

# Using the Heat Index: A Guide for Employers

## About Work/Rest Schedules

Rather than being exposed to heat for extended periods of time during the course of a job, workers should, wherever possible, be permitted to distribute the workload evenly over the day and incorporate work/rest cycles. Work/rest cycles give the body an opportunity to get rid of excess heat, slow down the production of internal body heat, slow down the heart rate, and provide greater blood flow to the skin.

For the best protection from heat-related illness, workers should spend the rest periods of the cycle in a cool place, for example in a lightly air conditioned room, trailer or vehicle, or if one is not available, then in full shade.

Rest periods do not necessarily mean that the workers are on break; these can be productive times. During the rest periods, workers may continue to perform mild or light work, such as completing paperwork, sorting small parts, attending a meeting, or receiving training (e.g., instructions for upcoming work, or a tailgate safety talk).

Have a knowledgeable person at the worksite that is well-informed about heat-related illness and able to modify work activities and the work/rest schedule as needed. When evaluating an appropriate work/rest schedule:

- Shorten work periods and increase rest periods:
  - As temperature rises
  - As humidity increases
  - When sun gets stronger
  - When there is no air movement
  - When protective clothing or gear is worn
  - For heavier work
  
- Assign new and un-acclimatized workers lighter work and longer rest periods. Monitor these workers more closely.

### **Choosing Shaded Rest Areas:**

When an air conditioned space is not available, choose or create rest areas with as many of the following beneficial characteristics as possible:

- In full (complete) shade.
- Where surfaces are not warm from earlier sun (e.g., north-facing wall).
- Opened to cooling breezes, but protect workers if breezes feel uncomfortably hot, which can increase risk of heat illness.
- Free of other hazards (e.g., moving traffic, excessive noise, falling objects).
- With sufficient space for the number of workers needing rest breaks at one time.
- Near a supply of cool drinking water.
- Equipped for workers to do productive light work while

The figures and tables below are examples of general guidelines for setting work/rest schedules. When possible, more frequent shorter periods of exposure to heat are better than fewer longer exposures. This means that the work/rest schedules are often based on 1-hour cycles and might call for a rest period of 15 minutes every hour during hot weather, but 45 minutes per hour when temperature and humidity are extreme. Individual requirements may vary greatly. The work/rest schedules in these tables do not guarantee protection against heat-related illness and should not be used as a substitute for good judgment or experience. The tables generally apply to healthy, acclimatized adults under the age of 40.

Setting appropriate work rest schedules is critical for protecting workers during outdoor work. Often it requires the assistance of a trained safety and health profession. In addition to the methods provided as examples below, OSHA provides free and confidential advice to services small and medium-sized businesses in all states across the country. Contact OSHA's On-site Consultation Program for assistance in developing your heat-related illness preventions plan and work/rest schedules that are appropriate for your worksite. For more information or for additional compliance assistance contact OSHA at 1-800-321-OSHA (6742).


### **Methods for Developing Work/Rest Schedules**

Figure 1 is the US Army Work/Rest/Water Consumption table used for setting work/rest schedules during field operations. The hydration and work/rest schedule assume an average sized, heat acclimated soldier wearing battle dress uniforms (BDU). Factors such as lack of acclimitization, poor fitness, and cumulative inadequate hydration and may increase the risk of heat-related illness and should be taken into account when using the schedules in Figure 1. This is one method for determining work/rest schedules using an alternate to the Heat Index called the Wet-Bulb Globe Temperature (WBGT). The WBGT is obtained using specialized equipment (a wet-bulb globe temperature meter, also known as a WBGT meter). The meter provides a heat reading based in part on factors similar to those NOAA uses to determine the heat index, but the WBGT reading also considers solar load (radiant heat, from sunshine) as well as how quickly moisture evaporates. WBGT meters are readily available from commercial sources of environmental monitoring and technical instruments. Several hand-held models cost less than \$200 (in 2011).

**FIGURE 1: US. ARMY APPROACH FOR SETTING WORK/REST SCHEDULES**

<h2 style="text-align: center;">Work/Rest and Water Consumption Table</h2> <p style="text-align: center;"><i>Applies to average sized, heat-acclimated soldier wearing BDU, hot weather. (See TB MED 507 for further guidance.)</i></p>							
Easy Work		Moderate Work		Hard Work			
<ul style="list-style-type: none"> <li>• Weapon Maintenance</li> <li>• Walking Hard Surface at 2.5 mph, &lt; 30 lb Load</li> <li>• Marksmanship Training</li> <li>• Drill and Ceremony</li> <li>• Manual of Arms</li> </ul>		<ul style="list-style-type: none"> <li>• Walking Loose Sand at 2.5 mph, No Load</li> <li>• Walking Hard Surface at 3.5 mph, &lt; 40 lb Load</li> <li>• Calisthenics</li> <li>• Patrolling</li> <li>• Individual Movement Techniques, i.e., Low Crawl or High Crawl</li> <li>• Defensive Position Construction</li> </ul>		<ul style="list-style-type: none"> <li>• Walking Hard Surface at 3.5 mph, ≥ 40 lb Load</li> <li>• Walking Loose Sand at 2.5 mph with Load</li> <li>• Field Assaults</li> </ul>		<ul style="list-style-type: none"> <li>• The work/rest times and fluid replacement volumes will sustain performance and hydration for at least 4 hrs of work in the specified heat category. Fluid needs can vary based on individual differences (± ¼ qt/hr) and exposure to full sun or full shade (± ¼ qt/hr).</li> <li>• NL = no limit to work time per hr.</li> <li>• Rest = minimal physical activity (sitting or standing) accomplished in shade if possible.</li> <li>• <b>CAUTION: Hourly fluid intake should not exceed 1½ qts.</b></li> <li>• <b>Daily fluid intake should not exceed 12 qts.</b></li> <li>• If wearing body armor, add 5°F to WBGT index in humid climates.</li> <li>• If doing Easy Work and wearing NBC (MOPP 4) clothing, add 10°F to WBGT index.</li> <li>• If doing Moderate or Hard Work and wearing NBC (MOPP 4) clothing, add 20°F to WBGT index.</li> </ul>	
Heat Category	WBGT Index, F°	Easy Work		Moderate Work		Hard Work	
		Work/Rest (min)	Water Intake (qt/hr)	Work/Rest (min)	Water Intake (qt/hr)	Work/Rest (min)	Water Intake (qt/hr)
1	78° - 81.9°	NL	½	NL	¾	40/20 min	¾
2 (GREEN)	82° - 84.9°	NL	½	50/10 min	¾	30/30 min	1
3 (YELLOW)	85° - 87.9°	NL	¾	40/20 min	¾	30/30 min	1
4 (RED)	88° - 89.9°	NL	¾	30/30 min	¾	20/40 min	1
5 (BLACK)	> 90°	50/10 min	1	20/40 min	1	10/50 min	1

For additional copies, contact: U.S. Army Center for Health Promotion and Preventive Medicine Health Information Operations Division at (800) 222-9698 or CHPPM - Health Information Operations@apg.amedd.army.mil. For electronic versions, see <http://chppm-www.apgea.army.mil/heat>. Local reproduction is authorized. June 2004



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Table 1 (below) presents an approach for setting work/rest schedules for workers wearing normal clothing drawn from the US EPA/OSHA joint publication, *A Guide to Heat Stress in Agriculture*. Tables 1 and 2 (below) use an adjusted temperature calculation to approximate the Wet Bulb Globe Temperature (WBGT). These tables are for use where instruments which measure WBGT are unavailable. Some of the work/rest times in Table 1 for hot/dry conditions may be conservative, due to approximation of WBGT. While Tables 1 and 2 allow 13° for the full heating effect of the sun, the effect of solar heat can be greater under some conditions. Table 1 is based in part on there being perceptible air movement. Where there is little or no air movement, Table 1 is not appropriate.

**TABLE 1. APPROACH FOR SETTING WORK/REST SCHEDULES FOR WORKERS WEARING NORMAL WORK CLOTHING<sup>1</sup>**

Adjusted Temperature* (calculated)	Light Work	Moderate Work	Heavy Work
90	Normal	Normal	Normal
91	Normal	Normal	Normal
92	Normal	Normal	Normal
93	Normal	Normal	Normal
94	Normal	Normal	Normal
95	Normal	Normal	45/15 <sup>2</sup>
96	Normal	Normal	45/15
97	Normal	Normal	40/20
98	Normal	Normal	35/25
99	Normal	Normal	35/25
100	Normal	45/15 <sup>2</sup>	30/30
101	Normal	40/20	30/30
102	Normal	35/25	25/35
103	Normal	30/30	20/40
104	Normal	30/30	20/40
105	Normal	25/35	15/45
106	45/15 <sup>2</sup>	20/40	Caution <sup>3</sup>
107	40/20	15/45	Caution <sup>3</sup>
108	35/25	Caution <sup>3</sup>	Caution <sup>3</sup>
109	30/30	Caution <sup>3</sup>	Caution <sup>3</sup>
110	15/45	Caution <sup>3</sup>	Caution <sup>3</sup>
111	Caution <sup>3</sup>	Caution <sup>3</sup>	Caution <sup>3</sup>
112	Caution <sup>3</sup>	Caution <sup>3</sup>	Caution <sup>3</sup>

\*Note: Adjust the temperature reading as follows before going to the temperature column in the table:

Full sun (no clouds)	add 13°
Partly cloudy/overcast	add 7°
No shadows visible/work is in the shade or at night	no adjustment
For relative humidity of:	
10%	subtract 8°
20%	subtract 4°
30%	no adjustment
40%	add 3°
50%	add 6°
60%	add 9°

For example, if the temperature is 91°, it is dusk, the relative humidity is 40%, and heavy work is to be done, such as moving heavy materials with a wheelbarrow:

Start with 91° and add 3° because the humidity is 40% [91°+3°=94°]. Go to 94° in the table; under these conditions, it would be reasonable to follow a normal work schedule.

NOTES:

1. This table is based on American Conference of Governmental Industrial Hygienists limits for heat-acclimatized adults in effect at the time the document was published (1993). Assumptions include physically fit, well-rested, and fully hydrated workers under the age of 40; adequate water intake; 30% relative humidity; natural ventilation with perceptible air movement; and air temperature readings in Fahrenheit, taken in the shade, no sunshine or no shadows visible.
2. 45/15 minutes = 45 minutes work and 15 minutes rest during each hour.
3. Indicates very high levels of heat stress. Consider rescheduling activities for a time when the risk of heat illness is lower.

**TABLE 2. APPROACH FOR SETTING WORK/REST SCHEDULES FOR WORKERS WEARING CHEMICAL-RESISTANT SUITS<sup>1</sup>**

Air Temperature	Work/Rest Schedules								
	--Light Work--			--Moderate Work--			--Heavy Work--		
	Full Sun	Partly Cloudy	No Sun <sup>2</sup>	Full Sun	Partly Cloudy	No Sun <sup>2</sup>	Full Sun	Partly Cloudy	No Sun <sup>2</sup>
75°F	Normal Schedule	Normal Schedule	Normal Schedule	Normal Schedule	Normal Schedule	Normal Schedule	35/25 <sup>3</sup>	Normal Schedule	Normal Schedule
80°F	30/30	Normal Schedule	Normal Schedule	20/40	Normal Schedule	Normal Schedule	10/50	40/20	Normal Schedule
85°F	15/45	40/20	Normal Schedule	10/50	25/35	Normal Schedule	Caution <sup>4</sup>	15/45	40/20
90°F	Caution <sup>4</sup>	15/45	40/20	Caution <sup>4</sup>	Caution <sup>4</sup>	25/35	Stop Work	Caution <sup>4</sup>	15/45
95°F	Stop Work	Stop Work	15/45	Stop Work	Stop Work	Stop Work	Stop Work	Stop Work	Stop Work

NOTES:

1. This table is based on values for heat-acclimatized adult workers under the age of 40 who are physically fit, well-rested, and fully hydrated; with the assumptions of Tyvek coveralls, gloves, boots, and a respirator being worn; adequate water intake; and air temperature readings taken in the shade. Cooling vests may enable workers to work for longer periods. Adjustments must be made when additional protective gear is worn.
2. No shadows are visible or work is in the shade or at night.
3. 35/25 = 35 minutes work and 25 minutes rest each hour.
4. Indicates very high levels of heat stress. Consider rescheduling activities for a time when the risk of heat illness is lower.

SOURCE: Adapted from: U.S. EPA/OSHA. 1993. A guide to heat stress in agriculture. EPA-750-b-92-001

Other resources with approaches and tips for setting work/rest periods include:

- OSHA’s Technical Manual Table III: 4-2 offers a simple chart showing several example WBGT meter readings and the appropriate work/rest schedules for light, moderate or heavy work.
- The American Conference of Governmental Industrial Hygienists (ACGIH) describes a detailed method of determining work/rest schedules based on numerous factors including WBGT meter readings. The schedule can be adjusted for work demands and clothing type. This work/rest schedule method is published as: Heat Stress and Strain, in TLVs and BEIs, American Conference of Industrial Hygienists, Cincinnati, OH.