Fatal and non-fatal accidents in tunnel construction work in Japan in 1999-2022

tunnel construction work industry Code No.030102

Type of accidents in tunnel construction work in 1999-2022

Type of accidents	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	total
fall from height	24	18	30	20	14	22	21	15	22	20	13	8	6	12	10	10	5	10	10	7	13	9	9	10	338
falling to same level	6	7	12	9	7	2	4	8	5	5	7	3	4	4	4	4	8	4	6	6	9	7	3	4	138
crash	3	8	7	9	3	4	3	8	3	5	3		4	2	1	3	3	9	5	4	3		2	3	95
struck by flying or falling object	32	24	26	25	14	13	25	22	9	15	12	14	9	14	9	3	13	13	13	12	10	14	7	14	362
collapse	17	17	11	18	10	6	8	10	7	7	10	5	4	8	4	8	7	11	9	8	4	2	9	7	207
crashed by	12	20	16	6	14	6	14	6	7	12	7	5	10	8	7	6	6	5	3	7	7	7	10	6	207
caught in/between	34	32	27	17	22	20	16	17	25	19	18	12	13	12	18	9	22	12	12	15	16	23	10	18	439
cut	2	3	2	2	4	4	3	3	1	1	2	2	1	1	1	2	1	1	4			1			41
injury to the sole of the foot			2										1				1								4
drown																					1		1		2
contact to high/low-	1	2	1	1	1	1	1		3	2		2	1	4	1			1	1	2	2			2	29

temperature																									
contact to harmful substance	1	7	6	8	1	6	5		2	3	1	2	1	1				1	2		6	2	2	1	58
electric shock												2													2
explosion		2								4				4											10
burst	1					2		1			1										1		1		7
fire		1	1		1			1																1	5
traffic accident (public road)	3	4	4	12	15	3	8	3	1	1	3	6	3	1	2	1		3		4		1	3	2	83
traffic accident (others)							1																		1
reaction to motion/improper motion	4	5	4	3	2	2	4	2	1	1	2	2	4	1	2	1		2	3	3	5	4	2		59
others		1				1	1	22				1				1	1	2	11		2	16	27		86
unclassifiable	1				1				1								1								4
total	141	151	149	130	109	92	114	118	87	95	79	64	61	72	59	48	68	74	79	68	79	86	86	68	2,177

Causal agents (large) of fatal and non-fatal accidents in tunnel construction work in 1999-2022

Causal (L) agents	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	total
machine	40	52	41	22	31	27	22	19	20	22	16	13	17	14	14	13	13	21	18	15	12	18	9	19	508

crane, conveying machine	27	26	22	25	23	19	25	20	13	16	18	13	13	11	15	7	18	11	8	16	7	15	18	10	396
other equipment	11	11	11	16	12	4	15	13	9	9	7	9	2	6	3	4	3	9	9	8	8	7	9	8	203
temporary buildings, establishments	18	20	37	26	13	16	17	20	17	18	14	10	13	20	13	10	14	8	13	6	17	14	10	14	378
substance, material	16	14	17	15	12	15	20	11	9	15	7	7	7	10	5	7	7	4	6	8	17	8	7	8	252
load	1	4	3				2	1	5		1		1	1			2	2		2	2		1	1	29
environment	27	22	18	24	15	10	13	33	11	14	14	11	7	9	8	7	9	15	14	12	10	8	5	8	324
others	1	2		2	3	1		1	3	1	2	1	1	1	1		2	4	11	1	6	16	27		87
total	141	151	149	130	109	92	114	118	87	95	79	64	61	72	59	48	68	74	79	68	79	86	86	68	2,177

Causal agents (middle) of fatal and non-fatal accidents in tunnel construction work in 1999-2022

Causal (M) agents	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	total
engine												1												1	2
power transmission mechanism							1					1													2
woodworking machine	1	1	1	1	2	4	2	1	1	1			1	1	1			2	2						22

construction machine	32	44	35	19	29	21	18	17	14	18	13	10	14	10	12	11	12	19	13	15	10	17	9	15	427
metal manufacturing machine	1	1									2		2						1		1	1			9
general machine	6	6	5	2		2	1	1	5	3	1	1		3	1	2	1		1		1			3	45
mobile silviculture machine																			1						1
crane	5	7	9	3	5	6	5	8	3	5	1	2	3	2	4	1	6	3	3	2	3	3	5	2	96
conveying machine	21	17	9	18	11	10	12	9	9	9	17	6	9	9	10	4	12	5	5	10	4	11	10	6	243
vehicle	1	2	4	4	7	3	8	3	1	2		5	1		1	2		3		4		1	3	2	57
pressure vessel	1				1							1											1		4
chemical facilities																									
welding equipment	1	1			1	1																			4
kiln, caldron																									
electric equipment								1	1			2											1	2	7
human power machine, tools	6		1	7	2		3	2	3	4	3	2	2	1	1	1	1	1	2	2	2	2	2	3	53
tools	2	7	5	5	7	2	8	7	4	5	4	3		5	2		1	6	3	4	5	3	3	3	94
other equipments,																									

facilities	1	3	5	4	1	1	4	3	1			1				3	1	2	4	2	1	2	2		41
temporary buildings, establishments	18	20	37	26	13	16	17	20	17	18	14	10	13	20	13	10	14	8	13	6	17	14	10	14	378
hazards, harmful substances		3	4	7	1	6	5	1	2	6	1	2		7				1			2	2	3	1	54
materials	16	11	13	8	11	9	15	10	7	9	6	5	7	3	5	7	7	3	6	8	15	6	4	7	198
load	1	4	3				2	1	5		1		1	1			2	2		2	2		1	1	29
natural environment	27	22	18	24	15	10	13	33	11	14	14	11	7	9	8	7	9	15	14	12	10	8	5	8	324
other causal agent	1							1			1	1						2	9		2	15	27		59
no causal agent		2		1	2	1			2	1	1		1	1			2	2		1	4	1			22
unclassifiable				1	1				1						1				2						6
total	141	151	149	130	109	92	114	118	87	95	79	64	61	72	59	48	68	74	79	68	79	86	86	68	2,177

Causal agents (small) of fatal and non-fatal accidents in tunnel construction work in 1999-2022

Causal (S) agents	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	total
engine												1												1	2
power transmission mechanism							1					1													2

circular sawing machine			1		2		2	1	1	1					1			2	2						13
band sawing machine																									
wood planer machine														1											1
hollow chisel mortiser, wood borer																									
chamfering machine, router, woodworking milling machine																									
chain saw																									
other woodworking machines													1												1
leveling, transporting or loading machine					3		1	1	2	1	1	1		1		1	2	5		1		1		1	22
excavating machine			12		4		6	5	1	6	2		3	3	5	4	6		2	5	3	1	2	1	71
foundation work machine					3				1								1			1		2	1	1	10
hardening machine													2					1							3

demolition machine			3		2		1		2	1		3			1		1	1	1	1	2		1	3	23
vehicle for high lift work			1		2		1	3	1	1	3				2			1	1	1	2	3	1	1	24
other construction machines			19		15		9	8	7	9	7	6	9	6	4	6	2	11	9	6	3	10	4	8	158
lathe																									
drill press, milling machine																									
grinding machine, buffing machine													1						1			1			3
power press																									
forging pressure hammer																									
shearing machine																									
other metal manufacturing machines											2		1								1				4
centrifugal machine																									
mixer, grinder			3				1		4	1		1		1					1					3	15
roll machine (except printingroll machine)																1									1

injection molding machine																									
food manufacturing machine																									
printing machine																									
industrial robot																									
other general power machines			2					1	1	2	1			2	1	1	1				1				13
felling machine																			1						1
mobile logging machine																									
skyline yarding machine																									
other mobile silviculture machine																									
crane			1		2		2	2	1		1	1			1		1	1	2			1	3		19
mobile crane			7		2		2	6	2	4		1	2	2	3	1	5	1	1	2	2	2	2	2	49
derrick crane																									
elevator, lift																		1							1
cargo lifting appliance																									
gondola																									

lumberyard equipment, logging cableway																									
simple skyline yarding equipment																									
other powered crane			1		1		1			1			1								1				6
truck			4		8		6	5	6	4	13	5	7	7	7	4	7	3	3	6	2	5	5	3	110
forklift																							1		1
railway equipment			2				2	3	2	3	2		1	1	2		5		1	2	2	2	3	1	34
conveyor					3		4				1	1						2	1	1		2		1	16
loader																						1			1
straddle carrier																									
rough terrain hauler										1												1	1		3
other powered conveying machines			3					1	1	1	1		1	1	1					1				1	12
cars, bus, motorcycle			4		7		8	3	1	2		5	1		1	1		3		4		1	3	2	46
railway vehicle																1									1
other vehicles																									
boiler																									

pressure vessel					1							1											1		3
other pressure vessels																									
chemical facilities																									
gas welding equipment																									
arc welding equipment					1																				1
other welding equipment																									
kiln, caldron																									
industrial dryer																									
other kiln, caldron																									
transmission								1																	1
electric power facilities									1			2												2	5
other electrical equipment																							1		1
human power cranes								2		1		1		1	1				1				1		8
human power hauling equipment					1		1		2	1											1		1		7

human power machine																								1	1
hand tool			1		1		2		1	2	3	1	2			1	1	1	1	2	1	2		2	24
ladder			3		2		3	2	3	2	1	1		2	1			4			4	1	1	1	31
slinging tool					1		3			1	3	1		1			1		1			1		2	15
other tools			2		4		2	5	1	2		1		2	1			2	2	4	1	1	2		32
other equipment, facilities			5		1		4	3	1			1				3	1	2	4	2	1	2	2		32
scaffolding			4		3		2	2	2	4	1	1	5	3		2		2	2		2		1	1	37
timbering			9		2		3	2	2		1		1	6	3		5	1	2	2	1		3	1	44
stairs, landing stage			2					1	2	1	3			2	1		2	1	1				1	1	18
opening			2				2	1	1	1				2		1			2	2	1	1		1	17
roof, beam, haze, crossbeam, principal rafter									1		1														2
working platform, boot board			4		4		2	3	1		2	1	1				2				2	2		1	25
passage			4		1		3	1		4	3	3	3	3		1	2		2	1	4	2	1	4	42
building, establishment			7		3		4	5	5	6	2	3	2	2	6	1	1	2	4	1	4	5	3	2	68
other temporary buildings,			5				1	5	3	2	1	2	1	2	3	5	2	2			3	4	1	3	45

establishments																									
explosive substance					1					2													1		4
inflammable substance														1											1
inflammable gas										2				5										1	8
harmful substance			1				4			1				1				1							8
radiation																									
other hazards, harmful substances			3				1	1	2	1	1	2									2	2	2		17
metal material			9		8		11	5	4	6	2	1	3	2	4	4	4	3	5	7	6	6	3	4	97
lumber, bamboo					1			1	1					1		2	1				2			1	10
stone, sand, substance			1		2		1	2	2		1	2	1			1	1			1	1		1	1	18
other materials			3				3	2		3	3	2	3		1		1		1		6			1	29
load			3				1	1	5		1		1	1				2		2	2			1	20
machine/equipment as load							1										2						1		4
natural ground, rock			17		14		11	11	8	12	13	9	4	6	7	4	8	14	10	9	4	6	5	7	179
standing tree			1						1	1	1					2	1		3		1	1			12
water																					1	1			2
abnormal																									

environment													1			1					1				3
high/cold temperature environment							1		1	1		2		3	1			1		1	1				12
other environments					1		1	22	1				2						1	2	2			1	33
other causal agent								1			1	1						2	9		2	15	27		58
no causal agent					2				2	1	1		1	1			2	2		1	4	1			18
unclassifiable					1				1						1				2						5
total	141	151	149	130	109	92	114	118	87	95	79	64	61	72	59	48	68	74	79	68	79	86	86	68	2,177

Workers age of fatal and non-fatal accidents in tunnel construction work in 1999-2022

Age	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	total
19 years old or less	1	1	2	1	1		1	2		2	1	2	1						1	1	1	1	1	1	21
20-29	20	22	17	17	17	7	18	12	3	7	6	6	5	5	7	3	7	8	8	3	8	12	14	5	237
30-39	28	33	29	20	25	23	35	34	25	27	21	13	16	13	8	18	12	16	8	11	11	10	8	8	452
40-49	35	32	42	41	23	18	27	26	16	16	21	15	16	21	18	9	18	15	26	21	20	24	23	11	534
50-59	42	48	43	42	32	35	27	34	30	32	22	16	19	22	16	13	15	23	20	19	22	16	24	28	640
60 years old or more	15	15	16	9	11	9	6	10	13	11	8	12	4	11	10	5	16	12	16	13	17	23	16	15	293
total	141	151	149	130	109	92	114	118	87	95	79	64	61	72	59	48	68	74	79	68	79	86	86	68	2,177

Workers' number of workplace of fatal and non-fatal accidents in tunnel construction work in 1999-2022

Workers scale	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	total
9 workers or less	27	32	31	28	34	19	18	33	21	20	19	17	14	18	15	10	17	13	24	13	18	26	16	22	505
10-29	70	79	73	63	43	47	57	55	49	53	36	29	22	26	28	24	34	32	32	30	31	35	37	24	1,009
30-49	32	34	28	20	16	20	24	14	13	14	21	13	14	18	8	4	11	15	17	15	12	17	19	12	411
50-99	8	5	11	14	13	4	13	15	2	4	1	1	6	9	6	4	5	11	4	7	12	6	12	5	178
100-299	3	1	5	5	3	2	2	1	2	3	2	4	5	1	2	6	1	1	2	1	5	2	2	4	65
300 workers or more	1		1							1								2		2	1			1	9
total	141	151	149	130	109	92	114	118	87	95	79	64	61	72	59	48	68	74	79	68	79	86	86	68	2,177

Month of fatal and non-fatal accidents in tunnel construction work in 1999-2022

Month	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	total
January	14	6	13	9	10	6	13	10	8	10	15	1	7	7	4	4	7	8	5	4	5	5	10	4	185
February	11	15	10	5	13	8	7	8	10	7	9	6	4	11	7	2	4	9	8	4	3	8	2	5	176
March	10	8	27	20	16	8	8	13	9	9	5	6	7	11	4	6	4	5	12	7	3	9	13	8	228
April	8	15	12	4	4	6	8	6	4	8	7	3	7	6	7	2	3	4	2	4	12	5	4	6	147
May	12	18	7	7	3	8	15	3	7	9	4	5	2	10	8	5	4	5	6	6	6	8	8	8	174
June	9	10	16	13	5	8	8	5	7	13	8	3	5	3	6	5	6	8	8	7	8	5	6	8	180

July	6	11	8	14	7	8	6	10	5	8	5	8	4	3	4	2	9	9	9	8	7	4	3	2	160
August	10	7	7	9	5	8	9	9	11	6	9	4	2	7	3	2	4	6	7	5	5	4	13	2	154
September	20	16	9	21	13	11	18	5	10	7	3	3	7	2	3	2	6	6	3	5	6	4	14	10	204
October	13	14	15	8	13	6	6	8	4	6	3	8	10	2	4	11	5	4	8	4	13	14	7	5	191
November	16	12	18	9	7	10	6	32	5	6	5	8	1	2	6	4	11	3	6	10	4	16	4	4	205
December	12	19	7	11	13	5	10	9	7	6	6	9	5	8	3	3	5	7	5	4	7	4	2	6	173
total	141	151	149	130	109	92	114	118	87	95	79	64	61	72	59	48	68	74	79	68	79	86	86	68	2,177

Prefecture of fatal and non-fatal accidents in tunnel construction work in 1999-2022

Prefecture	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	total
Hokkaido	5	12	7		12		7	30	9	7	8	3	1	2	6	2	4	1	3	6	5	16	12	12	170
Aomori		3			1		2		2	1			1	1				1	1		1		1		15
Iwate	10	5	7				1	3		1	3				1	5	6	8	4	4	5	3	4		70
Miyagi	1	2			1			2	4	1	1	1	1	1	1		1	1						1	19
Akita	2	2					3	3	2	1	1	1	2		1				2					1	21
Yamagata	3	2	2					2			3	2	2	1		1			5	1	1		1	2	28
Fukushima	2	2	3		2			3	3	6		3	1	1		4	4	3	3	2	2		2	1	47
Ibaraki	1				1		1	3	1						2										9
Tochigi	1	1	1				1		2	1	3	1			1		1		1					1	15
Gunma	5		5		1			2	1	1											1				16

Saitama	2		3		1			1			1				3	3	1	3						1	19
Chiba					2		6			1	1			1	1		3		2		1	1	3	1	23
Tokyo	7	3	10		12		21	8	2	9	4	11	14	15	8	6	4	3	1	6	6	7	9	4	170
Kanagawa	10	8	3		2		2	4	4	4	4	3	2		2	2		4	5	8	6	3	6	9	91
Niigata	5	5	3		9		5	3	4	6	1	2	1	2	3	1	3	2		1	1	2	2	2	63
Toyama	7	2	2		2			1		1	1	1	3	1	2	2	1								26
Ishikawa	5	2			2		3		1		1	1	1				1	1	1	2	7	3			31
Fukui		1	7		2		3		1	8	2	3	2	3	3	1	1	5	15	3	7	9	14	4	94
Yamanashi	1	2						1	1	1	1	1	6	4		2	3	6	3	1	1	3		1	38
Nagano	4	3	5		5		2	1	1	3	2				2	1		1	1	6	3	1		2	43
Gifu	4	5	9		2		8	7	2	1		2	1			1	6	2	2	3	2	2	6	1	66
Shizuoka	7	7	18		10		10	4	4	4	3	3		3	2			3	1	2	1	1	1	1	85
Aichi	5	1	1		2		1	2	2	5	1	5	1	5	2	2	7	1	1	1	5	5	3	5	63
Mie	2	3	2		4		3	2	6	2	1	2	4	3	1	1		1		1			1	3	42
Shiga		2	3		2					2	1								1				1	1	13
Kyoto	7	11	8		5		2	2	3	1	1	1	1	5	2	1	1			1	1			1	54
Osaka	5	1	2		2		2	3	3	4	7	1	3	3	1	2	1	2	4	2	3			2	53
Hyogo	5	13	5		1		2	4	2	6	1	1		3		4	2	6	1	1	2	1	1		61
Nara	1	4			3		1				3		1	1				1		1					16
Wakayama	1	1			2		1	3	1	2			1		2	2	1	2			1	14	1		35
Tottori			1							2			1				1	3	2	3	1			1	15

Shimane	1	1	4				2	1	2		3	5	1	1			1		1		1				24
Okayama		4	2		1		1	1	1	2	3		2	6	2					1					26
Hiroshima	1	6	3		2		3	2	3	2	1	2	2		2	1			2		1		2	1	36
Yamaguchi	1	3	2				1	1		1	3							1	1						14
Tokushima	3	1	1				1	2	1		1	1		1				2			3				17
Kagawa											2						1		1			2			6
Ehime			3		3		4	4	2		1					1			3	2		1	4	2	30
Kochi	4	4	3		1			1	3		3			1				2	1		1	1	4		29
Fukuoka	2	8	4				6	2	4	2	1	2				1	2	1		1		2	1	2	41
Saga		1						1			1				1	1	2	1	2	1					11
Nagasaki	5	1	2		2		1		1	1							3	3	5	5	2		5	2	38
Kumamoto	2	4	7		4			5		1			1		1		1		1	1	2	2		2	34
Oita	4	4	3		1			1	2	1	2		1	2	4		1	2	2	1	2	3		1	37
Miyazaki	2	6	3		6		1	2	3	4	1	2	2	2	3		1			1	1	3	1	1	45
Kagoshima	7	5	4		1		4		3			4	2	4		1	3	1	1		1				41
Okinawa	1		1				3	1	1		2						1	1			2	1	1		15
total	141	151	149	130	109	92	114	118	87	95	79	64	61	72	59	48	68	74	79	68	79	86	86	68	2,177

Fatal and non-fatal accidents mean fatal and non-fatal injuries and occupational diseases with work absence of 4 days and more.

Data of 2022 year do not include Covid-19 cases. Data of 2020 & 2021 year include Covid-19 cases. Fatal and non-fatal data are same situation.

Data of 2011 year include fatal and non-fatal accidents caused by Great East Japan Earthquake in 2011.

Data sources: https://anzeninfo.mhlw.go.jp/user/anzen/tok/anst00.html (MHLW, Japan)

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Fatal accidents in tunnel construction work in Japan in 1999-2022

tunnel construction work industry Code No.030102

Type of fatal accidents in tunnel construction work in 1999-2022

Type of accidents	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	total
fall from height	2	1		1	3			3	3				1	1	1	1			3					2	22
falling to same level			1			1																			2
crash						1						1													2
struck by flying or falling object		2	2	2	1		1									1		1				1		2	13
collapse	4	3	2	4	1				1	1	2	1		6	2	1	1	3	1	1	1	1	1		37
crashed by	3	3	3			1		1	1	1			1	1		1								2	18
caught in/between	2	4	1	1	5		1	2	2	3	3	1	1		1		3	2	3	5		5		2	47
cut																									
injury to the sole of the foot																									

drown														2							1		1		4
contact to high/low-temperature																									
contact to harmful substance																									
electric shock																									
explosion										2				2											4
burst																									
fire			1																						1
traffic accident (public road)																							1		1
traffic accident (others)																									
reaction to motion/improper motion																									
others								9																	9
unclassifiable																									
total	11	13	10	8	10	3	2	15	7	7	5	3	3	12	4	4	4	6	7	6	2	7	3	8	160

Causal agents (large) of fatal accidents in tunnel construction work in 1999-2022

Causal (L) agents	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	total
machine	3	4	3	3	4			3	2	3	2		2	2		1	2	3	3	2		2		2	46
crane, conveying machine	3	2	2		2	3	1	1		1	1	2		1			1			3		3	1	2	29
other equipment								1		1				1					1					2	6
temporary buildings, establishments	2	2	3	1	2			1	3				1	6	2	1			2			1		1	28
substance, material					1				1	2				2		1									7
load		1																1							2
environment	3	4	2	4	1		1	9	1		2	1			2	1	1	2	1	1	2	1	2	1	42
others																									
total	11	13	10	8	10	3	2	15	7	7	5	3	3	12	4	4	4	6	7	6	2	7	3	8	160

Causal agents (middle) of fatal accidents in tunnel construction work in 1999-2022

Causal (M) agents	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	total
engine																									
power transmission mechanism																									

woodworking machine																									
construction machine	2	3	3	3	4			3	2	3	2		2	2		1	2	3	1	2		2		2	42
metal manufacturing machine																									
general machine	1	1																	1						3
mobile silviculture machine																			1						1
crane			1		2			1																	4
conveying machine	3	2	1			3	1			1	1	2		1			1			3		3		2	24
vehicle																							1		1
pressure vessel																									
chemical facilities																									
welding equipment																									
kiln, caldron																									
electric equipment																									
human power machine, tools														1					1						2
tools										1														2	3
other equipments,																									

facilities								1																	1
temporary buildings, establishments	2	2	3	1	2			1	3				1	6	2	1			2			1		1	28
hazards, harmful substances										2				2											4
materials					1				1							1									3
load		1																1							2
natural environment	3	4	2	4	1		1	9	1		2	1			2	1	1	2	1	1	2	1	2	1	42
other causal agent																									
no causal agent																									
unclassifiable																									
total	11	13	10	8	10	3	2	15	7	7	5	3	3	12	4	4	4	6	7	6	2	7	3	8	160

Causal agents (small) of fatal accidents in tunnel construction work in 1999-2022

Causal (S) agents	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	total
engine																									
power transmission mechanism																									

circular sawing machine																									
band sawing machine																									
wood planer machine																									
hollow chisel mortiser, wood borer																									
chamfering machine, router, woodworking milling machine																									
chain saw																									
other woodworking machines																									
leveling, transporting or loading machine				1														1		1					3
excavating machine		2	3	2	1			2		1	1		1			1	2			1					17
foundation work machine																									
hardening machine																									

demolition machine	1				1				1	1															4
vehicle for high lift work								1	1		1								1			2		1	7
other construction machines	1	1			2					1			1	2				2						1	11
lathe																									
drill press, milling machine																									
grinding machine, buffing machine																									
power press																									
forging pressure hammer																									
shearing machine																									
other metal manufacturing machines																									
centrifugal machine																									
mixer, grinder		1																	1						2
roll machine (except printingroll machine)																									

injection molding machine																									
food manufacturing machine																									
printing machine																									
industrial robot																									
other general power machines	1																								1
felling machine																			1						1
mobile logging machine																									
skyline yarding machine																									
other mobile silviculture machine																									
crane					1																				1
mobile crane			1		1			1																	3
derrick crane																									
elevator, lift																									
cargo lifting appliance																									
gondola																									

lumberyard equipment, logging cableway																									
simple skyline yarding equipment																									
other powered crane																									
truck	1	2	1								1	2					1			3		2		2	15
forklift																									
railway equipment	2					3	1			1				1								1			9
conveyor																									
loader																									
straddle carrier																									
rough terrain hauler																									
other powered conveying machines																									
cars, bus, motorcycle																							1		1
railway vehicle																									
other vehicles																									
boiler																									

pressure vessel																									
other pressure vessels																									
chemical facilities																									
gas welding equipment																									
arc welding equipment																									
other welding equipment																									
kiln, caldron																									
industrial dryer																									
other kiln, caldron																									
transmission																									
electric power facilities																									
other electrical equipment																									
human power cranes														1					1						2
human power hauling equipment																									

human power machine																									
hand tool																									
ladder																									
slinging tool																								2	2
other tools										1															1
other equipment, facilities								1																	1
scaffolding	1				1				1					1											4
timbering			2											5	1										8
stairs, landing stage	1	1													1										3
opening									1										1					1	3
roof, beam, haze, crossbeam, principal rafter																									
working platform, boot board																									
passage																									
building, establishment		1	1	1	1			1	1							1			1			1			9
other temporary buildings,													1												1

establishments																									
explosive substance																									
inflammable substance																									
inflammable gas										2				2											4
harmful substance																									
radiation																									
other hazards, harmful substances																									
metal material					1				1							1									3
lumber, bamboo																									
stone, sand, substance																									
other materials																									
load		1																1							2
machine/equipment as load																									
natural ground, rock	3	4	2	4	1		1		1		2	1			2		1	2	1		1	1	1	1	29
standing tree																1									1
water																					1		1		2
abnormal																									

environment																									
high/cold temperature environment																									
other environments								9												1					10
other causal agent																									
no causal agent																									
unclassifiable																									
total	11	13	10	8	10	3	2	15	7	7	5	3	3	12	4	4	4	6	7	6	2	7	3	8	160

Workers age of fatal accidents in tunnel construction work in 1999-2022

Age	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	total
19 years old or less																									
20-29	1	2	3	1	2			1				1					1	1			1	1			15
30-39		1	1		1			6	1	1	3		3	2		2		2	1	3			1	1	29
40-49	4	4	3	1	2	1	2	2		2		1		3	2	1		1	4			1	1	1	36
50-59	4	6	3	6	4	2		4	6	3	2	1		4	1	1	1	1	1	3				3	56
60 years old or more	2				1			2		1				3	1		2	1	1		1	5	1	3	24
total	11	13	10	8	10	3	2	15	7	7	5	3	3	12	4	4	4	6	7	6	2	7	3	8	160

Workers' number of workplace of fatal accidents in tunnel construction work in 1999-2022

Workers scale	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	total
9 workers or less	1	2	1	3				6	3				1	4	2			2	3			3		1	32
10-29	6	3	4	2	7			6	3	4	1	1	1		1		2	2	2	3	1	2		2	53
30-49	1	6	3	1	2	3	1	1		1	4	1	1	4	1	3		1	1	1	1		1	3	41
50-99	3	1	1	1				2	1	1							1	1	1	1		1	2	2	19
100-299		1	1	1	1		1			1		1		4		1	1			1		1			15
300 workers or more																									
total	11	13	10	8	10	3	2	15	7	7	5	3	3	12	4	4	4	6	7	6	2	7	3	8	160

Month of fatal accidents in tunnel construction work in 1999-2022

Month	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	total
January	1	1				1		1	1	1	1					1		1	1	1		1			12
February		1		1	3				1		1			5	1			1		1		1			16
March	1		2	2	2		2	1								1			1	1	1	2	1		17
April			2	2					1	1				1	1		1		1					1	11
May		2			1					2		1		2	1	1		1	1			1		1	14
June	1		1		1			3	1			1		1		1			1					1	12

July		2			2					3			1				1			1					10
August	1	1	2	1		1		1			1												1		9
September	2		2			1			1		1		2							1				1	11
October	2	2		1							1			2				1			1	1	1	1	13
November	1	1	1	1	1			9				1			1		1		1	1		1			20
December	2	3							2					1			1	2	1					3	15
total	11	13	10	8	10	3	2	15	7	7	5	3	3	12	4	4	4	6	7	6	2	7	3	8	160

Prefecture of fatal accidents in tunnel construction work in 1999-2022

Prefecture	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	total
Hokkaido		2			1		1	9			1				1		1		1	1		3		3	24
Aomori		1							1																2
Iwate	2															1	1	2			1		1		8
Miyagi																									
Akita																									
Yamagata	1	1	1								1													1	5
Fukushima	1																				1				2
Ibaraki																									
Tochigi		1																							1
Gunma			1						1																2

Saitama																									
Chiba				2		1													1						4
Tokyo						1	1	2	1		1		1	1		2			1						11
Kanagawa	1	4						1											1					1	8
Niigata					2					2				2								1			7
Toyama	1		1																						2
Ishikawa																			1						1
Fukui			1							1	1									1		1			5
Yamanashi												1				1		1				2			5
Nagano	1	1	1																1	1					5
Gifu		1		1								1					1	1					1		6
Shizuoka		1	2	2										1						1					7
Aichi															1				1					2	4
Mie					1					2													1		4
Shiga			1	1	1																				3
Kyoto															1										1
Osaka	1				1						1		1												4
Hyogo	1		1																	1					3
Nara					1																				1
Wakayama									1									1							2
Tottori																									

Shimane				1									1												2
Okayama												1		6											7
Hiroshima																									
Yamaguchi								1																	1
Tokushima																									
Kagawa																									
Ehime								1																1	2
Kochi		1												2											3
Fukuoka	1								2	1															4
Saga																									
Nagasaki					1					1								1		1					4
Kumamoto			1					1																	2
Oita																									
Miyazaki					2	1									1		1								5
Kagoshima	1								1																2
Okinawa				1																					1
total	11	13	10	8	10	3	2	15	7	7	5	3	3	12	4	4	4	6	7	6	2	7	3	8	160

Data sources: https://anzeninfo.mhlw.go.jp/user/anzen/tok/anst00.html (MHLW, Japan)

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