

(9) For tunnels of greater dimension than indicated in figures 5 to 12, or for modifications or combination of sections of timbering for the same, drawings and design calculations shall be submitted to the industrial commission for approval. The use of metal liners is subject to the approval of the industrial commission.

(10) Tunnel excavations in which men are permitted to work shall not be less than 3 feet wide nor less than 4 feet in height. These measurements apply to distance between timbers.

(11) Any metal shield used for tunnel work shall be of a design subject to the approval of the industrial commission.

**History:** Cr. Register, December, 1962, No. 84, eff. 1-1-63.

**Ind 6.22 Mechanical haulage.** (1) When mechanical haulage is used, care shall be taken that the speed is not excessive depending upon the grades and condition of the tracks. No cars shall be pushed underground where it is practical to draw and all locomotives shall be equipped with headlights and gongs. Trolley poles shall be trailed whenever it is possible to do so. No locomotive shall be operated by a person under 18 years of age. No gas locomotive shall be used in any tunnel.

(2) Standing cars shall be blocked.

**History:** Cr. Register, December, 1962, No. 84, eff. 1-1-63.

**Ind 6.23 Sumps.** All sumps shall be securely covered or fenced except when being cleaned or repaired.

**History:** Cr. Register, December, 1962, No. 84, eff. 1-1-63.

#### Part IV

### ADDITIONAL RULES FOR WORK WHEN DONE UNDER COMPRESSED AIR

**Ind 6.24 Hours of work.** (1) (a) At pressures up to and including 16 pounds, an employe shall be permitted to work a total of 8 hours in one period with a 30 minute rest interval to be taken near the middle of the period. This rest interval need not be spent in open air unless it is convenient to do so.

(b) Not more than one 8-hour period shall be worked in any 24 hours.

(2) (a) At pressures over 16 pounds, an employe shall be permitted to work for limited periods in accordance with the restrictions of Table 9 and paragraphs (b) and (c) of this rule. *Attention is called specifically to the requirement that normal work periods be such that the time required for decompression falls above the dotted line in table 9.*

(b) Not more than 2 periods shall be worked in any 24 hours.

(c) The minimum time required in open air between work periods shall be as follows:

TABLE 8

Basic Pressure More Than (A) But Not More Than (B)		Minimum Time Required in Open Air Between Work Periods—Hours
(A) 16	(B) 26	1
26	34	2
34	40	3
40	44	4
44	48	5
48	50	6

(d) A normal work period is a period of operation regularly scheduled in accordance with the restrictions of table 9 and paragraphs (b) and (c) of this rule. *Under emergency conditions, when necessary to prevent loss of life, the project or equipment, a person may be under compression for longer than the normal work period, in which case special consideration must be given to the longer decompression time required in accordance with table 9.*

(e) The maximum pressure attained for a duration of more than 15 minutes in any work period shall be the "basic pressure" for that period.

(3) (a) Persons who have not previously worked in compressed air shall not work more than one period in the first 24 hours.

(b) No person shall be subjected to pressure in excess of 50 pounds except in an emergency.

**History:** Cr. Register, December, 1962, No. 84, eff. 1-1-63.

**Ind 6.25 Period of compression.** (1) When workmen enter the lock, air pressure shall not exceed 5 pounds during the first minute, then the pressure shall be held constant for an interval long enough to ascertain whether workmen are affected, and a similar pause shall be made after each 5 pounds raise in pressure.

**History:** Cr. Register, December, 1962, No. 84, eff. 1-1-63.

**Ind 6.26 Decompression.** (1) No person shall be permitted to pass to open air from a chamber in which work is being done under pressure except after decompression in an air lock in accordance with the provisions of Table 9 and paragraphs (2), (3) and (4) of this rule.

(2) The reduction of pressure in the minimum decompression time specified in Table 9 shall not be greater than to one-third of the basic pressure in the first 2 minutes. The reduction from this one-third pressure shall be accomplished at a rate as uniform as possible in the balance of the time required.

(3) If, at pressures over 16 pounds, the second work period is shorter than the first work period, the longer decompression time of the first period shall also be used after the second period.

(4) (a) When it is not reasonably practical to provide an approved man lock in direct connection with a working chamber, decompression may be accomplished as follows:

1. A separate decompression chamber meeting all the requirements of a man lock shall be provided at a location such that the total time spent in primary decompression in the working chamber air lock at a reasonably rapid rate, going from that air lock to the decompression chamber, and recompression in that chamber shall not exceed 5 minutes. This decompression chamber shall be in addition to the required medical lock. The medical lock shall not be used for this purpose.

2. Recompression in the decompression chamber shall be to a pressure substantially equal to the pressure of the working chamber which it is serving.

3. Final decompression in the decompression chamber shall be in accordance with the requirements of Table 9 and paragraphs (2) and (3) of this rule.

(5) Posted conspicuously inside of and at the entrance to each man lock or decompression chamber shall be a copy of Table 9 and a schedule showing the hours for starting and ending work periods and rest intervals for each shift at the pressure then in use in the work chamber. Violations of these rules shall be noted on the record of the individual involved.

TABLE 9.—SCHEDULE OF WORK PERIODS AND DECOMPRESSION TIME FOR WORK UNDER AIR PRESSURE

Basic Pressure		Total Minimum Decompression Time—Minutes								Lowest Pressure in First 2. Min.	Minimum Time in Open Air Between Work Periods
More Than (A) to Not More Than (B) psi	More Than 4 Hours	Work Period—More Than (C) But Not More Than (D) Hrs.						psi	Hours		
		(C)=3½	3	2½	2	1½	1			½	0
(A)	(B)	(D)=4	3½	3	2½	2	1½	1	½		
		Min.	Min.	Min.	Min.	Min.	Min.	Min.	Min.		
10	12	5	3	2	2	1	1	0	0	4	0
12	14	8	6	4	3	2	2	1	1	5	0
14	16	13	10	7	5	4	3	2	2	5	0
16	18	18	14	11	8	6	4	3	3	6	1
18	20	26	18	15	12	9	7	5	4	7	1
20	22	32	22	19	16	13	10	8	6	7	1
22	24	38	26	23	20	17	14	11	8	8	1
24	26	48	34	30	25	21	18	14	10	9	1
26	28	58	44	40	33	27	24	17	13	9	2
28	30	67	54	30	42	34	29	22	16	10	2
30	32	76	63	59	52	42	34	27	18	11	2
32	34	85	72	67	61	51	39	31	20	12	2
34	36	93	80	76	70	60	45	36	23	13	3
36	38	100	89	84	78	69	55	41	28	15	3
38	40	107	97	92	86	77	64	46	33	18	3
40	42	115	104	100	94	85	72	51	37	20	4
42	44	122	111	107	101	93	79	57	41	22	4
44	46	129	118	114	109	101	87	65	46	24	5
46	48	135	125	122	117	108	95	74	50	26	5
48	50	141	132	128	124	116	103	82	54	28	6

Normal work periods shall be such that the time required for decompression falls above or to the right of the dotted lines. A work period is any period of time that a person is subjected continuously to air pressure.

(See Examples on next page)

## INSTRUCTIONS AND EXAMPLES

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The working pressure is selected in the first column of Table 9. By following that line to the right, the first column of figures to the right of the *dotted* line indicates, at the top, the maximum normal work period at that pressure. The figure in that column at the pressure selected is the total number of minutes required for decompression after a normal work period. Following to the right across the table to the next to the last column is the lowest pressure to which a person may drop in the first 2 minutes of decompression. From this pressure to zero will require the balance of the time. The last column to the right indicates the minimum number of hours that must be spent in open air between work periods at the pressure selected.

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*Example 1.* If a person wishes to know the requirements at a basic pressure of 25 pounds per square inch, he finds that the normal work period must not be longer than 3 hours; for decompression he requires 25 minutes. He may drop the pressure from 25 to 9 pounds during the first 2 minutes of decompression, leaving 23 minutes to drop from 9 pounds to 0, and he must spend at least one hour in open air before working another period.

*Example 2.* At 35 pounds pressure, he may work 1½ hours, requires 36 minutes for decompression, may drop to 12 pounds in the first 2 minutes and use 34 minutes to drop to 0 pounds. He shall not work another period until he has spent at least 3 hours in open air.

*Example 3.* If a superintendent, for example, should spend only ½ hour in the working chamber at 35 pounds pressure, the total decompression time required would be 13 minutes, dropping to 12 pounds in the first 2 minutes and taking 11 minutes to drop to 0 pounds.

*Example 4.* If a workman at 35 pounds pressure was obliged to work an extra hour, or 2½ hours, to clean out a concrete pipe line that had jammed, he would be required to take 60 minutes for decompression, dropping to 12 pounds in the first 2 minutes and taking 58 minutes to drop to 0 pounds.

**History:** Cr. Register, December, 1962, No. 84, eff. 1-1-63.

**Ind 6.27 Gauges.** (1) A recording gauge to show the rate of decompression shall be connected to each man lock. A recording gauge shall also be placed to show the air pressures in the working chamber. The dial shall be of such size that the amount of rise or fall in the air pressure within any 5 minutes shall be readily shown.

(2) There shall be on the outer side of any working chamber at least one pressure gauge, which shall be accessible at all times and shall be kept in accurate working order. Additional fittings shall be provided so that check gauges may be attached at all necessary times. Pressure gauges shall be checked every 24 hours and a record kept of such check. One gauge shall be installed near the compressor station.

(3) Whenever men are working under a lake or stream a competent man shall be placed in charge of the valves and gauges which regulate and show the pressure in the working chamber. He shall not be employed more than 8 hours in any 24. At no time shall he operate more than 2 separate air lines.

**History:** Cr. Register, December, 1962, No. 84, eff. 1-1-63.