

CENTRAL INTELLIGENCE AGENCY

25X1A

ATTACHMENT I

United Steel Mills, National Corporation
 Praha II., Opletalova 35

Trade Mark Pold1
 NC 2

Kind		Chromonickel structural steel for hardening (Chromoniklova konstrukcni ocel k cementovani)					
Average chemical composition		C	Mn	Si	Cr	Ni	V
		0.17	0.80	0.25	0.90	0.55	0.05
Condition		Natural (ϕ 32 mm)	Annealed (ϕ 32 mm)		Tempered (ϕ 30 mm)		
Heat treatm.		-	720°C 4 hours in furnace		650°C 1 hour in air		830°C (oil)
Tensile stress * kg/mm ²		-	34.7 31.3		45.6 39.7		57.3
Average mechanical qualities							
Intensity of tensile test** kg/mm ²		85	55.4 53.1		60.8 59.4		94.0
Toughness of notch *** Messager mkg/cm ²		-	27.7 19.0		23.5 19.6		10.5
Strength of hardened layer		cca 62 Ro					
Heat treatment		Forging : 1100 - 800°C Annealing: cca 720°C / 4 hours, cool slowly in furnace Hardening: cca 870°C Tempering: simple 830°C (oil) double 860°C (oil) - 810°C (oil) Drawing (popousteni) : 150 - 200°C for a period of 1 - 2 hours					
Result of tempering of discs (Vysledek kaleni kotoucu)		Dimensions	Heat treatment	Edge	Strength kg/mm ² Middle		Edge
		ϕ 60 x 10mm	830°C oil	129	114		129
		ϕ 60 x 30mm	830°C oil	91	82		90
Remark							

* Mez prutaznosti
 ** Pevnost v tahu
 *** Vrub. houzevn.

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ATTACHMENT I

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United Steel Mills, National Corporation
 Praha II., Opletalova 35

Trade Mark Poldi
 NC 4

Kind							Chromonickel structural steel for hardening (Chromoniklova konstrukcni ocel k cementovani)								
Average chemical composition		C	Mn	Si	Cr	Ni	V		C		Mn	Si	Cr	Ni	V
		0.22	0.30	0.25	0.90	0.55	0.05								
Condition		Natural (Ø 32 mm)			Annealed (Ø 32mm)			Tempered (Ø 30mm)							
Heat treatment		-			720°C 4 hours in furnace			650°C 1 hour in air			830°C (oil)				
Average mechanical qualities		-			33.6			48.3			59.5				
Tensile stress* kg/mm2		-			49.0			63.2			65.5				
Intensity of tensile test** kg/mm2		85			57.7			71.3			102.7				
Toughness of notch *** Mesnager mkg/cm2		-			22.7			19.5			7.5				
					14.6						5.6				
Strength of hardened layer		cca 62 Rc													
Heat treatment		Forging : 1100 - 800°C													
		Annealing : 720°C, 4 hours, cool slowly in furnace													
		Hardening : cca 870°C													
		Tempering : simple 830°C (oil) double 860°C (oil) - 810°C (oil)													
		Drawing (popoust-ni) 150 - 200°C for a period of 1 - 2 hours													
Result of tempering of discs of various casts		Cast	Dimensions	Heat Treatment			Strength kg/mm2								
							Edge			Middle					
		A	Ø 60 x 10	830°C (oil)			132			115					
		B	Ø 60 x 10	830°C (oil)			106			95					
		A	Ø 60 x 30	830°C (oil)			101			90					
		B	Ø 60 x 30	830°C (oil)			96			85					
Remark															

* Mez prutaznosti
 ** Pevnost v tahu
 *** Vrub. houzevna.

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United Steel Mills, National Corporation
 Praha II., Opletalova 35

Trade Mark Poldi
 BzV 2

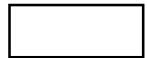
Kind							Chromonickel structural steel for hardening (Chromoniklova konstrukcni ocel pro cementovani)									
Average chemical composition		C	Mn	Si	Cr	Ni	V									
		0.17	0.80	0.25	0.90	1.45	0.05									
Condition		Natural (ϕ 32 mm)		Annealed (ϕ 32mm)			Tempered (ϕ 30mm)									
Heat treatment		-		720°C 4 hours in furnace			650°C 1 hour in air			830°C (oil)						
Average mechanical qualities		-		37.3			46.3			71.3						
Tensile stress* kg/mm ²		-		37.3			46.3			71.3						
Intensity of tensile test** kg/mm ²		90		59.6			67.4			104.0						
Toughness of notch *** Mesnager mkg/cm ²		-		22.6			21.0			11.4						
Strength of hardened layer		cca 62 Rc														
Heat treatment		Forging : 1100 - 800°C														
		Annealing : cca 720°C, 4 hours, cool slowly in furnace														
		Hardening : cca 870°C														
		Tempering : simple 830°C (oil) double 860°C (oil) - 810°C (oil)														
		Drawing : 150 - 200°C for a period of 1-2 hours														
Result of tempering of discs		Dimensions		Heat Treatment			Edge		Strength kg/mm ²			Middle		Edge		
		ϕ 60 x 10 mm		830°C (oil)			123		115			123				
		ϕ 60 x 30 mm		830°C (oil)			108		96			107				
Remark																

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United Steel Mills, National Corporation
 Praha II., Opletalova 35

Trade Mark Poldi
 BIV 4

Kind		Chromonickel structural steel for hardening (Chromoniklova konstrukcni ocel pro cementovani)				
Average chemical composition		C	Mn	Si	Cr	Ni V
		0.22	0.60	0.25	0.90	1.45 0.05
Average mechanical qualities	Condition	Natural (ϕ 32 mm)	Annealed (ϕ 32mm)		Tempered (ϕ 30mm)	
	Heat treatment	-	720°C 4 hours in furnace	650°C 1 hour in air	830°C (oil)	
	Tensile stress* kg/mm ²	-	40.1 37.6 38.2	45.5 48.2 67.3	84.6 73.9 74.5	
	Intensity of tensile test** kg/mm ²	100	66.2 62.0 62.4	71.6 73.0 80.0	123.0 114.0 115.4	
	Toughness of notch*** Messager mkg/cm ²	-	17.5 19.6 20.3	17.5 14.5 15.9	7.0 8.6 10.1	
Strength of hardened layer		cca 62 Rc				
Heat treatment		Forging : 1100 - 800°C Annealing : cca 720°C, 4 hours, cool slowly in furnace Hardening : cca 870°C Tempering : simple cca 830°C (oil) double cca 860°C (oil) - cca 810°C (oil) Drawing : 150 - 200°C for a period of 1 - 2 hours				
Result of tempering of discs		Dimensions	Heat Treatment	Strength kg/mm ²		
		ϕ 60 x 10 mm	830°C (oil)	Edge	Middle	Edge
		ϕ 60 x 30 mm	830°C (oil)	143	131	141
				131	105	127
Remark						

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ATTACHMENT II

1. The seventh conference of the Technical Committee for Heat Treatment of Steel (technickeho vyboru pro tepelne zpracovani - TVTZ) was held on 11 July 1951 at the Czechoslovak Enterprises for the Manufacture of Automobiles, Prague X, Krizikova Street 38. The following representatives were present:

Automobile Enterprises, National Enterprise Mlada Boleslav	(fnu) Snehota (fnu) Kopecky
Auto-Praga	Ing. (fnu) Vozenilek Ant. Kunc
Moto-Jawa	Dr. (fnu) Bartunek
Motorlet - Jinonice	J. Pekny
Ceska Zbrojovka - Strakonice	V. Komrska
Aero - Vysocany	-
Avia - Letnany	-
Pal - Kbely	(fnu) Panenka
Motorpal - Jihlava	Ing. (fnu) Mautner (fnu) Szelke
Motor-Union - Ceske Budejovice	(fnu) Schweighoffer
Tatra - Koprivnice	Prof. (fnu) Gronych
Rudy Letov - Letnany	J. Sladek
Draslovka - Kolin	Dr. (fnu) Gilrich
Draslovka - Uhrineves	-
Research Institute for the Protection of Material	-
United Steel Mills, National Corporation	Ing. (fnu) Jandacek
Czechoslovak Heavy Engineering Enterprises	Ing. O. Krasny
Czechoslovak Enterprises for the Manufacture of Automobiles	Ing. (fnu) Kneschk

2. The Conference was opened by Ing. Vozenilek. Tests with hardening powders (cementacni prasky) were discussed. Vozenilek informed the members of the conference that the Automobile Enterprises, National Corporation, had received from Chemapol, National Corporation, an offer of the hardening powder "Katalisator" from the USSR. Barium carbonate cannot be imported in sufficiently large quantities. The powder contains approximately 16% of barium carbonate. According to the analysis, the product is a good hardening powder based on BaCO₃. The nature of the binder is still under investigation. Ing. Vozenilek will work out a reply to the offer when the testing of the provided sample of powder is completed. Other members of the conference pointed out that it would be more profitable to import the basic chemicals instead of the prepared powder itself, which would cut down on transportation. The subject of the small amount in which this powder can be supplied was then discussed. Prof. Gronych stated that according to what he had heard, Draslovka had purchased the patent licence for hardening powders produced according to the formulas of Dr. Doskar of Svit, National Corporation. Ing. Mautner observed that barium clays (barnate zeminy) are available in sufficient quantity in Czechoslovakia and the main problem is to speed up the initiation of barium carbonate production. The Central Management of the Czechoslovak Enterprises for the Manufacture of Automobiles intends to forward a request to the Czechoslovak Chemical Enterprises to increase or introduce the manufacture of barium carbonate to meet the demand of the hardening mills (kalirny) from domestic sources of raw materials.* Ing. Krasny recommended that investigation of the possibilities of the production of barium carbonate be prescribed and treated as a specific problem.

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3. Tatra had been entrusted with testing material CE2 and CE1. The entire test has been carried out, and only the size of the grain remains to be ascertained. Powder B 8 shows an unusually strong carbonization of 1 : 1.2 percent on the surface; after four hours of treatment the percentage drops to 0.2. After eight hours it is 0.4%. The curves are symmetrical and the reaction strong: after four hours (sic), 0.55%; after twelve hours, 0.85%. The powder is insufficiently processed and equalized. Tatra tested the powder after it had been used and the barium content was greater than in the original powder. Powder B 8 is satisfactory on the whole, but still too sharp for chromium manganese steels.
4. The curves for powder B 15 after 12 hours drop to hardly acceptable values. Tests will be continued, however. Gronych pointed out the high cost of the tests. Up to 600 analyses have to be made. He will therefore not continue until funds are made available for the tests. Work on the tests will be discontinued as long as the hardening powders furnished produce an excessive amount of smoke. Komrska of Ceska Zbrojovka reported that his company has completed the analyses of the powder B 8. Powder B 15 is being tested. The results with material TYIW were unsatisfactory; it is difficult to harden, and after 12 hours, the carbonization is less than 0.7 percent. The qualities of material CE2 are more favorable. In the case of powder B 8 it was ascertained that in longer processes of hardening, strong decarbonization takes place on the surface to a depth of 0.2 mm. There was no decarbonization in the case of powder B 15.
5. Tests have been made with B 8 by Motorpal at Jihlava. After a certain length of time, a greater depth of carbonization takes place. Motorpal scientists are of the opinion that the powder B 8 is sometimes more effective than B 15. The company discontinued the tests with the furnished sample of powder in view of the fact that the powder gave off a harmful amount of gas and called forth protests from the workers. There would be no sense in carrying out tests with material of poor quality. Ceska Zbrojovka received from Draslovka a normal delivery of powder marked B 15, which contained only 8 percent of BaCO₃. As a result of its claim, the company received pure barium carbonate, which was added to make a total of 15 percent. There was no improvement in the effect, however. Instructions concerning the granulation test recommend SAE Motor Oil No. 20 for moistening. Powders stored for half a year or more lose their effectiveness.
6. It was agreed by the conference members that the Czechoslovak Enterprises for the Manufacture of Automobiles would send a letter to the Czechoslovak Chemical Enterprises and to Draslovka, to read as follows:

The firms of the Czechoslovak Enterprises for the Manufacture of Automobiles have carried out hardening tests with the provided samples of hardening powders B 8 and B 15. The results are unsatisfactory and unstable due to the poorly processed mixture and the use of a smoke-releasing binder. We request that Draslovka send all the enterprises participating in the tests a new shipment of samples of the powders B 8 and B 15, using the correct binder. (In foreign countries the use of motor oil SAE No. 20 is being recommended.)

We request that Draslovka, National Corporation, establish its own hardening mills where it could test its new hardening powders, similar to the ones held by the firm Durferrit, or the firm Goring in Germany. In these the enterprise could also make constant and regular checks of its products and examine the claims of its customers, and solve their problems as well.

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7. Dr. Bartunek stated that the situation concerning the delivery of samples of steel containing a lesser amount of nickel is not clear. Moto-Jawa was to receive 5,000 kg of this new material for testing purposes, and will only receive 50 kg. Ing. Vozenilek requested the representative of the United Steel Mills, National Corporation, to investigate why the steel would not be delivered in the amount agreed upon, since it is known that 15 tons of this steel had been cast. He mentioned that an inquiry had come from the UHZ concerning the savings made in nickel and requesting information in this respect. In the plants of the Czechoslovak Enterprises for the Manufacture of Automobiles savings in nickel of up to 50 percent were achieved by switching production to other kinds of steel, and other savings were achieved by changes in the construction of items of production. The result of the savings now depends only on the foundries. The plants have so far not even received the test rods (zkusebni tycky), in spite of the fact that the time limit for the delivery of the steel has already expired.
8. Ceska Zbrojovka has received 374 kg of NC2 steel, 25 mm thick. Analysis revealed the following qualities:
- C 0.14; Mn 0.71; S 0.015; Cr 0.96; Ni 0.69; V 0.12. Tensile strength 33.4 kg, resistance (mez pevnosti) 47 kg. The United Steelmills representative stated that vanadium would have to be reserved for other purposes and the more detailed results of the use of these kinds of steel would, therefore, not be available until later.
9. The Poldina foundry made tests with cyclic annealing (cyklicke zihani) of Ce2 and CE4 steel. It attained a very good degree of workability. Normalization took place at a temperature of 940°; the metal was then allowed to cool in air to a temperature of 550° and was then placed into a furnace heated to 550° for a period of two hours. It was then left to cool in air. The resistance (pevnost) was 70 kg/mm² as compared with 50 kg/mm² in the non-anneal state (ve stavu nezihanem). In Tatra, a complex brigade (komplexni brigada) is working on the annealing (cyklicke zihani) of CE2 material.
10. Ceska Zbrojovka has carried out the following tests with CE2 material:
- Test A
- I. Hardening with pre-heating to 900° C, 30 minutes.
Tempered isothermally to AS 140 - 180°, 5 minutes, then cooled in air.
- II. Tempered at 790° C in oil.
Removal of (pnuti) 160° C, 2.5 hours
Attainment of toughness (vrubova houzevnatost): 3.61 to 3.62 kg/cm².
- Test B
- I. Hardened at 900° C, 30 minutes.
Tempered into oil directly from hardening bath.
- II. Tempered at 790° C to AS 140, 180° C, 5 minutes, then cooled in air.
Refraction in layers (Vzdornost ve vrubu) was 5 to 5.56 kg/cm².
- The hardness on the surface in both cases 57 to 59 Rc 150 kg.
Depth of hardening approximately 0.3 mm.
- The size of the resulting deformation has so far not been registered.
11. Ing. Vozenilek recommended the use of isothermal tempering called "martempering" in oil. The parts are heated in a furnace in a tempering position (kalici poloha) and soaked in oil baths of 200° C. The deformation will probably be small, and the use of alkali (kalici trny) and presses can be avoided. Experiments in this method of tempering will be made in Auto-Praga and Tatra. The results attained abroad are good, and the use of tempering in

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- presses and (na trnech) is being abandoned. Ing. Janacek pointed to the fact that the oil used in the "martempering" process must have a high degree of inflammability and is therefore thick, which results in great losses due to the amount of oil that clings to the material (obrobky). Ing. Vozenilek suggested that an expert in the field of oils be invited to attend the next conference of the Technical Committee for Heat Treatment of Steel in order to provide information concerning tempering oils (kalici oleje). The viscosity at 200° C is approximately 2° Engler. He recommended the use of a good washer (pracka) in the process of tempering in heavy oil. Apart from this, a filter and a centrifuge should be connected to the circulation of the oil in order to avoid its aging through oxidation elements.
12. A prototype of the furnace for hardening by means of gas has been requested. The United Steel Mills, National Corporation, has promised to deliver casts made of a special heat-resisting alloy. The brick linings (vyzdivky) have been procured. By December 1951 the test furnaces will have been erected in Auto-Praga and Tatra. The liquids required for the creation of a hardening atmosphere have been developed (vyvinuty). BEZ is at present drawing up the plans for an endothermal generator for hardening gases. Ing. Mautner asked which enterprises are using the new hardening process called "karbonitridation". This method gives the surface a quality which lies between "nitridation" (nitridace) and ordinary hardening. Autopal would like to replace CRK steel by this method. Ing. Vozenilek noted that this procedure can be carried out in the new furnaces of BEZ and has already been used for 25 years in the heat treatment of chain links in Ceska Zbrojovka - Strakonice. Prof. Gronych requested that those interested in cast hardening crucibles send in their orders directly to the laboratory of Tatra, in order that these may be cast within the scope of the research.
13. In connection with the experience of Ceska Zbrojovka with the nitridation of the 2002 material, the following information was offered: the core strength (pevnost v jadre) is approximately 55 Rc. Nitrification takes place in gas at a temperature of 510° C for a period of 25 to 30 hours. Ceska Zbrojovka nitrifies tensile and other utensils on a series basis and with good results. Ing. Mautner drew attention to the fact that nitrification in gas causes the edges (ostri) to be too fragile and unable to resist shocks. Nitrification in baths is combined; in this case the edges resist shocks. Longer tests must, however, be made with the tools according to their kinds before the degree of success or failure can be expressed in figures. For instance, a normal screw tap (zavitnik) lasted about 6 hours. A nitrified (nitrovany) screw tap, used on the same kind of work, lasted 56 hours. In cases of exaggerated nitrification (30 minutes) the result was unfavorable and the edges broke off. Ing. Vozenilek pointed out that Ceska Zbrojovka nitridates mostly small press and cutting (rezne) instruments of 2002 steel for the manufacture of chains and not tools for (brobeni triskou), with the exception of the broach (protahovací trn) of 2002 steel. The cutting instruments have to be cyanided (kvanidovany) in salt baths. Auto-Praga, National Corporation, will carry out tests in this respect and is procuring furnaces to this end.
14. Gronych claimed that Tatra is getting CLK steel instead of CRK steel, and that the CLK steel is still marked with the numerical index CLK 1, CLK 2 and CLK 3. He asked the representative of the foundries for an explanation of the difference. Ing. Jandacek replied that the difference between CRK and CLK material lies only in the fact that the first kind is more closely watched during manufacture; otherwise, the composition of both is the same. He does not know anything about the additional index number 1, 2 and 3, since there was only one kind of this material in the foundries.

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15. Ing. Vozenilek pointed out the shortage of heating wire (topne draty) for furnaces. Heating wire had been supplied [redacted] At present it is not being manufactured by either Kovonute or the United Steel Mills. He recommends asking the Ministry of Heavy Industry and the State Planning Office who is to manufacture this wire. This action would certainly be of interest to the Czechoslovak Enterprises of Heavy Machinery and the CZPS. Ing. Jandacek stated that the United Steel Mills in Chomutov are manufacturing heating wire of AKC material and Autoxyd. 25X1
16. Ing. Jandacek remarked that in Zbrojovka-Lisen (P50/N10) they have a liquid by means of which the degrees of heat reached by cutting (vyhrati soucasti brousenim) can be immediately ascertained. It is very useful for control. This control enables the use of harder kinds of discs until the material gets heated.

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[redacted] Comment: Barium carbonate is also used for the protection of sugar-beets and the quantities required here are also large.

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