UNITED STATES DEPARTMENT OF COMMERCE
WASHINGTON 25, D.C.

National Bureau of Standards Certificate of Analyses

Spectrographic Tool Steel Standards

This supersedes the Provisional Certificate dated March 1, 1955

NUMBER[a]			DESIGNATION	Mn	Si	Cu	Cr	V	Mo	W	Co
				Percent	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
436	836	D836	Special (Cr 6–Mo 3–W 10)[b]	0.21	0.32	0.075	6.02	0.63	2.80	9.7	--------
437	837	D837	Special (Cr 8–Mo 2–W 3–Co 3)	.48	.53	----(c)	7.79	3.04	1.50	2.8	2.9
438	838	D838	Mo High Speed (AISI–SAE M30)	.20	.17	.17	4.66	1.17	8.26	1.7	4.9
439	839	D839	Mo High Speed (AISI–SAE M36)	.18	.21	.12	2.72	1.50	4.61	5.7	7.8
440	840	D840	Special W High Speed(Cr 2–W 13–Co 12)	.15	.14	.059	2.12	2.11	0.070	13.0	11.8
441	841	D841	W High Speed (AISI–SAE T1)	.27	.16	.072	4.20	1.13	.84	18.5	--------

[a] Sizes: 400 series, rods 7/32 inch in diameter and 4 inches long.
800 series, rods ½ inch in diameter and 2 inches long.
D800 series, disks 1¼ inches in diameter and ¼ inch thick.

[b] The carbon content of the standards is between 0.7 and 0.8 percent. By difference, the approximate iron contents are: 436, 836, and D836 — 79.2%; 437, 837, and D837 — 79.7%; 438, 838, and D838 — 77.6%; 439, 839, and D839 — 76.0%; 440, 840, and D840 — 69.1%; 441, 841, and D841 — 73.6%. The metallurgical structure of the standards is that resulting from hot-rolling and annealing.

[c] Dashes indicate elements not certified for spectrographic analysis.

CAUTION: These standards are intended for the analysis of tool steel samples with similar metallurgical history and dimensions. Samples with cross section larger than ⅛ inch in diameter may be analyzed with the ½-inch standards provided that the latter are mounted in a supporting piece such as a steel disk, 2½ inches in diameter and ¾ inch thick, drilled near the edge with holes to fit the standard closely and equipped with set-screws to lock the standard in place. The standards should be mounted with the circular cross section flush with one surface of the disk and may be cleaned and sparked in this position.

HOMOGENEITY of the standards was examined spectrochemically at the National Bureau of Standards and was found satisfactory for the elements certified.

CHEMICAL ANALYSES were made on millings cut from the cross section of the rods. The values indicated for the certified elements represent the averages of results from chemical analyses made by the National Bureau of Standards, Bethlehem Steel Co. (Bethlehem Works), Carpenter Steel Co., Cleveland Twist Drill Co., and the Crucible Steel Co. (Halcomb Works).

DISK STANDARD SAMPLES for use in X-ray spectrometric analysis were prepared from the rods ½ inch in diameter by upset forging. The use of the disk samples for optical emission analysis has not been investigated and is not recommended.

MATERIAL for the tool steel standards was furnished to the Bureau by the Bethlehem Steel Co.

WASHINGTON 25, D.C., September 22, 1959. A. V. ASTIN, *Director.*

U.S. GOVERNMENT PRINTING OFFICE 527623