1.0 SCOPE

This specification defines steel mill products and the applicable ASTM standard for mill tolerances for rough stock steel products (see Figures 1 and 2). Additional figures for tolerances not found in the ASTM standards but still apply are included in this specification (see Figures 3-7). Caterpillar subsidiary facilities may apply appropriate local national standard tolerances if these satisfy their processing requirements.

2.0 DEFINITION OF PRODUCTS

2.1 Plates (Other Than Floor Plates) - Flat, hot-rolled steel, ordered to thickness or mass and typically width and length, see Figure 1.

2.2 Hot-Rolled Sheet - Manufactured by hot rolling slabs in a continuous mill to the required thickness and can be supplied in coils or cut lengths as specified. Hot-rolled carbon and high-strength low-alloy (HSLA) steel sheet is commonly classified by size as follows in Figure 1 for coils and cut lengths.

2.3 Cold-Rolled Sheet - Manufactured from hot-rolled descaled coils by cold reducing to the desired thickness, generally followed by annealing to recrystallize the grain structure. If the sheet is not annealed after cold reduction it is known as full hard with a hardness of 84 HRB minimum and can be used for certain applications where ductility and flatness are not required. Cold-rolled carbon and cold-rolled high-strength low-alloy sheet are commonly classified by size as shown in Figure 1.

2.4 Hot-Rolled Strip - Manufactured by hot rolling billets or slabs to the required thickness. It may be produced single width or by rolling multiple width and slitting to the desired width. It can be supplied in coils or cut lengths as specified in Figure 1.

2.5 Cold-Rolled Carbon Steel Strip – Is in cut lengths or coils, furnished to closer tolerances than cold rolled carbon steel sheet, with specific temper, with specific edge or specific finish, and in sizes shown in Figure 1.

Cold-rolled strip is produced with a maximum specified carbon not exceeding 0.25 percent. Strip tolerance products may be available in widths wider than 600 mm by agreement between purchaser and supplier. However, such products are technically classified as cold rolled sheet.

2.6 Heavy Thickness Sheet And Strip Coils - This material is commonly available as hot-rolled sheet and strip in coil form only furnished in the size classifications shown in Figure 1.

Product	Width, mm		Thickness, mm	
	Over	Through	Over	Through
Plate	200	---	6	---
	1200	---	4.5	---
Hot-Rolled Sheet	300	1200, Incl	0.8	6.0, Excl
	1200	---	0.8	4.5, Excl
Cold-Rolled Sheet (Carbon)	---	300, Incl	---	2.0
	300	---	---	4.0
Cold-Rolled Sheet (High-Strength Low-Alloy)	---	300, Incl	0.5	2.0, Incl
	300	---	0.5	---
Hot-Rolled Strip (Carbon)	---	100	1.2	5.0
	100	200	1.2	5.0
	200	300	1.2	6.0, Excl
Hot-Rolled Strip (High-Strength Low-Alloy)	---	200	1.8	5.0
	200	300	1.8	6.0, Excl
Cold-Rolled Carbon Steel Strip	12.5	600	---	7.6
Heavy Thickness Strip Coils	200	300	6.0	25
Heavy Thickness Sheet Coils	300	1200	6.0	25
	1200	---	4.5	25

Figure 1

3.0 MILL TOLERANCES

See Figure 2 for the applicable ASTM standard for mill tolerances for rough stock steel products.

Product	Condition	ASTM Reference
Carbon and Alloy Steel Bar	Hot Rolled	A29/A29M
	Cold Finished	A29/A29M
	Flat Bar	A29/A29M
	Bar Sized -Structural	A29/A29M
Carbon, High Strength Low Alloy, and Alloy Steel Plates	Hot Rolled	A6/A6M, for Flatness See Figures 5, 6, and 7 Below
	Quench and Tempered	A6/A6M, for Flatness See Figure 6 Below
Carbon Steel Tread Plate		A786/A786M
Carbon and High Strength Low Alloy Steel Sheet	Hot Rolled	A568/A568M
	Cold Rolled	A568/A568M
Carbon and High Strength Low Alloy Steel Strip	Hot Rolled	A749/A749M
	Cold Rolled	A109/A109M
Carbon Steel, Heavy Coils of Hot Rolled Sheet and Strip	Hot Rolled	A635/A635M
	Sheet Sized	A635/A635M
Seamless Carbon and Alloy Steel Mechanical Tubing	Hot Finished	A519
	Cold Drawn	A519
Electric Resistance-Welded Carbon and Alloy Mechanical Tubing	As-Welded Hot Rolled	A513
	As -Welded Cold Rolled	A513
	Welded – DOM or Welded Sink Drawn	A513
Carbon and Alloy Steel Pipe		A530/A530M
Structural Shapes		A6/A6M

Figure 2

4.0 APPLICABLE TOLLERANCES NOT FOUND IN ASTM STANDARDS

4.1 Machining Allowances for Hot Rolled Carbon and Alloy Steel Bars, see Figures 3 and 4.

HR OR THERMALLY TREATED
ALLOY STEEL BARS (ROUNDS)

SIZE OVER	SIZE INCL	MINIMUM ALLOWANCE ON DIAMETER
TO .62		.032
.62	.88	.042
.88	1.00	.046
1.00	1.12	.050
1.12	1.25	.056
1.25	1.38	.060
1.38	1.50	.066
1.50	2.00	.084
2.00	2.50	.104
2.50	3.50	.144
3.50	4.50	.180
4.50	5.50	.220
5.50	6.50	.250
6.50	8.25	.310
8.25	9.50	.406

Figure 3

HR CARBON STEEL BARS (ROUNDS)

SIZE OVER	SIZE INCL	MINIMUM ALLOWANCE ON DIAMETER
	TO .88	.050
.88	1.00	.056
1.00	1.12	.062
1.12	1.25	.068
1.25	1.38	.074
1.38	1.50	.080
1.50	2.00	.106
2.00	2.50	.130
2.50	3.50	.180
3.50	4.50	.230
4.50	5.50	.280
5.50	6.50	.330
6.50	8.25	.418
8.25	9.50	.480
9.50	10.00	.506

Figure 4

4.2 Maximum value of flatness for steel plate with minimum specified yield strength 450 MPA or less, see figure 5. If the plate has been temper rolled use Figure 6 for flatness.

WIDTH / THICKNESS	UNDER 1250	1250 TO 1600	1601 TO 2000	2001 TO 2500	2501 TO 3000	OVER 3001
4.50–6.20	14	16	18	22	26	38
6.21–9.99	12	14	16	20	24	31
10.0–24.9	10	12	14	16	18	20
25.0–62.9	8	10	12	14	16	18
OVER 62.9	8	8	10	12	14	16

Figure 5

Note: Figure 5 does not apply to plate ordered to 1.5% minimum reduction temper rolled or stretched with a stretcher leveler.

Figure 5 applies to any 4000 mm length within a plate.

Figure 5 shall apply to the full length for plate less than 4000 mm in length.

Values for flatness shall be obtained by subtracting the thickness of the plate from the maximum value of deviation measured from a flat surface.

4.3 Maximum value of flatness for steel plate with minimum specified yield strength over 450 MPa, see Figure 6.

WIDTH / THICKNESS OVER INCL	UNDER 1250	1250 TO 1600	1601 TO 2000	2001 TO 2500	2501 TO 3000	OVER 3001
4.50 – 6.20	21	24	27	33	39	42
6.20 – 9.99	18	21	24	30	36	39
9.99 – 24.9	15	18	21	24	27	30
24.9 – 62.9	12	15	18	21	24	27
OVER 62.9	12	12	15	18	21	24

Figure 6

Note: Figure 6 applies to any 4000 mm length within a plate.

Figure 6 shall apply to the full length for plates less than 4000 mm in length.

Values for flatness shall be obtained by subtracting the thickness of the plate from the maximum value of deviation measured from a flat surface.

4.4 Maximum value of flatness for steel plate that has been 1.5% minimum reduction temper rolled or stretcher leveled and has a minimum specified yield strength of 450 MPA or less, see Figure 7.

WIDTH / THICKNESS		915 AND UNDER	916 TO 1805	1806 AND OVER
OVER	INCL			
4.50	14.0	3	6	6

Figure 7

Note: Figure 7 applies to any 4000 mm length within a plate.

Figure 7 shall apply to the full length for plate less than 4000 mm in length.

Values for flatness shall be obtained by subtracting the thickness of the plate from the maximum value of deviation measured from a flat surface.

5.0 SUBSIDIARY SPECIFICATIONS (FOR CATERPILLAR REFERENCE ONLY)

At the time of release of 1E2177, Change 15, the following subsidiary versions of 1E2177 were in use by Caterpillar facilities outside of the United States. Subsidiary versions may be released without a change to this version of 1E2177. The Engineering Data System (EDS) provides information on the status of subsidiary version specifications and should be referenced for current information.

CMRSA (Albaret)	"H" Version
Caterpillar Belgium S.A.	"H" Version
Caterpillar Brasil Limitada	"G" Version
Caterpillar France S.A.	"H" Version
Shin Caterpillar Mitsubishi (Sagami)	"X" Version
Shin Caterpillar Mitsubishi (Akashi)	"X" Version

Figure 8

6.0 REFERENCES

ASTM A29/A29M, A6/A6M, A786/A786M, A568/A568M, A749/A749M, A109/A109M, A635/A635M, A519, A513, A530/A530M