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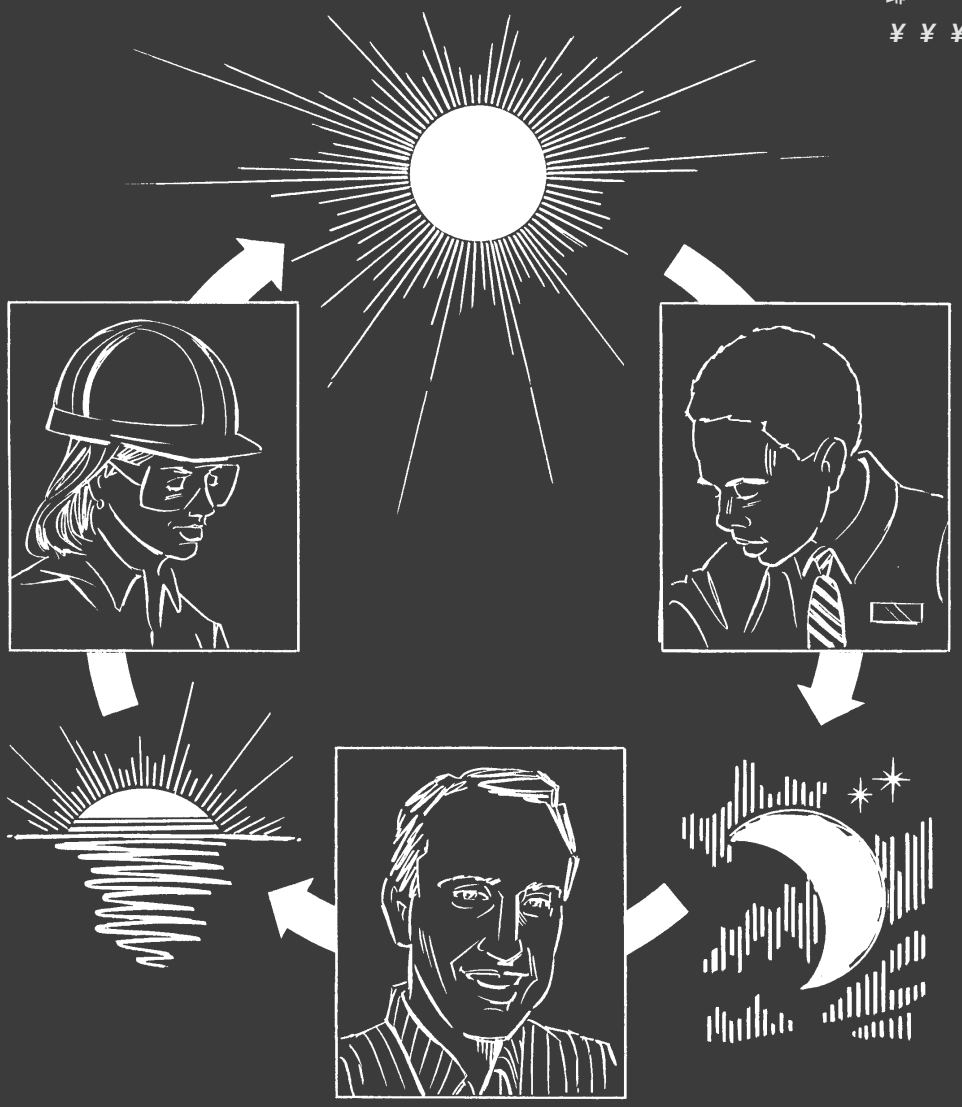
PLAIN LANGUAGE ABOUT SHIFTWORK



U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health

CDC
CENTERS FOR DISEASE CONTROL AND PREVENTION

Plain Language About Shiftwork

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Public Health Summary

What are the hazards?

Shiftworkers and night workers often are tired and sleepy because of their work schedule. Being overly tired makes it difficult to concentrate, which increases the possibility of errors or accidents. This can be a risk both to the worker and to the public. The stress of shiftwork also can aggravate health conditions, such as heart disease or digestive disorders.

How do these hazards occur?

Working at night makes it difficult to get enough sleep. Sleep after night work usually is shorter and less refreshing or satisfying than sleep during the normal nighttime hours. Brain and body functions slow down during the nighttime and early morning hours. The combination of sleep loss and working at the body's low-point can cause excessive fatigue and sleepiness. This makes it more difficult to perform well, which increases the risk of accidents. Also, shiftwork can be stressful because of frequent switching from a day to night schedule and because of separation from family and friends. These stresses can be harmful to health.

How can these hazards be avoided?

Many workers cannot avoid night or rotating shiftwork. Therefore, this booklet suggests ways of coping with shiftwork. Organizational or group approaches include redesigning the work schedule, redistributing the workload, improving the work environment, and instituting programs to improve worker awareness. Individual approaches include improved sleep strategies, exercise and diet programs, and relaxation techniques.

How do I get more information?

If you would like extra copies of this booklet, or if you have questions about the material in this booklet, contact the National Institute for Occupational Safety and Health (NIOSH) at the number listed below.

1-800-35-NIOSH
(1-800-356-4674)

Plain Language About Shiftwork

About this booklet....

This document gives basic facts about shiftwork and talks about ways to make shiftwork life easier. It is organized into six sections. If you prefer, go directly to the section of interest to you. The six sections are:

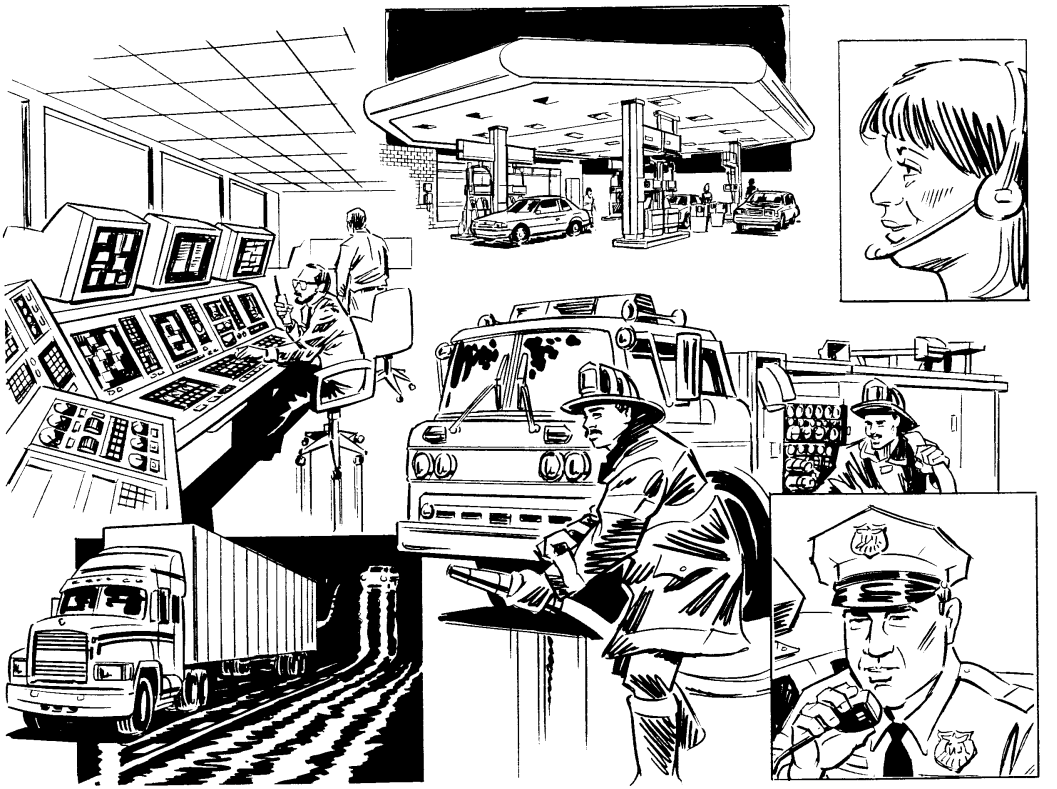
Introduction

Demanding work schedules are a fact of life in modern, 24-hour society. Goods are produced and services are provided at all hours of the day and night. Because of this, people are required to work at all hours. These kinds of work schedules can be quite a strain and can affect a worker's safety or health. Mistakes from a fatigued shiftworker also can affect the public's safety or health.

To prepare this document, we borrowed ideas and information from many people who have studied shiftwork or done shiftwork themselves. Some of our sources are mentioned in the recommended reading list at the end of this document. We encourage the reader to check this list to learn more about shiftwork.

1

Background Information



Defining Shiftwork

There are many work schedules that are called shiftwork. Shiftwork involves working outside the normal daylight hours. That is, outside the hours of around 7 a.m. to 6 p.m., the time period in which many people in our society work a 7- to 8-hour shift. Shiftworkers might work in the evening, in the middle of the night, overtime or extra-

long workdays. They also might work regular days at one time or another. Many shiftworkers "rotate" around the clock, which involves changing work times from day to evening, or day to night. This might happen at different times of the week or at different times of the month. Police officers and firefighters, for example, often work rotating shifts. Other workers might have a "permanent" shift and only work at night or in the evenings. Waiters and waitresses, for example, might work only the evening shift. Night watchmen, on the other hand, might work only the overnight or "graveyard" shift.

Society and Employer Reasons for Shiftwork

There are several reasons for shiftwork. A major reason is that modern technology has made it possible to do many activities at any time of the day or night. This "24-hour society" of ours requires that important services be provided at all times. Critical services include public safety, such as police and fire protection; military defense; health care; transportation; and public utilities, such as electrical power, water and telephone. Other industries must operate 24 hours per day because the production process is much longer than 8 hours and must be performed continuously. Many chemical products require such a process. Also, manufacturing industries often have expensive machinery that needs to be operated continuously in order to be profitable.

Because several occupations and industries operate around the clock, other services have expanded their hours to accommodate evening and nighttime workers. (They also have expanded access for all the rest of us who simply enjoy the convenience.) Some obvious examples are grocery stores, gas stations, and restaurants that are open 24 hours per day, seven days per week. The increase in these expanded-time services in the past decade or two has opened up the job market for new shiftworkers. This is ironic. Because there are so many shiftworkers, society now needs more shiftworkers.

Numbers of Shiftworkers

Estimates of the number of shiftworkers varies with the definition of shiftwork. The Bureau of Labor Statistics reports that about five percent of American adults work in the evening. Permanent night workers and workers with irregular schedules make up another four percent. Still another four percent are rotating shiftworkers. All together, this amounts to about 15.5 million people.

Almost any occupation or industry has some people doing shiftwork. A quick check of lists provided by the Bureau of Labor Statistics shows about 2 to 10 percent of almost any occupation working evening, night, or rotating shifts. These kinds of schedules happen quite often among police officers and firefighters. More than half of them work evenings and nights, and about a quarter of them rotate shifts. Many transportation and public utility workers — about one-fifth of them — also work shifts. Long-haul truckers often make their best time in the evening or at night.

Lately, many materials must be delivered "just in time," or just before they are used in manufacturing. For example, parts for making automobiles are delivered this way. This practice has forced more truckers to take trips at all hours and at the last minute to make their deliveries on time.

People Who Work Shifts

If we look only at full-time jobs, men work more night and rotating shifts, while women work more evening shifts and do more part-time work. However, full-time shiftworking women are not far behind in numbers. And more women are entering the workforce full time, so these numbers are changing quickly. Younger people are more likely to work shifts than older people. African-Americans do more shiftwork than Caucasian-Americans. Single people work more shifts than

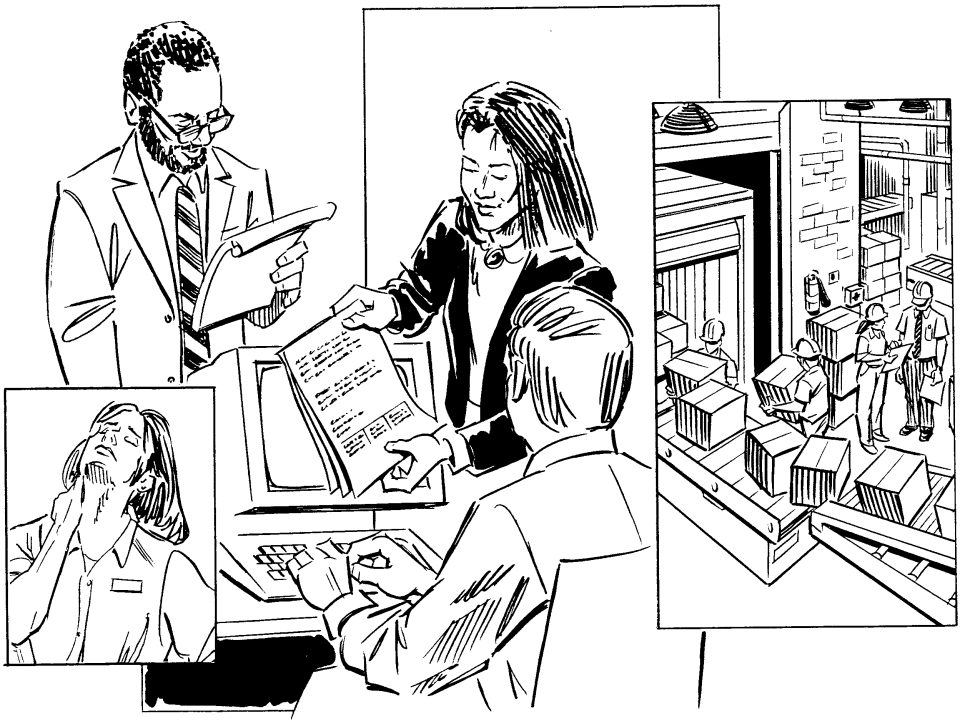
married people. If we look at married couples who each have paying jobs, about one-quarter to one-third of these couples have at least one partner who is a shiftworker. If we look at mothers with children at home, single mothers work shifts more often than married mothers.

Employee Reasons to Do Shiftwork

Some workers actually prefer non-day work, but most do not seek out shiftwork. Reasons for employees choosing shiftwork include better pay, more available time during the day for child care, more daylight hours for recreation, and more time to attend school. Some workers prefer the night shift because it is quieter and there are fewer supervisors. Usually, however, workers say they did not choose shiftwork. They do it either because it is required of the job, or no other job is available.

2

How to Examine Work Schedules



Shiftwork experts often are asked what is the best or worst work schedule. There is no simple answer to this question because there is no ideal schedule that fits every situation. Both good and bad points can be found in most work schedules. In this section, we suggest ways to examine work schedules to identify their advantages and disadvantages.

Types of Work Schedules

There are hundreds of different shiftwork schedules. However, it is difficult to accurately count the many shiftwork schedules being used. No thorough records are kept by the federal government, trade organizations, or labor unions. Different schedules might be used by the same occupation, the same industry, or even the same workplace.

The most common shift schedule probably is five days on a single shift followed by two days off. If this is a rotating shift schedule, the worker will change to a new shift after the days off. Depending on the job, it is even possible to work 7, 10, or 14 days in a row. Offshore oil rig workers, for example, might work two weeks out on the rig followed by two weeks off at home.

Since so many different schedules exist, researchers have thought of ways to measure different features of the schedules. These features are used to study how work schedules might affect safety, health, or productivity. The features are listed in Table 1 with explanations below.

Work Schedule Features

We already have mentioned the time of the shift and whether shifts are permanent (fixed) or rotating. It also is important to consider:

- How long a shift might be.
- How many shifts are worked before a rest day.
- How many rest days are on weekends.
- Whether there is overtime.
- How much rest is taken between shifts.
- How much rest is taken during the shift.
- Whether the work schedule is regular and predictable.

As we will explain, all of these features can affect the amount of stress and fatigue a person feels because of the work schedule. If people experience too much stress and fatigue, then they might not do their jobs safely and efficiently. Or they might develop health problems. Here are some particulars about the different shift features.

Time of Shift: Twenty-four hour operations usually are divided into two or three shifts. Start- and end-times depend on the length of the shift. Day shift (also called morning or first shift) starts around 5 to 8 a.m. and ends around 2 to 6 p.m. Evening shift (also called afternoon or second shift) starts around 2 to 6 p.m. and ends around 10 p.m. to 2 a.m. Night shift (also called third, "graveyard," or "mid" shift) starts around 10 p.m. to 2 a.m. and ends around 5 to 8 a.m.

Why is the time of shift important? Because people who work in the late night or early morning hours often feel sleepy and fatigued during their shift. This happens because their body rhythm (also called a *circadian rhythm*) tells them to be asleep at those times. Night workers also must sleep during the day, when their circadian rhythm tells them to be awake. Because of this, day sleep is short and feels "light" or unsatisfying. Often, night workers don't get enough sleep during the day to combat nighttime fatigue and sleepiness. Also, day workers sometimes must wake up very early to go to work. This might cause them to cut off their sleep, which makes them feel tired during the day.

Shift times also determine when a worker can see family and friends. Many social events take place in the evening, which means they might be missed by evening or night workers. Parents who work the evening shift might not see their children during the week because they are at work when the kids return from school. If this happens too often, it can be stressful.

Permanent versus Rotating Schedules: We might think that permanent night workers adapt or get used to their work times. Usually, the longer somebody does something, the easier it becomes. With experience, many night workers figure out tricks or personal methods to fight off some of the nighttime fatigue. However, research tells us that most permanent night workers never really get used to the schedule. That is, there are many nights when they still feel tired and sleepy. Fatigue occurs because most night workers go back to a day schedule on their days off. This is not surprising because family and friends are active during the day. Also, many errands and chores (like getting the car fixed) must be done during the day. Because most night workers often return to a day schedule, they never completely allow their sleep and body rhythms to adapt to being awake at night. They also sleep less during the day, so they don't recover from fatigue. This fatigue can carry over from day to day. Over several days, fatigue can accumulate to unsafe levels.

People working rotating schedules face a similar situation. Because the shift times are always changing, they can never completely adapt to a set work schedule. Rotating schedules are often used because they are considered fairer to all workers. Everybody in the workforce takes their turn at both the popular and unpopular shifts. Rotating shiftworkers are always trying to get used to changing work times. This is not easy, which is why rotating shiftworkers have more complaints than other workers about physical health and psychological stress. Research has shown that rotating shifts have special features that might affect a person's ability to get used to the schedule. These features are explained below.

Speed and Direction of Rotation: Adapting to rotating shifts can be affected by the speed of rotation and the direction of rotation. Speed of rotation means the number of consecutive day, evening, or night shifts before a shift change occurs. Direction of rotation means the order of shift change: A *forward* rotation is in the clockwise direction,

from day to evening to night shift. A *backward* rotation is in the counterclockwise direction, from day to night to evening shift.

Different *rotation speeds* also affect a worker's ability to get used to change of shift times. We have already talked about the same situation under permanent versus rotating shifts. Longer rotations (for example, three to four weeks of working the same hours) are supposed to allow workers more time to get used to night shifts. However, workers usually return to a day schedule on their days off. A fast rotation (every two days, for example) allows no time to get used to night work. Some researchers prefer the fast rotation, because the worker quickly gets through the tough shifts and then has a couple of days off. Very fast rotations are used in Europe more than in America.

Direction of rotation can affect the ability of circadian (daily body) rhythms to adapt to the change in work times. Sleep, for example, is a circadian rhythm because each person sleeps for part of every day. Some researchers suggest that a forward, or clockwise, rotation is better for helping a worker adjust to new sleep times. This suggestion was made because it is easier to go to bed later and wake up later than earlier. Our body rhythms make us feel more awake and alert in the early evening. This makes it harder to fall asleep earlier. Backward rotations work against the body rhythm by forcing the worker to go to sleep earlier and earlier.

Although we don't have hard and fast numbers, it seems that backward rotation schedules are used frequently in the United States. It is not completely clear why. It is partly because of custom (We always did it this way) and partly because workers like the "long change." In the long change, workers pick up an extra day off when going to

evening shifts after night shifts. This happens because evening shift starts late in the day, which leaves most of that day free for non-work activities.

Work-Rest Ratios (or How Much Work Before a Rest): The more a person works, the less time he or she will have for rest. People who work an 8-hour shift will have 16 hours left in a day to do everything else, and also to get some rest. People who work a 12-hour shift have only 12 hours to do everything else and to rest. In a situation like this, the extra work hours mean more tiredness and less time for rest. This is a two-edged sword. For example, many times a worker's home responsibilities, such as taking care of children, cannot change from day to day. So, if workers do overtime or a 12-hour shift, they still must take care of home duties. Since these duties take the same amount of time every day, workers may sacrifice rest and sleep after a long workday. This example shows us how important the length of shift can be in terms of stress and fatigue.

When looking at work versus rest, we also must consider how many breaks are taken during the shift and the length of breaks. Depending on the type of work and length of the day, several short breaks might be better than a few long breaks. Short breaks might be better particularly for jobs requiring heavy physical labor.

How tired a worker is also depends partly on how many days in a row he or she works. Fatigue builds up over several workdays, as well as over a single workday. This happens especially when a person gets less sleep between workdays than on rest days. As we mentioned earlier, a worker might not get enough sleep between long workdays because of home responsibilities. So, if a person works several days in a row, for example, six or seven, a good deal of sleep might be lost. Then the worker feels quite tired during the last one or two shifts.

Table 1: Work Schedule Features

Feature	Particulars	Example
Time of Shift	Day, evening or night	
Shift Rotation		
Permanent	Fixed shift times (no rotation)	
Rotating	Changing shift times	
Speed	Number of workdays before shift change	Rapid: 2 days per shift Slow: 21 days per shift
Direction	Clockwise (forward) or counterclockwise (backward) change	Clockwise: day to evening to night Counter: day to night to evening
Work-Rest Ratios (or How Much Work Before a Rest)		
Weekly	Number of workdays to number of restdays	5 workdays/2 restdays 7 workdays/3 restdays
	Overtime workdays	
Daily	Work hours to rest hours	8 h work/16 h rest 12 h work/12 h rest
	Rest breaks within a day	Lunch, coffee break
	Overtime work hours	
How Regular or Predictable?		
	Can affect any other part of the schedule	Emergency or “on-call” Unplanned overtime Demand-based scheduling or working off a “call board”

How Regular or Predictable? Most jobs have a very regular, set schedule. A worker usually knows the schedule ahead of time. Even if the shift times change, a worker will know several days beforehand. This makes it easy to schedule other non-work activities, such as making sure somebody is at home when the children get there. Other jobs are not so regular or predictable. For example, health care workers might respond to emergencies that keep them on the job much longer than expected. Or, they might be on call for such emergencies. At a factory, a breakdown or a last-minute call for a product might keep workers at the plant working overtime. Railroad workers sometimes work off a "call board." This means they can be assigned to a train at the last minute to move a "just-in-time" order of goods.

If workers cannot predict their schedules, it is difficult to get adequate rest. Maybe they just get to sleep when they are called back to work, or maybe they have just worked a long shift when an emergency happens. So, they stay at work a few more hours. Maybe they are on call and never get deep, satisfying sleep because they are always listening for the phone. Some people call this "sleeping with one eye open."

3

Health and Safety Effects of Shiftwork

We have mentioned several positive points about shiftwork. Because of shiftworkers, our society is kept moving 24 hours a day. To the worker, shiftwork might mean extra pay or more free hours during the daytime. We also mentioned that shiftwork schedules are demanding and likely to produce stress and fatigue. Here we

summarize ways that shiftwork might affect safety, health, or ability to do the job. Some of these things happen very soon after starting shiftwork. We talk about these under Immediate Effects. Health changes take a longer time to appear. We talk about health under Long-Term Health Effects.

Immediate Effects

Sleep

Soon after starting shiftwork, people notice changes in their sleep. Night workers usually get the least amount of sleep. Evening shiftworkers get the most sleep, and day shiftworkers get a medium amount of sleep. Night workers are forced to sleep during the day, when their circadian rhythm makes them feel more awake. Day sleep is usually shorter than night sleep—sometimes two or three hours shorter. Day sleep also is lighter than night sleep. Day sleepers often say they don't sleep as deeply as they do at night. Because their sleep is lighter, they are easily awakened by sounds. This makes sleeping difficult. Since there is more activity during the day, there are more sounds to wake up the sleeping shiftworker. Both permanent night workers and rotating shiftworkers sleep worse when working nights. However, rotating shiftworkers sleep the least of all.

Sleep loss makes it much easier to fall asleep at inappropriate times. This affects a worker's ability to perform safely and efficiently. Sleepiness can affect performance both on and off the job. Driving to and from work is a major concern. Sleepiness affects our ability to concentrate or pay attention, and driving requires us to pay attention at all times. So, if a person is sleepy, it is easier to have an accident. Several jobs, such as operating dangerous machinery, also require us to pay attention at all times. So sleepiness can be risky in many different occupations. This risk is not simply a matter of falling completely asleep. After sleep loss, it is possible to have very brief periods of sleep that last only a few seconds. Most people may not even realize

these short sleeps are happening. During those few seconds of sleep, they are not paying attention at all. If something dangerous happens at those times, the worker or somebody else could get seriously hurt.

Circadian Rhythm, Performance, and Safety

The circadian rhythm is a major body rhythm with regular ups and downs in the 24-hour day. Many systems in the body are very active at certain times of day, and not active at all at other times of day. Usually the most activity happens in late afternoon or early evening. For example, the body's ability to produce energy from food (metabolism) is highest in the afternoon to evening. The least activity usually happens in the middle of the night when most people are asleep. This is one reason people feel most active and alert around 4 to 6 o'clock in the afternoon, and sleepiest at 4 to 6 o'clock in the morning.

There also are personal differences in circadian rhythms. Some people are morning types or "larks." Morning people feel most active and alert early in the day. They usually go to bed early in the evening. Other people are evening types or "owls." Evening people feel most active in late afternoon or evening, and like to stay up late into the night. Fishermen who are out on the water before dawn usually are morning types. Musicians who perform in the evening usually are evening types. Most people, however, are somewhere in-between the strict morning and evening types.

The internal circadian rhythm affects how alert people feel. This affects their ability to perform. People perform best when alertness and internal body activity is high, and worst when alertness and activity are low. In the normal day-work, night-sleep situation, people work when the circadian rhythm is high and sleep when it is low. On average, this schedule is best for performance, which means it also is best for safety. When workers perform poorly, they are more likely to make errors that could lead to accidents or injuries.

When working the night shift, a person is at work when his or her circadian rhythm is low and asleep when it is high. Such a schedule means that a person is trying to stay alert when the circadian rhythm is low. On average, this is not the best time of day for performance. This low-point affects physical activity and the ability to concentrate. If a worker also has lost sleep, fatigue could combine with the circadian low-point to double the effect on one's ability to perform. Poor performance could affect both productivity and safety. Studies of errors and accidents at different times of day show an increased risk at night when the circadian rhythm is low and sleep has been lost.

Interference with Social and Family Life

Most social and family events happen during the evening or on weekends. Because shiftworkers are on the job in the evening or on weekends, or because they sleep during the day, they often miss out on social or family activities. When shiftworkers are asked about problems with their work schedule, they usually say that the number one problem is missing family and friends. Most shiftworkers agree that sleep also is a problem, but sometimes they would rather lose a little sleep just to see other people, especially their spouse or children.

The amount of time shiftworkers spend with family and friends depends on their schedule. It also depends on their social and leisure activities and how flexible these activities are. Shiftwork interferes little with activities that are not on a strict time schedule. Gardening, woodworking, or fixing cars are these kinds of activities. Shiftwork does interfere with activities that are strictly scheduled, such as clubs or team sports. Shiftworkers often miss these activities because of work. Child care or visits to the children's school also can be a problem because of the work schedule.

A shiftwork schedule affects not only the worker but also the rest of the family. For example, children at play must be quiet during the day because the shiftworker is asleep.

Long-Term Health Effects

In the long run, it is possible for a demanding work schedule to affect a person's health. However, studying health problems in workers is difficult. If possible, workers will change jobs if they think the work is making them ill. A shiftworker might change to a day job for that reason. This is called the "healthy worker" or the "survivor" effect. Workers who stay on the job are those who can "take it." Because sick workers leave the job, it is much harder to show a relationship between job factors and poor health. Therefore, researchers have only fairly healthy shiftworkers to study.

With that in mind, it is not clear whether or not one's work schedule is the actual cause of health problems. But, workers who quit doing shiftwork often point to health problems as a major reason for quitting. Plus, a stressful schedule can combine with other factors to hurt a person's health. If a person has other major stresses in life, such as a bad marriage or a loved one with a chronic illness, a demanding work schedule certainly won't help the situation. If a worker has poor health habits, such as using too much alcohol or tobacco, it will be more difficult to resist the stress of the work schedule. A demanding schedule also might aggravate an existing health problem.

Digestive Problems: Some research has suggested that shiftworkers have more upset stomachs, constipation, and stomach ulcers than day workers. Other research has not backed up this suggestion. But, there is always the problem of having only healthy workers to study. Digestive problems could be more common in shiftworkers because digestion follows a *circadian rhythm*. Usually people eat at regular times during the day. They also eliminate waste at regular times during the day. Shiftwork can interfere with regular eating and digestive

patterns by changing work and sleep times frequently. So, it is not surprising that this could lead to nausea and other stomach problems. However, digestive problems also could be caused by lack of nutritious food. For example, sometimes on night shift only junk food from vending machines is available.

Heart Disease: Heart problems also have been noted more often among shiftworkers than day workers. For example, Swedish researchers studied paper mill workers in a small town for several years. This study is especially meaningful, because the paper mill was the only employer in town. This made it difficult for the employees to stop working shifts. Most of them had done shiftwork for most of their lives. Researchers found that the longer people worked shifts, the more likely they were to develop heart disease. However, the way in which the work schedule affects the heart is not at all clear. Work schedule stress might cause heart disease, but it is more likely a combination of stress, diet, smoking and drinking habits, other life stresses, and family history of heart disease.

It is difficult to say exactly how the work schedule fits in with all the other factors producing heart disease. Earlier we talked about several different work schedule features that could cause stress and fatigue. Right now we can only guess about which combination of those features has the most impact on a person's health. Constantly shifting from a day to a night schedule may be one of the stressful factors. But long work hours, high workloads, and irregular schedules also can play a role.

4

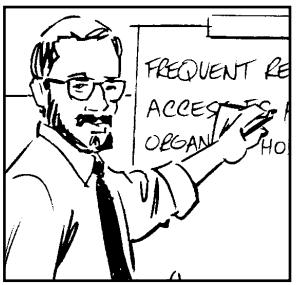
Improving Shiftwork Through the Organization

Work Schedule Design

There are few laws or regulations governing work hours or work scheduling in the United States. The federal government has placed a 10-hour limit on the length of time a long-haul trucker can drive each day. There also are federal regulations governing flight time and rest time for commercial airline pilots. Various state laws establish rules for overtime pay and child labor. Other than these regulations, the law does little to guide design of a work schedule to reduce stress or

fatigue. Nevertheless, research has suggested that work schedules can be improved. Older, poorly designed work schedules might even be dangerous because new technologies can change both the physical and mental demands placed on a worker. A well-designed work schedule can improve health and safety, worker satisfaction, and productivity. Therefore, a good work schedule is an advantage for both the organization and the worker.

Changing a schedule is not easily done and must be handled carefully. Designing a work schedule has a large and immediate impact on all workers. All people on the job must abide by the work hours, or they will lose their jobs. Also, working hours affect how people arrange the rest of their lives. So any time a work schedule is changed, many aspects of job life and home life must be considered. It is recommended that any work schedule change should first be temporary and evaluated carefully. The benefits of the change must outweigh the possible negative aspects. If it really is a change for the better, then it can be established on a permanent basis. Because such a change is complex, it is a good idea to consult *ergonomics, or human factors,* specialists for help in work schedule design and evaluation.



Shown below are some possibilities that the organization could consider to improve a shiftwork schedule. Given the limited amount of knowledge and research at this time, these should be considered as suggestions and not as strict guidelines or regulations. Remember, all aspects of job and home life must be considered when changing a work schedule. Some suggestions may be useful in a particular work situation, and some may not.

Consider alternatives to permanent (fixed or non-rotating) night shift: Most workers never really get used to night shift because they go back to a daytime schedule on their days off. Also, some workers on fixed night shifts lose contact with management and the

Improving Shiftwork Schedules

- **Avoid permanent (fixed or non-rotating) night shift.**
- **Keep consecutive night shifts to a minimum.**
- **Avoid quick shift changes.**
- **Plan some free weekends.**
- **Avoid several days of work followed by four- to seven-day "mini-vacations."**
- **Keep long work shifts and overtime to a minimum.**
- **Consider different lengths for shifts.**
- **Examine start-end times.**
- **Keep the schedule regular and predictable.**
- **Examine rest breaks.**

rest of the workers in the organization. They may end up feeling too isolated or somehow "different" from the rest of the workers. This could make communication difficult. If possible, consider a rotating night shift schedule, but take measures to ease the burdens often experienced in the typical weekly shift rotation. Some suggestions for making rotation less taxing are given below. We realize, however, that permanent night shift sometimes is the only choice, such as in a nighttime security guard job.

Keep consecutive night shifts to a minimum: Some researchers suggest that only 2 to 4 nights in a row should be worked before a couple of days off. This keeps circadian rhythms from being overly disturbed and limits sleep loss.

Avoid quick shift changes: A break of only seven to ten hours should be avoided before rotating to a new shift, such as going from

morning to night shift on the same day of the week. With so quick a change, it is difficult to get much rest before going back to work. On return to work after a quick change, most people are very tired and sleepy. At the end of a night shift, at least 24 hours are recommended before rotating to another shift. Some researchers even suggest that 48 hours should be the minimum between shifts.

Plan some free weekends: If a seven-days-per-week schedule is required, allow one or two full weekends off each month. Loss of contact with friends and family is a major problem for shiftworkers. Weekends are the best time to meet family and friends who are on a day schedule.

Avoid several days of work followed by four- to seven-day "mini-vacations": Working several days in a row followed by several days off can be very fatiguing. For example, some schedules require 10 to 14 days of work followed by five to seven days off. Frequent "mini-vacations" are well liked by some workers, especially younger ones. However, older workers find it difficult to recover during the mini-vacations before they return to another long spell of work. Poor recovery from fatigue can produce accidents and damage health. A long work spell should be used only when there is no other choice, such as when long travel distances are required to do the work (e.g., mining or oil exploration).

Keep long work shifts and overtime to a minimum: Extra work hours add to fatigue. They also allow less rest time per day. If 12-hour shifts are used, two or three 12-hour shifts in a row should be the maximum. Two in a row is probably best for night shift. One or two days off should follow these night shifts.

Consider different lengths for shifts: Try adjusting shift length to the workload. Heavy physical or mental work or monotonous boring work is especially difficult at night. Maybe night shifts could be shorter. If possible, move heavy work to shorter shifts and lighter work to longer shifts.

Examine start-end times: Flexible start-end times, or "flextime," can be useful for those with child care needs or a long commute time. Consider moving shift start-end times away from rush hour. Morning shifts should not start too early (5 to 6 a.m.) because night sleep often is cut short before an early shift.

Keep the schedule regular and predictable: Workers should know their schedule well ahead of time, so they can plan their rest, child care, and contact with family and friends. Studies of train accidents showed that very irregular schedules contributed to the accidents by producing sleep loss and fatigue.

Examine rest breaks: Sometimes the standard lunch and coffee break are not enough to recover from fatigue. For example, card dealers in gambling casinos get a 10 to 15 minute break every hour because their jobs require so much concentration. If their concentration is low, it is easier for a player to cheat at cards, and the casino will lose money. In jobs requiring repetitive physical work, brief rest breaks each hour seem to be best for recovery from muscle fatigue.

Workload Distribution

In some jobs, it might be possible to schedule heavy or demanding work at times when workers are most alert or at peak performance. We mentioned that the afternoon and early evening hours are times of peak performance. If possible, avoid doing the heaviest or most dangerous work in the middle of the night or early morning hours. This is the time when circadian rhythms are low, and sleepiness is high. Especially avoid heavy or dangerous work if the worker is at the end of a 12-hour shift in the early morning hours. Extra fatigue from long work hours can combine with early morning sleepiness to increase accident risk.

Work Environment

Poor working conditions add to the strain of shiftwork. Adequate lighting, clean air, proper heat and air conditioning, and reduced noise will avoid adding to the shiftworker's burden. Shiftworkers also may be particularly sensitive to toxic substances because circadian rhythm changes make the body more sensitive to toxic exposure at certain times of day. Workers also should have access to hot and nutritious meals during evening and night shifts. If a cafeteria is not available, a microwave will allow workers to warm meals brought from home or bought from vending machines.

Electronic Monitoring

Modern computer technology makes it possible to check a worker's performance every minute of the day. Some people have suggested that a monitoring or test system could be used to check a worker for dangerous levels of fatigue. There are performance tests on the market that claim to test fatigue or determine whether the worker is using drugs. However, many of them have not been tested scientifically, so we cannot recommend them at this time.

Some computer systems actually measure worker output or productivity. For example, a computer might measure the number of times a worker taps a keyboard or how many phone calls are completed in an hour. If a worker slows down too much, it could be a sign of fatigue. It may be possible to use this system as a fatigue test. But this is tricky business. The feeling of being watched constantly can be very stressful to workers. (Big brother is watching you.) It can make workers feel they have no control over their jobs. We suggest that computer monitoring be used only when the workers themselves choose it for safety purposes.

Access to Health Care and Counselling

Often, going to one's health clinic or to personal or marriage counselling is not possible in the evening or at night. Expanded access to these services will help improve shiftworkers' physical and mental health and boost morale. If services are not available within the organization, a directory of community health and counselling facilities with expanded hours could be provided.

Training/Awareness Programs

Meetings to make all workers aware of the ups and downs of shiftwork can be useful, especially for new shiftworkers. It is important to invite family members to these meetings, so they can know what to expect from the shiftworker. Use the meetings to share information on all issues mentioned in this document and in the recommended reading. Talking about personal experiences also is very valuable in these types of meetings. If people are having trouble adapting to shiftwork, it is important they know they are not alone. They might learn some tricks from other workers that could make their job life easier. The family will learn just how tough the work schedule can be. It will help to know when to go easy on the worker because of the schedule.

Social Programs

A little extra effort at organizing get-togethers, hobby clubs, or sports and game activities can lessen the feeling of isolation. There is no special reason for these activities to take place only in the day or evening. For example, nighttime or early morning bowling leagues are available in some places.

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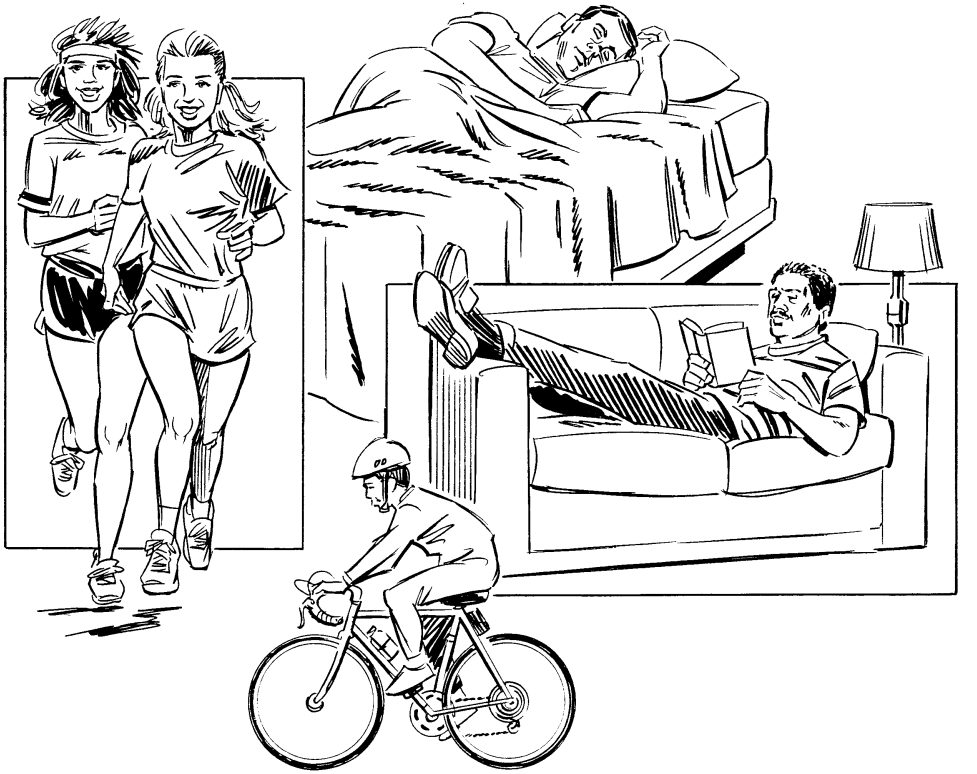
Coping Strategies for the Individual



Getting Enough Good Sleep

Take responsibility for getting enough sleep to feel rested and restored. For some people this happens without doing anything

special. However, most shiftworkers need to become more aware of what to do to get satisfying sleep and when to do it.

When to Sleep after Night Shift: This depends on the individual. Try different times and see what works best for you. As you experiment with different sleep times, keep a written record of when you go to sleep, when you wake up, and how rested you feel. This will help you identify which sleep schedule works best for you.

Some workers like to sleep in one longer period, but many workers need two shorter sleep periods to get enough sleep after the night shift. It is a good idea to go to bed as early as possible after the night shift in order to maximize sleep. A second sleep also could be taken in the afternoon to get ready for night shift. Try taking advantage of the natural tendency to be sleepy in mid-afternoon. You might get your most satisfying sleep at that time.

Does Rest Equal Sleep? Just resting without sleep is not enough. The brain has to have sleep, or you will be sleepy later in the day or during night shift. However, rest without sleep still is valuable for body and muscle recovery. Schedule at least seven hours in bed, even if you don't sleep the whole time.

What is the Minimum Amount of Sleep? The vast majority of workers need at least six hours of sleep but most need more than this. Most people do not feel refreshed and at their best with just six hours. Staying with your own preferred amount of sleep is best in the long run. You might find that you need less as you become more experienced with shiftwork.

Switching Back to Days: When switching back to days after the night shift, it is best to get most of your sleep the following night. Sleep just a couple of hours shortly after night shift to shake off sleepiness. Then stay awake all day and go to sleep at your regular bedtime at night.

Napping: Shiftworkers frequently nap, especially when working night shift. Added to your regular sleep, a short afternoon or evening nap will help fight sleepiness during the night. However, napping is not long enough to replace regular sleep. If you nap, allow enough time for drowsiness to wear off before starting work. If you have time to nap at work during your break, don't make the nap too short. A nap of 15 minutes or less might actually make you more sleepy. Twenty to 30 minutes should be the minimum for a nap during a work break. Again, allow enough time for drowsiness to wear off before doing hazardous work. And don't use work-break naps to replace your sleep at home. Naps work best when they are extra sleep time. They don't work as well when you are trying to make up for lost sleep.

Protect Sleep

Block Out Noise: Switch off the phone and disconnect the doorbell. Use ear plugs. Ask the family to use headphones for the stereo or TV. Set strict times for noisy activity, such as vacuuming, clothes washing, or children playing. Don't allow these activities during your sleep times. Locate your bedroom in the quietest place. If possible, get away from outside noise and also away from the kitchen or bathroom. Soundproof the bedroom with insulation and heavy curtains. Put signs out to say you are sleeping. Tell friends and neighbors when not to call.

Keep a Regular Sleep Routine: Make the bedroom as dark as possible. Always sleep in the bedroom. Follow your regular bedtime routine every time you go to sleep. For example, wash up and brush your teeth so you feel comfortable. This can serve as a signal to your body that it is time to sleep. Don't use the bed for anything except what it is intended for. For example, don't read, eat, watch TV, write bills, or argue with your spouse in bed. Make sure you have a comfortable bed that won't disturb your sleep.

Avoid Heavy Foods and Alcohol Before Sleep: Heavy, greasy foods are anti-sleep because of stomach upsets. If you must eat, a light snack won't disturb your sleep. Alcohol might make you feel sleepy, but it will wake you up too quickly after falling asleep. Don't drink alcohol in the hour or two before sleep.

Exercise

In general, keeping physically fit helps resist stress and illness. Regular exercise also keeps a person from becoming tired too quickly. A big question for the shiftworker is when to exercise. The timing of exercise is important, so that it does not make a person too tired to work. Exercise also should not interfere with sleep. If a worker does physical labor, too much exercise before work might make work too tiring. Twenty minutes of aerobic exercise before work (for example, a brisk walk, bike ride, jog, or swim) is enough to help any worker wake up and get going and also keep the heart in shape. Try to avoid exercise in the three hours before sleep. Exercise tends to activate the body or wake it up. This might make it difficult to fall asleep.

The timing of exercise also might help a person rotate from one shift to another. Since brisk exercising activates the body to produce energy, it also might help the body rhythm shift to the new work time. Try exercise before going on shift. Early morning exercise is good for day shift, afternoon exercise is good for evening shift, and early evening exercise is good for night shift. Don't overdo it or you will be too exhausted to work.

Relaxation Techniques

Being able to wind down and take it easy is just as important as being able to wake up and get going. Give yourself time to relax and get rid of work-time stresses. This will make home life and sleep easier. Find out what is best for you personally to help you relax best. It could be just sitting down and closing your eyes for a while. Or it could be meditating, praying, reading, taking a bath, or watching TV.

The following simple exercise may help you start your quiet relaxation time. Try lying down on the carpet or bed, or sitting in an easy chair. One by one, slowly tense each muscle group in your body, then slowly let them relax. Do this for your arms, legs, stomach, neck, and face muscles. Breath deeply during this exercise and go slowly. Try to feel all the muscle tension draining away from your body. This is a simple way to let go of all the stresses of the day and to slow down.

Diet

TV and the newspapers have highlighted diets recommending certain foods to help people wake up and other foods to help them relax. Right now we cannot recommend either diet for the shiftworker. There have not been enough scientific tests to decide whether either diet really helps a person wake up or relax. In some cases the two diets recommend the same kinds of foods to do opposite things: one diet recommends eating protein to wake up, while the other diet recommends eating protein to relax or become sleepy. This conflict makes it even more difficult to decide whether either diet really works. There simply are not enough studies of people using these diets to be able to recommend them.

We can recommend sticking to a diet that, along with exercise, helps a person stay physically fit. This means avoiding fatty and sugary foods, which make a person gain too much weight. Heavy or fatty

meals should be avoided especially in the middle of the night because they are the most difficult to digest at that time. Eating lighter meals in the middle of the night helps reduce stomach upsets.

Bright Light

Recent research tells us that bright light can affect our circadian rhythm. As we mentioned already, the circadian rhythm normally makes us feel most active and alert in the late afternoon, and most tired and sleepy in the middle of the night. Lately, we have learned that the high-point and the low-point of the circadian rhythm can be changed by exposure to bright light. By bright light we mean as much sunlight as on a bright summer day. Bright light affects *melatonin*, which is a chemical naturally produced by the brain. More melatonin makes us feel sleepier. Melatonin usually is produced during the early part of nighttime sleep. Bright light in the evening will reduce melatonin, or make it appear later in the night.

In laboratory research, people exposed to a few hours of bright light in the morning felt alert earlier in the day. They also felt sleepier earlier in the night. People exposed to bright light late in the afternoon felt most alert in late evening. Their low-point in alertness during the night also was delayed.

Some researchers have suggested that exposure to bright light could control the alertness of shiftworkers. The well-timed exposure of a worker to bright light could quickly increase alertness at night. After exposure to more bright light, they then could quickly switch back to being alert during the day. Right now, we see this as a promising idea

that needs more work to be practical. Unlike use of drugs, it appears that there are no bad side effects from controlling bright light exposure. Still, workers have to be careful about using bright light, so that they will be alert at the right time. For bright light to work, a worker also must stay in low light or in darkness during some times of day. In other words, if you get too much bright light at the wrong time, this might change the circadian rhythm in the wrong direction. If this happens, you won't be alert at the times you really need to be.

To sum up, we think it is possible to use bright light to change peak alertness to different times of the day. But right now, it takes an expert to work out the right light-dark schedule to fit a particular work schedule. If workers are exposed to bright light and low light at the wrong times, they might end up moving their circadian rhythm in the wrong direction. Using this strategy requires a lot of careful effort from the worker. This might make it too impractical for some shiftworkers.

Caffeine, Alcohol, and Other Drugs

Just like many people in our society, some shiftworkers drink caffeinated beverages as a pick-me-up before or during work. They also might drink alcoholic beverages to relax or to be social. Other types of drugs, such as amphetamines and sleeping pills, also have been used to help people wake up or relax and go to sleep. Here we discuss these substances and whether we can recommend them at this time.

Caffeine: Caffeine is a mild stimulant that helps a person feel more alert and perhaps perform better. Caffeine is the most widely used drug in the world. It is a natural ingredient in coffee and tea (iced tea too!), and it is added to many soft drinks (for example, most colas, some root beers, Dr. Pepper, and Mountain Dew). Caffeinated beverages are a common part of our everyday diet and are easily available.

Because of this, caffeine is used more than any other drug to maintain alertness and performance, or to help fight off sleepiness. Research backs up our everyday experience. There are many studies that show caffeine does help maintain alertness and performance. Research also tells us that caffeine is a fairly safe drug if used in small doses. By a small dose, we mean one to three cups of coffee or tea, or one to three soft drinks per day.

In small doses, caffeine is the only drug we can recommend as an aid for the shiftworker. If you drink caffeinated beverages, do so before the shift or early in the shift. Try to avoid caffeine late in the shift, especially late in the night shift. Too much caffeine, or caffeine late in the shift, makes it difficult to fall asleep after the shift. If you do get to sleep, caffeine makes sleep lighter and less satisfying. So don't drink too much and don't drink late in the shift.

If you now are drinking a lot of caffeine (say five to six cups of coffee every day), we recommend that you cut down. Cutting down may make relaxation easier and might improve sleep. Reduce caffeine use gradually over several days. Cut down only by one-half cup or one cup every couple of days. Cutting down too fast could produce headaches, nervousness, and bad moods or irritable feelings.

Amphetamines, Diet Pills, "Uppers": These types of drugs are very strong stimulants that increase alertness and can eliminate sleep all together. Unfortunately, they are too strong and cannot be recommended. Most of these drugs are either illegal or can be obtained only by prescription. It is too easy to become addicted to these drugs. A worker might end up using them every day just to get going. Also, over the long run a person has to take more and more of these drugs just to make them continue to work. This increases the possibility of becoming addicted. Frequent use produces extreme nervousness and mood changes, and performance actually becomes worse.

Alcohol: One or two alcoholic drinks per day, taken with food, is OK for relaxation and to be social. By one drink, we mean eight to twelve ounces of beer, four to six ounces of wine, or one ounce of hard liquor. However, we recommend avoiding alcohol during work time, even during meal breaks. Also, we do not recommend using alcohol to help sleep. Alcohol can make a person sleepy, so falling asleep is easy. But, alcohol actually disturbs sleep. After drinking alcohol, a person wakes up more frequently and sleeps more lightly. Alcohol can also reduce sleep so a person doesn't sleep as long as they want or need to. Avoid alcohol for one to two hours before sleep, especially if you have to go to work after sleeping.

Sleeping Pills: These drugs can be divided into prescription and nonprescription (over-the-counter) types. Nonprescription sleeping pills usually contain the same drug used in allergy and sinus medicines. Nonprescription drugs sometimes make a person drowsy and help them fall asleep. However, most are fairly long acting, which means that the user can still feel drowsy after waking up. If used often (e.g, more than once or twice per week), nonprescription pills usually stop working and fail to make a person drowsy.

Prescription sleeping pills work pretty well to help a person fall asleep and stay asleep, even during the daytime. However, we cannot recommend regular use (e.g., more than once or twice per week) because there is no research on shiftworkers and long-term use of sleeping pills. It probably is not a good idea for shiftworkers to use sleeping pills every time they want to sleep during the day. For some people, it is too easy to become dependent on sleeping pills. They might end up using them every time they have to sleep. When this happens, they become nervous or irritable if they run out of pills. Also, some long-acting sleeping pills produce too much drowsiness after waking from sleep. This is less of a problem with the newer, short-acting sleeping pills. However, before considering prescription drugs, we recommend trying the other techniques for improving

sleep. If all else fails and there still are problems with sleep, the worker should discuss taking prescription sleeping pills with his or her doctor.

Melatonin: As we mentioned already, melatonin is produced naturally by the brain at certain times of the day. The timing of the brain's melatonin production can be controlled by bright light. Melatonin also can be taken as a drug. Taken this way, melatonin makes a person feel sleepy. So it might help improve daytime sleep for the shiftworker.

Melatonin often is sold in health food stores and can be bought without a prescription. However, we cannot recommend melatonin for regular use by the shiftworker until more research is conducted. We need to find out how much melatonin should be taken. We need to learn the best time to take melatonin for a particular work shift. We also need to know if taking too much can damage your health. If taken too often, melatonin could create unknown problems. Also, the different brands of melatonin sold in stores might have different strengths or potency. So, we don't know whether taking one amount of one brand works as well as taking the same amount of another brand. Right now, we will have to take a wait-and-see attitude about melatonin until more research is done.

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Recommended Reading

Authors: Corlett, E.N., Quiennec, Y., and Paoli, P.
Title: Adapting Shiftwork Arrangements
Publisher: European Foundation for the Improvement of Living and Working Conditions, Dublin, Ireland
Year Published: 1988

Authors: Folkard, S. and Monk, T.H. (editors)
Title: Hours of Work: Temporal Factors in Work-Scheduling
Publisher: John Wiley and Sons, New York
Year Published: 1985

Author: Lamberg, L.
Title: Bodyrhythms: Chronobiology and Peak Performance
Publisher: William Morrow and Company, New York
Year Published: 1994

Author: Monk, T.H.
Title: How to Make Shift Work Safe and Productive
Publisher: American Society of Safety Engineers, Des Plaines, Illinois
Year Published: 1988

Authors: Monk, T.H. and Folkard, S.
Title: Making Shiftwork Tolerable
Publisher: Taylor and Francis, London
Year Published: 1992

Author:	Scott, A.J. (editor)
Title:	Shiftwork: Occupational Medicine State of the Art Reviews. Volume 5, Number 2.
Publisher:	Hanley and Belfus, Inc., Philadelphia
Year Published	1991

Author:	U.S. Congress, Office of Technology Assessment
Title:	Biological Rhythms: Implications for the Worker (OTA-BA-463)
Publisher:	U.S. Government Printing Office, Washington, D.C.
Year Published:	1991

Author:	Wedderburn, A.
Title	Guidelines for Shiftworkers
Publisher:	European Foundation for the Improvement of Living and Working Conditions, Dublin, Ireland
Year Published:	1991

DHHS (NIOSH) Publication No. 97-145