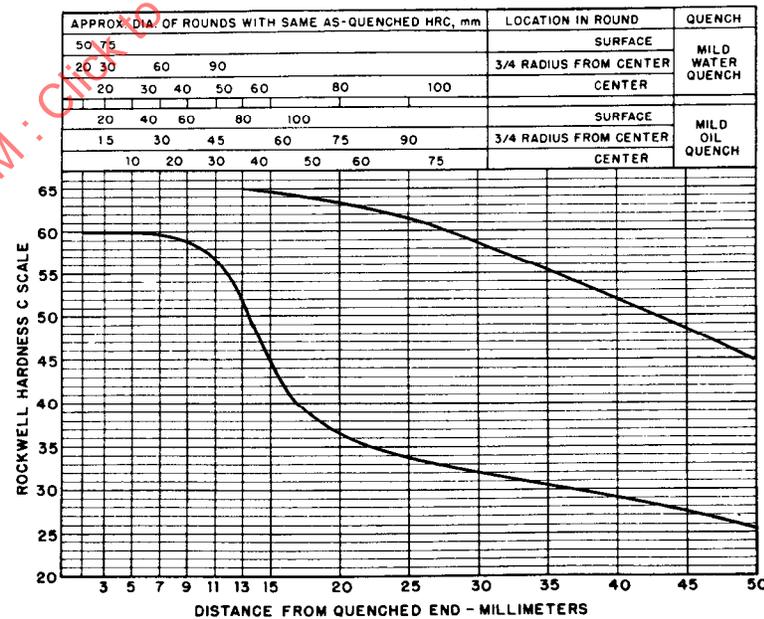
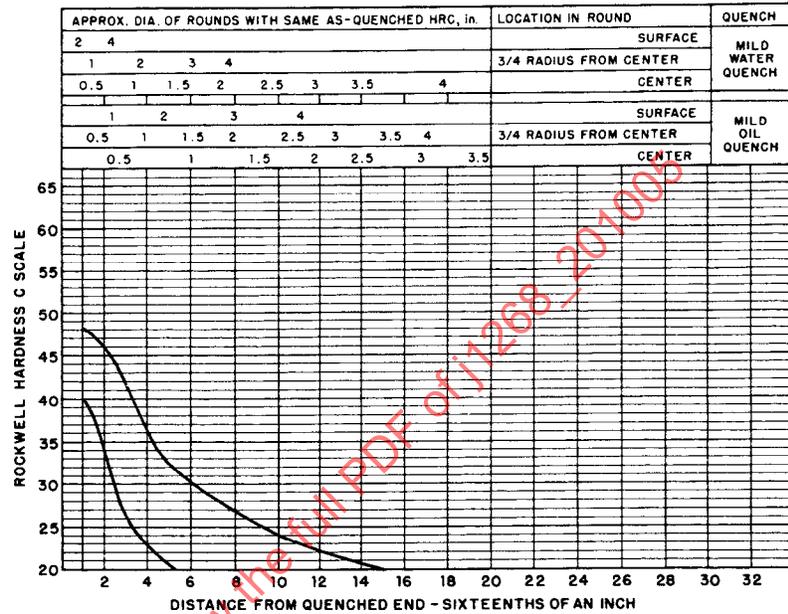


FIGURE 51 - UNS H50601 - HARDENABILITY BAND - SAE 50B60H

HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	48	40
2	46	34
3	41	26
4	36	23
5	33	20
6	30	--
7	28	--
8	27	--
9	25	--
10	24	--
11	23	--
12	22	--
13	21	--
14	21	--
15	20	--
16	--	--
18		
20		
22		
24		
26		
28		
30		
32		

HEAT TREATING TEMPERATURES
 *NORMALIZE 1700 °F
 AUSTENITIZE 1700 °F
 *For forged or rolled specimens only

UNS H51200		HARDENABILITY BAND				SAE 5120H	
%C	%Mn	%Si	%Ni	%Cr	%Mo		
0.17/0.23	0.60/1.00	0.15/0.35	--	0.60/1.00	--		



HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE MILLIMETERS	HRC	
	MAX.	MIN.
1.5	48	40
3	46	35
5	41	25
7	34	22
9	31	20
11	29	--
13	27	--
15	25	--
20	22	--
25	--	--
30		
35		
40		
45		
50		

HEAT TREATING TEMPERATURES
 *NORMALIZE 925 °C
 AUSTENITIZE 925 °C
 *For forged or rolled specimens only

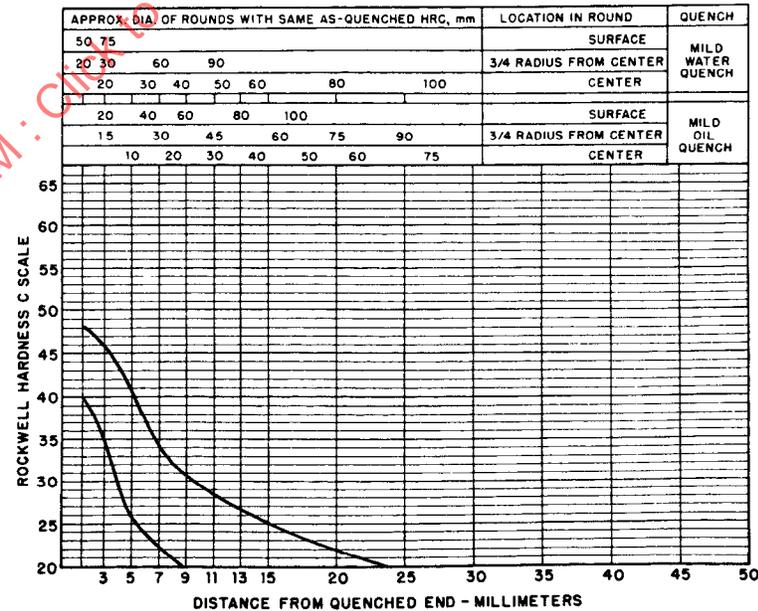


FIGURE 52 - UNS H51200 - HARDENABILITY BAND - SAE 5120H

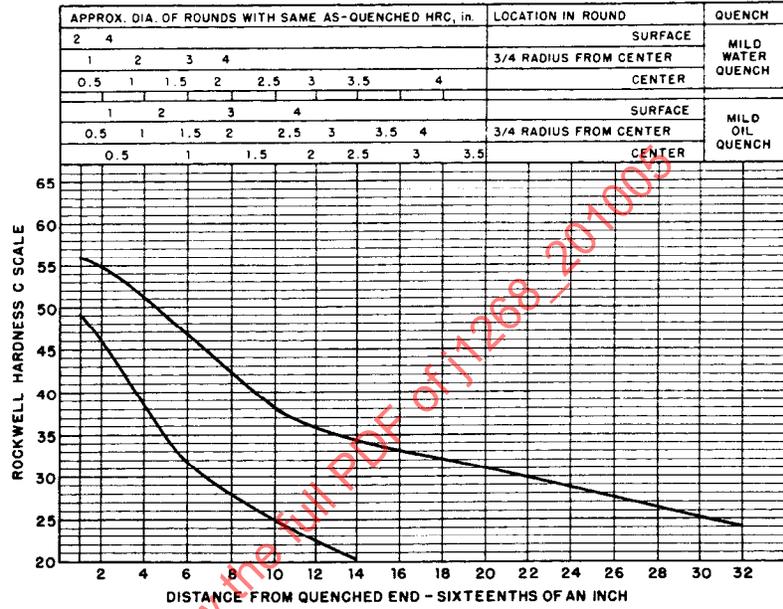
HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	56	49
2	55	46
3	53	42
4	51	39
5	49	35
6	47	32
7	45	30
8	42	28
9	40	26
10	38	25
11	37	23
12	36	22
13	35	21
14	34	20
15	34	--
16	33	--
18	32	--
20	31	--
22	30	--
24	29	--
26	27	--
28	26	--
30	25	--
32	24	--

HEAT TREATING TEMPERATURES	
*NORMALIZE	1650°F
AUSTENITIZE	1600°F

*For forged or rolled specimens only

UNS H51300 **HARDENABILITY BAND** SAE 5130H

%C	%Mn	%Si	%Ni	%Cr	%Mo
0.27/0.33	0.60/1.00	0.15/0.35	--	0.75/1.20	--



HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE MILLIMETERS	HRC	
	MAX.	MIN.
1.5	56	49
3	55	46
5	53	42
7	50	37
9	48	33
11	45	30
13	42	27
15	39	25
20	35	21
25	33	--
30	31	--
35	30	--
40	28	--
45	26	--
50	24	--

HEAT TREATING TEMPERATURES	
*NORMALIZE	900 °C
AUSTENITIZE	870 °C

*For forged or rolled specimens only

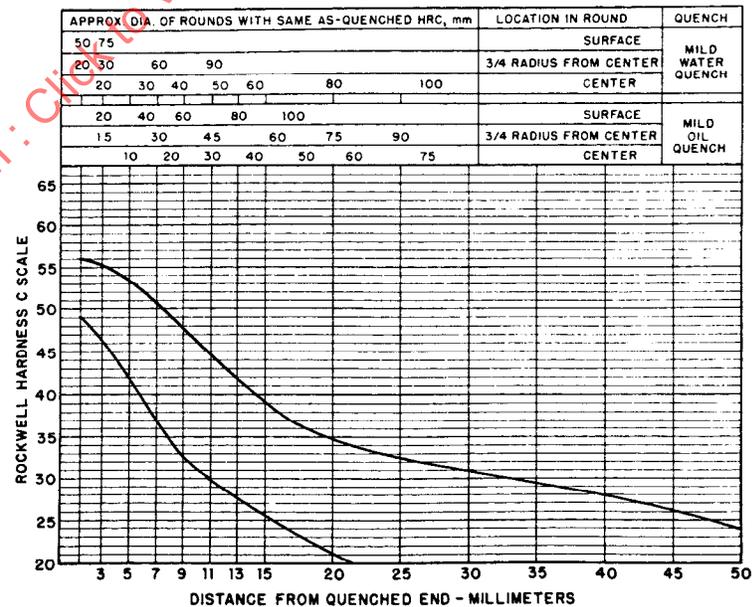


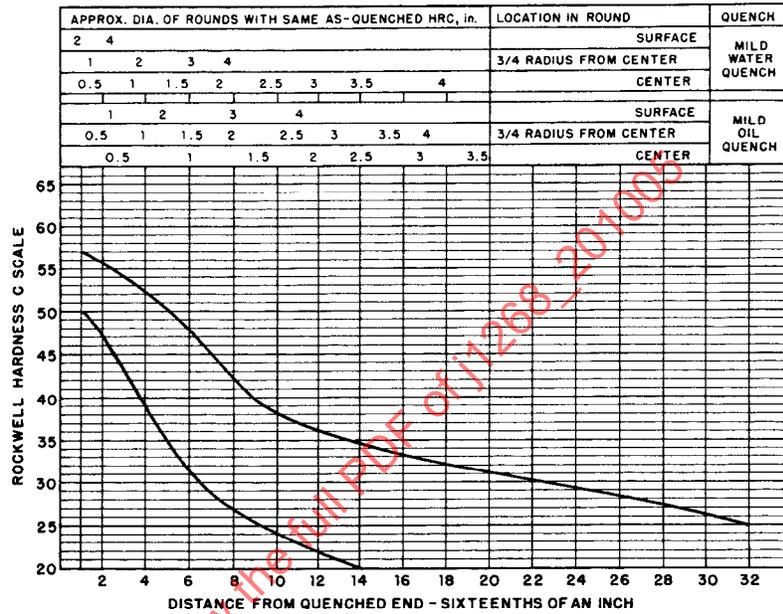
FIGURE 53 - UNS H51300 - HARDENABILITY BAND - SAE 5130H

HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	57	50
2	56	47
3	54	43
4	52	40
5	50	35
6	48	32
7	45	29
8	42	27
9	40	25
10	38	24
11	37	23
12	36	22
13	35	21
14	34	20
15	34	--
16	33	--
18	32	--
20	31	--
22	30	--
24	29	--
26	28	--
28	27	--
30	26	--
32	25	--

HEAT TREATING TEMPERATURES
 *NORMALIZE *1650 °F
 AUSTENITIZE 1600 °F
 *For forged or rolled specimens only

UNS H51320 **HARDENABILITY BAND** SAE 5132H

%C	%Mn	%Si	%Ni	%Cr	%Mo
0.29/0.35	0.50/0.90	0.15/0.35	--	0.65/1.10	--



HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE MILLIMETERS	HRC	
	MAX.	MIN.
1.5	57	50
3	56	47
5	54	42
7	52	38
9	49	33
11	45	29
13	42	26
15	39	25
20	35	21
25	33	--
30	32	--
35	31	--
40	29	--
45	27	--
50	25	--

HEAT TREATING TEMPERATURES
 *NORMALIZE 900 °C
 AUSTENITIZE 870 °C
 *For forged or rolled specimens only

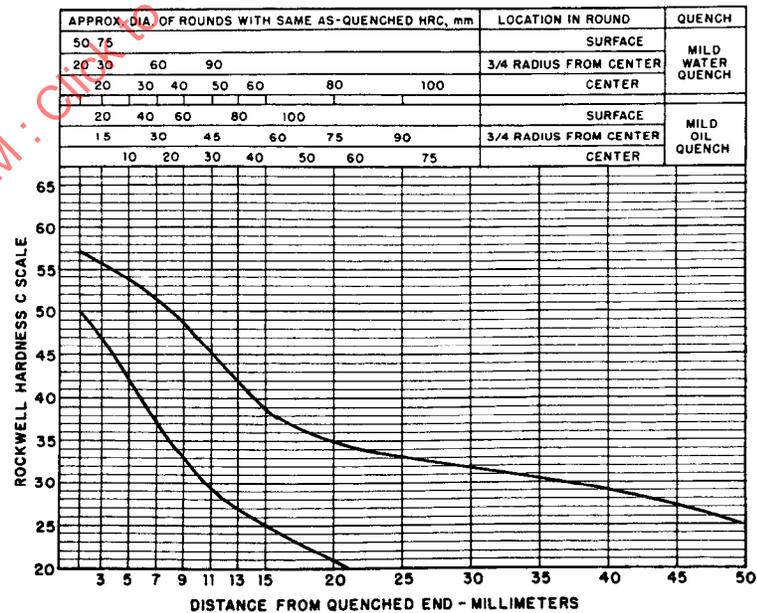


FIGURE 54 - UNS H51320 - HARDENABILITY BAND - SAE 5132H

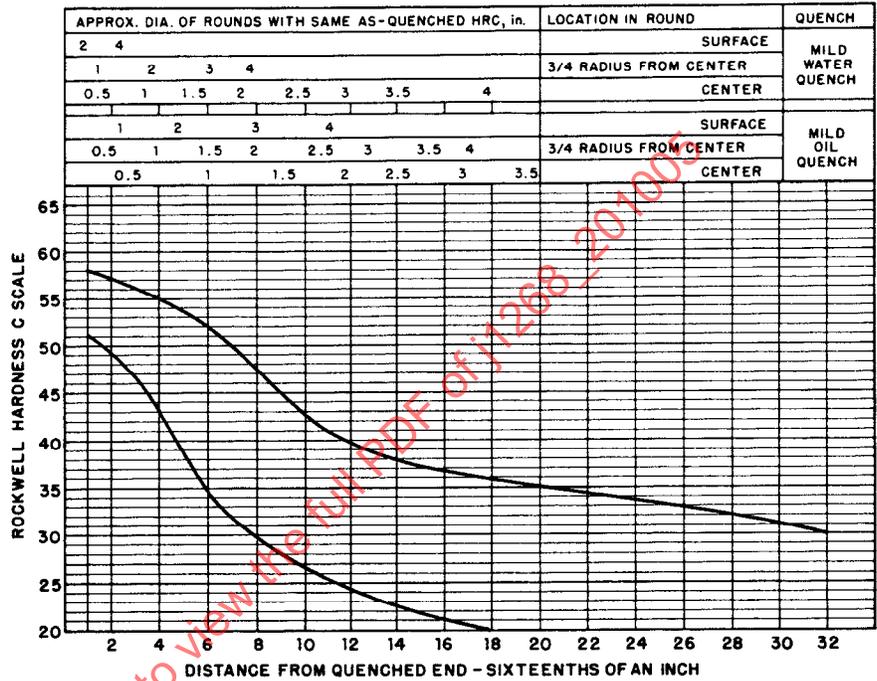
HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	58	51
2	57	49
3	56	47
4	55	43
5	54	38
6	52	35
7	50	32
8	47	30
9	45	28
10	43	27
11	41	25
12	40	24
13	39	23
14	38	22
15	37	21
16	37	21
18	36	20
20	35	--
22	34	--
24	33	--
26	32	--
28	32	--
30	31	--
32	30	--

HEAT TREATING TEMPERATURES	
*NORMALIZE	1650 °F
AUSTENITIZE	1600 °F

*For forged or rolled specimens only

UNS H51350 **HARDENABILITY BAND** SAE 5135H

%C	%Mn	%Si	%Ni	%Cr	%Mo
0.32/0.38	0.50/0.90	0.15/0.35	--	0.70/1.15	--



HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE MILLIMETERS	HRC	
	MAX.	MIN.
1.5	58	51
3	58	49
5	56	46
7	54	41
9	53	36
11	50	32
13	47	30
15	44	27
20	40	23
25	37	21
30	35	--
35	34	--
40	33	--
45	32	--
50	31	--

HEAT TREATING TEMPERATURES	
*NORMALIZE	900 °C
AUSTENITIZE	870 °C

*For forged or rolled specimens only

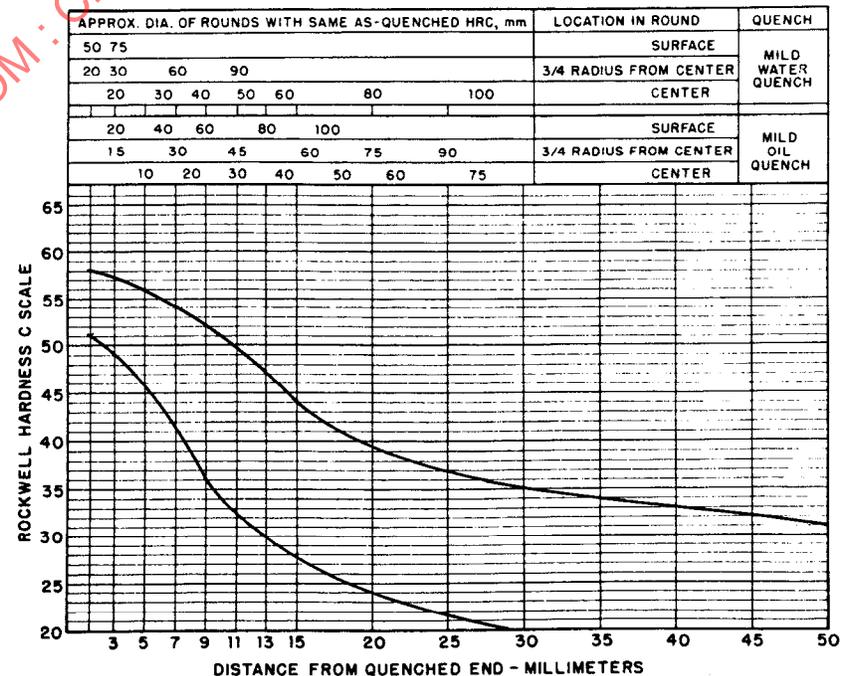


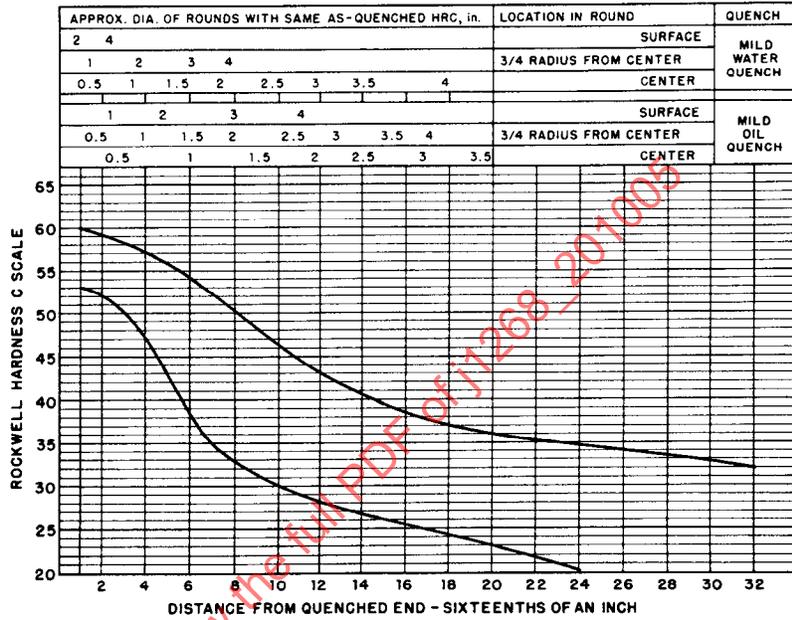
FIGURE 55 - UNS H51350 - HARDENABILITY BAND - SAE 5135H

HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	60	53
2	59	52
3	58	50
4	57	48
5	56	43
6	54	38
7	52	35
8	50	33
9	48	31
10	46	30
11	45	29
12	43	28
13	42	27
14	40	27
15	39	26
16	38	25
18	37	24
20	36	23
22	35	21
24	34	20
26	34	--
28	33	--
30	33	--
32	32	--

HEAT TREATING TEMPERATURES
 *NORMALIZE 1600°F
 AUSTENITIZE 1550°F
 *For forged or rolled specimens only

UNS H51400 **HARDENABILITY BAND** SAE 5140H

%C	%Mn	%Si	%Ni	%Cr	%Mo
0.37/0.44	0.60/1.00	0.15/0.35	--	0.60/1.00	--



HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE MILLIMETERS	HRC	
	MAX.	MIN.
1.5	60	53
3	59	52
5	58	50
7	57	45
9	55	40
11	53	35
13	50	32
15	47	30
20	42	28
25	39	25
30	36	23
35	35	21
40	34	--
45	33	--
50	32	--

HEAT TREATING TEMPERATURES
 *NORMALIZE 870°C
 AUSTENITIZE 845°C
 *For forged or rolled specimens only

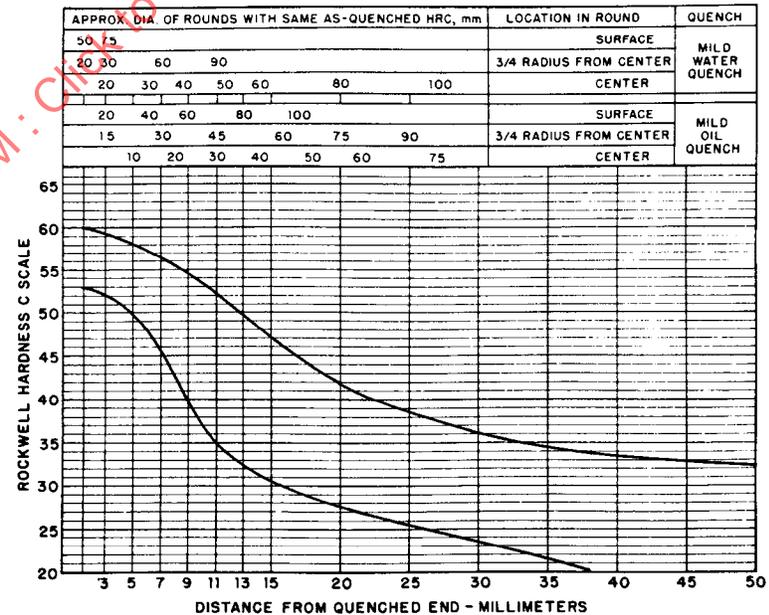


FIGURE 56 - UNS H51400 - HARDENABILITY BAND - SAE 5140H

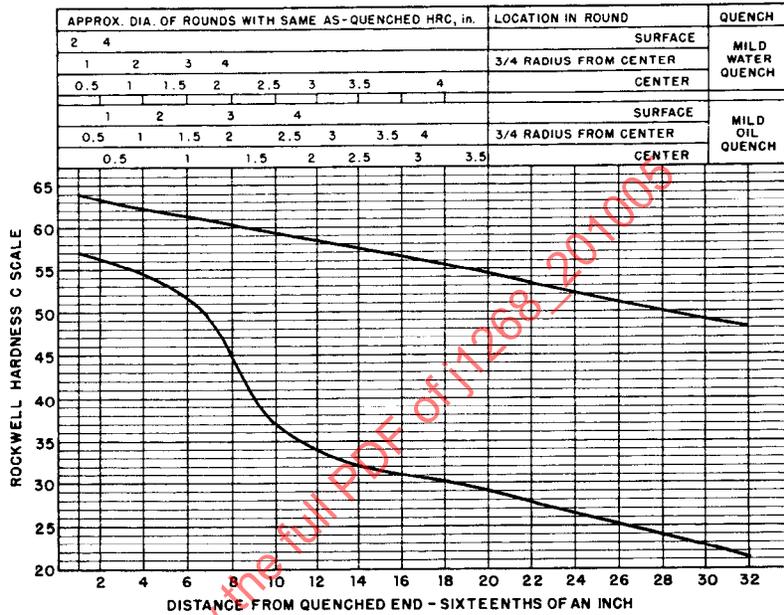
HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	64	57
2	64	56
3	63	55
4	62	54
5	62	53
6	61	52
7	61	49
8	60	45
9	60	40
10	59	37
11	59	35
12	58	34
13	58	33
14	57	32
15	57	32
16	56	31
18	55	30
20	54	29
22	53	27
24	52	26
26	51	25
28	50	24
30	49	22
32	48	21

HEAT TREATING TEMPERATURES	
*NORMALIZE	1600 *F
AUSTENITIZE	1550 *F

*For forged or rolled specimens only

UNS 51470 **HARDENABILITY BAND** SAE 5147H

% C	% Mn	% Si	% Ni	% Cr	% Mo
0.45/0.52	0.60/1.05	0.15/0.35	--	0.80/1.25	--



HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE MILLIMETERS	HRC	
	MAX.	MIN.
1.5	64	57
3	64	56
5	63	55
7	62	54
9	61	52
11	61	49
13	60	44
15	60	39
20	58	33
25	57	31
30	55	29
35	53	27
40	52	25
45	50	23
50	49	21

HEAT TREATING TEMPERATURES	
*NORMALIZE	870 °C
AUSTENITIZE	845 °C

*For forged or rolled specimens only

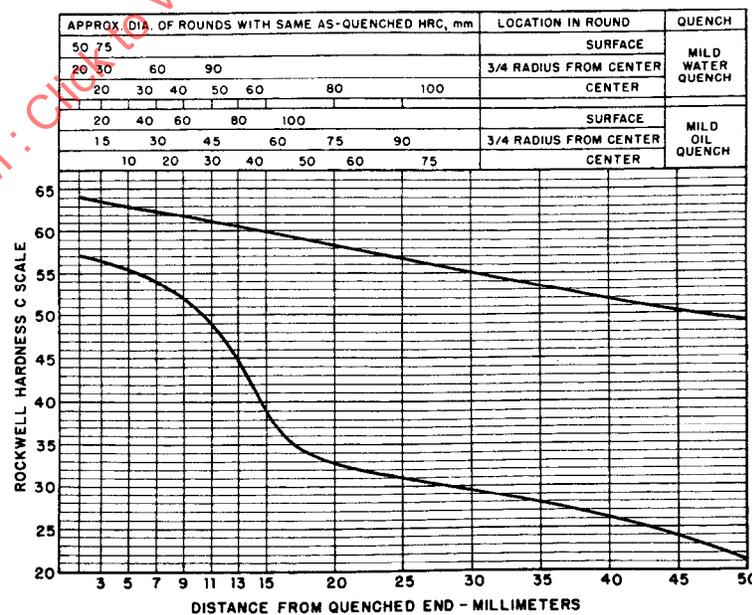


FIGURE 57 - UNS 51470 - HARDENABILITY BAND - SAE 5147H

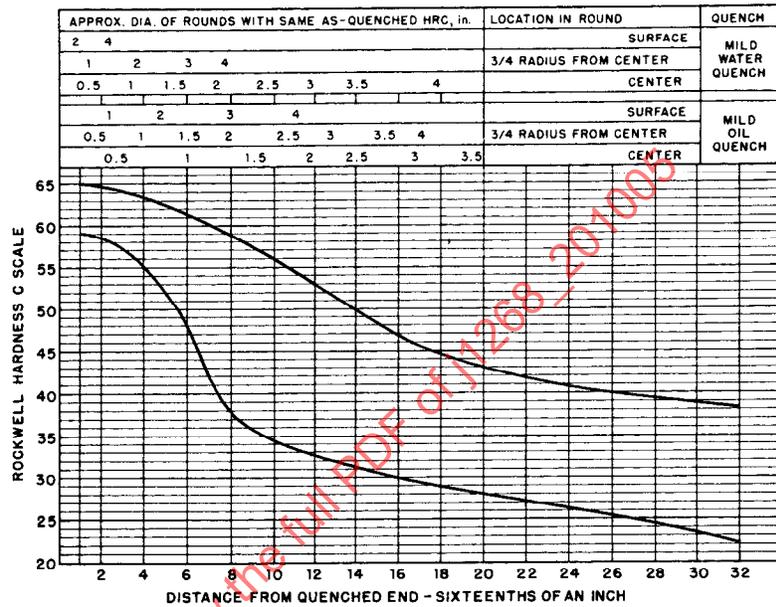
HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	65	59
2	65	58
3	64	57
4	63	56
5	62	53
6	61	49
7	60	42
8	59	38
9	58	36
10	56	34
11	55	33
12	53	32
13	51	31
14	50	31
15	48	30
16	47	30
18	45	29
20	43	28
22	42	27
24	41	26
26	40	25
28	39	24
30	39	23
32	38	22

HEAT TREATING TEMPERATURES	
*NORMALIZE	1600 *F
AUSTENITIZE	1550 *F

*For forged or rolled specimens only

UNS H51500 **HARDENABILITY BAND** SAE 5150H

%C	%Mn	%Si	%Ni	%Cr	%Mo
0.47/0.54	0.60/1.00	0.15/0.35	--	0.60/1.00	--



HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE MILLIMETERS	HRC	
	MAX.	MIN.
1.5	65	59
3	65	58
5	64	57
7	63	56
9	62	53
11	60	49
13	58	42
15	57	38
20	52	36
25	47	34
30	44	33
35	42	32
40	40	29
45	39	28
50	38	27

HEAT TREATING TEMPERATURES	
*NORMALIZE	870 °C
AUSTENITIZE	845 °C

*For forged or rolled specimens only

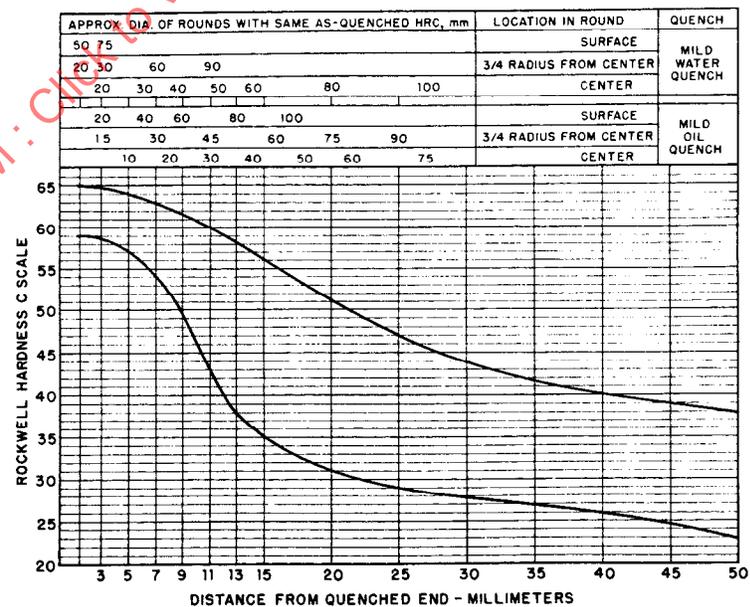


FIGURE 58 - UNS H51500 - HARDENABILITY BAND - SAE 5150H

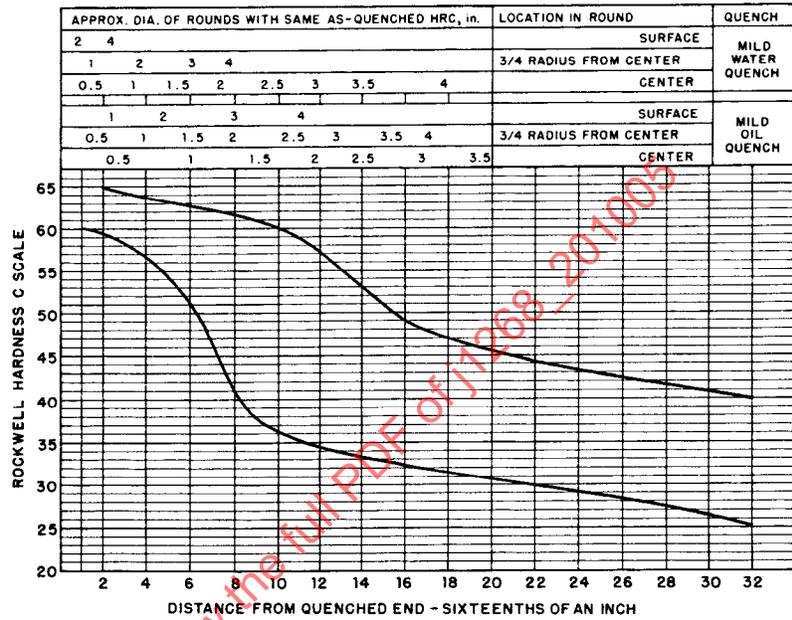
HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	--	60
2	65	59
3	64	58
4	64	57
5	63	55
6	63	52
7	62	47
8	62	41
9	61	37
10	60	36
11	59	35
12	57	34
13	55	34
14	52	33
15	51	33
16	49	32
18	47	31
20	45	31
22	44	30
24	43	29
26	42	28
28	41	27
30	41	26
32	40	25

HEAT TREATING TEMPERATURES	
*NORMALIZE	1600*F
AUSTENITIZE	1550*F

*For forged or rolled specimens only

UNS H51550 **HARDENABILITY BAND** SAE 5155H

%C	%Mn	%Si	%Ni	%Cr	%Mo
0.50/0.60	0.60/1.00	0.15/0.35	--	0.60/1.00	--



HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE MILLIMETERS	HRC	
	MAX.	MIN.
1.5	--	60
3	65	59
5	64	58
7	64	56
9	63	53
11	62	48
13	61	40
15	60	37
20	56	34
25	50	32
30	46	30
35	44	29
40	43	28
45	42	27
50	41	25

HEAT TREATING TEMPERATURES	
*NORMALIZE	870 °C
AUSTENITIZE	845 °C

*For forged or rolled specimens only

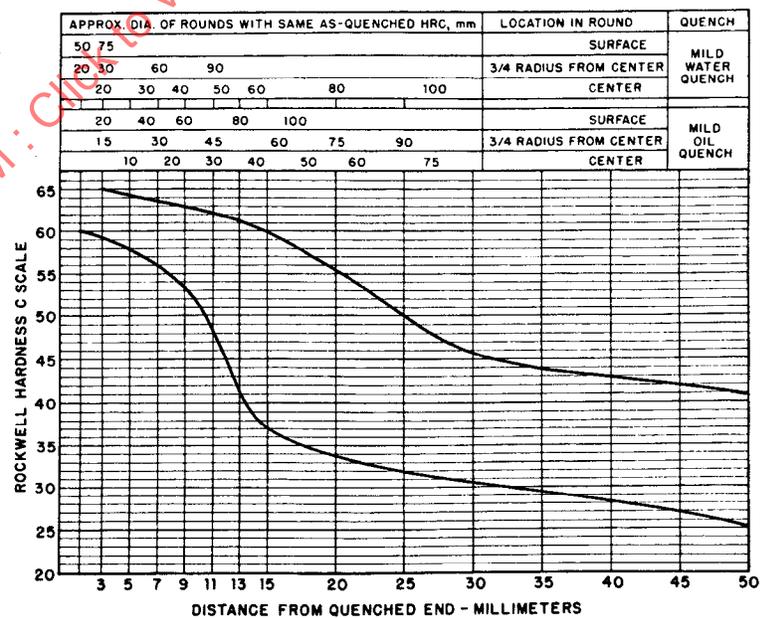


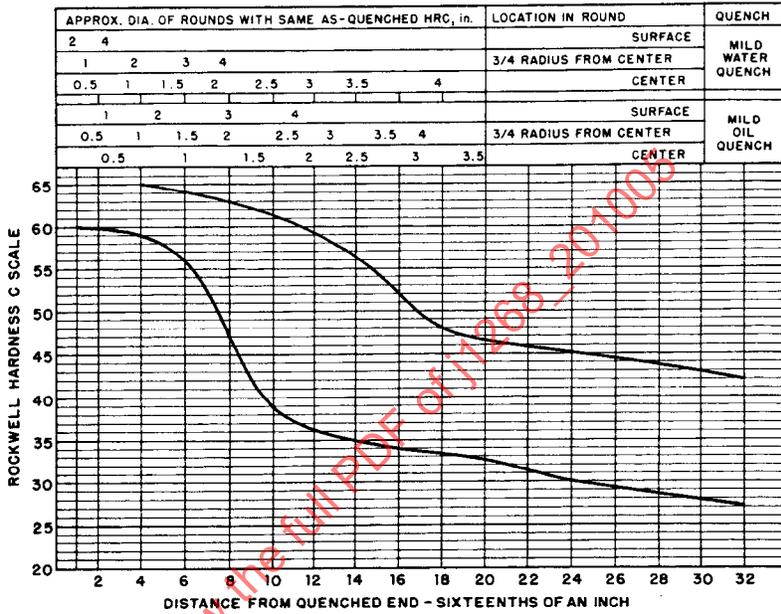
FIGURE 59 - UNS H51550 - HARDENABILITY BAND - SAE 5155H

HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	--	60
2	--	60
3	--	60
4	65	59
5	65	58
6	64	56
7	64	52
8	63	47
9	62	42
10	61	39
11	60	37
12	59	36
13	58	35
14	56	35
15	54	34
16	52	34
18	48	33
20	47	32
22	46	31
24	45	30
26	44	29
28	43	28
30	43	28
32	42	27

HEAT TREATING TEMPERATURES	
*NORMALIZE	1600 °F
AUSTENITIZE	1550 °F
*For forged or rolled specimens only	

UNS H51600 **HARDENABILITY BAND** SAE 5160H

%C	%Mn	%Si	%Ni	%Cr	%Mo
0.55/0.65	0.65/1.00	0.15/0.35	--	0.60/1.00	--



HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE MILLIMETERS	HRC	
	MAX.	MIN.
1.5	--	60
3	--	60
5	--	60
7	--	59
9	65	57
11	64	52
13	64	46
15	62	40
20	58	36
25	52	34
30	48	32
35	46	30
40	44	28
45	42	27
50	41	27

HEAT TREATING TEMPERATURES	
*NORMALIZE	870 °C
AUSTENITIZE	845 °C
*For forged or rolled specimens only	

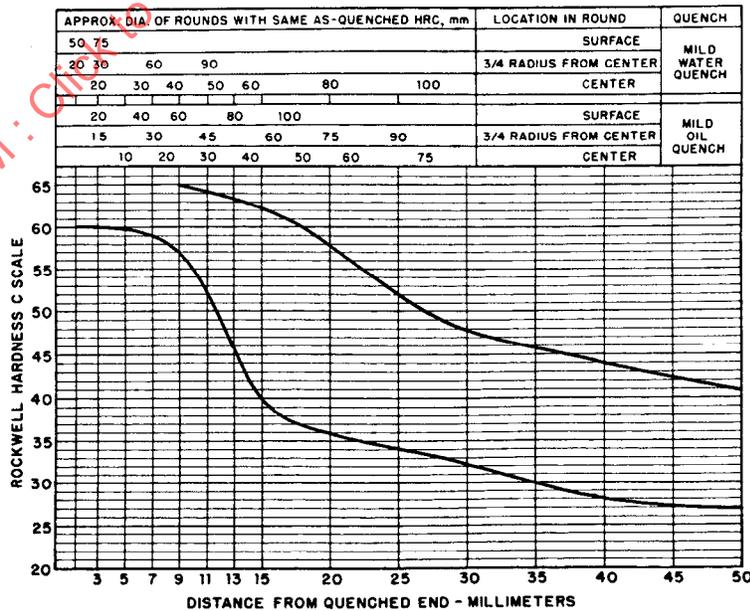


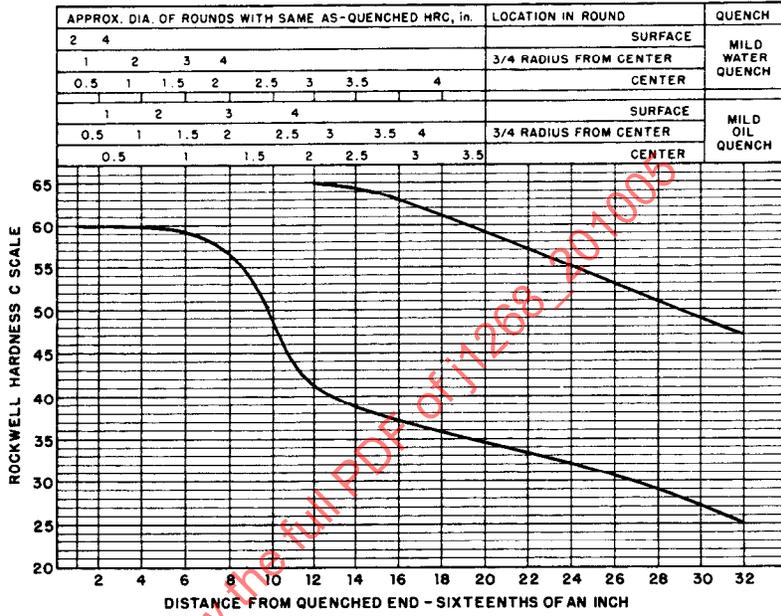
FIGURE 60 - UNS H51600 - HARDENABILITY BAND - SAE 5160H

HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	--	60
2	--	60
3	--	60
4	--	60
5	--	60
6	--	59
7	--	58
8	--	57
9	--	54
10	--	50
11	--	44
12	65	41
13	65	40
14	64	39
15	64	38
16	63	37
18	61	36
20	59	34
22	57	33
24	55	31
26	53	30
28	51	28
30	49	27
32	47	25

HEAT TREATING TEMPERATURES
 *NORMALIZE 1600 °F
 AUSTENITIZE 1550 °F
 *For forged or rolled specimens only

UNS H51601 **HARDENABILITY BAND** SAE 51B60H

%C	%Mn	%Si	%Ni	%Cr	%Mo	%B
0.55/0.65	0.65/1.10	0.15/0.35	--	0.60/1.00	--	0.0005/0.003



HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE MILLIMETERS	HRC	
	MAX.	MIN.
1.5	--	60
3	--	60
5	--	60
7	--	60
9	--	59
11	--	58
13	--	56
15	--	52
20	65	40
25	63	37
30	61	35
35	57	32
40	54	30
45	51	28
50	47	25

HEAT TREATING TEMPERATURES
 *NORMALIZE 870 °C
 AUSTENITIZE 845 °C
 *For forged or rolled specimens only

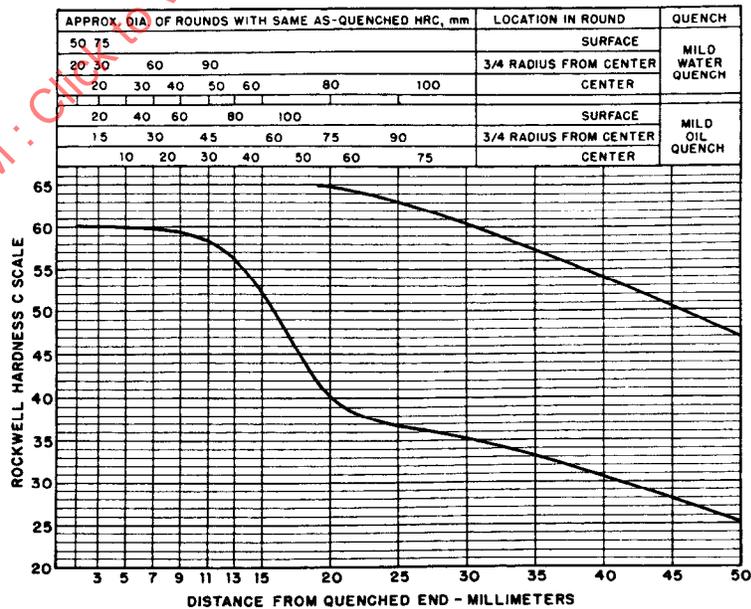


FIGURE 61 - UNS H51601 - HARDENABILITY BAND - SAE 51B60H

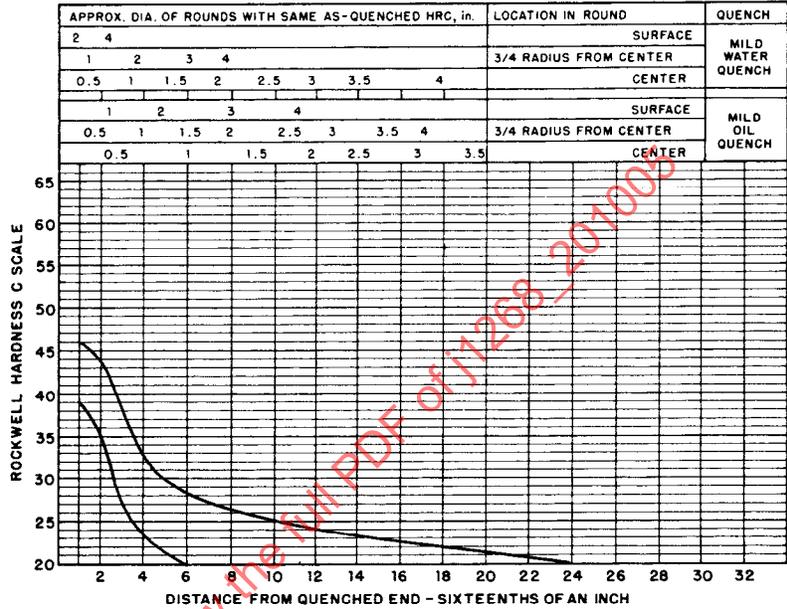
HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	46	39
2	44	36
3	38	28
4	33	24
5	30	22
6	28	20
7	27	--
8	26	--
9	26	--
10	25	--
11	25	--
12	24	--
13	24	--
14	23	--
15	23	--
16	22	--
18	22	--
20	21	--
22	21	--
24	20	--
26	--	--
28	--	--
30	--	--
32	--	--

HEAT TREATING TEMPERATURES	
*NORMALIZE	1700 °F
AUSTENITIZE	1700 °F

*For forged or rolled specimens only

UNS H61180 **HARDENABILITY BAND** SAE 6118H

%C	%Mn	%Si	%Ni	%Cr	%Mo	%V
0.15/0.21	0.40/0.80	0.15/0.35	--	0.40/0.80	--	0.10/0.15



HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE MILLIMETERS	HRC	
	MAX.	MIN.
1.5	46	39
3	44	36
5	37	28
7	32	24
9	30	22
11	28	--
13	27	--
15	25	--
20	24	--
25	23	--
30	22	--
35	21	--
40	20	--
45	--	--
50	--	--

HEAT TREATING TEMPERATURES	
*NORMALIZE	925 °C
AUSTENITIZE	925 °C

*For forged or rolled specimens only

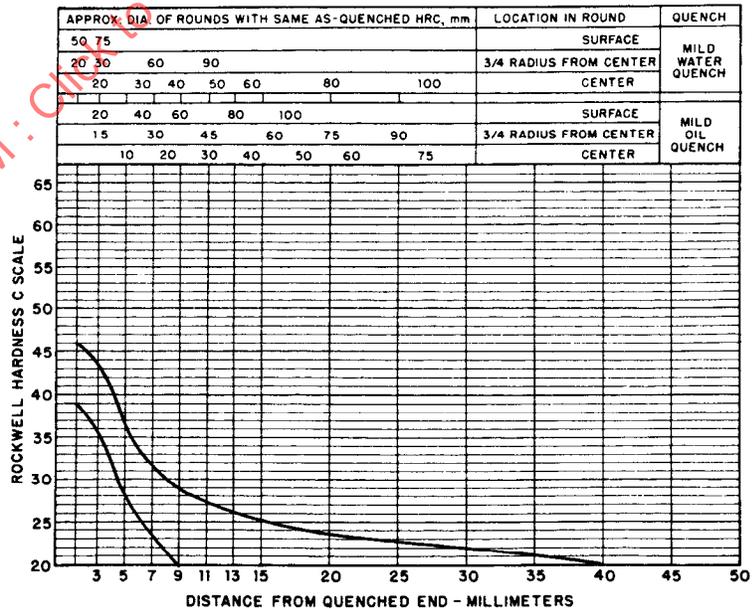


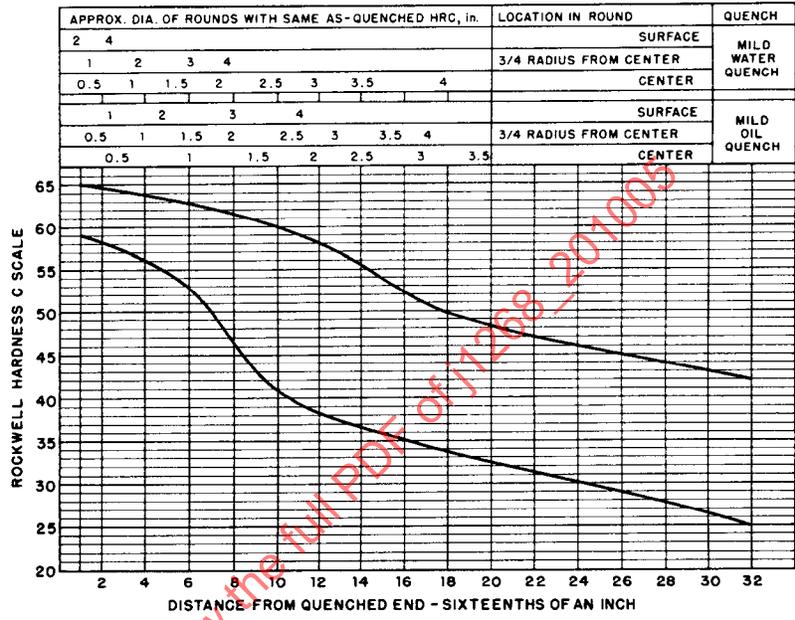
FIGURE 62 - UNS H61180 - HARDENABILITY BAND - SAE 6118H

HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	65	59
2	65	58
3	64	57
4	64	56
5	63	55
6	63	53
7	62	50
8	61	47
9	61	43
10	60	41
11	59	39
12	58	38
13	57	37
14	55	36
15	54	35
16	52	35
18	50	34
20	48	32
22	47	31
24	46	30
26	45	29
28	44	27
30	43	26
32	42	25

HEAT TREATING TEMPERATURES
 *NORMALIZE 1650 °F
 AUSTENITIZE 1600 °F
 *For forged or rolled specimens only

UNS H61500 **HARDENABILITY BAND** SAE 6150H

%C	%Mn	%Si	%Ni	%Cr	%Mo	%V
0.47/0.54	0.60/1.00	0.15/0.35	--	0.75/1.20	--	0.15 min.



HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE MILLIMETERS	HRC	
	MAX.	MIN.
1.5	65	59
3	65	58
5	65	57
7	64	55
9	63	53
11	63	50
13	61	46
15	60	42
20	58	37
25	53	35
30	50	33
35	47	31
40	45	29
45	44	27
50	43	25

HEAT TREATING TEMPERATURES
 *NORMALIZE 900 °C
 AUSTENITIZE 870 °C
 *For forged or rolled specimens only

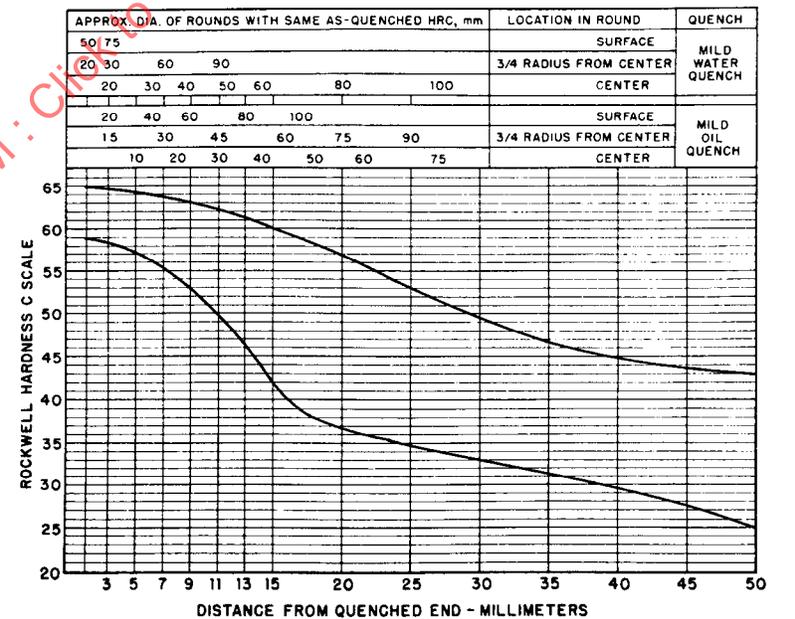


FIGURE 63 - UNS H61500 - HARDENABILITY BAND - SAE 6150H

HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	63	56
2	63	56
3	63	56
4	63	56
5	63	55
6	63	54
7	62	53
8	62	51
9	61	48
10	60	44
11	60	41
12	59	39
13	58	38
14	57	37
15	57	36
16	56	35
18	55	34
20	53	32
22	52	31
24	50	30
26	49	29
28	47	28
30	45	28
32	43	27

HEAT TREATING TEMPERATURES	
*NORMALIZE	1600 °F
AUSTENITIZE	1550 °F

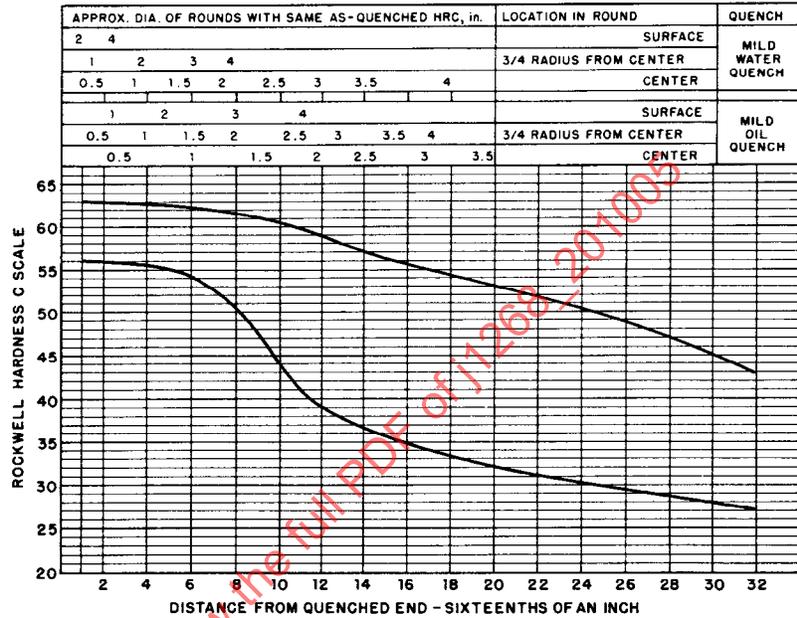
*For forged or rolled specimens only

UNS H81451

HARDENABILITY BAND

SAE 81B45H

%C	%Mn	%Si	%Ni	%Cr	%Mo	%B
0.42/0.49	0.70/1.05	0.15/0.35	0.15/0.45	0.30/0.60	0.08/0.15	0.0005/0.003



HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE MILLIMETERS	HRC	
	MAX.	MIN.
1.5	63	56
3	63	56
5	63	56
7	63	56
9	63	55
11	63	53
13	62	49
15	60	47
20	58	38
25	56	35
30	54	33
35	52	31
40	50	29
45	47	28
50	44	27

HEAT TREATING TEMPERATURES	
*NORMALIZE	870 °C
AUSTENITIZE	845 °C

*For forged or rolled specimens only

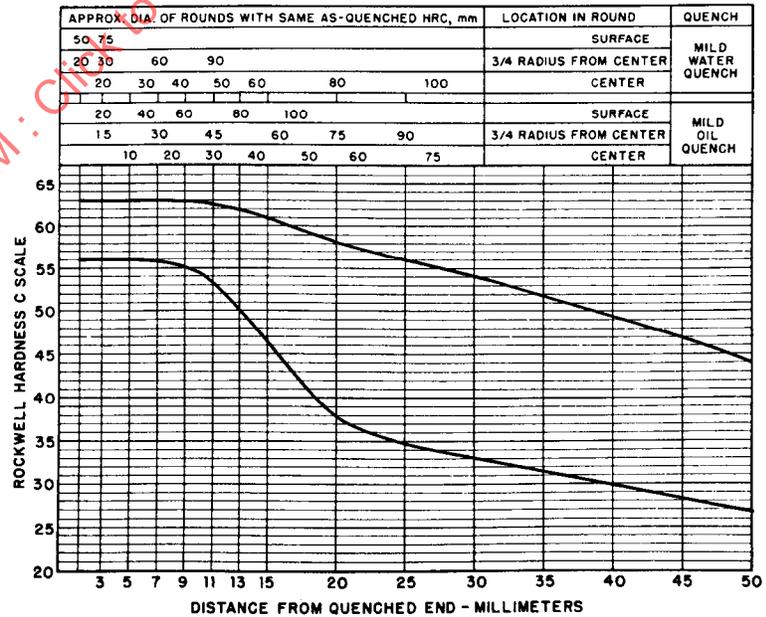


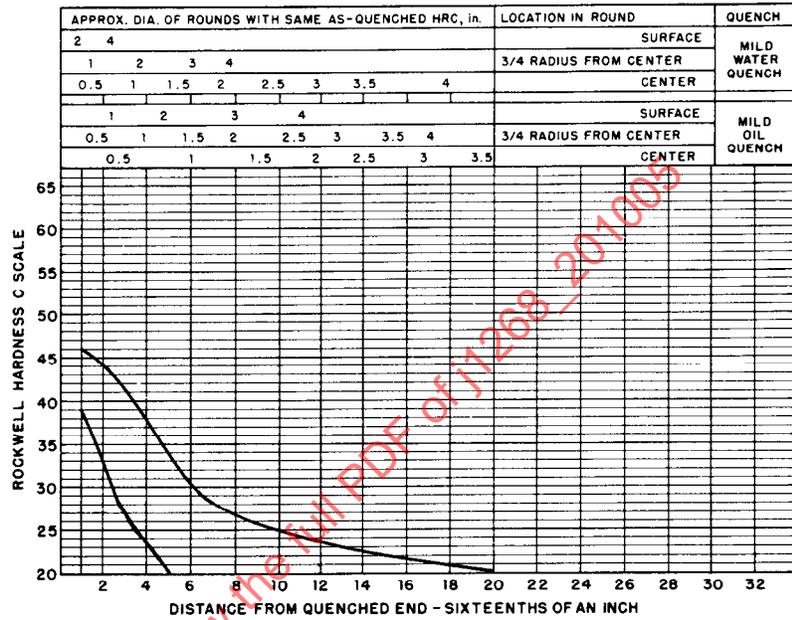
FIGURE 64 - UNS H81451 - HARDENABILITY BAND - SAE 81B45H

HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	46	39
2	44	33
3	41	27
4	38	24
5	34	20
6	31	--
7	28	--
8	27	--
9	26	--
10	25	--
11	24	--
12	23	--
13	23	--
14	22	--
15	22	--
16	21	--
18	21	--
20	20	--
22	--	--
24	--	--
26		
28		
30		
32		

HEAT TREATING TEMPERATURES
 *NORMALIZE 1700 °F
 AUSTENITIZE 1700 °F
 *For forged or rolled specimens only

UNS H86170 **HARDENABILITY BAND** SAE 8617H

%C	%Mn	%Si	%Ni	%Cr	%Mo
0.14/0.20	0.60/0.95	0.15/0.35	0.35/0.75	0.35/0.65	0.15/0.25



HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE MILLIMETERS	HRC	
	MAX.	MIN.
1.5	46	39
3	44	33
5	42	27
7	37	23
9	32	20
11	29	--
13	27	--
15	25	--
20	23	--
25	22	--
30	20	--
35	--	--
40		
45		
50		

HEAT TREATING TEMPERATURES
 *NORMALIZE 925 °C
 AUSTENITIZE 925 °C
 *For forged or rolled specimens only

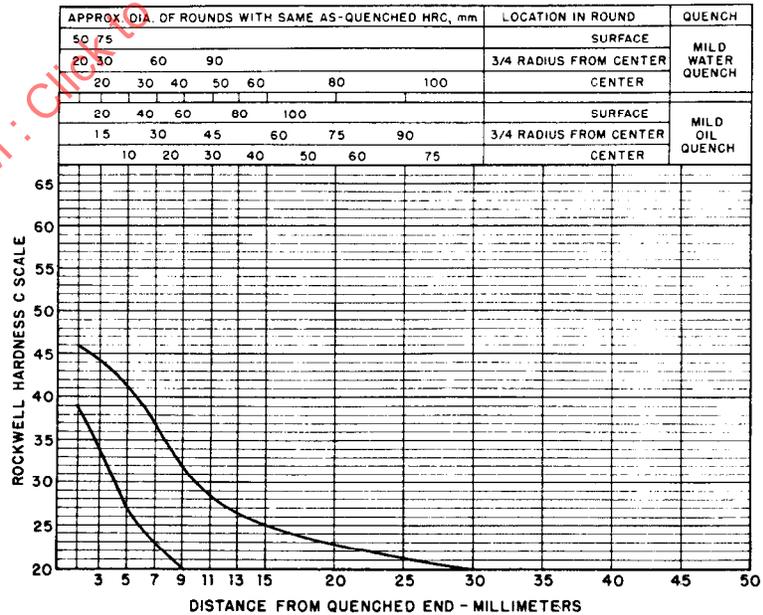


FIGURE 65 - UNS H86170 - HARDENABILITY BAND - SAE 8617H

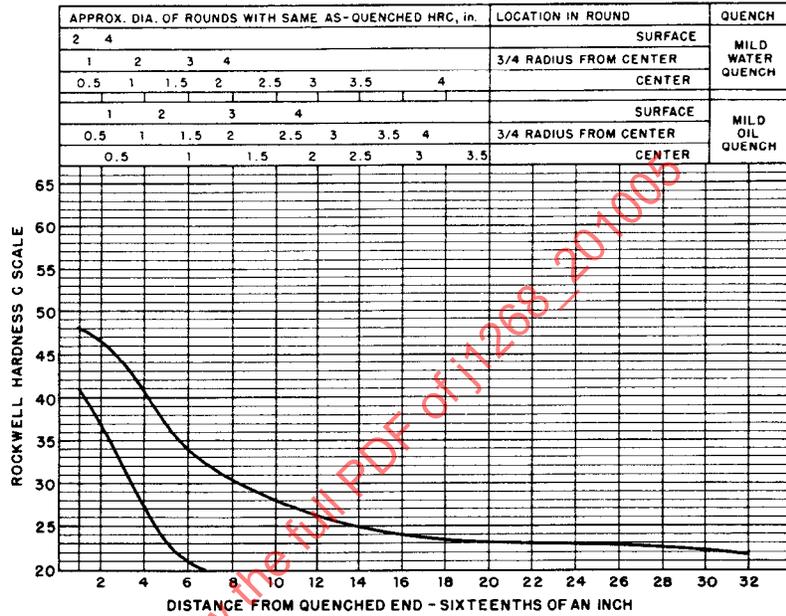
HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	48	41
2	47	37
3	44	32
4	41	27
5	37	23
6	34	21
7	32	--
8	30	--
9	29	--
10	28	--
11	27	--
12	26	--
13	25	--
14	25	--
15	24	--
16	24	--
18	23	--
20	23	--
22	23	--
24	23	--
26	23	--
28	22	--
30	22	--
32	22	--

HEAT TREATING TEMPERATURES	
*NORMALIZE	1700 °F
AUSTENITIZE	1700 °F

*For forged or rolled specimens only

UNS H86200 **HARDENABILITY BAND** SAE 8620H

%C	%Mn	%Si	%Ni	%Cr	%Mo
0.17/0.23	0.60/0.95	0.15/0.35	0.35/0.75	0.35/0.65	0.15/0.25



HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE MILLIMETERS	HRC	
	MAX.	MIN.
1.5	48	41
3	47	37
5	44	31
7	40	25
9	35	22
11	33	20
13	30	--
15	29	--
20	26	--
25	24	--
30	23	--
35	23	--
40	23	--
45	22	--
50	22	--

HEAT TREATING TEMPERATURES	
*NORMALIZE	925 °C
AUSTENITIZE	925 °C

*For forged or rolled specimens only

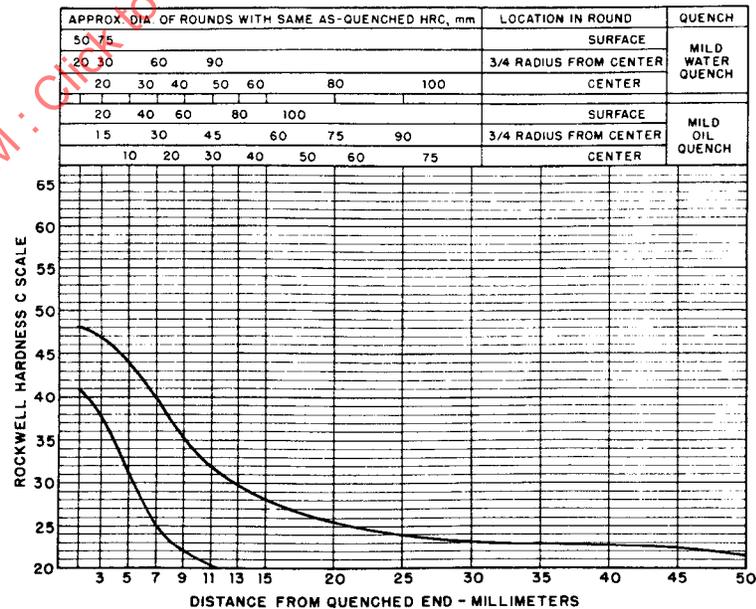


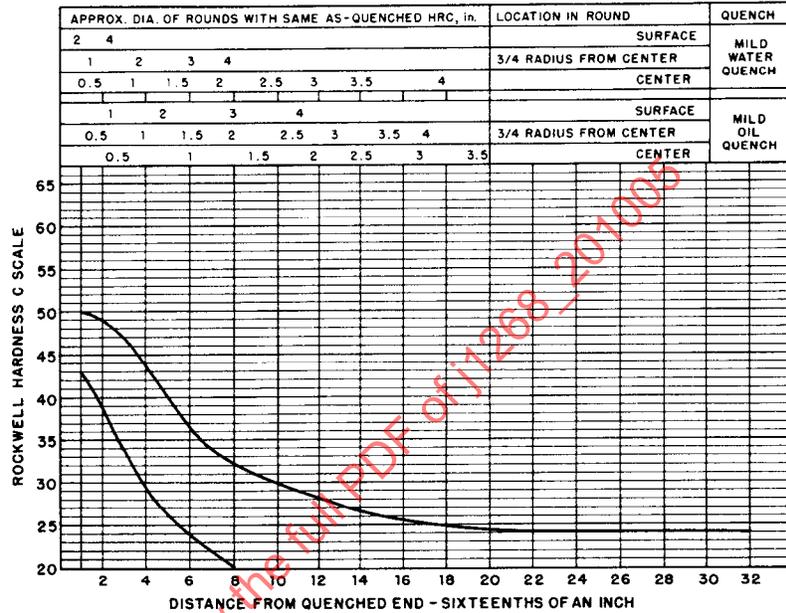
FIGURE 66 - UNS H86200 - HARDENABILITY BAND - SAE 8620H

HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	50	43
2	49	39
3	47	34
4	44	30
5	40	26
6	37	24
7	34	22
8	32	20
9	31	--
10	30	--
11	29	--
12	28	--
13	27	--
14	26	--
15	26	--
16	25	--
18	25	--
20	24	--
22	24	--
24	24	--
26	24	--
28	24	--
30	24	--
32	24	--

HEAT TREATING TEMPERATURES
 *NORMALIZE 1700°F
 AUSTENITIZE 1700°F
 *For forged or rolled specimens only

UNS H86220 **HARDENABILITY BAND** SAE 8622H

%C	%Mn	%Si	%Ni	%Cr	%Mo
0.19/0.25	0.60/0.95	0.15/0.35	0.35/0.75	0.35/0.65	0.15/0.25



HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE MILLIMETERS	HRC	
	MAX.	MIN.
1.5	50	43
3	50	39
5	47	34
7	43	28
9	39	25
11	35	22
13	32	20
15	31	--
20	28	--
25	26	--
30	25	--
35	24	--
40	24	--
45	24	--
50	24	--

HEAT TREATING TEMPERATURES
 *NORMALIZE 925 °C
 AUSTENITIZE 925 °C
 *For forged or rolled specimens only

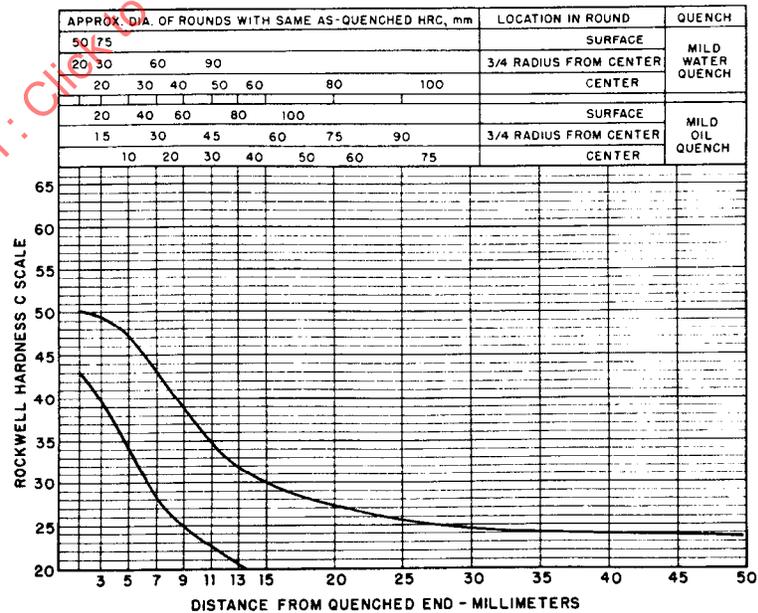


FIGURE 67 - UNS H86220 - HARDENABILITY BAND - SAE 8622H

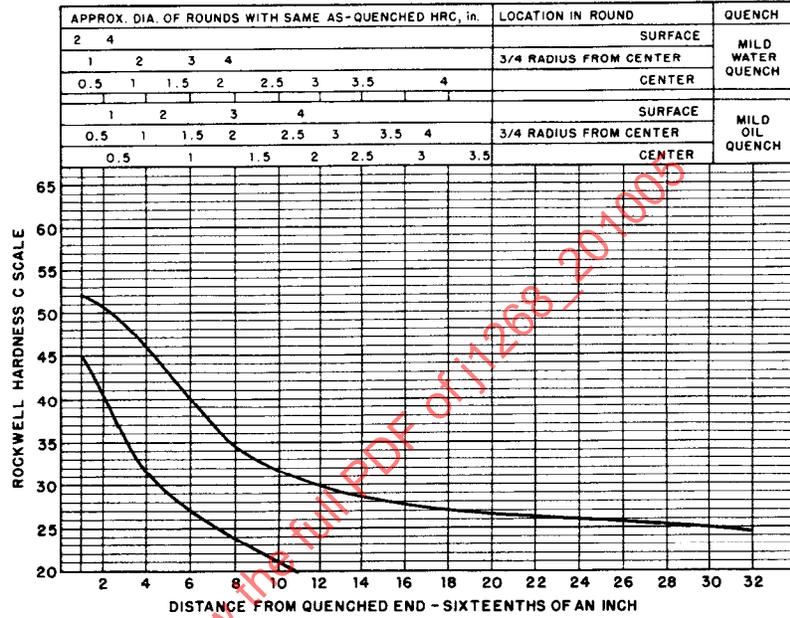
HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	52	45
2	51	41
3	48	36
4	46	32
5	43	29
6	40	27
7	37	25
8	35	23
9	33	22
10	32	21
11	31	20
12	30	--
13	29	--
14	28	--
15	28	--
16	27	--
18	27	--
20	26	--
22	26	--
24	26	--
26	26	--
28	25	--
30	25	--
32	25	--

HEAT TREATING TEMPERATURES	
*NORMALIZE	1650 °F
AUSTENITIZE	1600 °F

* For forged or rolled specimens only

UNS H86250 **HARDENABILITY BAND** SAE 8625H

%C	%Mn	%Si	%Ni	%Cr	%Mo
0.22/0.28	0.60/0.95	0.15/0.35	0.35/0.75	0.35/0.65	0.15/0.25



HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE MILLIMETERS	HRC	
	MAX.	MIN.
1.5	52	45
3	51	40
5	48	35
7	45	31
9	41	28
11	38	25
13	35	23
15	33	21
20	29	--
25	28	--
30	27	--
35	26	--
40	26	--
45	26	--
50	25	--

HEAT TREATING TEMPERATURES	
*NORMALIZE	900 °C
AUSTENITIZE	870 °C

* For forged or rolled specimens only

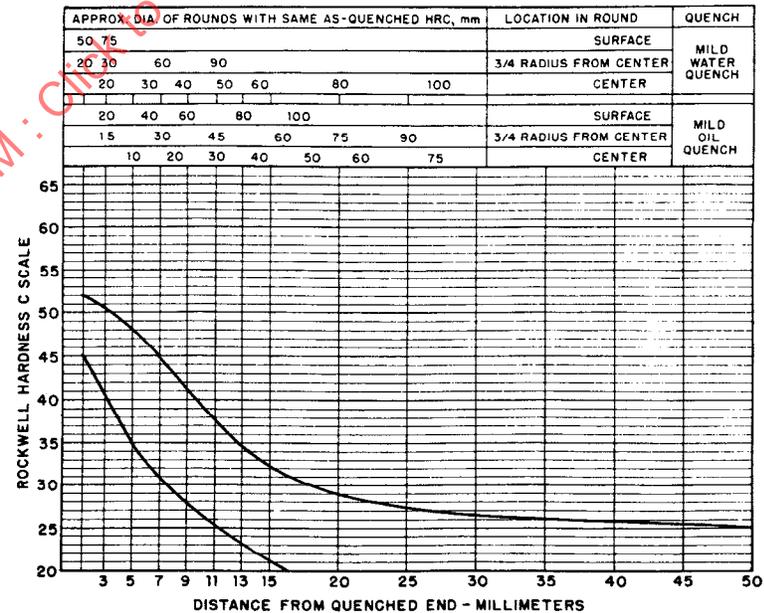


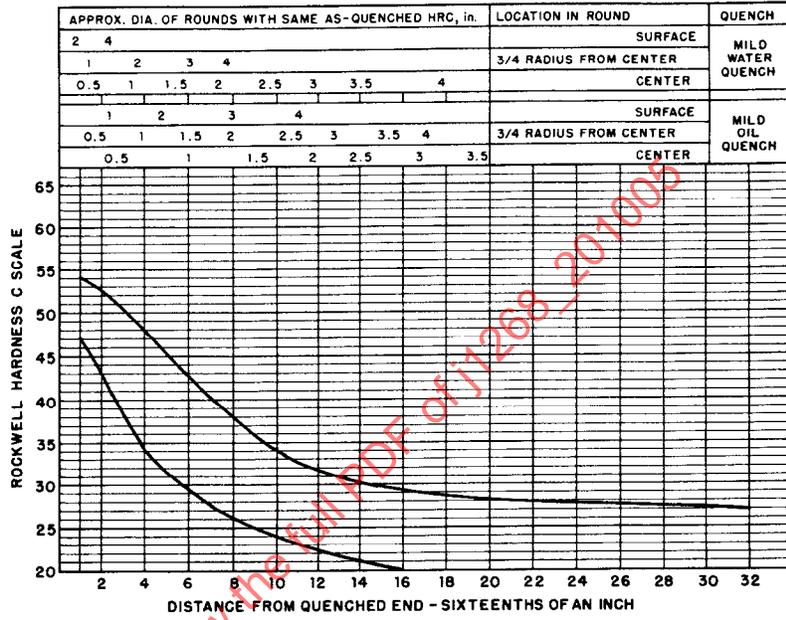
FIGURE 68 - UNS H86250 - HARDENABILITY BAND - SAE 8625H

HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	54	47
2	52	43
3	50	38
4	48	35
5	45	32
6	43	29
7	40	27
8	38	26
9	36	24
10	34	24
11	33	23
12	32	22
13	31	21
14	30	21
15	30	20
16	29	20
18	28	--
20	28	--
22	28	--
24	27	--
26	27	--
28	27	--
30	27	--
32	27	--

HEAT TREATING TEMPERATURES
 *NORMALIZE 1650 °F
 AUSTENITIZE 1600 °F
 *For forged or rolled specimens only

UNS H86270 **HARDENABILITY BAND** SAE 8627H

%C	%Mn	%Si	%Ni	%Cr	%Mo
0.24/0.30	0.60/0.95	0.15/0.35	0.35/0.75	0.35/0.65	0.15/0.25



HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE MILLIMETERS	HRC	
	MAX.	MIN.
1.5	54	47
3	53	43
5	50	38
7	47	34
9	44	30
11	41	27
13	38	25
15	35	24
20	32	21
25	30	20
30	28	--
35	27	--
40	27	--
45	27	--
50	27	--

HEAT TREATING TEMPERATURES
 *NORMALIZE 900 °C
 AUSTENITIZE 870 °C
 *For forged or rolled specimens only

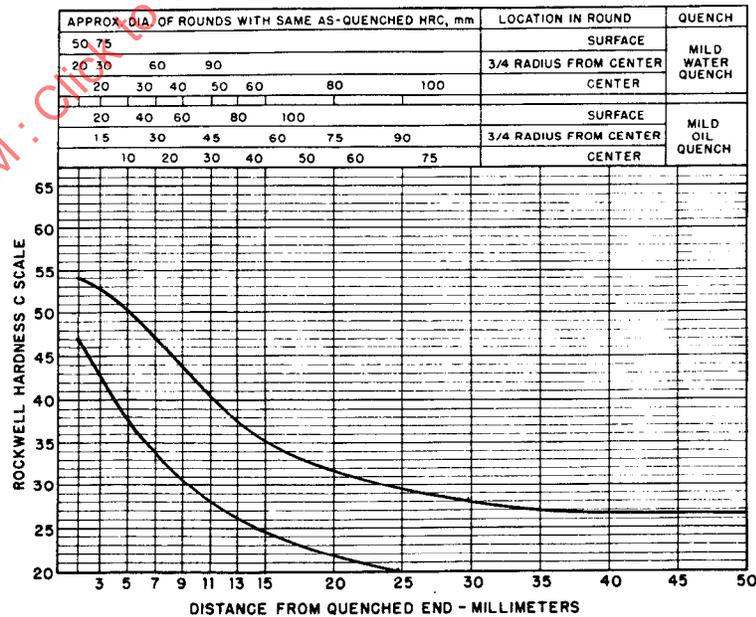


FIGURE 69 - UNS H86270 - HARDENABILITY BAND - SAE 8627H