

SAE J1868 FEB88

**Restricted
Hardenability Bands
for Selected Alloy
Steels**

**SAE Standard
Issued February 1988**

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RESTRICTED HARDENABILITY BANDS FOR SELECTED ALLOY STEELS

Restricted hardenability steels have been in use for some time but the specific restrictions for a particular grade depend upon customer needs and vary from mill to mill. Such steels are desirable to provide more controlled heat treatment response and dimensional control for critical parts. Because of increasing interest in steels with restricted hardenability, the SAE Iron and Steel Technical Committee directed Division 8 to prepare a set of standard steels with restricted hardenability.

In general, steels with restricted hardenability (RH Steels) will exhibit a hardness range not greater than 5 HRC at the initial position on the end-quench hardenability bar and not greater than 65% of the hardness range for standard H-band steels (SAE J1268) in the "inflection" region. Generally the restricted hardenability band follows the middle of the corresponding standard H-band. An example of the RH band compared with the standard H band is given for SAE 4140 in Fig. 1.

1. GRADES OF STEEL:

RH steels and their corresponding minimum and maximum composition limits are shown in Table 1 for a selected group of 12 alloy steels used in substantial tonnages and covering a nominal carbon content range of 0.20% - 0.60%. As the need arises for restricted hardenability in other grades, they will be added to the standard.

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2. CHEMICAL COMPOSITION LIMITS:

To meet restricted hardenability, yet provide flexibility for producers, composition limits are the same as those given in SAE J404, Chemical Compositions of SAE Alloy Steels. (These limits are somewhat narrower than allowed for standard H-steels). It should be understood that alloys which satisfy the restricted hardenability band will fall within SAE J404 composition limits, but not all steels melted to the composition limits would meet the required RH band. The limits are given in Table 1, and as indicated in the footnotes, are subject to permissible variations for product analysis and may contain certain levels of elements not specified.

3. IDENTIFICATION:

As a means of identifying steels specified to restricted hardenability band limits, the suffix letters RH have been added to the conventional series number. (In the Unified Numbering System, "H" will appear as a prefix to indicate a steel made to hardenability limits, and "9" will appear as the last of the five numbers, to indicate that the hardenability limits are restricted.) It is important that steel consumers use these special identifying designations in specification requirements, as there is no other means of determining when restricted hardenability band limits apply. When the special identifications are used, the steel shall conform to all conditions pertaining to chemical composition limits, restrictions, testing technique, and so forth, as outlined herein.

4. GRAIN SIZE:

The limits set forth for RH bands are intended to apply to steels exhibiting austenitic grain size ASTM No. 5 or finer (see SAE J418).

5. USE OF RESTRICTED HARDENABILITY LIMITS:

For specification purposes, one must use the tabulated values of Rockwell hardness (HRC) as a function of distance from the quenched end of the hardenability bar, either in U.S. customary units (sixteenths of an inch) or in metric (SI) units (millimeters). Values below 20 HRC are not specified because such values are not as accurate. Band limits are also shown graphically and are so depicted for convenience in estimating the hardness values at various intermediate locations on the end quench test bar and for quick comparisons of the various RH grades. The values of Approximate Diameter of Rounds with Same As-Quenched Hardness shown above each RH-band, were selected from the ranges appearing in Fig. 7 of SAE J406. The RH bands are presented graphically, with distances from the quenched end in both U.S. customary units and also in metric (SI) units.

The hardenability testing technique used as a basis for acceptance shall be in accordance with SAE J406.

5. (Continued):

For specification purposes, RH band steels shall be within the minimum and maximum HRC range specified at the J1 (J1.5 mm) position and shall meet one additional minimum and one additional maximum HRC value. In this specification, the two additional hardness values shall represent the approximate hardness for 50% martensite for the minimum and maximum specified carbon content, respectively. In general, these points define the critical locations of the Jominy hardenability band for purposes of characterizing heat treatment response. The four specification points are circled in the tables of hardness versus Jominy distance and on the RH bands. For all other Jominy positions, a tolerance of two points HRC is permitted for a maximum consecutive 3/16 in or 5 mm Jominy distance on the restricted hardenability band.

For example, referring to Fig. 1, a hardenability test bar of a steel meeting the requirements for 4140RH must exhibit a hardness at J1 not less than 54 HRC nor more than 59 HRC. At J12, the test bar must exhibit hardness not less than 43 HRC, but the maximum hardness can be as high as 51 HRC (or even 53 HRC if this region of the test bar is chosen as the exception). At J20, the bar must exhibit hardness not greater than 47 HRC, but the minimum hardness can be as low as 37 HRC (or as low as 35 HRC if this region of the test bar is chosen as the exception).

(A similar example, for 4140RH with distances from the quenched end in millimeters, would limit hardness at J1.5 mm to not less than 54 HRC nor more than 59 HRC. At J20 mm, the test bar must exhibit hardness not less than 42 HRC. At J30 mm, the test bar must exhibit hardness not greater than 48 HRC.)

HARDNESS LIMITS FOR SPECIFICATION PURPOSES					
"J" DISTANCE SIXTEENTHS OF AN INCH	MAX HRC		MIN HRC		
	4140 H	4140 RH	4140 RH	4140 H	
1	60	59	59	53	53
2	60	59	59	54	53
3	60	59	54	52	52
4	59	58	53	51	51
5	59	58	52	51	51
6	58	57	51	50	50
7	58	56	50	48	48
8	57	55	49	47	47
9	57	54	48	44	44
10	56	53	46	42	42
11	56	52	44	40	40
12	55	51	43	39	39
13	55	51	42	38	38
14	54	50	41	37	37
15	54	50	40	36	36
16	53	49	39	35	35
18	52	48	38	34	34
20	51	47	37	33	33
22	49	45	36	33	33
24	48	44	35	32	32
26	47	43	34	32	32
28	46	42	34	31	31
30	46	41	33	31	31
32	44	41	33	30	30

HEAT TREATING TEMPERATURES
RECOMMENDED BY SAE

*NORMALIZE 1600 °F
AUSTENITIZE 1550 °F

*For forged or rolled specimens only

SAE 4140 H/RH

HARDENABILITY BAND

UNS H41400/9

	% C	% Mn	% Si	% Ni	% Cr	% Mo	
H RH	0.37/0.44	0.65/1.10	0.15/0.35	--	0.75/1.20	0.15/0.25	
	0.38/0.43	0.75/1.00	0.15/0.35	--	0.80/1.10	0.15/0.25	

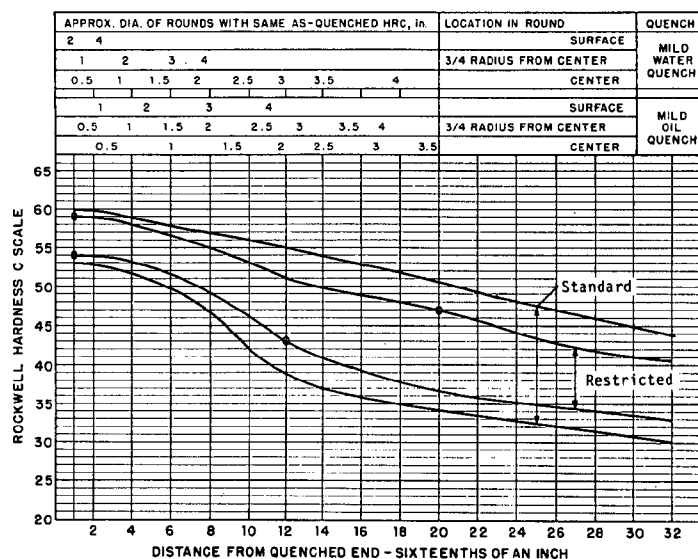


FIGURE 1 - Comparison of H-Band and RH-Band for SAE 4140

TABLE 1 - Compositions of Restricted Hardenability Steels

UNS No.*	SAE Steel No.	Ladle Chemical Composition, Weight % ^{a,b,c}					
		C	Mn	Si	Ni	Cr	Mo
H40279	SAE 4027RH	0.25/0.30	0.70/0.90	0.15/0.35	--	--	0.20/0.30
H41189	SAE 4118RH	0.18/0.23	0.70/0.90	0.15/0.35	--	0.40/0.60	0.08/0.15
H41209	SAE 4120RH	0.18/0.23	0.90/1.20	0.15/0.35	--	0.40/0.60	0.13/0.20
H41409	SAE 4140RH	0.38/0.43	0.75/1.00	0.15/0.35	--	0.80/1.10	0.15/0.25
H41459	SAE 4145RH	0.43/0.48	0.75/1.00	0.15/0.35	--	0.80/1.10	0.15/0.25
H41619	SAE 4161RH	0.56/0.64	0.75/1.00	0.15/0.35	--	0.70/0.90	0.25/0.35
H51309	SAE 5130RH	0.28/0.33	0.70/0.90	0.15/0.35	--	0.80/1.10	--
H51409	SAE 5140RH	0.38/0.43	0.70/0.90	0.15/0.35	--	0.70/0.90	--
H51609	SAE 5160RH	0.56/0.64	0.75/1.00	0.15/0.35	--	0.70/0.90	--
H86209	SAE 8620RH	0.18/0.23	0.70/0.90	0.15/0.35	0.40/0.70	0.40/0.60	0.15/0.25
H87209	SAE 8720RH	0.18/0.23	0.70/0.90	0.15/0.35	0.40/0.70	0.40/0.60	0.20/0.30
H88229	SAE 8822RH	0.20/0.25	0.75/1.00	0.15/0.35	0.40/0.70	0.40/0.60	0.30/0.40

^aSmall quantities of certain elements may be found in alloy steel which are not specified or required. These elements are to be considered as 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%.

^bMaximum sulfur content is to be 0.040% and maximum phosphorus content is to be 0.025%.

^cRanges and limits are subject to the permissible variations for product analysis shown in Table 4 of SAE J409.

*Tentative

HARDNESS LIMITS FOR SPECIFICATION PURPOSES

"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	(51)	(46)
2	48	42
3	43	34
4	(37)	28
5	32	24
6	28	22
7	26	20
8	24	--
9	23	--
10	22	--
11	22	--
12	21	--
13	21	--
14	20	--
15	--	--
16	--	--
18		
20		
22		
24		
26		
28		
30		
32		

HEAT TREATING TEMPERATURES
RECOMMENDED BY SAE

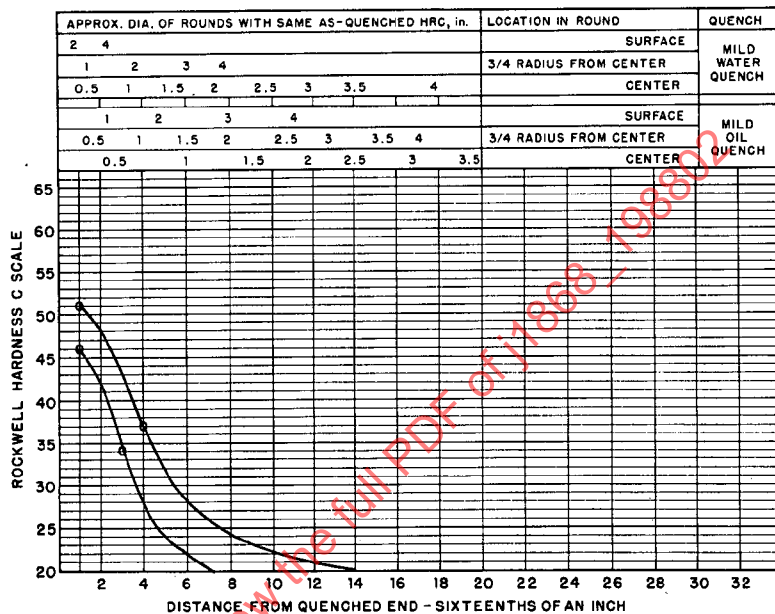
*NORMALIZE 1650 °F
AUSTENITIZE 1600 °F

*For forged or rolled specimens only

SAE 4027RH

HARDENABILITY BAND UNS H40279

%C	%Mn	%Si	%Ni	%Cr	%Mo
0.25/0.30	0.70/0.90	0.15/0.35	--	--	0.20/0.30



HARDNESS LIMITS FOR SPECIFICATION PURPOSES

"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	(47)	(42)
2	44	38
3	38	30
4	(33)	25
5	29	22
6	27	20
7	25	--
8	24	--
9	23	--
10	22	--
11	21	--
12	20	--
13	--	--
14	--	--
15	--	--
16	--	--
18		
20		
22		
24		
26		
28		
30		
32		

HEAT TREATING TEMPERATURES
RECOMMENDED BY SAE

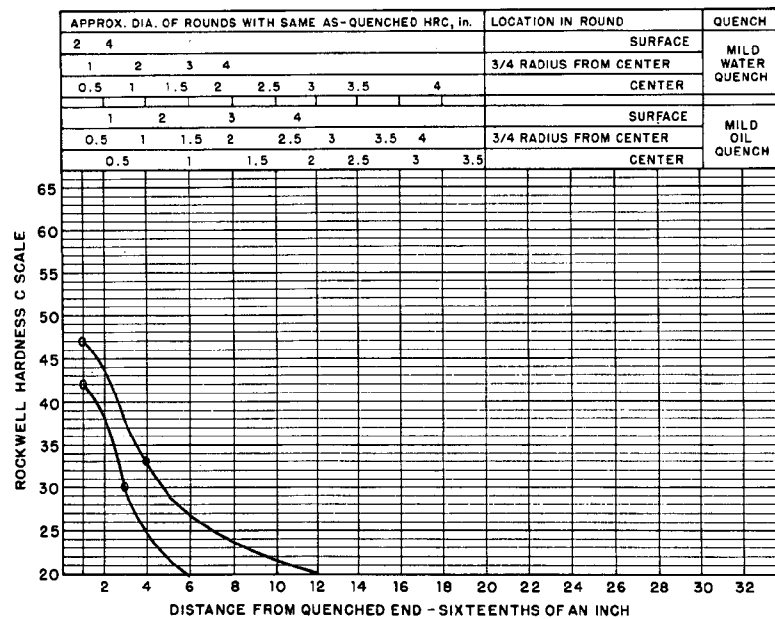
*NORMALIZE 1700 °F
AUSTENITIZE 1700 °F

*For forged or rolled specimens only

SAE 4118RH

HARDENABILITY BAND UNS H41189

%C	%Mn	%Si	%Ni	%Cr	%Mo
0.18/0.23	0.70/0.90	0.15/0.35	--	0.40/0.60	0.08/0.15



HARDNESS LIMITS FOR SPECIFICATION PURPOSES

"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	(47)	(42)
2	45	39
3	41	35
4	38	(30)
5	(34)	26
6	31	24
7	29	22
8	28	21
9	26	20
10	25	--
11	24	--
12	23	--
13	23	--
14	22	--
15	22	--
16	21	--
18	20	--
20	--	--
22	--	--
24	--	--
26	--	--
28	--	--
30	--	--
32	--	--

HEAT TREATING TEMPERATURES RECOMMENDED BY SAE

*NORMALIZE 1700 °F
AUSTENITIZE 1700 °F

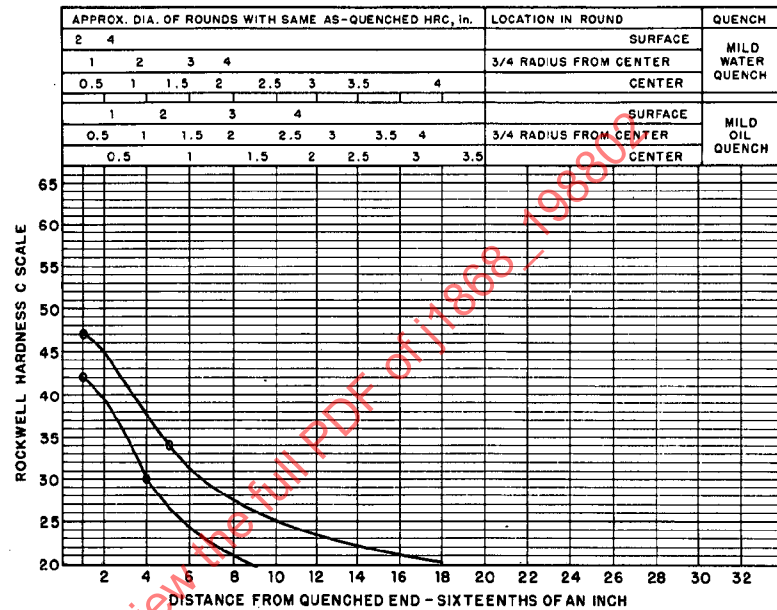
*For forged or rolled specimens only

SAE 4120RH

HARDENABILITY BAND

UNS H41209

%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 SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	(59)	(54)
2	59	54
3	59	54
4	59	53
5	58	52
6	57	51
7	56	50
8	55	49
9	54	48
10	53	46
11	52	44
12	52	(43)
13	51	42
14	50	41
15	50	40
16	49	39
18	48	38
20	(47)	37
22	46	37
24	45	36
26	44	35
28	43	35
30	42	34
32	41	33

HEAT TREATING TEMPERATURES RECOMMENDED BY SAE

*NORMALIZE 1600 °F
AUSTENITIZE 1550 °F

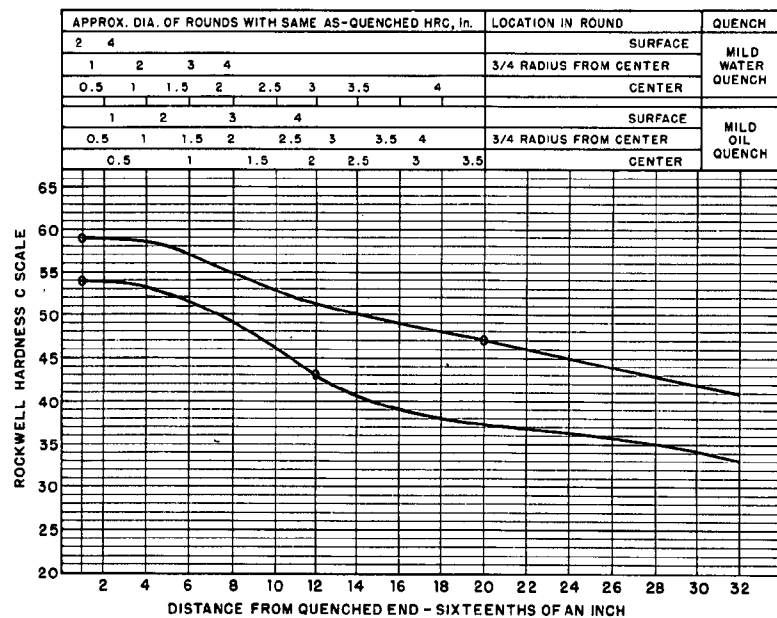
*For forged or rolled specimens only

SAE 4140RH

HARDENABILITY BAND

UNS H41409

%C	%Mn	%Si	%Ni	%Cr	%Mo
0.38/0.43	0.75/1.00	0.15/0.35	--	0.80/1.10	0.15/0.25



HARDNESS LIMITS FOR SPECIFICATION PURPOSES

"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	62	57
2	62	57
3	61	56
4	61	56
5	60	55
6	60	55
7	59	54
8	59	53
9	58	52
10	58	52
11	58	51
12	57	50
13	57	49
14	56	48
15	56	47
16	55	46
18	54	44
20	53	43
22	52	42
24	51	40
26	51	40
28	50	39
30	50	38
32	49	37

HEAT TREATING TEMPERATURES
RECOMMENDED BY SAE

*NORMALIZE 1600 °F
AUSTENITIZE 1550 °F

*For forged or rolled specimens only

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	60
10	65	60
11	65	60
12	64	59
13	64	59
14	64	59
15	63	58
16	63	57
18	62	56
20	62	54
22	61	53
24	60	51
26	59	49
28	58	47
30	57	46
32	57	45

HEAT TREATING TEMPERATURES
RECOMMENDED BY SAE

*NORMALIZE 1600 °F
AUSTENITIZE 1550 °F

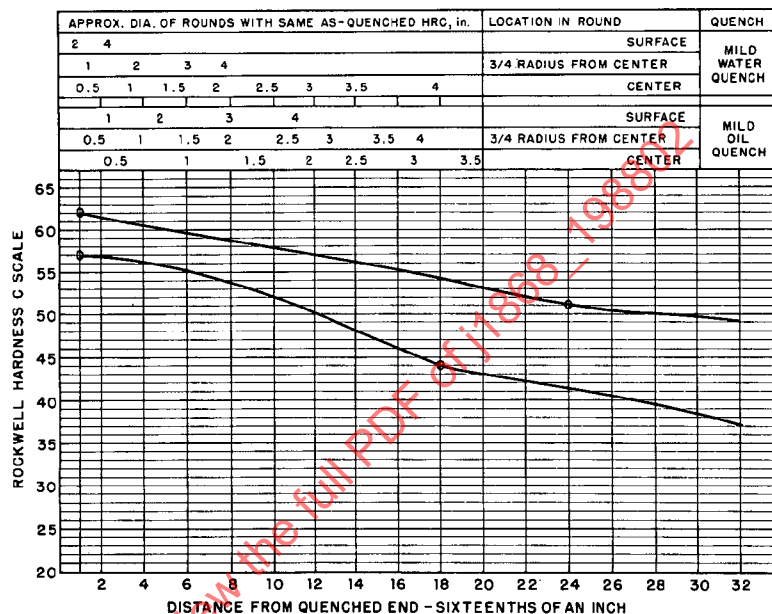
*For forged or rolled specimens only

SAE 4145RH

HARDENABILITY BAND

UNS H41459

%C	%Mn	%Si	%Ni	%Cr	%Mo
0.43/0.48	0.75/1.00	0.15/0.35	--	0.80/1.10	0.15/0.25

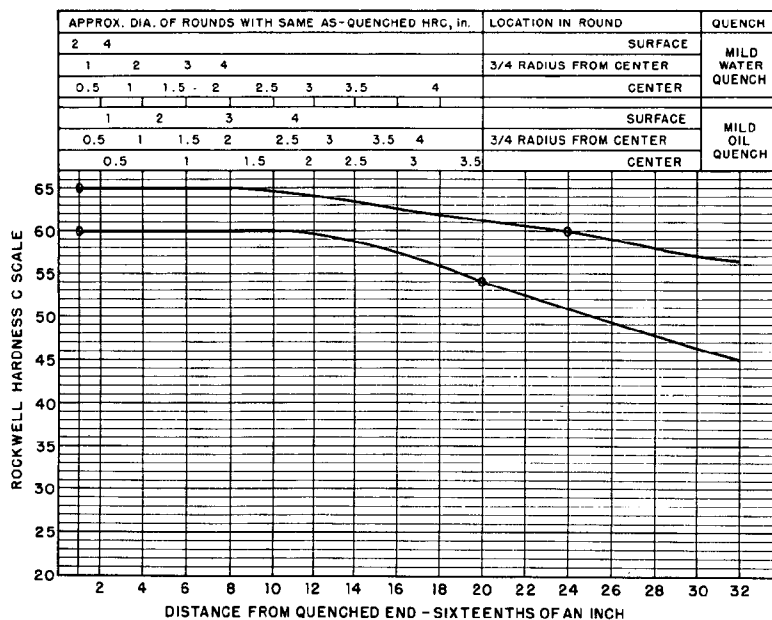


SAE 4161RH

HARDENABILITY BAND

UNS H41619

%C	%Mn	%Si	%Ni	%Cr	%Mo
0.56/0.64	0.75/1.00	0.15/0.35	--	0.70/0.90	0.25/0.35



HARDNESS LIMITS FOR SPECIFICATION PURPOSES

"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	(55)	(50)
2	53	47
3	51	44
4	49	41
5	46	37
6	44	(35)
7	42	33
8	(39)	31
9	37	29
10	35	27
11	34	26
12	33	25
13	32	24
14	31	23
15	30	22
16	29	21
18	28	20
20	27	--
22	26	--
24	25	--
26	24	--
28	23	--
30	22	--
32	21	--

HEAT TREATING TEMPERATURES RECOMMENDED BY SAE

*NORMALIZE 1650 °F
AUSTENITIZE 1600 °F

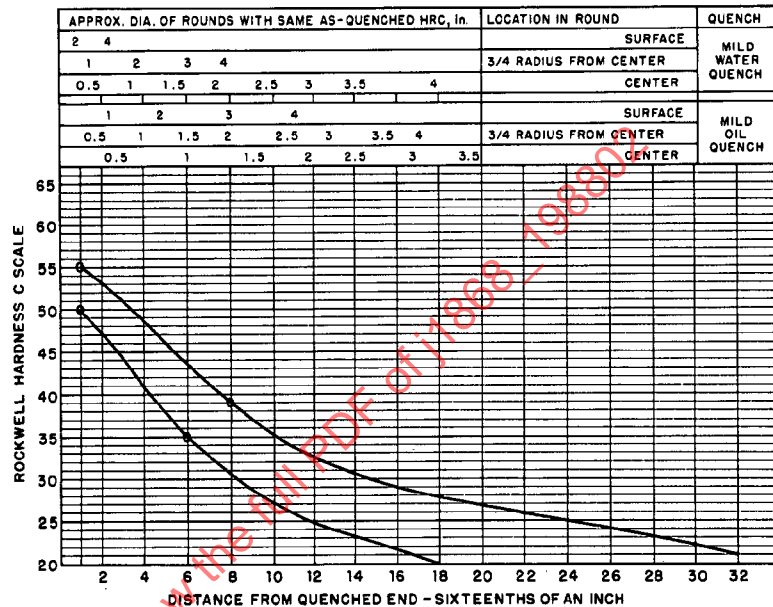
*For forged or rolled specimens only

SAE 5130RH

HARDENABILITY BAND

UNS H51309

%C	%Mn	%Si	%Ni	%Cr	%Mo	
0.28/0.33	0.70/0.90	0.15/0.35	--	0.80/1.10	--	



HARDNESS LIMITS FOR SPECIFICATION PURPOSES

"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	(59)	(54)
2	58	53
3	57	51
4	55	49
5	53	45
6	51	(41)
7	48	38
8	46	36
9	(44)	34
10	43	33
11	41	32
12	40	31
13	39	30
14	37	29
15	36	28
16	35	27
18	34	26
20	33	25
22	32	24
24	31	23
26	30	22
28	30	21
30	29	20
32	29	--

HEAT TREATING TEMPERATURES RECOMMENDED BY SAE

*NORMALIZE 1600 °F
AUSTENITIZE 1550 °F

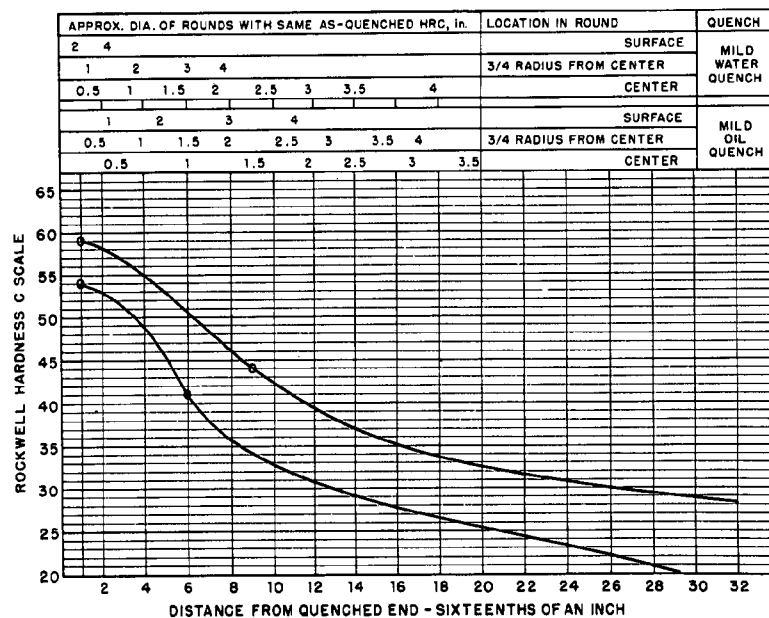
*For forged or rolled specimens only

SAE 5140RH

HARDENABILITY BAND

UNS H51409

%C	%Mn	%Si	%Ni	%Cr	%Mo	
0.38/0.43	0.70/0.90	0.15/0.35	--	0.70/0.90	--	



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	59
5	64	58
6	63	57
7	62	54
8	60	50
9	58	45
10	56	42
11	55	40
12	53	39
13	51	38
14	50	37
15	48	36
16	47	36
18	44	35
20	43	34
22	42	33
24	41	32
26	40	31
28	39	30
30	39	29
32	38	29
HEAT TREATING TEMPERATURES RECOMMENDED BY SAE		
*NORMALIZE	1600	°F
AUSTENITIZE	1550	°F
*For forged or rolled specimens only		

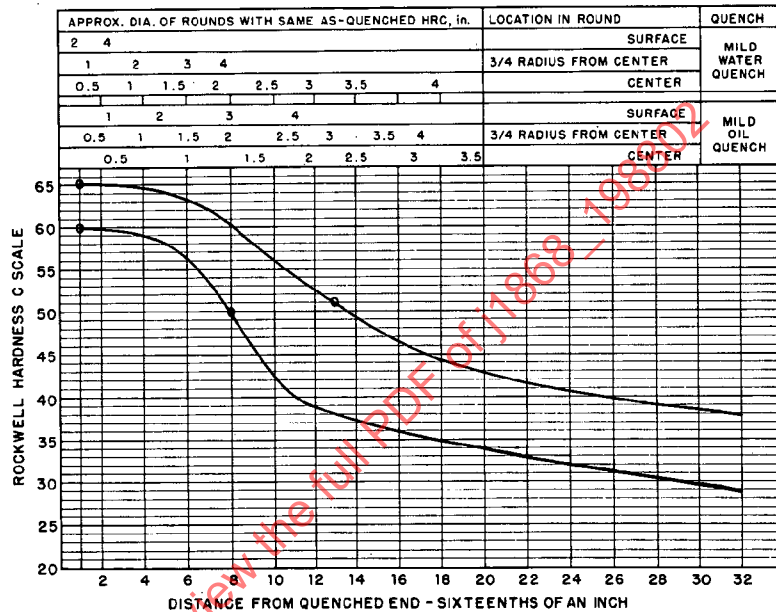
HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	47	42
2	45	39
3	41	35
4	38	30
5	34	26
6	31	24
7	29	22
8	28	21
9	26	20
10	25	--
11	24	--
12	23	--
13	23	--
14	22	--
15	22	--
16	21	--
18	20	--
20	--	--
22	--	--
24	--	--
26	--	--
28	--	--
30	--	--
32	--	--
HEAT TREATING TEMPERATURES RECOMMENDED BY SAE		
*NORMALIZE	1700	°F
AUSTENITIZE	1700	°F
*For forged or rolled specimens only		

SAE 5160RH

HARDENABILITY BAND

UNS H51609

%C	%Mn	%Si	%Ni	%Cr	%Mo	
0.56/0.64	0.75/1.00	0.15/0.35	--	0.70/0.90	--	

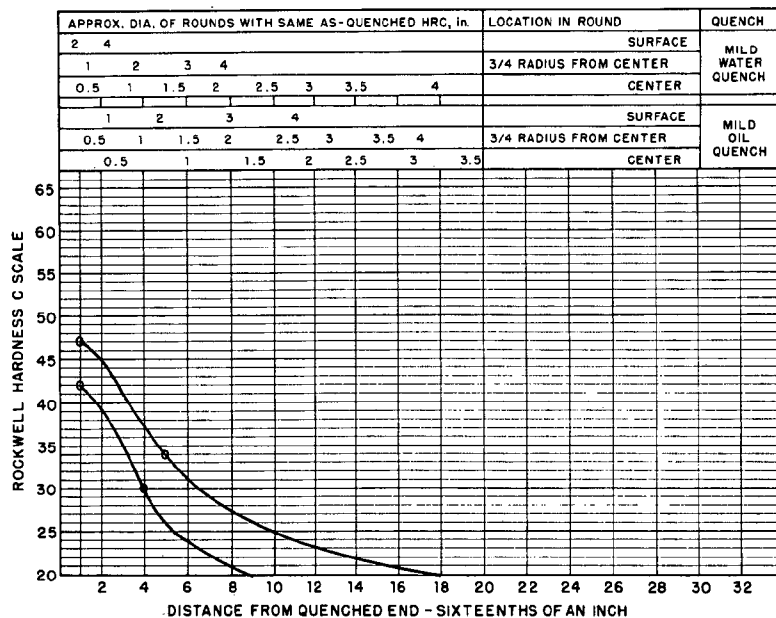


SAE 8620RH

HARDENABILITY BAND

UNS H86209

%C	%Mn	%Si	%Ni	%Cr	%Mo	
0.18/0.23	0.70/0.90	0.15/0.35	0.40/0.70	0.40/0.60	0.15/0.25	



HARDNESS LIMITS FOR SPECIFICATION PURPOSES

"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	(47)	(42)
2	45	39
3	43	37
4	40	(32)
5	36	28
6	(33)	26
7	31	24
8	29	23
9	28	22
10	27	21
11	26	20
12	25	--
13	25	--
14	24	--
15	24	--
16	23	--
18	23	--
20	22	--
22	22	--
24	21	--
26	20	--
28	--	--
30	--	--
32	--	--

HEAT TREATING TEMPERATURES RECOMMENDED BY SAE

*NORMALIZE 1700 °F
AUSTENITIZE 1700 °F

*For forged or rolled specimens only

HARDNESS LIMITS FOR SPECIFICATION PURPOSES

"J" DISTANCE SIXTEENTHS OF AN INCH	HRC	
	MAX.	MIN.
1	(49)	(44)
2	48	43
3	47	40
4	43	35
5	40	(31)
6	37	29
7	(35)	27
8	33	26
9	32	25
10	31	25
11	30	24
12	30	23
13	29	23
14	28	23
15	28	22
16	27	22
18	27	21
20	26	20
22	26	--
24	26	--
26	26	--
28	25	--
30	25	--
32	25	--

HEAT TREATING TEMPERATURES RECOMMENDED BY SAE

*NORMALIZE 1700 °F
AUSTENITIZE 1700 °F

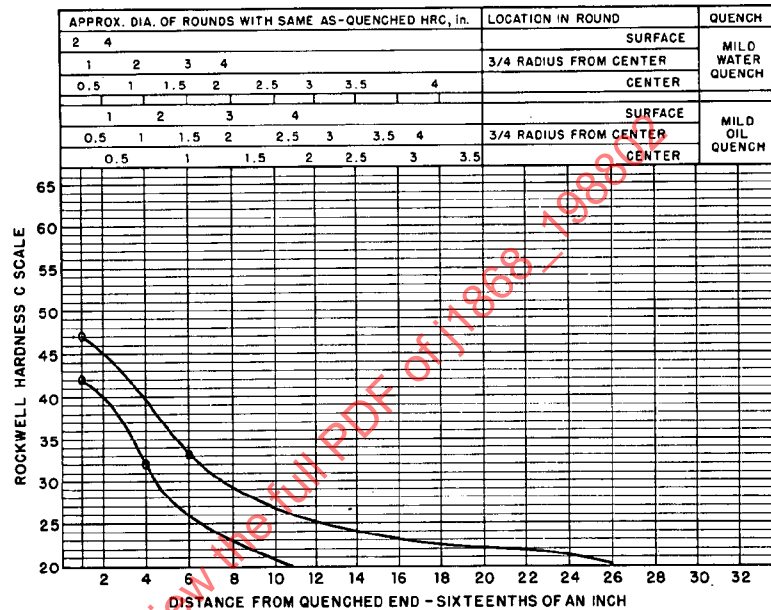
*For forged or rolled specimens only

SAE B720RH

HARDENABILITY BAND

UNS H87209

%C	%Mn	%Si	%Ni	%Cr	%Mo
0.18/0.23	0.70/0.90	0.15/0.35	0.40/0.70	0.40/0.60	0.20/0.30

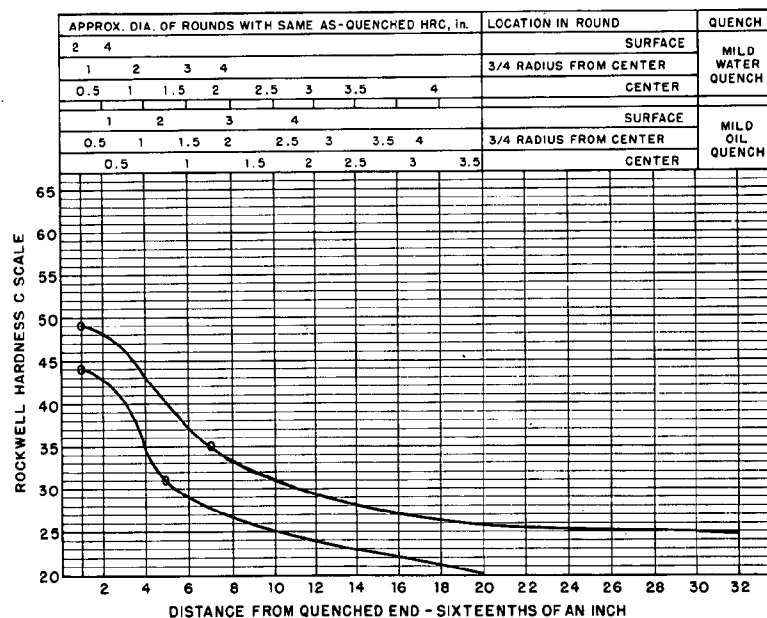


SAE 8822RH

HARDENABILITY BAND

UNS H88229

%C	%Mn	%Si	%Ni	%Cr	%Mo
0.20/0.25	0.75/1.00	0.15/0.35	0.40/0.70	0.40/0.60	0.30/0.40



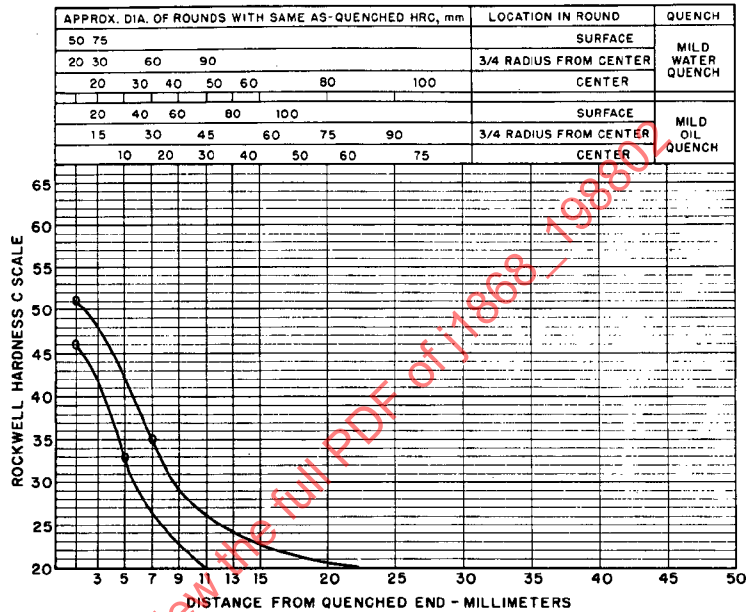
SAE 4027RH

HARDENABILITY BAND

UNS H40279

%C	%Mn	%Si	%Ni	%Cr	%Mo	
0.25/0.30	0.70/0.90	0.15/0.35	--	--	0.20/0.30	

HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE MILLIMETERS	HRC	
	MAX.	MIN.
1.5	(51)	(46)
3	48	47
5	42	(33)
7	(35)	26
9	29	23
11	26	20
13	24	--
15	23	--
20	21	--
25	--	--
30		
35		
40		
45		
50		
HEAT TREATING TEMPERATURES RECOMMENDED BY SAE		
*NORMALIZE	900	°C
AUSTENITIZE	870	°C
* For forged or rolled specimens only		



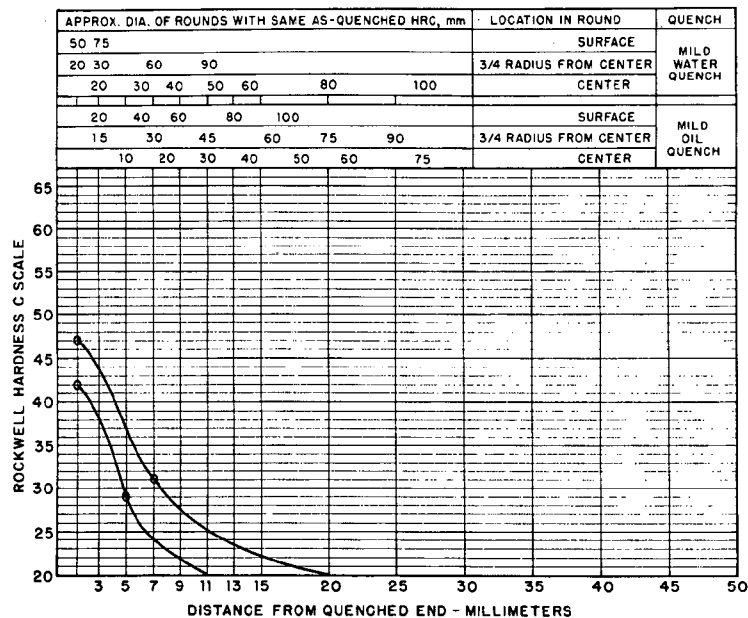
SAE 4118RH

HARDENABILITY BAND

UNS H41189

%C	%Mn	%Si	%Ni	%Cr	%Mo	
0.18/0.23	0.70/0.90	0.15/0.30	--	--	0.08/0.15	

HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE MILLIMETERS	HRC	
	MAX.	MIN.
1.5	(47)	(42)
3	44	38
5	37	(29)
7	(31)	24
9	28	21
11	25	20
13	24	--
15	23	--
20	20	--
25	--	--
30		
35		
40		
45		
50		
HEAT TREATING TEMPERATURES RECOMMENDED BY SAE		
*NORMALIZE	925	°C
AUSTENITIZE	925	°C
* For forged or rolled specimens only		



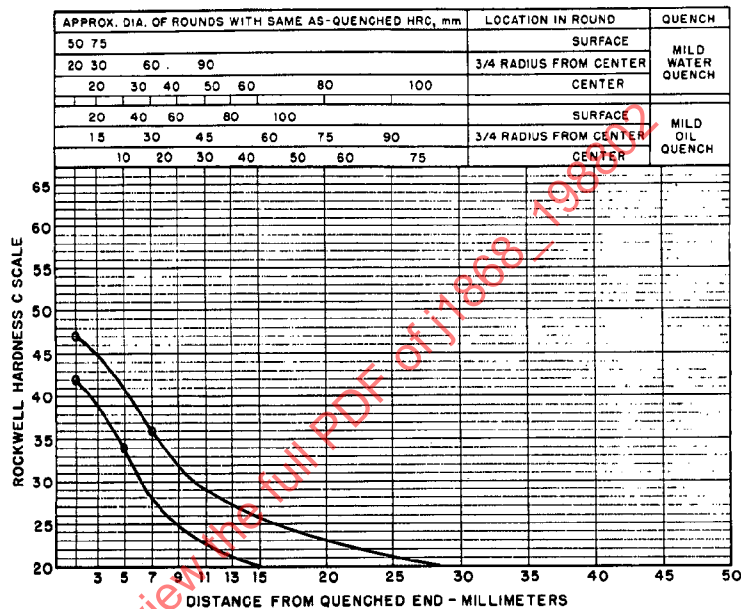
SAE 4120RH

HARDENABILITY BAND

UNS H41209

%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	(47)	(42)
3	45	39
5	41	(34)
7	(36)	28
9	32	25
11	29	22
13	28	21
15	26	20
20	23	--
25	21	--
30	--	--
35	--	--
40		
45		
50		
HEAT TREATING TEMPERATURES RECOMMENDED BY SAE		
*NORMALIZE	925	°C
AUSTENITIZE	925	°C
* For forged or rolled specimens only		



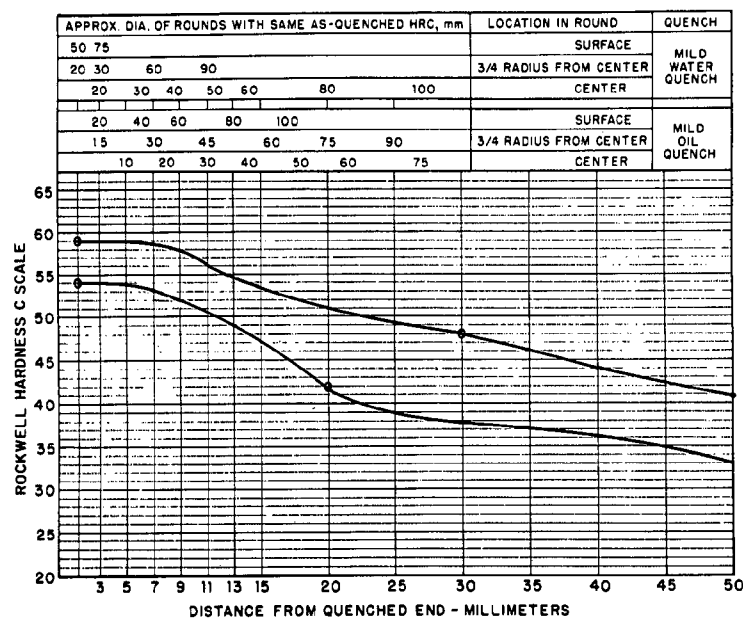
SAE 4140RH

HARDENABILITY BAND

UNS H41409

%C	%Mn	%Si	%Ni	%Cr	%Mo	
0.38/0.43	0.75/1.00	0.15/0.35	--	0.80/1.00	0.15/0.25	

HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE MILLIMETERS	HRC	
	MAX.	MIN.
1.5	(59)	(54)
3	59	54
5	59	54
7	59	53
9	58	52
11	56	50
13	55	49
15	54	47
20	51	(42)
25	49	39
30	(48)	38
35	46	37
40	44	36
45	43	35
50	41	33
HEAT TREATING TEMPERATURES RECOMMENDED BY SAE		
*NORMALIZE	870	°C
AUSTENITIZE	845	°C
* For forged or rolled specimens only		



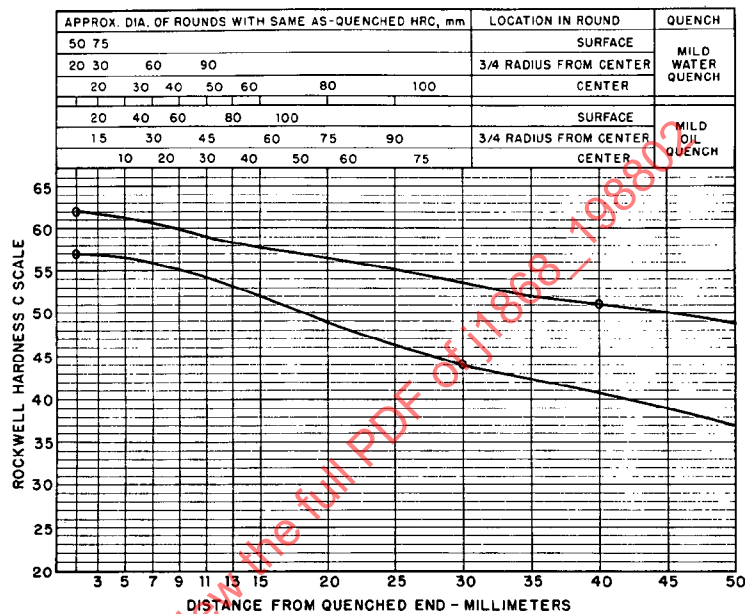
SAE 4145RH

HARDENABILITY BAND

UNS H41459

%C	%Mn	%Si	%Ni	%Cr	%Mo	
0.43/0.48	0.75/1.00	0.15/0.35	--	0.80/1.10	0.15/0.25	

HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE MILLIMETERS	HRC	
	MAX.	MIN.
1.5	(62)	(57)
3	62	57
5	61	56
7	61	56
9	60	55
11	59	54
13	59	53
15	58	52
20	57	49
25	55	46
30	54	(44)
35	52	42
40	(51)	40
45	50	39
50	49	37
HEAT TREATING TEMPERATURES RECOMMENDED BY SAE		
*NORMALIZE	870 °C	
AUSTENITIZE	845 °C	
*For forged or rolled specimens only		



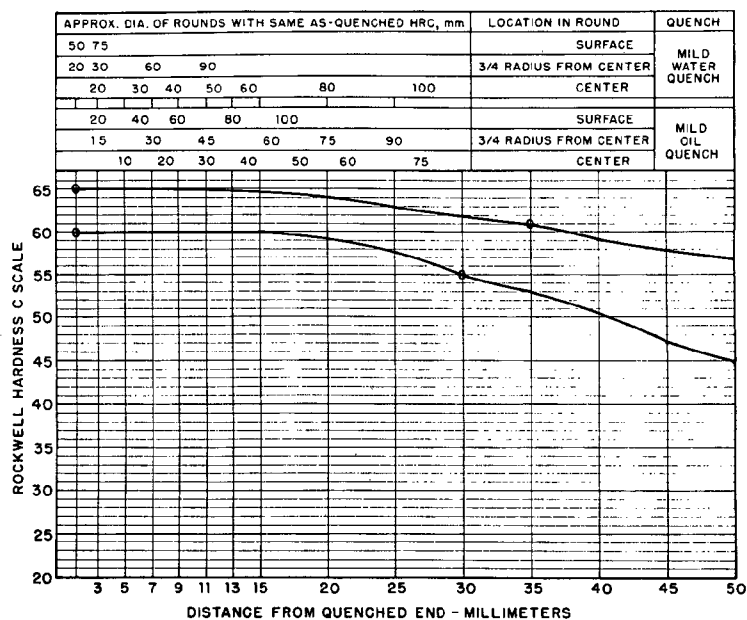
SAE 4161RH

HARDENABILITY BAND

UNS H41619

%C	%Mn	%Si	%Ni	%Cr	%Mo	
0.56/0.64	0.75/1.00	0.15/0.35	--	0.70/0.90	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	64	59
25	63	57
30	62	(55)
35	(61)	53
40	59	50
45	58	47
50	57	45
HEAT TREATING TEMPERATURES RECOMMENDED BY SAE		
*NORMALIZE	870	°C
AUSTENITIZE	845	°C
*For forged or rolled specimens only		

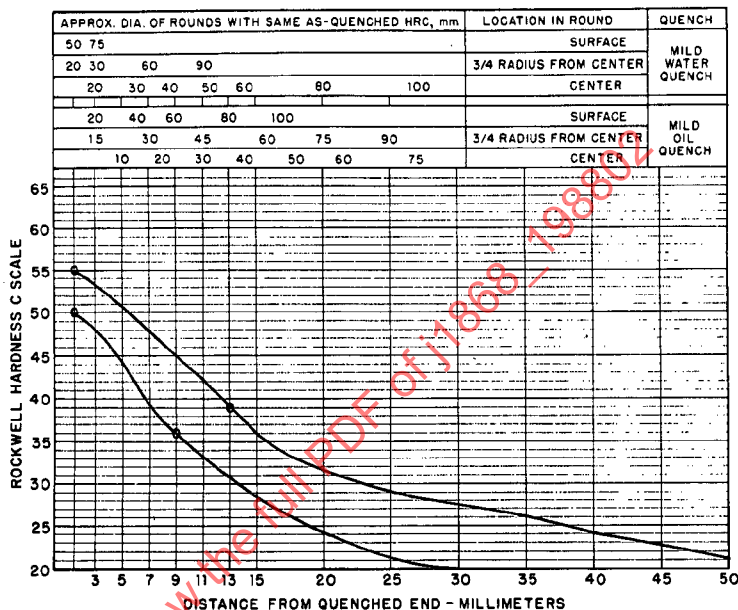


SAE 5130RH

HARDENABILITY BAND UNS H51309

%C	%Mn	%Si	%Ni	%Cr	%Mo	
0.28/0.33	0.70/0.90	0.15/0.35	--	0.80/1.10	--	

HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE MILLIMETERS	HRC	
	MAX.	MIN.
1.5	55	50
3	53	47
5	51	44
7	48	39
9	45	36
11	42	33
13	39	31
15	36	28
20	32	24
25	29	21
30	28	20
35	26	--
40	24	--
45	23	--
50	21	--
HEAT TREATING TEMPERATURES RECOMMENDED BY SAE		
*NORMALIZE	900	°C
AUSTENITIZE	870	°C
* For forged or rolled specimens only		



SAE 5140RH

HARDENABILITY BAND UNS H51409

%C	%Mn	%Si	%Ni	%Cr	%Mo	
0.38/0.43	0.70/0.90	0.15/0.35	--	0.70/0.90	--	

HARDNESS LIMITS FOR SPECIFICATION PURPOSES		
"J" DISTANCE MILLIMETERS	HRC	
	MAX.	MIN.
1.5	59	54
3	58	53
5	57	51
7	55	47
9	52	42
11	48	38
13	46	36
15	44	34
20	39	30
25	35	27
30	33	25
35	32	24
40	31	22
45	30	21
50	29	20
HEAT TREATING TEMPERATURES RECOMMENDED BY SAE		
*NORMALIZE	870	°C
AUSTENITIZE	845	°C
* For forged or rolled specimens only		

