

TRANSVAAL AND ORANGE FREE STATE CHAMBER OF MINES

RESEARCH ORGANISATION

A PROVISIONAL GUIDE TO SURFACE ACCLIMATIZATION

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A PROVISIONAL GUIDE TO SURFACE ACCLIMATIZATION

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INTRODUCTION

WHY SURFACE ACCLIMATIZATION?

1. In 1953, when the Chamber of Mines methods of acclimatization were introduced in the gold mining industry, the productive work performed by labourers during the period of acclimatization meant appreciable financial gains for mines in which temperatures were so high as to require the acclimatization of their labour forces (1). During the past few years, however, considerable advances have been made in mechanizing some mining operations so that at present there are many mines in which it is more economical to remove rock from underground by mechanical means than by shovelling by labourers. On these mines it is becoming increasingly difficult to find areas underground where environmental temperatures and working conditions are suitable for acclimatizing labourers. This often means that an area has to be heated, artificially, so that an increase occurs in temperatures in neighbouring areas. From a production point of view it can, therefore, be said that on certain mines the additional shovelling performed during acclimatization of labourers has become a disadvantage rather than an advantage.

2. The number of labourers working under conditions of high wet bulb temperatures has increased over the past ten years (2) and, consequently, the need for acclimatizing labourers is greater than ever. The introduction of a method for the acclimatization of labourers to heat without interfering with the normal production underground has, therefore, become necessary. The Human Sciences Laboratory has, over the past 15 years, used a method of acclimatizing labourers artificially in climatic chambers. Briefly, this method consists of a four-hour per day step test procedure for 12 days in an environmental condition of about 93°F W.B. and 96°F D.B. and a wind velocity of 80 ft/min. Hundreds of subjects have been acclimatized successfully in this manner and a high standard of heat acclimatization has been achieved. It was, therefore, thought that this artificial method could also be employed advantageously by the Mining Industry. Naturally, certain changes and modifications had to be made to the laboratory procedure. In the present report are described in rough outline these modifications as presently applied at East

/Daggafontein . . .

Daggafontein, President Brand and Western Holdings. These three mines assisted materially in the formulation of ideas and concepts for this new acclimatization procedure and can be regarded as the pioneers in this regard.

ADVANTAGES OF SURFACE ACCLIMATIZATION

3. The method of acclimatizing labourers on the surface of the mine has several advantages which may more than compensate for the large initial capital cost involved in the construction of climatic chambers. All the possible tasks and training procedures that could possibly be linked with surface acclimatization have not been explored but the following are some of the more obvious advantages of this method:

- (a) During the acclimatization of labourers underground the environmental temperatures and the rate of the work performed are not always in accordance with those specified for the Chamber of Mines methods of acclimatization. This can result in the failure of labourers attaining a good standard of acclimatization (3). In an acclimatization centre on the surface, day-to-day variations in environmental temperature and rate of work can be eliminated and, therefore, a more uniform standard of acclimatization can be attained by the labourers.
- (b) Because well-trained and intelligent bossboys are not always available in an acclimatization centre underground, heat stroke cases have occurred during the acclimatization period (2,4). Several cases have been reported of bossboys, who, although they have been regarded as reliable, failed to detect high temperature cases. Because temperatures are measured frequently during surface acclimatization, it is now possible to eliminate this error.
- (c) When labourers are being acclimatized underground the gangs are usually spread over a large area due to the lack of suitable environmental conditions. This makes the supervision and control over acclimatization procedures difficult. In a surface climatic chamber the labourers are concentrated in a comparatively

small area and supervision is much more easy and closer.

- (d) Medical treatment of sick or suspected heat stroke cases occurring in underground acclimatization centres is usually delayed due to the comparative inaccessibility of these areas, whereas, on surface, medical officers can be contacted easily and such labourers given attention without delay. Further, it will be a matter of only opening a door to expose a hyperpyrexial case to cool air.
- (e) There will be almost no delay in acclimatizing labourers after their arrival on the mine. It will not be necessary to issue them first with underground clothing, and to have them aptitude tested, and so on.
- (f) Training procedures could advantageously be linked with surface acclimatization which occupies only about 4½ hours per day of the recruit's time.
- (g) There will not be any interference with production processes or ventilation arrangements underground.
- (h) It will not be necessary to transport acclimatization groups underground and this may result in some saving.
- (i) Because of the more uniform standard of acclimatization achieved the period of acclimatization can be shortened in a surface acclimatization centre.
- (j) Supervisory costs will be less for surface acclimatization and even the Human Sciences Laboratory may gain in scientific time in this respect.

EQUIPMENT AND BUILDING REQUIREMENTS FOR SURFACE
ACCLIMATIZATION

4. Full details regarding the design, operation and control of a climatic chamber to be used for acclimatizing labourers on the surface are given in a paper by T. Hodgson, which is to be published soon in "The S.A. Mine Ventilation Society Journal". Only the more basic requirements of a surface

/acclimatization

acclimatization centre will be dealt with here:

- (a) Because the size of the building to be used or erected for surface acclimatization purposes will depend, naturally, upon the number of labourers who have to be acclimatized at a mine at any one time, a minimum exercise space of 7 sq. ft/labourer is required, added to which should be adequate passage space between rows to allow the observer to take temperatures.
- (b) Apparently it is more advantageous to have an elongated building rather than a square one. Rows of 25 - 30 labourers stepping next to each other with about 24 inches shoulder room can be recommended as this would simplify supervision.
- (c) It is necessary to control the temperature of the chamber within 0.5°F of the required level. This is particularly important as far as the wet bulb temperature is concerned. The preferred wind velocity should be about 75 feet per minute and should not exceed 100 feet per minute. Vertical and horizontal gradients in temperature should be minimal and down-draft ventilation is desirable. Walls and ceiling should be well insulated and no condensed water should drip down on to the men.
- (d) A waterproof metronome is required to indicate the rate of stepping. Either a flashing light or a sound metronome can be used. A metronome in which both these systems are incorporated is probably the most useful. The flashing light metronome should be mounted against the walls at a height of seven feet. This will ensure that the metronome is at about the same level as the labourer's eyes when the men are standing on the stepping platform. The strain of watching the metronome should thereby be reduced to a minimum. The lights on the metronome should not be so bright as to cause a glare.
- (e) Stepping blocks or concrete beams should be erected. These should be about 12 in. wide, 12 in. high and long enough to accommodate the required number of

/subjects ...

subjects. In order to make the stepping height adjustable, wooden boards with non-skid surfaces and measuring 2 in. x 12 in. x 24 in. should be provided.

- (f) A water-proofed, large-faced clock with a seconds hand should be provided in the climatic chamber.
- (g) In order to obtain reliable environmental temperature measurements a good psychrometer of the Assmann type should be installed in a permanent position in the chamber.
- (h) Provision should be made for a sufficient number of oral thermometers to enable readings to be taken on least 25 men at a time.
- (i) A screen or cubicle should be provided inside the chamber to facilitate the taking of rectal temperatures.
- (j) Change rooms with adequate shower, dressing and waiting facilities should adjoin the climatic room. This change room should preferably be heated to about 80°F D.B.
- (k) European supervisors should be provided with an office for the compilation of records.
- (l) An accurate, sturdily-constructed and easily-read scale should be provided for determination of the correct stepping height.

ENVIRONMENTAL TEMPERATURE REQUIREMENTS

5. Labourers can be acclimatized in a climatic chamber for three ranges of underground temperature conditions. Basically, the acclimatization method is the same in each instance, but differences exist with respect to the environmental temperature of the chamber, the number of days in the chamber, the rate of stepping and the number of days on which additional work (see paragraph 24) should be performed. For mines in which underground temperatures do not exceed 84°F W.B., a three day procedure at 87 - 88°F W.B. would be sufficient to detect and

/eliminate

eliminate incipient disease conditions and prevent heat disorders. For all underground conditions between 84 to 90°F W.B., the temperature in the climatic room must be set at 89°F W.B. (Presently-developed techniques do not as yet cater for underground temperatures exceeding 90°F W.B. See paragraph 36). In all cases the difference between the wet- and dry-bulb temperatures should be about 3°F. As an easy reference to the correct procedure that should be employed the following Table is provided:

T A B L E I

Category	Max. U/g Temperature	Acclimatizing Temperatures		Stepping Rate	Additional Work*
		WB	DB		
3-Day	84°F WB	87-88°F	91°F	Refer Table 2	1 hour
5-Day	87°F WB	89°F	92°F	Refer Table 3 (1st 5 days)	3 hours
9-Day	90°F WB	89°F	92°F	Refer Table 3	3-5 hours

* See para. 24.

6. In a properly-designed climatic room, the control over the variations in environmental temperature should be about 0.5°F and temperature measurements need not, therefore, be made more frequently than once every 30 minutes. When a variation of more than 0.5°F from the desired wet bulb temperature occurs, corrective measures should be instituted and temperature measurements made every 15 minutes until the wet bulb temperature is back to normal.

7. Should an increase in the wet bulb temperature of the room be between 1.0° and 2.0°F and should this increase persist for more than 30 minutes, the labourers should be made to work at half the prescribed rate indicated in Tables 2 and 3. When the increase in temperature reaches 2.0°F or more, labourers should be made to stop work altogether and, if necessary, to leave the climatic chamber. A fall of 1°F in wet bulb temperature, persisting for more than one hour, requires that the work of that hour should be repeated and, if the temperature cannot be corrected within two hours, then it would be better to repeat the whole run on the following day.

/WORK ...

WORK RATE AND DURATION

8. The rate of work required to acclimatize labourers satisfactorily in a surface climatic room was set after extensive experimentation and the routine for progressively increasing this rate should not be altered nor ignored. At the start all men work at a uniform rate of about 1560 ft lbs/min. (12 steps/min) and this rate is increased at half-hourly intervals to about 3120 ft lbs/min. (24 steps/min.). To compensate for body weight differences amongst the men and to ensure that the men work at roughly the same load, the height of the step must be adjusted according to the labourer's weight as follows:

<u>Weight</u>	<u>Height of the step</u>
Below 120 pounds	14 inches
120 to 140 pounds	12 inches
Above 140 pounds	10 inches

(A man weighing 130 lbs and stepping 1 foot in height at a rate of 12 steps/min will work at $130 \times 1' \times 12 = 1560$ ft lbs/min.), The appropriate stepping heights can be set by using the wooden boards mentioned previously. Men will then either step from or onto a wooden board or, if his weight is between 120 and 140 lbs, without the addition of any such boards.

9. In order to eliminate confusion a successfully completed 'step' is defined as the movement of the body from the floor onto the stepping block and back to the same place on the floor. The upper body should be kept as erect as possible, the arms should swing freely and when the subject is standing on top of the block his body should not be bent or leaning backwards. It should be observed that the same foot leads in the upward and the downward movement of the step. Both feet should complete the full cycle.

10. The duration of stepping is four hours every day and the number of consecutive days on which the Bantu should work is given in Table I. The routines for increasing the work rate when the three-day procedure is used are given in Table 2 and those for the five- and nine-day procedures in Table 3.

T A B L E 2

Number of steps/min. for each half-hour of work

Day of Acclimatization	1st	2nd	3rd	4th	5th	6th	7th	8th
1	12	12	12	24	12	12	12	24
2	12	24	12	24	12	24	12	24
3	24	24	12	24	12	24	24	24

T A B L E 3

Number of steps/min. for each half-hour of work

Day of Acclimatization	1st	2nd	3rd	4th	5th	6th	7th	8th
1	12	12	12	12	12	12	12	24
2	12	12	12	12	12	24	12	24
3	12	12	12	24	12	24	12	24
4	12	24	12	24	12	24	12	24
5	12	24	12	24	12	24	24	24
6	12	24	12	24	24	24	24	24
7	12	24	24	24	24	24	24	24
8	24	24	24	24	24	24	24	24
9	24	24	24	24	24	24	24	24

11. While a constant check should be kept on the rate of work, it is advisable to count the number of steps that the labourers take, rather than observe whether they keep time with the metronome. The loss of one or two steps over a period of one minute need not be regarded as serious.

STAFF REQUIREMENTS

12. In a small climatic chamber accommodating about 20 labourers, two or three trained persons should be sufficient to perform all the necessary duties. As the number of labourers increases, however, staff requirements will increase also. Generally one European supervisor, assisted by eight bossboys could be expected to deal with up to 100 labourers per day. The recommendation made in paragraph 74 of the original "Guide to

/the Chamber

the Chamber of Mines Methods of Acclimatization" that a senior official should be appointed to take overall direct responsibility for acclimatization still holds.

SUPERVISOR

13. Supervisors of shiftboss status who have been thoroughly trained in acclimatization procedures, both underground and on surface, should be in charge of acclimatization procedures in the climatic chamber. The duties of a supervisor should be:

- (a) The weighing of labourers and dividing them into weight categories on the first day of work. The men should be weighed in the nude and their weights recorded.
- (b) To allot a serial number to each labourer.
- (c) To ensure that each labourer is stepping to the correct height as specified in paragraph 8 above.
- (d) To measure and record the labourer's oral (and rectal) temperatures at intervals and under the conditions outlined in paragraphs 20 and 33 below.
- (e) To attend to labourers who complain of feeling ill, or who are dizzy etc., and to send to hospital all cases suspected of being ill.
- (f) To measure and record environmental temperatures and to take the necessary steps with regard to undue increases in room temperature as indicated in paragraphs 6 and 7 above.
- (g) To ensure that labourers who develop high temperatures are cooled and rested.
- (h) To indicate to the bossboy in charge of a row which labourers have oral temperatures of 100.8°F , 101.0°F and above, and 102.4°F and above.
- (i) In addition to making physiological measurements, the supervisor in charge of acclimatization procedures in the climatic room should be responsible for checking whether the operation and control of

/conditions ..

conditions in the climatic room are normal. This will entail checking pressure gauges, water pumps, etc., and rectifying any irregularities.

BOSSBOYS

14. Bossboys should be trained in acclimatization duties and be able to recognise symptoms of, and know how to treat, heat stroke and heat collapse cases. Generally, a bossboy should not have more than about 15 labourers to attend to but the maximum number will depend on the size and arrangement within the climatic room. Thus, two rows of 25 - 30 labourers each can be attended by three bossboys, one of whom will be in overall charge and also assist in the hourly temperature observations. All the bossboys should be well trained in those duties associated with surface acclimatization but two tasks require special attention and, therefore, a bossboy should be assigned to each of them. These are the washing down of high temperature cases and the issue of drinking water to the labourers. The latter task may seem unimportant but for the smooth running of acclimatization procedures it is essential to have an intelligent bossboy who has a good knowledge of the procedures and who can also assist elsewhere when necessary.

15. The duties of bossboys are as follows:

- (a) To ensure that the labourers in their charge step in the correct manner and at the correct rate. (In order to be able to do this efficiently each bossboy should himself be completely familiar with the method of stepping). They should continually observe that the rate of stepping is maintained, particularly at high stepping rates, and, where necessary, demonstrate the rate and method to the labourers.
- (b) To enquire, at intervals of about 15 minutes, after each labourer's well-being and to draw the attention of the supervisor to those labourers who are suspected of being ill. The bossboy should allow labourers to sit down if they feel dizzy, as indicated in paragraph 32.

/(c) To

- (c) To remind the supervisor when temperatures are to be observed, that is, at hourly intervals, and also to indicate to him those labourers whose temperatures have to be checked after half-an-hour's rest or work. He should also, when necessary, change the work rate of the labourers in his row.
- (d) To prepare the thermometers before each temperature recording.
- (e) During the temperature recordings they should assist in watching for malpractices (breathing through mouth and moving thermometer from under the tongue).
- (f) To remove the thermometer from the labourer's mouth, wipe it and then hand it to the supervisor to read.
- (g) To check that labourers indicated by the supervisor as having oral temperatures of 100.8°F, 101.0°F or 102.4°F, receive the correct "tag".

ORGANIZATION OF SURFACE ACCLIMATIZATION

STAGGERING THE TIMES OF ENTRY OF LABOURERS

16. For ease of control and supervision it is advisable to stagger the times of entry of labourers into the room row by row. The acclimatization chambers presently in use have four rows of steps, each accommodating from 20 - 30 labourers. Naturally the period between the entry of each row of labourers will depend upon the number of men in a row, but generally about 10 minutes should be sufficient.

17. Staggering the entry of labourers according to rows will result in each row of men having their temperatures taken and being issued with water at different times. Strict control should be kept to ensure that the correct times are observed. To this end it is suggested that a suitably water-proofed electric clock be installed in the chamber.

/IDENTIFICATION ..

IDENTIFICATION OF LABOURERS

18. As the supervisor in charge of acclimatization procedures on the surface has to measure many temperatures in quick succession it is essential that a more rapid means for identification than the "arm-band" be used. At the same time the supervisor will want to know at a glance whether the labourer is stepping at the correct height. The labourer should therefore carry a mark identifying the weight category to which he belongs. These requirements can be met by hanging a disc with a serial number around the neck of each labourer. Thus a labourer having a serial number 'A1' will weigh more than 140 pounds and will be the first in that weight category. Another way of identifying labourers according to their weights has been suggested, namely, by making labourers in the different weight categories wear shorts of different colours. Both the serial number and company number should be entered in the records.

CLOTHING

19. Labourers being acclimatized should work without shoes of any kind and in shorts only. With this kind of stepping exercise boots and long pants can cause considerable chafing of the skin. Labourers should, however, be required to wear boots for the rest of the day in order to harden their feet and thus prevent boot-rub occurring underground.

MEASUREMENT OF BODY TEMPERATURE

20. Oral temperature should be measured while the labourer stands, before the start of work and then again at the end of each hour of work during the entire period of acclimatization. In order to decrease the influences of outside temperature, initial oral temperatures should be measured after the labourers have been resting for about 20 minutes, preferably in the change room, provided the latter is air-conditioned. Properly trained bossboys may insert the thermometers, but the responsibility for reading and recording the temperatures is that of the supervisor only. A labourer should stop working immediately before the thermometer is inserted in his mouth

/and

and start stepping as soon as the thermometer has been removed, unless otherwise instructed.

21. To facilitate the measurement of a large number of temperatures, it is suggested that each 'row' should have its own set of thermometers. These thermometers can then be prepared by the responsible bossboy in good time for the measurements.

22. No attempt should be made to measure the temperatures of more than about 25 labourers at any time and the utmost care should be taken to read thermometers correctly. In instances where it is suspected that the thermometer reading is not correct, such as when a fall in body temperature is recorded while the rate of work has either remained the same or has been increased, the temperature measurement should be repeated.

DRINKING WATER

23. Immediately after the oral temperature recording, and just before the end of each half-hour of work, the labourers should each be offered one pint of drinking water. At least some of this should definitely be drunk. The temperature of drinking water should not be lower than that of water which is generally regarded as 'cool' (70° - 75°F).

ADDITIONAL EXERCISE

24. During the acclimatization period only the lower parts of the body are exercised in stepping. Many types of work performed underground require the use of the upper part of the body. It is recommended that during the acclimatization period, other than the four hours daily, labourers should exercise the upper parts of their bodies by shovelling rock continuously for at least one hour per day for several days depending on whether a three-, five-, or nine-day procedure is used. (Ref. Table I). This shovelling could in fact be made part of the training programme. Mines still employing labourers to do

/most

most of the removal of rock should allot more hours to surface shovelling than those fully mechanised in this respect. Any attempt to achieve upper-body training while men are stepping up and down is fraught with danger and has been shown to be unsuccessful.

RECORDS

25. An example of the record sheet to be used is attached. Temperatures recorded after a rest period should be recorded under 'remarks'. In addition to this, the supervisor should keep a record of the following information: The date acclimatization was commenced; the serial number of each labourer; temperatures of 101.0°F and above developed by each labourer, and if the labourer has been sent for a medical examination. Such a record will enable the supervisor to determine when a labourer has developed oral temperatures of 101.0°F and above on three consecutive days and other relevant information with regard to hospital cases, absence, etc.

HYGIENE

26. The conditions of temperature and moisture in the acclimatization room are conducive to the growth of bacteria. It is essential, therefore, that the floor of the chamber should be washed with a disinfectant after each acclimatization run. (A half pint "Supadet" together with ½ ounce of "Sterimist" in 5 gallons of water can be recommended for cleaning and sterilization purposes). It should further be seen to that all the labourers take a shower after the 4-hour period of exposure to heat.

THE TREATMENT OF HIGH TEMPERATURE, ILL, AND SUSPECTED HEAT STROKE CASES

27. A labourer with an initial oral temperature of 101.0°F or above should not be allowed to work and should be sent for a medical examination.

28. When a labourer develops an oral temperature of 100.8°F , he should continue stepping, and his temperature measured again after a further half-hour of work. To remind the supervisor of such a case a yellow identifying tag could be placed around the labourer's neck.

29. In the event of any labourer developing an oral temperature of 101.0°F or above during work, the following should be done:

- (a) A red tag (or other means of identification) should be placed around his neck to identify him from other labourers.
- (b) He should be cooled with water for three minutes, preferably in the climatic room.
- (c) He should be rested in a sitting position for half-an-hour in the chamber at the place where he had been stepping.
- (d) His oral temperature should be measured after he has rested for half-an-hour.
- (e) If after this period of rest his temperature is 100.0°F or below, he should continue to work; if it is above 100.0°F he should be sent to hospital for a medical examination.
- (f) Only when the labourer is regarded as fit for work, should the red tag be removed.

30. A labourer who develops an oral temperature of 101.0°F or above on the last day of acclimatization should not be transferred to underground working areas. He should continue to work in the acclimatization centre at a rate of work similar to that which he performed on the 'last' day. He should be transferred to underground working areas only when he has completed four hours of work without developing an oral temperature of 101.0°F or above.

31. Labourers developing oral temperatures of 101.0°F or above on three consecutive days should be sent to hospital for a medical examination.

32. A labourer who tends to collapse or who feels dizzy should first have his temperature recorded and if this is 101°F or above he should be treated as in paragraph 29 above. If his temperature is below 101°F , he should be given a drink of water and be rested in a sitting position for five minutes. Should the dizzy spells recur after this period of rest he should be treated as described in paragraph 33 below.

33. If the oral temperature of a labourer who has complained of feeling ill is found to be less than 101.0°F , his rectal temperature should be taken. Rectal temperatures should be measured in privacy behind the screen or cubicle provided for this purpose. Thermometers used for this procedure should be kept separate from those used for the measurement of oral temperatures. Should the rectal temperature be 102.4°F or more the labourer should be rested and the same procedure followed as described for cooling those men with oral temperatures above 101.0°F . It should be noted, however, that even if a labourer's temperature is low he should still be sent to hospital even if there is any doubt as to whether he is ill or not. (Also see the first part of paragraph 42(b) in "A Guide to the Chamber of Mines Methods of Acclimatization" (November, 1963)). Once it has been decided to send a labourer to hospital, he should leave the chamber immediately.

34. Labourers who develop oral or rectal temperatures of 105.0°F or above should first be cooled until their rectal temperatures have fallen to 101.0°F , before they are sent to hospital. It is advisable to send for a medical officer in such a case.

ABSENTEES AND TRANSFERS

35. A labourer who has been absent from underground during the acclimatization period due to an illness involving fever should be re-acclimatized. The period of re-acclimatization should be at the discretion of the Medical Officer. In cases where absence due to illness does not apply, the following procedures are recommended:

/During ...

During acclimatization

- (a) A labourer who has been absent for up to three days during his acclimatization period may continue with acclimatization at the stage at which it was interrupted.
- (b) A labourer who has been absent for four days or more should start the acclimatization procedure again.

After acclimatization

- (c) Labourers who have been absent from underground for eight days or more and who will be required to work in areas where the wet bulb temperature does not exceed 84°F, should be acclimatized for the full three-day period. (See Table I) When they have been absent for less than eight days, they may return to work without re-acclimatization.
- (d) The periods of re-acclimatization for absentees who are required to work in areas with wet bulb temperatures in excess of 84°F, are given in Table 4 below.

T A B L E 4

Maximum temperature of working area	Period of absence from work	Days to be spent in surface chamber (see Tables 2 & 3).
87°F W.B.	1 to 7 days	Re-acclimatization not required
	8 to 14 days	Days 4 and 5
	15 to 21 days	Days 3, 4 and 5
	22 or more days	Days 1 to 5
90°F W.B.	1 to 7 days	Re-acclimatization not required
	8 to 14 days	Days 7, 8 and 9
	15 to 21 days	Days 4 to 9
	22 or more days	Days 1 to 9

- (e) When labourers are transferred from cool to hot working places, from light work to hard work or from an area of high wind velocity to one of low wind velocity, the period of acclimatization which they should undergo should not be less than that specified for a period of absence of eight to 14 days.

GENERAL

36. It should be emphasized that the procedure employed at present for surface acclimatization caters only for mines having underground temperature conditions of 90°F W.B. or below. Men acclimatized by these procedures should, therefore, not be expected to work in climatic conditions above 90°F W.B. unless they have successfully completed a further three days in an underground acclimatization centre where the wet bulb temperature is 92°F. During this additional period of acclimatization the treatment of high temperature cases should be the same as that followed in acclimatization centres underground. Labourers who develop oral temperatures of 101.0°F or above on the third day should be retained in the acclimatization centre until they have completed one shift without developing a high temperature.

37. For reasons of safety it might be advisable to give special treatment to the young novice to the industry and to the older worker. The psychological tension associated with initial trips underground can result in an increase in body temperature of up to 1°F. This type of labourer should be reserved for the cooler areas of the mine, that is, where temperature conditions do not exceed 87°F W.B. and they would, therefore, require only five days of acclimatization on the surface.

38. In order to prevent dissatisfaction amongst labourers with this new procedure it is advisable to pay them at underground rates while they are being acclimatized on the surface. Labourers should be encouraged to sing tribal songs in rhythm with the stepping. This would eliminate

/the monotony . . .

the monotony associated with the procedure.

39. Decisive and firm action should be taken immediately when labourers refuse to subject themselves to the procedure described for surface acclimatization. If a labourer refuses to continue stepping he should leave the chamber immediately and be instructed to repeat the whole session the following day.

40. All labourers, especially those who have not worked under hot conditions before, should be encouraged to add extra salt to their food. This will ensure that the salt lost during the exposure to heat is replaced.

41. This "Guide" is supplementary to the original and accepted "Guide to the Chamber of Mines Methods of Acclimatization" and should always be used in conjunction with it. Further, it should be noted that this is only a provisional "Guide" and that refinements and alterations to the procedure are bound to be made in due course.

R E F E R E N C E S

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