ICS 13.100
C 52

中华人民共和国国家职业卫生标准

GBZ 2.1—2019

1

Occupational exposure limits for hazardous agents in the workplace

— Part 1: Chemical hazardous agents

2019 - 8 - 27 2020 - 4 - 1

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GBZ

GB/T

GBZ

A A OELs

GBZ

GBZ/T GBZ/T GBZ/T GBZ/T GBZ/T GBZ/T

CAS

PC-TWA

TWA

B

A

A

GBZ

GBZ

1

1

2

GBZ
GBZ
GBZ/T
GBZ/T
GBZ/T
GBZ/T
GBZ/T
GBZ/T
GBZ/T

3

GBZ/T

3.1

chemical hazardous agents

3.2

occupational exposure

3.3

adverse health effects

3.4

critical adverse health effects

3.5

occupational exposure limits OELs

3.5.1

permissible concentration-time weighted average PC-TWA

h h

3.5.2

permissible concentration-short term exposure limit PC-STEL

h h min

3.5.3

maximum allowable concentration MAC

3.6 .

peak exposures PE

min

PC-TWA PC-STEL PC-TWA

min PC-TWA

3.7

exposure level

3.8

ratio of occupational exposure level to OELs

ratio of mixed exposure

3.9

action level

administration level

administration concentration

3.10

biological monitoring

3.11

biological exposure limit BEL

d h

Biological Exposure Indices BEIs

biological limit values BLVs

4

4.1

1

			CAS	OELs mg/m^3				
				MAC	**PC-TWA**	**PC-STEL**		
1		Antu						—
2		Ammonia						—
3	-	-Aminopyridine						
4		Ammonium sulfamate						—
5		Cyanamide						—
6		Octogen						—
7		Crotonaldehyde						—
8		Paraquat						—
9		Chlorothalonil						G B
10	Ba	Barium and soluble compounds, as Ba						—
11		Fenthion						
12		Benzene						G
13		Aniline						
14		Phenyl ether						—
15		Benzoquinone						—
16		EPN						
17		Styrene						G B

1

			CAS	OELs mg/m^3				
				MAC	PC-TWA	PC-STEL		
18		Pyridine						—
19		Benzyl chloride						G A
20		Propionic acid						—
21		Acetone						—
22	CN	Acetone cyanohydrin, as CN					/	
23		Allyl alcohol						
24		Acrylonitrile						G B
25		allethrin						—
26		Acrolein						
27		Acrylic acid						
28		Methyl acrylate						
29		*n*-Butyl acrylate						
30		Acrylamide						G A
31		Glyphosate						G A
32		Oxalic acid						—
33	~	Raffinate oil(~)						—
34		Diazomethane						—

			CAS	OELs mg/m^3				
				MAC	PC-TWA	PC-STEL		
35		Ozone						—
36	o,o- -S-( )	o,o-dimethyl methylcarbamoylmethyl phosphorodithioate (Rogor)						
37	O,O- -(- - -) ( )	(-trichloro-1-hydroxyethyl)dimethylphosphonate (Trichlorfon,Metrifonate or Dipterex)						—
38	N-3,4- -N`,N`- ( )	1,1-Dimethyl-3-(3,4-Dichlorophenyl)urea(Diuron)						—
39	- -	-Dicholrophenoxyacetic acid -D						G B
40	(DDT)	Dichlorodiphenyltrichloroethane(DDT)						G A
41	Te	Tellurium and Compounds (except H_2Te), as Te						—
42	Bi_2Te_3	Bismuth telluride, as Bi_2Te_3						—
43		Iodine						—
44		Iodoform						—
45		Methyl iodide						
46		Hydrazoic acid vapor						—

			CAS	OELs mg/m^3				
				MAC	PC-TWA	PC-STEL		
47		Sodium azide						—
48	-	-Butadiene						G
49	-	-butoxyethanol						—
50		Butylene						—
51		Chlorpyrifos						
52		Terephthalic acid						—
53		*p*-Dichlorobenzene						G B
54		Parathion						G B
55		*p*-Tert-butyltoluene						—
56		*p* –Nitroaniline						
57		*p*-Nitrochlorobenzene						
58		Polymetyhlene polyphenyl isocyanate (PMPPI)						
59		Diphenylamine						—
60		Diphenylmethane diisocyanate						
61	-	Dipropylene glycol monomethyl ether [-Methoxymethylethoxy]propano DPGMEl						

1

			CAS	OELs mg/m^3				
				MAC	PC-TWA	PC-STEL		
62		Diacetone alcohol						—
63	-N-	-N-Dibutylaminoethanol						
64		-Dioxane						G B
65		Polychlorinated dibenzo-*p*-dioxins and polychlorinated dibenzofurans						G
66		Chlorodifluoromethane					-N-	

1

			CAS	OELs mg/m^3				
				MAC	PC-TWA	PC-STEL		
77		Carbon disulfide						
78	- -1-	1,1-Dichloro-1-nitroethane						—
79	-	1,3-Dichloropropanol						G B
80	-	-Dichloropropane						G
81	-	-Dichloropropene						G B
82		Dichlorodifluoromethane						—
83		Dichloromethane						G A
84		Dichloroacetylene						—
85	-	-Dichloroethane						G B
86	-	-Dichloroethylene all isomers						—
87		Diborane						—
88		Diglycidyl ether						—
89	( )	Dinitrobenzene(all isomers)						

1

			CAS	OELs mg/m^3				
				MAC	PC-TWA	PC-STEL		
90		Dinitrotoluene						G B - -
91	-	-Dinitro-o-cresol						
92	-	-Dinitrochlorobenzene						
93		Nitrogen oxides(Nitric oxide, Nitrogen dioxide)						—
94		Sulfur dioxide						—
95		Chlorine dioxide						—
96		Carbon dioxide						—
97	Sn	Tin dioxide,as Sn						—
98	-	-Diethylaminoethanol						
99		Diethylene triamine						
100		Diethyl ketone						—
101		Divinyl benzene						—
102		Diisobutyl ketone						—
103	TDI	Toluene-2,4 –diisocyanate ; Toluene-2,6 –diisocyanate TDI						
104		Dibutyltin dilaurate						
105	V	Vanadium and compounds,as V					—	—
		Vanadium pentoxide fume dust						G B
		Ferrovanadium alloy dust						—

			CAS	OELs mg/m^3				
				MAC	PC-TWA	PC-STEL		
106		Phenol						
107		Furan						G B
108	F	Hydrogen fluoride, as F						—
109	( )(F)	Fluorides and compounds(except HF) , as F						—
110	Zr	Zirconium and compounds, as Zr						—
111	Cd	Cadmium and compounds, as Cd						G
112	-	Mercury metal vapor						
113	- Hg	Mercury organic compounds, as Hg						G B
114	Co	Cobalt and compounds, as Co						G B
115		Benzoyl peroxide						—
116		Methyl ethyl ketone peroxide (MEKP)						
117		Hydrogen peroxide						—
118		Cyclohexylamine						—
119		Cyclohexanol						
120		Cyclohexanone						
121		Cyclohexane						—

1

			CAS	OELs mg/m^3				
				MAC	PC-TWA	PC-STEL		
122		Cyclonite (RDX)						
123		Propylene oxide						G B
124		Epichlorohydrin						G A
125		Ethylene oxide						G
126		Yellow phosphorus						—
127	- -	o-Anisidine *p*-Anisidine						G B o-
128		Hexylene glycol						—
129	-	-Diisocyantohexane -Hexamethylene diisocyanate						
130		Caprolactam						—
131	-	-Hexanone Methyl n-butyl ketone						
132		Monomethylamine						—
133		Thimet						
134		Toluene						
135	N- O-	*N*-Methyl aniline *o* -Toluidine						G *o* -

1

			CAS	OELs mg/m^3				
				MAC	PC-TWA	PC-STEL		
136		Methanol						
137		Cresol(all isomers)						
138		Methylacrylonitrile						
139		Methacrylic acid						—
140		Methyl methacrylate						
141		Glycidyl methacrylate						—
142		Methyl hydrazine						
143		Methyl demeton						
144	18-	18-Methyl norgestrel						—
145		Methyl tert-butyl ether MTBE						—
146		Methyl mercaptan						—
147		Formaldehyde						G
148		Formic acid						—
149	-	Methyl ethyl ketone -Butanone						—
150	-	-Methoxyethanol						
151	-	-Methoxyethyl acetate						

1

			CAS	OELs mg/m^3				
				MAC	PC-TWA	PC-STEL		
152		Methoxychlor						—
153		Resorcinol						—
154	( )	Coke oven emissions, as benzene soluble matter						G
155		Hydrazine						G A
156		Monocrotophos						
157		Furfuryl alcohol						
158		Furfural						
159		Cortisone						—
160	-	Picric acid -Trinitrophenol						—
161		Decaborane						
162		Biphenyl						—
163		Dibutyl phthalate						—
164		Phthalic anhydride						
165		*o*-Dichlorobenzene						—
166		*o*-Chlorostyrene						—
167		*o*-Chlorobenzylidene malononitrile						
168		*o*-sec-Butylphenol						

1								
			CAS	OELs mg/m^3				
				MAC	PC-TWA	PC-STEL		
169		Phosphamidon						

1

			CAS	OELs mg/m^3				
				MAC	PC-TWA	PC-STEL		
184		Hexachlorocyclopentadiene						—
185		Hexachloronaphthalene						
186		Hexachloroethane						G B
187		Chlorine						—
188		Chlorobenzene						—
189		Chloroacetone						
190		Allyl chloride						—
191	β-	β-Chloroprene						G B
192		Ammonium chloride fume						—
193		Mercuric chloride						—
194		Chloropicrin						—
195		Hydrogen chloride and chlorhydric acid						—
196		Cyanogen chloride						—
197		Zinc chloride fume						—
198		Chloromethyl methyl ether						G
199		Methyl chloride						
200	%	Chlorodiphenyl (%Cl)						G A
201		Chloronaphthalene						

1

			CAS	OELs mg/m^3				
				MAC	PC-TWA	PC-STEL		
202		Ethylene chlorohydrin						
203		Chloroacetaldehyde						—
204		Chloroacetic acid						
205		Vinyl chloride						G
206	α-	α-Chloroacetophenone						—
207		Chloroacetyl chloride						
208		Malathion						G A
209		Maleic anhydride						
210		Morpholine						
211		Coal tar pitch volatiles, as Benzene soluble matters						G
212	MnO_2	Manganese and inorganic compounds, as MnO_2						—

1

			CAS	OELs mg/m^3				
				MAC	PC-TWA	PC-STEL		
	Mo	Molybdenum and compounds, as Mo	Mo				—	—
213		Molybdenum and insoluble compounds					—	—
		Molybdenum and soluble compounds						—
214		Demeton						
215		Naphthalene						G B
216	-	-Naphthol						—
217		Decalin						—
218		Urea					**	—
	(Ni)	Nickel and inorganic compounds, as Ni						G Sen
219		Nickel metal and insoluble compounds	Ni					G B
		Soluble nickel compounds					—	—
220	Be	Beryllium and compounds, as Be	Be					G

1

			CAS	OELs mg/m^3				
				MAC	PC-TWA	PC-STEL		
221		Unsymmetric dimethylhydrazine						G B
222	Pb	Lead and inorganic Compounds, as Pb	Pb					G B G A
		Lead dust						
		Lead fume						
223		Lithium hydride						—
224		Hydroquinone						—
225		Potassium hydroxide						—
226		Sodium hydroxide						—
227		Cesium hydroxide						—
228		Calcium cyanamide						—
229	CN	Hydrogen cyanide,as CN						
230	CN	Cyanides, as CN						
231		Fenvalerate						

			CAS	OELs mg/m^3				
				MAC	PC-TWA	PC-STEL		
248		Trichloroethylene						G
249		Trinitrotoluene						
250		Tribromomethane						
251	Cr	Chromium trioxide chromate dichromate, as Cr	Cr					G
252		Triethyltin chloride						
253		Sumithion						
254	- - - -	3-(A-acetonylbenzyl)4-hydroxycoumarin(Warfarin)						—
255		Arsine						G
256	As	Arsenic and inorganic compounds, as As	As					G
257		Paraffin wax fume						—
258		Decabromodiphenyl ether					—	—

			CAS	OELs mg/m^3				
				MAC	PC-TWA	PC-STEL		
259	( )	Asphalt (petroleum) fume, as benzene soluble matter						G B
260		Bis(marcaptoacetate) dioctyltin						—
261	A	Bisphenol A(BPA)						—
262		Disulfiram						—
263		Bis(chloromethyl) ether						G
264		Carbon tetrachloride						G B
265		Tetrachloroet hylene						G A
266		Tetrahydrofuran						—
267		Silicon tetrahydride						—
268		Germanium tetrahydride						—
269		Carbon tetrabromide						—
270	Pb	Tetraethyl lead, as Pb						
271		Turpentine						—
272	Tl	Thallium and soluble compounds, as Tl	Tl					
273	Ta	Tantalum and oxide,as Ta	Ta					—
274		Sodium carbonate						—

1

			CAS	OELs mg/m^3				
				MAC	PC-TWA	PC-STEL		
275		Carbonyl chloride Phosgene						—

276

			CAS	OELs mg/m^3				
				MAC	PC-TWA	PC-STEL		
289	Se	Selenium and compounds, as Se (except hexafluoride, hydrogen selenide)	Se					—
290		Cellulose						—
291		Nitroglycerine						
292		Nitrobenzene						G B
293	1-	-Nitropropane						—
294	2-	-Nitropropane						G B
295		Nitrotoluene (all isomers)						G A
296		Nitromethane						G B
297		Nitroethane						G B
298		Octane						—
299		Bromine						—
300		Hydrogen bromide						—
301	-	-Bromopropane 1-BP					/	G B
302		Methyl bromide						
303		Deltamethrin						—

			CAS	OELs mg/m^3				
				MAC	PC-TWA	PC-STEL		
304		Brodifacoum						—
305		Calcium oxide						—
306		Magnesium oxide fume						—
307		Zinc oxide						—
308		Omethoate					**	
309		Liquified petroleum gas(L.P.G.)						—
310		Carbon monoxide						—
		not in high altitude area						—
		In high altitude area						—
	m~ m	m~ m						—
	m	m						—
311		Ethylamine						
312		Ethyl benzene						G B
313		Ethanolamine						—
314		Ethylenediamine						
315		Ethylene glycol						—
316		Ethylene glycol dinitrate						
317		Acetic anhydride						—

			CAS	OELs mg/m^3				
				MAC	PC-TWA	PC-STEL		
318	N-	N-Ethylmorpholine						
319		Ethyl amyl ketone						—
320		Acetonitrile						
321		Ethyl mercaptan						—
322		Ethyl ether						—
323		Acetaldehyde						G B
324		Acetic acid						—
325		Propyl acetate						—
326		Butyl acetate						—
327		Methyl acetate						—
328		Amyl acetate (all isomers)						—
329		Vinyl acetate						G B
330		Ethyl acetate						—
331		Ketene						—
332		Acephate						
333		Acetylsalicylic acid(aspirin)						—
334	-	-Ethoxyethanol					/	

1

			CAS	OELs mg/m^3				
				MAC	PC-TWA	PC-STEL		

1

			CAS	OELs mg/m^3				
				MAC	PC-TWA	PC-STEL		
354		*n*-Heptane						—
355		*n*-Hexane						
356		Dimethyl sulfoxide						
357		*p*-phenylene diamine						
358		Trimethyltin chloride						

G G A G B A A. A. A.

TEQ Toxic Equivalent Quantity -TCDD

4.2

2

			CAS	PC-TWA mg/m^3			
1		Dolomite dust					—
2		Fiberglass reinforced plastic dust					—
3		Tea dust					—
4	SiO_2	Precipitated silica dust					—
5		Marble dust					—
6		Welding fume					G B
7		Titanium dioxide dust					G B
8		Zeolite dust					G
9		Phenolic aldehyde resin dust					—
10		Industrial enzyme-containing dust					
11		Grain dust(free SiO_2 %)					
12		Wollastonite dust				—	—
13	SiO_2 %	Diatomite dust(free SiO_2 %)					—
14		Ammonium Perchlorate					—
15	SiO_2 %	Talc dust (free SiO_2 %)					—
16		Active carbon dust					—
17		Polypropylene dust				—	—
18		Polyacrylonitrile fiber dust					—

CAS

			CAS	PC-TWA mg/m^3			
33		Limestone dust					—
34	10%	Asbestos Asbestos 10% dust Asbestos fibre		f/m^3			G
35		Graphite dust					—
36	SiO_2 < %	Cement dust (free SiO_2< %)					—
37		Carbon black dust					G B
38		Silicon carbide dust					—
39		Carbon fiber dust					—
40	% SiO_2 % % SiO_2 % SiO_2 %	Silica dust % free SiO_2 % % free SiO_2 % free SiO_2 80 %					G
41	SiO_2 < %	Rare – earth dust (free SiO_2< %)					—
42		Detergent mixed dust					
43		Tobacco dust					—
44		Fluorspar mixed dust					—
45		Mica dust					—
46		Perlite dust					—
47		Vermiculite dust					—
48		Barite dust					—

2

			CAS	PC-TWA mg/m^3			
49	[a]	Particles not otherwise regulated				—	—
a	SiO_2 %					SiO_2 %	

4.3

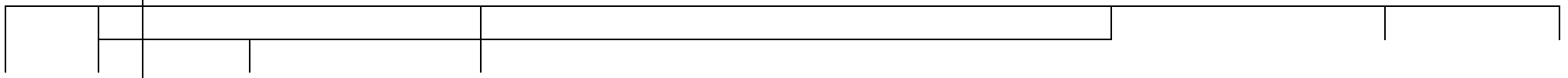
3

			CAS	OELs				
				MAC	PC-TWA	PC-STEL		
1		Beauveria bassiana	—	/m^3	—	—	—	—
2		Subtilisins		—	ng/m^3	ng/m^3	—	
3		Industrial enzyme	—	—	μg/m^3	μg/m^3		

4.4

4

1.		Benzene		S-phenylmercapturic acid in urine S-PMA	μmol/mol Cr μg/g Cr	
			-	t,t-muconic acid tt-MA in Urine	mmol/mol Cr mg/g Cr	
2.		Styrene		Mandelic acid plus phenylglyoxylic acid in urine	mmol/mol Cr mg/g Cr	
					mol/mol Cr mg/g Cr	
3.		Acetone		Acetone in urine	mg/L	
4.		Glyphosate		Glyphosate in urine	mg/L	
5.	1,3-	-Butadiene	- - - N-	-bis-hydroxy - - (N- acetylcysteine) butane DHBMA in urine	mg/g Cr	
6.		Xylene		Methylhippuric acids in urine	g/g Cr g/L	
7.	N,N-	N,N-Dimethylformamide	N- NMHb	N- methylcarbyl hemoglobin adduct	nmol/g Hb	
8.	N,N-	N,N-Dimethylacetamide	N-	N-Methylacetamide in urine	mg/g Cr	
9.		Dichloromethane		Dichloromethane in urine	mg/L	
10.		Carbon disulfide	- -4-	-Thiothiazolidine-4-carboxylic acid (TTCA) in urine	mmol/ mol Cr mg/g Cr	
11.		Phenol		Total phen TD0.0002 28 796.25 31.i32 Tw69 1 Tf14.7867 0 TD0 Tc0 Tw0 Tw<001300110016>Tj/TT2 1 Tf41 0 TD-0.00		



14.		Mercury and inorganic compounds		Total inorganic mercury in urine	μmol/mol Cr μg/g Cr	
15.		Toluene		Hippuric acid in urine	mmol/mol Cr g/g Cr mmol/L g/L	
				Toluene in End-Exhaled Air	mg/m^3	min min
					mg/m^3	
16.		toluene diisocyanate TDI		Toluenediamine(-TDA) in urine	μmol/mol Cr	
17.		Soluble Chromate		Total Chromium in urine	μmol/mol Cr μg/g Cr	
18.		Lead and compounds		Lead in blood	μmol/L μg/L	
19.		Trichloroethylene		Trichloroacetic acid in urine	mmol/L mg/L	

20.

26.		Ethyl benzene		Mandelic acid and phenylglyoxylic acid MA and PGA in urine	g/g Cr	
27.		Organophosphate insecticides		cholinesterase activity of Whole blood (correction value)	%	
					%	
28.		n-Hexane	-	-Hexanedione in urine	μmol/L mg/L	
Cr Creatinine						

5

5.1 GBZ

5.2 GBZ/T GBZ/T

5.3

5.4 BELs
GBZ/T

6

6.1

6.1.1 GBZ

6.1.2

6.1.3

6.1.4

6.1.5

6.1.6

6.2

6.2.1

6.2.2

6.2.3

6.2.4

6.2.5

6.2.6

6.3

6.3.1 MAC
maximum exposure concentration CME MAC

6.3.2 PC-TWA PC-STEL
exposure concentration of time weighted average C_{TWA} PC-TWA

exposure concentration of short term C_{STE}

PC-STEL

6.3.3 PC-TWA PC-STEL C_{TWA}

PC-TWA PC-TWA

min h PC-TWA

6.3.4 OELs

OELs

6.4

GBZ/T 225

6.5

6.5.1

5

0 1% OEL		
1% 10% OEL		SDS
10% 50% OEL		
50% OEL		
OEL	OELs	

6.5.2 GBZ/T

7

A

A

A.1

A.1.1

A.1.2

A.1.3

A.2

A.2.1 PC-TWA PC-STEL
MAC

A.2.2 PC-TWA

C_{TWA}

A.2.2.1 C_{TWA}

A.2.2.2 C_{TWA}

C_{TWA}

C_{TWA} A.1

$$C_{TWA} = \frac{C_1T_1 + C_2T_2 + ... + C_nT_n}{8}$$

C_{TWA} —— h mg/m^3

—— h h h

h

C_1 C_2……C_n——T_1 T_2……T_n

T_1 T_2……T_n——C_1 C_2……C_n

1

PC-TWA mg/m

C_{TWA} mg/m^3× h+ mg/m^3× h+ mg/m^3× h+ mg/m^3× h / mg/m^3 mg/m^3
PC-TWA

A.2.3 TWA PC-TWA

PC-STEL

A.2.3.1 PC-STEL

-

A.2.3.2 PC-STEL PC-TWA
PC-TWA PC-STEL
PC-TWA PC-STEL C_{TWA} C_{STE}
PC-STEL PC-TWA PC-STEL min
min
C_{TWA} PC-TWA PC-STEL

A.2.3.3 PC-STEL

A.2.4 ,
PC-TWA PC-STEL
PC-TWA

A.2.4.1 PC-STEL min PC-TWA PC-STEL C_{TWA} PC-TWA
PC-TWA

A.2.4.2

A.2.4.3 PC-STEL MAC

A.2.4.4 B.2.2.3

A.2.5 MAC

A.2.5.1 MAC
MAC PC-TWA PC-STEL
MAC

A.2.5.2 MAC

A.2.6 mg/m^3 ppm A

$$C = \frac{\text{ppm} \times MW}{24.05}$$

C ——
ppm ——
MW ——
—— KPa mol

A.3

A.3.1 OELs OEL
s

A.3.2
OELs

A.3.2.1
A OELs

$$\frac{C_1}{PC-TWA_1} \quad 1;\frac{C_2}{PC-TWA_2} \quad 1;\frac{C_n}{PC-TWA_n} \quad 1$$

C_1 C_2 ……C_n ——
PC-TWA$_1$ *PC-TWA*$_2$ ……*PC-TWA*$_n$——

A.3.2.2
A.

A.4.1 OELs

PC-TWA

A.4.2 OELs

A.4.3

A.5

A.5.1

PC-TWA P
C-TWA

A.5.2

A.5.3

A.5.4

A.6

A.6.1 IARC G G A G B
IARC
G G A G
B G G IARC
G G A G B

A.6.2

A.7

A.7.1 OELs 8 h 40 h

A.7.2 h h h h h TWA
h MAC PC-STEL

A.7.3 h h

PC-TWA
Brief Scala OEL= Reduction Factor RF
RF

A.7.3.1 h A

$$RF = \frac{8}{\mathrm{h}} \times \frac{24-\mathrm{h}}{16}$$

h—— h

A.7.3.2 d h A

$$RF = \frac{40}{\mathrm{h}} \times \frac{168-\mathrm{h}}{128}$$

h—— h

A.7.4 PC-TWA MAC PC-STE
L h

A.8

A.8.1

A.8.1.1
/

A.8.1.2 BELs

A.8.2 BELs BELs

A.8.2.1 BELs OELs BELs

A.8.2.2 BELs toxicokinetic toxicodynamic
BELs

A.8.2.3 BELs

BEL BEL

A.8.2.4
BEL

A.9 OELs

A.9.1 A.8.1¾ Ž (2T9 1 Tf 2.28 0

BEL

A.9.2.5

A.9.3

B

B.1

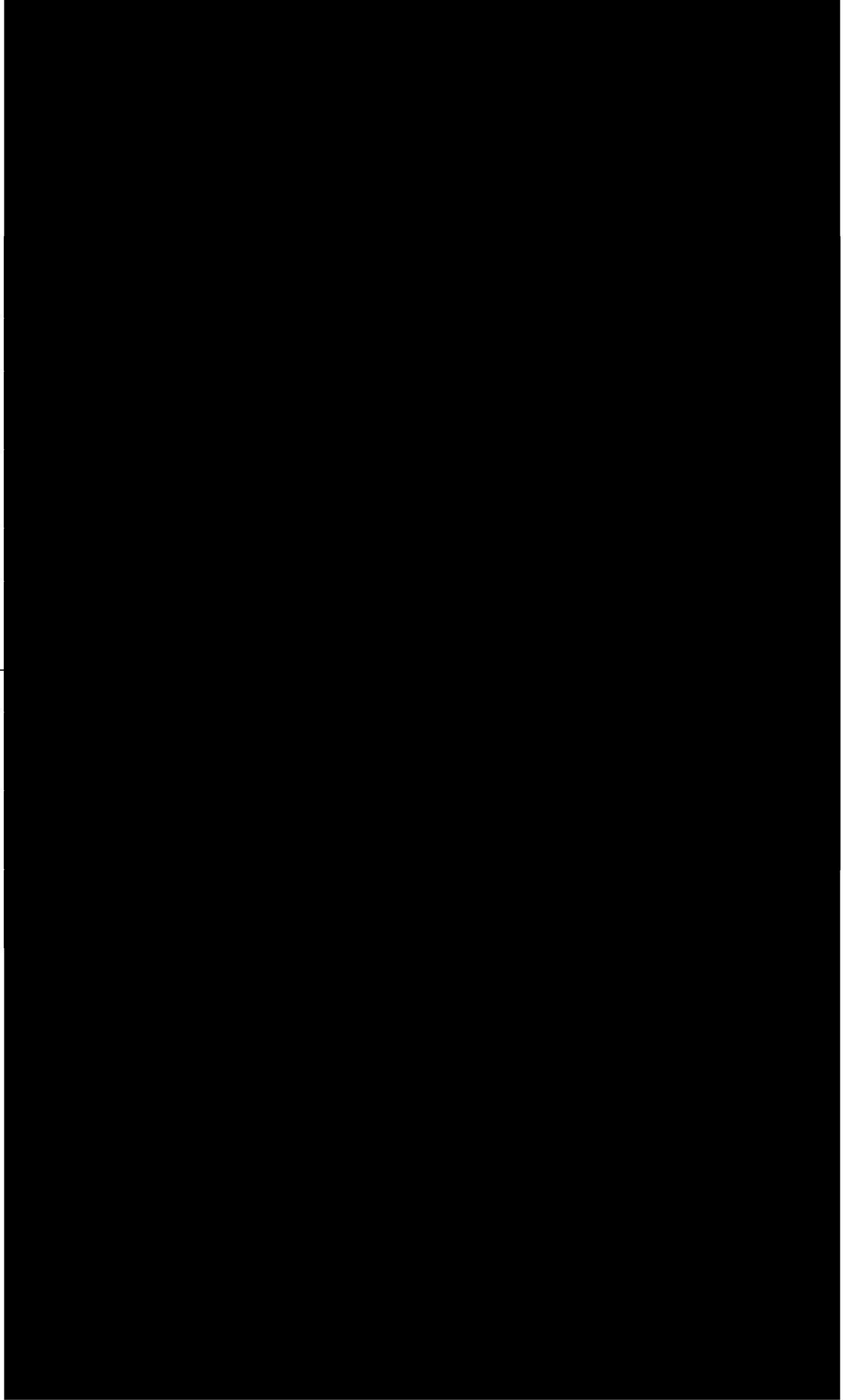
GBZ GBZ

B.2

B.1

B.1

B.3 WS/T



B.4 B

B.3

		N NMHb		
		N DHBMA		

B.3