ALASKA LEGISLATURE COMMITTEE FILES 1997-1998 8672
9278 HOUSE LABOR & COMMERCE

This is not a union vs non-union issue; this is a people, family, city, and state issue.

If the law is changed so as to allow 12 hour work days, you are placing the employees, their families, the community, and the state in jeopardy.

1st Scenario: If the company was working a seven day, 12 hour per day operation, they will still be paying some overtime. Example: The logical shifts would be: one person - Monday, Tuesday, Wednesday at 12 hours per day, and Thursday at 6 hours per day. second person -Thursday at 6 hours per day, and Friday, Saturday, and Sunday at 12 hours per day. Each employee would work 42 hours per week with 2 hours of overtime pay.

If the demand for gold, in this case, declined, a natural cut back would be to go to a six day operation. Then each person would work 36 hours per week, which would reduce the employees take home pay, thus affecting their family, the community, and the state's economy. The employees have no guarantee of 40 hours per week.

2nd Scenario: If the company was working a seven day a week, 24 hours per day operation. I have an example with me of a major nation-wide firm working in a state that, several years back, changed the state law to allow 12 hour days, but kept overtime over 40 hours per week. In this example (the schedule for 1997) the employee is forced to work the following schedule:

Work - 2 shifts on days; off - 3 1/2 days, going back to work at 7:00 p.m.; work - 2 shifts on nights; off - 2 days; works - 3 shifts on days; off - 2 1/2 days, going back to work at 7:00 p.m.; works - 2 shifts on nights; 3 days off, etc.

These employees' pay period is every two weeks, thus the paycheck is for a total of 96 hours; 80 hours of straight time and 16 hours of overtime. Part of the reason for the total overtime hours is that all Sunday work is at time and one-half wages.

The real problem with this type of work schedule is the inability for a consistent family life. The parent is not regularly available for family functions, i.e., church, school meetings, boy/girl scouts, musicals, plays, etc., that children participate in.

We already have major problems in our communities with juvenile crime; and why? Because of the lack of having the core family unity and children being unsupervised.

Instead of furthering opportunities for destruction of our families and communities, we need to watch big business to make sure they are not playing a major role in this destruction just for the almighty dollar.

On another note, and I do not have the paperwork to back this up, however, I am working on getting it, in the early 1980s, the oil companies did a study on the length of work days and the length of time spent living in camps on the North Slope. They determined that the amount of work/production accomplished in the hours worked between 10 and 12 was not worth even straight time wages - this is very inefficient.

We all came from some where; some of us came 25 years ago, some after that.

It seems to me that with a little effort, Alaska could be a better place to live by learning from the mistakes made in the lower 48 states, rather than blindly going forward adopting laws that have failed in the lower 48 and that make situations worse for Alaskans.

Finally, this morning I received a copy of the current work schedule at Ft. Knox and the newly proposed work schedule if this were to become the law. It is very obvious why the employees at Ft. Knox are supporting this change in the law. What they re currently working is called the "Southern Swing"; seven days, seven afternoons, seven nights. This type of work schedule has been done away with almost entirely throughout the Lower 48; and why" Because of mental and physical health and family problems of employees. Divorces and suicides have entered into this.

The company's proposed new work schedule is very similar to the second scenario I spoke about, and it's obvious why an employee would prefer this over their current work schedule ("Southern Swing"). Even though people working this scenario in the Lower 48 don't care for it.

In closing, I would ask that the law not be changed for the sake of the employees and their families (in particular, their children) and that work schedules like the "Southern Swing" be outlawed.

Ed Hamilton

TEH\FtKnox

O-OFF
D-DAY SHIFT
N-NIGHT SHIFT

[redacted]

12 HOUR SHIFT SCHEDULE

All weeks in each column work the shift schedule directly below them.

January-December
1997
Schedule

[redacted]

S	M	T	W	T	F	S
	DEC. 15 - DEC. 21					
15	16	17	18	19	20	21
	JAN. 12 - JAN. 18					
12	13	14	15	16	17	18
	FEB. 9 - FEB. 15					
9	10	11	12	13	14	15
	MAR. 9 - MAR. 15					
9	10	11	12	13	14	15
	APR. 6 - APR. 12					
6	7	8	9	10	11	12
	MAY 4 - MAY 10					
4	5	6	7	8	9	10
	JUNE 1 - JUNE 7					
1	2	3	4	5	6	7
	JUNE 29 - JULY 5					
29	30	1	2	3	4	5
	JULY 27 - AUG. 2					
27	28	29	30	31	1	2
	AUG. 24 - AUG. 30					
24	25	26	27	28	29	30
	SEPT. 21 - SEPT. 27					
21	22	23	24	25	26	27
	OCT. 19 - OCT. 25					
19	20	21	22	23	24	25
	NOV. 16 - NOV. 22					
16	17	18	19	20	21	22
	DEC. 14 - DEC. 20					
14	15	16	17	18	19	20

TEAM							
A	D	D	O	O	N	N	O	O
B	N	N	O	O	D	D	O	O
C	O	O	N	N	O	O	D	D
D	O	O	D	D	O	O	N	N

S	M	T	W	T	F	S
	DEC. 22 - DEC. 28					
22	23	24	25	26	27	28
	JAN. 19 - JAN. 25					
19	20	21	22	23	24	25
	FEB. 16 - FEB. 22					
16	17	18	19	20	21	22
	MAR. 16 - MAR. 22					
16	17	18	19	20	21	22
	APR. 13 - APR. 19					
13	14	15	16	17	18	19
	MAY 11 - MAY 17					
11	12	13	14	15	16	17
	JUNE 8 - JUNE 14					
8	9	10	11	12	13	14
	JULY 6 - JULY 12					
6	7	8	9	10	11	12
	AUG. 3 - AUG. 9					
3	4	5	6	7	8	9
	AUG. 31 - SEPT. 6					
31	1	2	3	4	5	6
	SEPT. 28 - OCT. 4					
28	29	30	1	2	3	4
	OCT. 26 - NOV. 1					
26	27	28	29	30	31	1
	NOV. 23 - NOV. 29					
23	24	25	26	27	28	9
	DEC. 21 - DEC. 27					
21	22	23	24	25	26	27

A	O	D	D	O	O	N	N
B	O	N	N	O	O	D	D
C	D	O	O	N	N	O	O
D	N	O	O	D	D	O	O

S	M	T	W	T	F	S
	DEC. 29 - JAN. 4					
29	30	31	1	2	3	4
	JAN. 26 - FEB. 1					
26	27	28	29	30	31	1
	FEB. 23 - MAR. 1					
23	24	25	26	27	28	1
	MAR. 23 - MAR. 29					
23	24	25	26	27	28	29
	APR. 20 - APR. 26					
20	21	22	23	24	25	26
	MAY 18 - MAY 24					
18	19	20	21	22	23	24
	JUNE 15 - JUNE 21					
15	16	17	18	19	20	21
	JULY 13 - JULY 19					
13	14	15	16	17	18	19
	AUG. 10 - AUG. 16					
10	11	12	13	14	15	16
	SEPT. 7 - SEPT. 13					
7	8	9	10	11	12	13
	OCT. 5 - OCT. 11					
5	6	7	8	9	10	11
	NOV. 2 - NOV. 8					
2	3	4	5	6	7	8
	NOV. 30 - DEC. 6					
30	1	2	3	4	5	6
	DEC. 28 - JAN. 3					
28	29	30	31	1	2	3

A	N	O	O	D	D	O	O
B	D	O	O	N	N	O	O
C	O	D	D	O	O	N	N
D	O	N	N	O	O	D	D

S	M	T	W	T	F	S
	JAN. 5 - JAN. 11					
5	6	7	8	9	10	11
	FEB. 2 - FEB. 8					
2	3	4	5	6	7	8
	MAR. 2 - MAR. 8					
2	3	4	5	6	7	8
	MAR. 30 - APR. 5					
30	31	1	2	3	4	5
	APR. 27 - MAY 3					
27	28	29	30	1	2	3
	MAY 25 - MAY 31					
25	26	27	28	29	30	31
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4	5	6	7	8	9	10

TEAM							
A	O	N	N	O	O	D	D
B	O	D	D	O	O	N	N
C	N	O	O	D	D	O	O
D	D	O	O	N	N	O	O

TEAMS

Ft. Knox

Current Schedule — Southern Swing

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Week 1							
Week 2			Swing	Swing	Swing	Swing	Swing
Week 3	Swing	Swing		Night	Night	Night	Night
Week 4	Night	Night	Night				

	Hours	Dollars
Straight Time	40	$700
Overtime	0	$0
Straight Time	40	$700
Overtime	0	$0
Straight Time	40	$700
Overtime	8	$210
Straight Time	40	$700
Overtime	0	$0
Straight Time	160	$2,800
Overtime	8	$210
Total	168	$3,010

Proposed

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Week 1	Days	Days	Days	Days			
Week 2					Night	Night	Night
Week 3	Night				Day	Day	Day
Week 4	Off	Night	Night	Night	Off		

Straight Time	40	$700
Overtime	8	$210
Straight Time	36	$630
Overtime	0	$0
Straight Time	40	$700
Overtime	8	$210
Straight Time	36	$630
Overtime	0	$0
Straight Time	152	$2,660
Overtime	16	$420
Total	168	$3,080

$1540.

Alaska State Legislature

Please enter into the record my testimony to the LABOR & COMMERCE committee name

committee on HB 68 bill/subject, dated 1-29-97.

DEAR REPRESENTATIVE ROKEBERG
Fax #9074652040

For the record I am sending you and the committee supporting documentation why 12 hour work days are bad for employees along with documentation why the current work schedule (Southern Swing) should be outlawed

THANK YOU
Ed Hamilton
Fax #9073376668

Signed: ED HAMILTON
Testifier

Representing (Optional)

10242 JAMESTOWN DR. TJ Anch. 99507
Address

W. 9072694346 H. 9073443478
Phone No.

9/86 Legislative Information Office

J. Sleep Res. (1995) 4, Suppl. 2, 51–58

Extended workshifts and excessive fatigue

ROGER R. ROSA
National Institute for Occupational Safety and Health, Division of Biomedical and Behavioral Science, Cincinnati, Ohio, USA

SUMMARY Studies of overtime have pointed to fatigue as a potential factor producing, for example, a three-fold increase in accident rate after 16 h of work, increases in back injuries, hospital outbreaks of bacterial infection, or nuclear-power plant safety compromises. Fatigue has been measured more directly in studies of scheduled long workshifts, where performance decrements in both work-related tasks and laboratory-type behavioural tests have been observed, and significant loss of sleep and increases in subjective sleepiness have been reported. Analyses of accidents or injuries during scheduled extended workshifts, however, have produced equivocal results. Factors which could compound the fatiguing effects of extended workshifts, such as workload, noise, chemical exposure, or duties and responsibilities outside of the workplace, rarely have been studied systematically. It is concluded that extended workshift schedules should be instituted cautiously and evaluated carefully, with appropriate attention given to staffing levels, workload, job rotation, environmental exposures, emergency contingencies, rest breaks, commuting time, and social or domestic responsibilities.

KEYWORDS accidents, long work hours, overtime, performance decrements, sleep loss, work scheduling.

INTRODUCTION

Socio-economic developments in industrialized countries over the past two decades have produced a trend toward increasing use of workdays or workshifts longer than the typical 8 h. Some schedules compress the workweek by completing a 36–48 h week in 3 or 4 days instead of 5. Other situations require frequent bouts of overtime work because of impending deadlines (e.g. in construction), understaffing (e.g. in nursing), or emergency contingencies (e.g. in firefighting). Other industries, such as shipping, mining, or oil drilling, formally schedule long periods of work, followed by long rest periods, because the difficulty with travel to a remote site makes frequent staff turnover impractical. The degree to which the jobs in any of these contexts can be performed safely and efficiently has been the subject of considerable debate. In Europe, such debate has intensified recently as a current directive on working time proposes, with some exceptions, a minimum daily rest period of 11 consecutive hours, and a maximum of 8 h of night work (Harrington 1994). The concern of this directive, and the debate in general, is the avoidance of excessive fatigue and the possible risks of accident and injury in the short term, or deterioration of health in the long term. The purpose of this review is to characterize the state of knowledge on long work hours and their association with fatigue, and point to some factors which might produce fatigue or deterioration of performance and alertness in the worker. Studies of extended workshifts can be divided roughly into those concerned with scheduled long workshifts, such as the 10- or 12-h shifts used in compressed workweeks, and those concerned with unscheduled or sporadic long workshifts, which collectively can be termed as overtime.

Correspondence: Dr Roger R. Rosa, NIOSH, Taft Laboratories, Mail Stop C-24, 4676 Columbia Parkway, Cincinnati, OH 45224, USA. Fax: +1 513 533 8510.

OVERTIME

Survey and questionnaire studies have associated overtime mostly with health outcomes or with outcomes which are both health- and safety-related. Overtime has been associated least with outcomes which are primarily within the domain of safety, such as accidents or acute traumatic injuries. An exception is a recent analysis of a national occupational-injury database where a constant accident/injury rate was observed through nine consecutive hours of work, followed by a progressive increase to three times that rate at 16 h of work (Åkerstedt 1994). That report is preliminary, however, so it is not clear whether those rates

are associated with overtime vs. scheduled extended shifts, or whether the effects are concentrated in specific occupations or industries.

In the health or health/safety domain, overtime has been associated with lower self-ratings of health status (Broadbent *et al.* 1985), lower birth weight or gestational age in children of women working overtime (Marbury 1992), and increased presence of corticosteroids (in women) possibly indicative of a stress response (Härenstam and Theorell 1990; Lundberg and Palm 1989). Increased triglycerides and cholesterol (risk factors for cardiovascular disease) were observed in construction managers who frequently worked overtime (Sutherland and Davidson 1993). This group also reported higher levels of job dissatisfaction and poor psychological health. Frequent overtime work was associated with heavy and problem-drinking in men (Kawakami *et al.* 1993), higher suicide rates in both men and women (Starrin *et al.* 1990), and cardiovascular mortality in women (Starrin *et al.* 1990). In all of these studies, the possibility of a role for fatigue as one of the underlying factors producing health compromises at least should be considered, but such a possibility is highly speculative given that no attempt was made to measure fatigue.

A few reports raise the possibility of a more direct role of fatigue from working overtime. In a case-control study, overtime was identified as a risk factor for occupational low back injury in mail handlers (Daltroy *et al.* 1991), while another study reported that complaints of low back pain were more frequent in those who worked less overtime (Svensson and Andersson 1983). In the latter study, the authors suggested that workers with low back pain had limited their working hours because of their condition.

Two reports identified increased staff overtime as a factor contributing to separate outbreaks of *Staphylococcus aureus* infection in hospitals (Arnow *et al.* 1982; Russell *et al.* 1983). In both incidents, an unanticipated combination of high patient load and understaffing resulted in extensive use of overtime to meet demands for patient care and treatment. The infectious outbreaks associated with these periods of overtime were attributed by the investigators both to time pressure from the high patient load, and to high levels of fatigue from long work hours, which resulted in inadequate compliance with aseptic practices (i.e. skipping steps or rushing through procedures). While perceived time pressure or fatigue levels were not assessed directly in these studies, the fatigue interpretations given by the authors are consistent with our laboratory study demonstrating increased errors and faster response times (a speed-accuracy tradeoff) in an externally-paced reasoning task during 12-h work days compared to rest days (Rosa and Colligan 1988).

Operator fatigue from working overtime was also suggested as a factor that is detrimental to safety performance in nuclear-power plants (Baker *et al.* 1994). In a plant-level analysis of operator, technical, and maintenance staff overtime, safety incidents were associated most strongly with operator average annual overtime, which ranged from 300 to 1200 h. These results were attributed to operator fatigue, rather than overall plant inefficiency, because no strong association was observed between safety incidents and technical staff or maintenance staff overtime.

Worksite studies taking behavioural measures of fatigue (e.g. performance tests or self-report scales) in association with overtime are rare. In a cohort study of automotive industry workers, however, recent experience with overtime was associated with poorer performance on neuropsychological tests, such as trailmaking and card sorting, which are sensitive to fatigue-related deficits in attention or cognitive function (Proctor 1992).

In summary, cross-sectional studies have associated overtime work with a handful of health and safety outcomes which may be related to fatigue. In most of these studies, it was recognized that the fatigue effects of overtime occurred in combination with other personal, occupational, or organizational factors and that, because of the cross-sectional designs, clear directions of causality could not be determined. The putative role of sleep loss, excessive fatigue, or their combination, usually was not explicit. Only one study attempted to quantify fatigue deficits using behavioural measures. No studies were identified which were able to prospectively measure safety- or health-related effects of overtime. The irregular and often unscheduled nature of overtime work, however, would make such a study difficult to conduct.

SCHEDULED EXTENDED WORKSHIFTS

Surveys of on-the-job fatigue effects of scheduled extended workshifts have considered efficiency and productivity, accidents, absenteeism, and subjective reports. Regardless of the outcome variables tested, there are no consistent trends. With respect to productivity, there were, for example, equal numbers of oil refineries reporting increases, decreases, or no change after the introduction of 12-h shifts (Campbell 1980). Nevertheless, a major US electronics manufacturer and a majority of US government sites abandoned 12-h workshifts because of reductions in productivity (Tepas and Tepas 1981). Studies of absenteeism have also produced equivocal results (Campbell 1980), as have surveys of accidents and injuries. No change in accident frequency or severity, for example, was observed in 57 oil refineries, an increase was observed in five refineries, and a decrease was observed in eight refineries (Campbell 1980). Another study reported no increases in accidents, or in violations of occupational health and safety regulations, in a sample of oil refineries (Nordvarp *et al.* 1979). The adequacy of the survey approach used in these studies is open to question, however, as the investigators reported only managers' impressions in response to brief, general questions to determine the frequency of accidents or safety violations. Since the cause of most of these incidents involves a multiplicity of factors, a more fine-grained analysis than is gained from one or two brief questions is required

determine the contributory role of long workshifts. Such an approach was used in a long-term study of accidents over 10-y periods of 8-h and 12-h shifts in a yarn manufacturer (Laundry and Lees 1991). In that study, lower rates of the most minor injuries on the job, but higher rates of more major injuries off the job, occurred during the 10-y period of 12-h shifts.

Despite the fact that some studies of scheduled extended workshifts have reported little or no effect on gross indices of health and safety, there still are persistent concerns about excessive fatigue. Such concerns were given as a primary reason for not adopting the compressed workweek by 800 members of the American Management Association (Wheeler *et al.* 1972). In Singapore, 12-h shift systems in several industries were abandoned because of their adverse impact on worker health and social life (Kogi *et al.* 1989). The reported health factors associated with fatigue included insufficient sleep and weight loss, while other factors potentially associated with fatigue included lower productivity, high turnover, and more frequent part-time work on off-duty days. Even among industries using long workshifts, the subjective impression of increased fatigue is acknowledged. Studies have shown that the primary source of worker dissatisfaction with compressed workweeks was increased fatigue (Hodge and Tellier 1975). Despite the fatigue, however, employees generally were more satisfied with the compressed schedule.

Attempts at more direct assessments of fatigue have analysed job factors or administered laboratory-type performance tests and self-report scales. With a standard nursing-care job analysis, Mills *et al.* (1983) concluded that 12-h shifts had no adverse impact. Todd *et al.* (1989), on the other hand, concluded that overall nursing care was adversely affected by 12-h shifts, while direct physical care was not affected. Reid *et al.* (1993), however, reported that nurses' direct care time with patients was reduced on 12-h shifts as more unscheduled rest breaks were taken. In his analysis of truck-driver accidents, Hamelin (1987) reported that accident risk was particularly high after 11 h of work, especially if work occurred at night.

Behavioural assessment of extended workshifts with standard performance tasks and self-report scales have indicated some improvements and some decrements associated with these shifts. Volle *et al.* (1979) reported decreased grip strength and decreased critical flicker fusion frequency in a factory on 10-hour shifts compared to a similar factory on 8-h shifts. Peacock *et al.* (1983) reported increased sleep, improved subjective alertness and cardiovascular fitness in police officers after a switch from 8-h to 12-h shifts, and no effect on critical flicker-fusion frequency or grammatical reasoning performance. Mills *et al.* (1983) reported increased subjective fatigue in nurses across a 12-h shift, and more frequent errors in a grammatical reasoning task and a medical record reviewing task. Daniel and Potasova (1989) concluded that chemical workers on 12-h shifts performed more poorly on reasoning, visual search, reaction time and tapping tasks when compared to 8-h shift workers. They suggested, however, that differences in the capabilities of the workers selected for each shift system contributed to these results.

The United States National Institute for Occupational Safety and Health has conducted two worksite evaluations of extended workshifts using standard performance tests and self-report scales. In the authors' first study (Rosa *et al.* 1989), decreased reaction time and grammatical reasoning performance and increased subjective fatigue were observed after 7 months of 12-h shifts as compared to the previous 8-h shift schedule. Daily sleep logs indicated a 1-h sleep debt by the end of the 12-h/3–4 day workweek. Performance did not deteriorate across the workweek, however, indicating that the shorter workweek compensated somewhat for the longer workshift. After 3.5 y on the 12-h shift schedule, declines in alertness with time on-shift and reductions in total sleep time were still apparent, and few improvements were observed relative to the 7-month test phase (Rosa 1991). In a second worksite study at a natural gas utility, there were decrements in reaction time performance and subjective alertness 10 months after the change to the 12-h shift schedule (Rosa and Bonnet 1993). There were also reductions in sleep across the workweek which were most apparent on 12-h night shifts. The declines in alertness observed in the authors' studies were most apparent at night when lowered circadian arousal added to fatigue resulting from hours of work (see also Hamelin 1987).

TWO SPECIAL CASES OF LONG WORK HOURS

The 'on-call' schedules of hospital-resident physicians in training and the part-time work of adolescents who also attend school constitute two special cases of long work hours which do not fit neatly into the overtime or scheduled extend workshift categories. The average 80-h workweek of resident physicians has received substantial study over the last three decades because the potential for functional impairment from the combination of long work hours and sleep deprivation might compromise patient care. Behavioural studies of resident physician fatigue, however, have met with equivocal results. Several of these studies have been reviewed recently and tabulated in detail by Leung and Becker (1992). These authors attribute the lack of consistent results to three methodological domains including differences in test methodology, variations in the definition of sleep deprivation, and failures to distinguish between acute and chronic sleep loss. With respect to differences in test methodology, some studies used standard neuropsychological or laboratory performance tests, other studies used work-related tasks, and a third set of studies used medical examination results. Definitions of experimental (sleep-deprived) and control (rested) conditions by different studies varied by several hours. Deconson *et al.* (1988), for example, defined sleep-deprived subjects as those receiving

less than 4 h of sleep and control subjects as those receiving more than 4 h of sleep in the 24 h prior to testing. Rubin *et al.* (1991), on the other hand, defined the sleep deprivation condition as less than 2 h of sleep and the rested condition as more than 6 h of sleep in the previous 33 hours. Many studies did not define the rested condition at all. While some attempt was made to define acute sleep loss in the previous 24–48 h, little effort was made to quantify chronic sleep debt or circadian-rhythm disruptions which may have accumulated over several days. In addition to the methodological concerns highlighted by Leung and Becker (1992), the consecutive number of hours worked (as opposed to simply resting at the hospital) was considered rarely, which may have contributed further to the variable results. A notable exception concerning work hours is an early study by Wilkinson *et al.* (1975), who reported that greater numbers of hours worked within the on-call duty period were associated with lower self-reported levels of work efficiency. Despite a failure to observe fatigue or sleep-loss effects in some studies, the number of studies observing such effects has prompted recent review and revision of resident physician work schedules, both within hospital systems and at the government or professional-association level (American College of Physicians 1989; Leung and Becker 1992; Scott 1992).

A second special case of long work hours involves adolescents engaged in part-time employment. If the primary 'job' of adolescents is schoolwork (in the USA, approximately 35 h of school attendance plus homework), then any additional employment can be construed as within the domain of extended work hours. Based on a survey of over 3900 students, Steinberg and Dornbusch (1991) reported that approximately half had part-time employment, and that half of those employed worked more than 20 h per week. Increasing hours of employment was associated with poorer school performance, higher psychological stress, more frequent substance abuse, and reduced parental supervision. Those students working the most hours tended to obtain the least sleep and were the most sleepy during the day based both on electroencephalographic assessment (the Multiple Sleep Latency Test), and on subjective reports of intrusive sleepiness while driving or frequent inattention during class (Carskadon 1989/90; Carskadon 1990). From these studies, it can be asserted that schoolwork plus 20 or more hours of employment places a significant number of students at acute risk of accident or injury (from sleepiness, possibly combined with substance use), and also presents a developmental disadvantage because of poor school performance (if they attend school at all) and increased stress.

FACTORS PRODUCING FATIGUE

A multitude of factors can contribute to the level of fatigue or performance efficiency observed during extended workshifts. These factors can be divided roughly into those related to work-rest scheduling, job tasks and workload, the environment (both within and around the workplace), and social/domestic demands and support. Of these factors, only work-rest scheduling has been examined with any frequency and only in its broadest terms, i.e. considering such parameters as number of hours worked, day work vs. night work, number of consecutive days worked, or opportunity for sleep/recovery. When increased fatigue is observed, as in our own worksite studies, then fatigue, sleepiness, or performance loss, will increase with number of hours worked. This effect will be higher on night shift compared to day shift and may be compounded by partial sleep deprivation, but may be tempered by a shorter workweek.

Virtually no worksite research has compared different job tasks or workloads under the same extended workshift schedules, and environmental or social elements have been recognized but not studied systematically in terms of how they might affect fatigue (see Carskadon 1989/90, for an exception). With respect to job tasks, it appears that scheduled extended workshifts have been applied most frequently in jobs that are sedentary, automated, or require relatively more cognitive as opposed to physical activity (e.g. control room monitoring, computer operations). Almost no studies have examined extended workshifts in jobs with high physical workloads. One notable exception is a study of 12-h workshifts in underground mining where the associated fatigue was judged to be no different from that seen on 8-h shifts. That study was conducted at a remote mine site where the workers stayed at the site for several days (Duchon *et al.* 1994). Such a practice also occurs on off-shore oil rigs using extended workshifts. Environmental factors and support systems are quite different in those situations because non-work activities are restricted (e.g. prohibition of alcohol, no access to a second job) and food and housing needs are provided at the site (Parker 1994).

In addition to physical workload, other job factors can affect fatigue observed on long workshifts. Job pacing, for example, has been examined only rarely, although worker-paced jobs afford, and externally-paced jobs forbid, the opportunity for unscheduled rest breaks to reduce fatigue (Reid *et al.* 1993).

Environmental and social effects have been recognized but not studied systematically. As mentioned above, workers are separated from the demands and distractions of home and community when long workshifts might be manageable. Such observations lead to questions about the compounding fatigue effects of a long commuting time in heavy traffic, or the fatigue effects of a high domestic workload, such as in the care of small children. For example, if the individual working long shifts is the primary caretaker in the home, then that person's own rest and recovery may be sacrificed for the needs of the children.

Other environmental exposures on the job can affect fatigue but there are few standards for work periods longer than 8 h. Chemical solvents cause drowsiness (Dick 1991

and noise, vibration, or heat may produce performance decrements (Hockey 1983, reviews), yet little is known about the influence of an additional 2–4 h of daily exposure to any of these agents.

CONCLUSION

In conclusion, research demonstrating increased fatigue with long workshifts, and a lack of substantial research on other factors which may modulate fatigue, indicates that schedules requiring long workshifts should be instituted with caution. If such schedules are used they should be evaluated carefully. While many jobs allow a wide margin of error, any situation where increased fatigue, decreased sleep, or performance loss can be demonstrated is a situation where the margin for error is reduced, albeit by some unknown amount.

If experts in a certain occupation or industry already consider a job to be dangerous on an 8-h shift, then extended workshifts probably should be avoided. When extended workshifts are used, it is conservative to assume *a priori* that the margin for error will be reduced and contingency plans should be devised accordingly. A primary concern is having sufficient personnel to cover all working hours, because an individual required to work an additional 6–12 h overtime following their usual 12-h shift may push fatigue past acceptable limits.

In addition, workloads should be distributed to account for critical time periods when fatigue is assumed to be high. From our own studies, the final 4 h of a 12-h night shift was identified as a critical time because the fatigue from extra hours of work combines with the circadian low-point in arousal to produce the highest amount of subjective sleepiness and fatigue, and the lowest efficiency in performance.

Where demand permits, breaks should be distributed liberally throughout the shift to provide temporary recovery from the task at hand. Job rotation also becomes more critical as repetitive work, or long, monotonous tasks can induce boredom and loss of attention. The risk of fatigue-related mishaps off the job must also be anticipated because institutionalized safety procedures at the worksite will be absent. A critical time in this regard is the commute to and from the worksite as excessive fatigue can compromise the quick response time occasionally needed to drive in dense urban traffic, and also increase the potential for drowsiness during long monotonous drives in unpopulated areas.

Studies of long workshifts at remote worksites point to the influence of domestic obligations adding to work-related fatigue. Especially when children are involved, day-to-day home duties may not change just because additional hours are worked each day. Therefore, if a substantial number of single parents of small children comprise the workforce, then use of long workshifts may not be advisable.

Beyond the initial anticipation and rectification of factors which may exacerbate extended workshift fatigue, periodic quantitative evaluation of the work schedule is strongly advised for continued prevention of undue risk. Evaluation efforts should extend beyond the initial 'honeymoon' or 'Hawthorne' period, when the mere act of change is viewed positively, into the time of potential complacency when a relaxed state of vigilance could allow problems to arise.

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The Prevalence and Health Impact of Shiftwork

NANCY P. GORDON, SCD, PAUL D. CLEARY, PHD, CLAIRE E. PARKER, MD, AND CHARLES A. CZEISLER, PHD, MD

Abstract: Data from the National Center for Health Statistics National Survey of Personal Health Practices and Consequences were analyzed to determine the impact of variable shift schedules on health-related behaviors of persons in the United States labor force. Twenty-six per cent of men and 18 per cent of women in the US labor force reported working a variable shift in Spring 1980. As compared to men working non-variable work schedules, those working variable shifts exhibited higher rates of heavy drinking, job stress, and emotional problems. Female variable shift workers reported higher rates of sleeping pill, tranquilizer, and alcohol use, as well as lower social network scores, more job stress, and more emotional problems. (*Am J Public Health* 1986; 76:1225–1228.)

Introduction

When Thomas Edison opened the first power plant in Manhattan in 1882 and thereby made available a steady and reliable source of power throughout the day and night, he also opened the potential for round-the-clock equipment and service operations. Throughout industrial nations over the past 20 years, there has been a dramatic increase in the practice of using two or more shifts of workers to cover operations exceeding the length of a normal work day. Shiftwork has become common in the food, health, safety, and transportation services, in certain industries where the technical processes cannot be interrupted without deterioration or destruction of the product, and in industries where expensive equipment can only be used profitably when in constant operation. In France, the proportion of businesses operating with multiple shifts rose from 10 per cent to 22 per cent between 1957 and 1974. In the United States, the proportion of manufacturing centers operating on multiple shifts has been increasing about 3 per cent every five years, with some major industries having more than half of their workers on shifts.[1] While some schedules may have permanent assignment to a given shift, others may rotate.

Despite the growing number of people forced by their work schedules to deviate their life schedules from the traditional sleep-activity cycle, relatively little is known about the physiological, medical, and psychosocial consequences of night and rotating shiftwork. Since both occupational health specialists and union leaders have tended to focus on toxic exposures in the workplace, few outside the fields of ergonomics and sleep disorders have studied the impact of different types of work schedules.

There are a number of reasons to expect that workers on rotating shifts may experience adverse consequences as a result of their work schedules. First, it is well documented that certain physiologic functions, e.g., body temperature and hormonal release, vary systematically over the course of the day.[2] These physiologic functions are regulated by the body's internal clock which has a longer than 24-hour intrinsic period and which is synchronized to the 24-hour day by cues from the external environment (zeitgebers), e.g., light and temperature. These circadian rhythms play important roles in regulating sleep, alertness, and other physiologic processes. When workers are forced to alter their sleep/activity schedule abruptly to correspond to a new work shift, there is usually a mismatch between the body's resources and the demands placed upon it until the circadian phase can adjust. Also, working at night usually disrupts social activities, and it is well established that the degree and quality of social interaction are related to physical and mental health.[3]

The best documented health consequences of night and rotating shiftwork are disorders of sleep and digestion.[2] Several studies have reported an excess of sleep problems among night and rotating shiftworkers as compared to those working straight day or afternoon shifts. These difficulties include difficulty in falling asleep, shorter duration of sleep, poorer quality of sleep, and persistent feelings of fatigue akin to "jet lag". Night and rotating shiftworkers are also more likely to report disrupted eating habits and poorer diets than those who work straight day or afternoon shifts, as well as a higher prevalence of gastric and peptic ulcers, gastritis, and constipation.

Field studies have indicated that night and rotating shiftworkers are at excessive risk for involvement in accidents and serious injuries on the job.[4] The incidence of errors and accidents is much higher during the early morning hours (4:00 to 6:00 am) than at any other time of day.[5] Laboratory studies have shown an association between disturbances in circadian rhythms and loss of attention, motivation, ability to concentrate, and a slowing of perceptual-motor processes.[5] Thus, it may be that rotating shift schedules place some workers at greater risk for accidents and injuries because their circadian rhythms are continuously disrupted.

There has been little research on the extent to which variable shift schedules are related to drug, alcohol and cigarette use, and psychological and social problems. In a study of 900 electricity workers in Australia, Wallace, *et al.* found that shiftworkers reported higher levels of cigarette, coffee and tea consumption, and more frequent use of laxatives, sleeping pills, pain killers, and cough medicine than did day workers. Shiftworkers also reported more interference to their family lives, especially in terms of the time available to spend with their wives and children.[6] Mott found a significant association between the extent to which shiftworkers perceived that their work schedule interfered with their ability to fulfill roles as spouses or parents and self-reported psychological and psychosomatic disturbances.[7] Staine, and Pleck found that shiftwork was related to problems in scheduling family activities.[8]

The present study examined the impact of variable shiftwork on a broad range of health practices, perceived stress, and social network participation in a representative sample of US workers. The literature reviewed above refers

From the Division of Health Policy Research and Education, Harvard University and the Departments of Medicine and Social Medicine and Health Policy, Harvard Medical School. Address reprint requests to Paul D. Cleary, PhD, Division of General Medicine and Primary Care, Beth Israel Hospital, 330 Brookline Avenue, Boston, MA 02215. This paper, submitted to the *Journal* May 30, 1985, was reviewed and accepted for publication March 3, 1986.

to both straight night and variable shiftwork. Unfortunately, because of the way the data for this study were collected, it was not possible to estimate the effects of these two different types of work schedules.

Methods

The National Center for Health Statistics National Survey of Personal Health Practices and Consequences (NSPHPC) is a two-wave panel study of a three-stage stratified cluster sample of the non-institutionalized adult population aged 20–64 years in the United States.[9,10] Telephone interviews were conducted with 3,025 respondents in the Spring of 1979, representing a response rate of 81 per cent. In the Spring of 1980, 2,436 of the original respondents (81 per cent) were reinterviewed. The interview contained questions about sociodemographic characteristics, perceived health status and health practices, as well as a question about whether the respondent had a "variable work schedule, including both day and night work." The main disadvantage of telephone interviews is that approximately 7 per cent of US households do not have a telephone. However, the quality of data collected in telephone interviews appears to be similar to that collected during face-to-face interviews.[10] The proportion of women interviewed for this survey was substantially higher than the proportion of women in the population. Results from this survey have been compared to results from the National Health Interview Survey and it has been determined that the unrepresentative sex ratio in this sample did not result in any appreciable bias in the distribution of respondents with respect to race, marital status, or employment.[10] No adjustments were made for this discrepancy, but all analyses were conducted for each sex separately.

The data are weighted, when appropriate, to adjust for the fact that persons were randomly sampled within households and therefore people from small households were overrepresented. The weighting factor was normalized so that the total sample size of the weighted sample is equal to the original sample size. The standard errors of estimators are affected by the stratification, clustering, and weighting. A design effect of 1.2 was taken into account in all statistical tests to account for these effects.

We first examined the prevalence of exposure to a variable shiftwork schedule during a one-year period in this sample. We then examined the extent to which variable shiftwork was related to alcohol and coffee consumption, cigarette smoking, use of sleeping pills, tranquilizers, and digestion aids, average length of sleep, social network scores,[11] and stress. These analyses were conducted using the data collected in Spring 1980 because the full range of questions about health practices were asked only in that interview. Finally, we developed logistic regression models to estimate the impact of work schedules on the health practices controlling for individual characteristics.

Results

In Spring 1980, approximately 26 per cent of the men and 18 per cent of the women in the United States labor force worked a variable shift schedule. Among individuals who were employed at both Spring 1979 and Spring 1980, the proportion who reported working a variable shift schedule at either Wave I, Wave II, or both Waves was much higher—36.1 per cent of men and 26.3 per cent of women. This estimate of the fraction of the population exposed to variable shift schedules within a one-year period is much greater than previous estimates.[12]

TABLE 1—Proportion of Currently Employed Men and Women in the United States Aged 20–64 Working Variable Shifts by Education, Age, and Income* (Spring 1980)

	Men (weighted N = 828)	Women (weighted N = 633)
Education Level	%	%
Less than High School Grad	25.2	21.4
High School Grad	28.1	16.4
Some College/Training	28.8	18.6
4+ Years College	21.4	16.2
Age (years)		
20–34	27.8	20.5
35–44	24.7	16.9
45–54	21.4	13.7
55–64	30.0	13.0
Income Level		
< $10,000/year	32.2	17.8
$10,000–14,999	25.9	14.9
$14,999–24,999	20.9	18.2
> $25,000/year	28.1	17.0
Total	25.8	17.6

*Proportion of labor force responding "yes" to the question: "Does your job involve a variable work shift? That is, do you work the day shift sometimes and the night shift at other times?"

The data presented in Table 1 indicate that among all persons employed in Spring 1980 variable shiftwork was not associated with age, education, or income level in any important way, although older women were less likely to work variable shifts. It is interesting to note that although many people think of variable shiftwork as a blue collar phenomenon, education was not clearly related to the probability of being a shiftworker. A variety of professionals such as health care workers and computer users must work variable shifts.

The differences in reported self-medication for digestion and sleep problems, alcohol use, and perceived stress between those working variable shifts and straight shifts in Spring 1980 are presented in Table 2. Men who worked variable shifts were more likely to be heavy drinkers and somewhat more likely to use digestion aids on a regular basis. Women who worked variable shifts were significantly more likely to use sleeping pills and tranquilizers on a regular basis, to have lower social network scores, and to be heavier drinkers than women working straight shifts. Both men and women also were more likely to report a great deal of job stress and severe emotional problems if they worked variable shifts.

Since heavy drinking, medication use, and stress were all associated with age, income, and/or education level, we conducted multivariate analyses to determine whether variable shiftwork remained an independent risk factor for increased drug and alcohol use, low social network scores, and stress after controlling for these variables. Table 3 shows that adjusting for age, income, and education, men and women who work variable shifts were more likely to experience job stress and emotional problems, and female shift workers were more likely to use sleeping pills or tranquilizers, drink heavily, and have lower social network scores.

Contrary to our expectations, variable shiftworkers did not differ from those who worked straight shifts in rates of heavy (> 1 pack/day) cigarette smoking or coffee drinking. We also did not find the expected difference in number of hours of daily sleep. Unfortunately, the NSPHPC did not contain questions about quality of sleep.

TABLE 2—Differences between Men and Women Variable and Non-variable Shiftworkers on Measures of Drug and Alcohol Use, Sleep and Stress

	Men		Women	
	A (weighted N = 214)	B (weighted N = 614)	A (weighted N = 146)	B (weighted N = 708)
	%	%	%	%
Frequent Sleeping Pill Use	0.5	2.5	1.8	6.2
Any Sleeping Pill Use	1.6	2.3	8.9	3.1
Frequent Sleeping Pill/Tranquilizer Use	1.7	1.6	5.3	1.1
Any Sleeping Pill/Tranquilizer Use	3.2	5.2	16.0	7.9
Frequent Indigestion Aid Use	7.3	4.7	5.0	4.2
Heavy Drinking (> 4 drinks/day)	15.9	10.9	7.8	3.2
Heavy Smoking (> 1 pack/day)	12.2	11.3	8.2	7.2
Low Social Network Score	8.3	12.4	22.8	12.8
Average < 7 Hrs Sleep/Night	30.7	28.5	26.0	21.4
Experience Extreme Job Stress	30.0	18.7	22.4	13.8
Experience Severe Emotional Problems	10.2	4.3	15.7	8.8
Frequent Coffee Use (> 5 cups per day)	27.8	25.1	15.1	16.2

Frequent use includes the three categories "pretty often" and "almost daily".
Column A = variable shiftworkers.
Column B = non-variable shiftworkers.

TABLE 3—Odds Ratios for Drug and Alcohol Use, Shortened Sleep, and Stress, Men and Women Variable vs Regular Shiftworkers, Adjusted for Age, Education, and Income Level

	Men (N = 801)	Women (N = 856)
	RR (95% CI)	RR (95% CI)
Frequent Sleeping Pill Use	0.86(.25:2.89)	2.60(1.01:6.68)
Frequent Sleeping Pill/Tranquilizer Use	1.09(.57:2.08)	1.77(1.08:2.92)
Frequent Indigestion Aid Use	1.32(.92:1.90)	1.08(.68:1.84)
Heavy Drinking (> 4 drinks per day)	1.22(.94:1.57)	1.55(1.04:2.33)
Heavy Smoking	1.16(.79:1.63)	1.02(.70:1.48)
Low Social Network Scores	.83(.63:1.11)	1.22(1.10:1.56)
Average < 7 Hrs Sleep/Night	1.11(.91:1.34)	1.19(.95:1.49)
Experience Extreme Job Stress	1.43(1.17:1.75)	1.22(1.04:1.68)
Experience Severe Emotional Problems	1.67(1.20:2.30)	1.34(1.02:1.77)

Frequent use includes response categories "pretty often" and "almost daily".

Discussion

Our results indicate that a substantial proportion of the US labor force works a variable shift schedule, and that this type of schedule is associated with higher levels of sleeping pill and tranquilizer use, heavier alcohol use, and lower social network scores among women; more frequent use of indigestion aids among men; and higher rates of drinking and severe job stress among both men and women. However, contrary to our expectations, it was not related to patterns of cigarette smoking or coffee drinking. Some of these negative findings may be due in part to our inability to identify individuals who worked a straight night shift. A recent study of shiftworkers found no significant difference between rotating shiftworkers and straight shiftworkers on overall quantity of sleep, but did find a consistent negative effect on quality of sleep, even when such factors as psychological stress, noisiness of sleeping room, and coffee consumption were controlled.[13] Research has shown that night workers have a higher prevalence of sleep and digestive disorders and disrupted social lives than day workers. Thus, combining those who work straight shifts, irrespective of whether they are night or day, may obscure certain effects.

Another consideration is the instability of the population working a variable shift. Examination of the longitudinal data on respondent work schedule at Waves I and II showed that approximately 40 per cent of the men and 51 per cent of the women working variable shifts at Wave II had not been doing so at Wave I, and 13.8 per cent of the men and 8.8 per cent of the women working straight shifts at Wave II had been working variable shifts at Wave I. There is some evidence to suggest that those who transfer out of variable shiftwork may do so because they were experiencing more adverse health or social consequences than those who remain with a variable shift schedule.[14] It is also possible that those who started variable shift schedules during the year were not exposed long enough to experience the deleterious effects. We examined differences among workers in each of the four shift history categories in our sample, and found no consistent patterns. However, it may be that there were too few respondents to calculate reliable estimates for each of the subcategories.

With round-the-clock operations here to stay for the foreseeable future, it is important for public health researchers to examine more carefully the impact of shiftwork and other industrial practices introduced as a result of technological advances on the health, behavior, and quality of life of workers and their families. The growing interest in the workplace as an arena for health intervention provides an opportunity for occupational health, health promotion, and organization development specialists to cooperate in the exploration of how the structure of work influences lifestyles and health. The product of this cooperative effort could be the

development of recommendations for workplace changes to enhance the health, well-being, and productivity of the labor force, and to reduce the effects of work-induced stress, fatigue, and constraints on social interaction.

Research suggests that restructuring the way work is done, i.e., redesigning shift schedules to be more compatible with the body's circadian rhythms, can lead to improved health, reduced stress, and increased job satisfaction and productivity.[13,14] Further research in, and application of the principles of sleep research and ergonomics—the study of how to improve the interaction of people with their physical environment—may well broaden the scope and potential effectiveness of worksite health promotion activities.

ACKNOWLEDGMENTS

The authors would like to thank Khoi Le and Joseph Ronda for their computer programming assistance on this project and Douglas K. Ayres for his comments on earlier versions of this paper. Support for this study came from a W.K. Kellogg Foundation grant to the Working Group on Health Promotion and Disease Prevention, Division of Health Policy Research and Education, at the John F. Kennedy School of Government, Harvard University.

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NIH Consensus Panel Issues Report on The Prevention of Venous Thrombosis and Pulmonary Embolism

A National Institutes of Health (NIH) consensus development statement on the Prevention of Venous Thrombosis and Pulmonary Embolism now may be obtained from the NIH Office of Medical Applications of Research.

The report was prepared by a panel of experts, which considered scientific evidence presented at a consensus development conference at the NIH. It contains recommendations and conclusions concerning venous thrombosis and pulmonary embolism.

At NIH, consensus conferences bring together researchers, practicing physicians, representatives of public interest groups, consumers, and others to carry out scientific assessments of drugs, devices, and procedures in an effort to evaluate their safety and effectiveness.

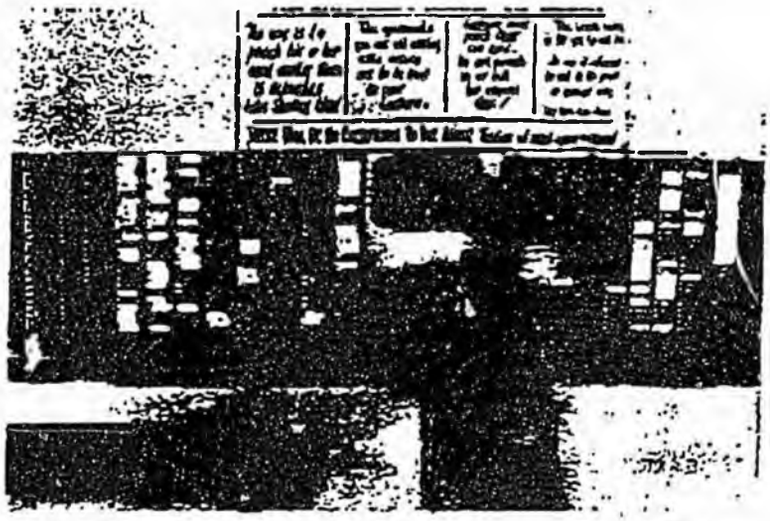
Free, single copies of the consensus statement on the prevention of venous thrombosis and pulmonary embolism are available from:

Michael J. Bernstein
Office of Medical Applications of Research
National Institutes of Health
Building 1, Room 216
Bethesda, MD 20892

Working Around the Clock: Shiftwork and Health

by Nancy Mogck

LOHP Intern



(Photo: Ken Light.)

It was my own personal experience with shiftwork that sparked an interest in the subject for me. I began as most workers new to shiftwork do, with total ignorance of its implications and effects. The oil refinery where I worked steadfastly ignored all problems related to shiftworking. The company provided no educational programs to help employees try to cope with shiftwork, nor any options for those, like myself, who had adverse reactions to unusual work schedules.

Refineries are only one kind of industry where shiftwork is common. Approximately one of every four workers in the U.S. has a job which involves some form of shiftwork. That number is on the increase as computerization makes it possible to run more and more operations and facilities on a 24-hour basis. Lumber mills, steel mills, glass factories, and other production facilities that employ equipment and machinery that can be operated 24 hours a day usually must have people to work around the clock. And most emergency services are 24-hour operations. Police, firefighters, hospital staff, and many others may often be shift workers. Much of the transportation industry requires shiftwork too: pilots, flight attendants, bus drivers, taxi drivers, truck drivers, and train crews may all be at work in the middle of the night.

More stores and restaurants have begun to operate on a 24-hour basis as well. (Most Safeway Stores in California, for example, are now open 24 hours a day.) The military and power plant operators also work shifts.

Is there anything wrong with shiftwork, other than the fact that it's inconvenient—that it involves working odd hours and usually having days off other than Saturday and Sunday? The effects of shiftwork on the individual and the repercussions on society are relatively new fields of study. Consequently, issues involving shiftwork have not been adequately addressed in many industrialized countries—and even less so here in the U.S., where production and profits usually take precedence over the health and well-being of individuals and society.

WHAT IS SHIFTWORK?

In order to get a clear grasp of the issues involved, one must begin with an understanding of what shiftwork is. Most people know it means working odd hours, but many have no idea of the variety of shiftwork schedules that exist. Many also don't realize that some schedules are much more harmful to health than others.

Some of the more common types of schedules that are labeled as shiftwork include:

- **Rotating shifts.** Shifts that rotate between day, swing, and graveyard; or just between day and swing. An individual might rotate weekly, monthly, every six months, etc. Such a shift could also involve stints shorter or longer than the normal eight hours. (For example, parts of the U.S. military do six-hour stints with twelve-hour rest periods in between, making the "day" 18 hours instead of 24.)

- **Straight shifts.** Any regular shift other than the normal day shift; in other words, some evening hours are included in the workday. These shifts do not rotate but might be straight swing (like noon to 8 pm or 4 pm to midnight), or straight graveyard (like 10 pm to 6 am or midnight to 8 am.)

- **12-hour shifts.** There are many variations on the 12-hour day. Some rotate; some don't. The advantage purportedly is that by lengthening the workday hours, workers can get three- and four-day weekends.

Of the above possibilities, weekly rotation that involves all three shifts (day, swing, and graveyard) is the worst. The rotation is especially hard on the body if it does not "follow the sun." (A move from day to swing to graveyard would be following the sun.) I worked such a schedule for seven years. The schedule I worked also included some mandatory 16-hour shifts.

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BIOLOGICAL RHYTHMS

The effect of shiftwork on health can best be understood by examining the human connection to natural rhythms.

All plants and animals, including even single-cell algae, operate on biological clocks. In humans, body rhythms or body clocks are synchronized with the light/dark cycle in such a way that we are active primarily during the day. We are not nocturnal animals. These rhythms are called *circadian* rhythms.

Scientists define cues that help regulate bodily rhythms as either *exogenous* or *endogenous*. Exogenous factors are those outside of the organism such as light/dark cues. Nocturnal species become most active during the night, darkness being one of the exogenous cues that begins their activity. (At the Primate Center in the San Francisco Zoo, for example, a simulated nighttime atmosphere, including night noises, keeps the nocturnal primates somewhat active during the day when zoo visitors can observe them.)

For humans, the social environment and awareness of clock time are also important exogenous cues. What we do and when we do it has a lot to do with what the rest of society is doing, what time it is, and whether it is day or night.

Endogenous cues are internal. Researchers have found that many internal body rhythms are paced from a specific area of the brain. Hormonal activity, heart rate, body temperature, nerve impulses, eating, sleeping, and numerous other internal body functions are rhythmically orchestrated by the brain, each body function having its own separate high and low activity periods throughout the 24-hour day. For example, muscle contractions in the stomach occur approximately every 90 minutes because circadian rhythms affect the stomach muscles.

Another example is body temperature; our body temperatures rise and fall throughout the 24-hour period. Though this is a small variation of only about 1°F, it affects our performance levels. The body temperature drops to its lowest point around 4 am, and starts slowly to rise again around 6 am. Anyone who has worked graveyard shifts knows from experience that from about 4 am to 6 am, activity and alertness levels hit an all-time low; this is the most difficult time during the 24-hour period to stay awake and alert.

The internal and external cues are synchronized to achieve a balance within the body. A well-balanced, synchronized human organism will not only sleep at night and be active during the day; internal rhythms will also be in balance so that, for example, body temperature and hormonal levels rise and fall at appropriate times throughout the 24-hour cycle, in sync with the external cues. When out of balance, the organism is in a state of *dischronia*. Dischronia occurs when there is confusion of signals to the part of the brain that triggers circadian responses.

Those who have traveled are familiar with jet-lag, which is a perfect example of desynchronization. Usually a few days of rest and recuperation will help a traveler's body rhythms adjust to a new time zone. Until one has adjusted, though, fatigue, disorientation, clumsiness, and crankiness will prevail.

Compare this to the shift worker who cannot rest and recuperate after every change in "time zone" (i.e. shift change.) Thus one begins to glimpse the problems shiftworkers face when they rotate weekly. They remain in a constant state of jet-lag. Furthermore, such frequent upsets of the circadian rhythms make it impossible for the rhythms to get resynchronized. There is not time, except for a two- or three-week vacation, for the numerous body functions involved in this intricate system of rhythms to resynchronize because some of these functions, once thrown out of whack, take as long as 25 days to normalize.

According to a 1978 article in the *Journal of Occupational Medicine* by Winget, Hughes, and LaDou *(see accompanying bibliography)*:

> "When resynchronizing to a 12-hour shift, the EEG rhythm resynchronizes within five days and the respiratory rate rhythm within 11 days, whereas the potassium excretion rate rhythm requires more than 25 days to return to normal."

HEALTH CONSEQUENCES OF DESYNCHRONIZATION

The health consequences of desynchronized body rhythms are just beginning to be studied and documented. Sleep disorders and gastrointestinal disease are the most widespread and commonly known health problems among shiftworkers at this time.

Sleep disorders related to shiftwork have been studied by researchers at various sleep disorder centers. They have discovered some very interesting facts about the sleep process.

First, and most obviously: Most shiftworkers who sleep during the day

Firefighters and other emergency personnel work around the clock. (Photo: LOHP Photo File.)

do not sleep under ideal conditions of quiet and darkness. Since the majority of activities in society occur during the day, workers who try to sleep by day must sleep with the noise of traffic, planes, lawn mowers, children playing, and other normal daytime noise. Warmer temperatures and the light of day also become enemies. It is difficult, as one example, to darken bedrooms positioned to receive sunlight. (When I was on shiftwork, I finally taped up one of my bedroom windows using the best shade material I could purchase, and coupled that with a pulldown shade and yet another window covering. I never looked out that window again until I was off shiftwork six years later.)

But when the sleep pattern is altered from night to day, even under *ideal* conditions there are problems. Brain waves show that sleep stages are severely affected. Affected sleep stages include the "REM" (Rapid Eye Movement or dream sleep) phase and "Phase 2," the basic sleep stage. Stages 3 and 4, the deep sleep stages, appear to be unaffected. Daytime sleeping is not as beneficial as nighttime sleeping because the affected stages (REM and Phase 2) do not occur rhythmically the way they should. Only nighttime sleep, in a synchronized human body, allows for the necessary sleep phases.

It has been shown that when shiftworkers sleep during the day, they sleep from one to four hours less than when they sleep at night. Even if they do manage to sleep seven or eight hours, they will not wake up refreshed. Sleeping during the day negatively affects both the quantity and the quality of sleep.

Sleep deprivation results from this unnatural day-sleeping. The consequences are fatigue, reduced alertness, and general malaise. Furthermore, it takes at least two weeks for the abnormal brain patterns that result from a day-sleeping schedule to return to normal once a nighttime sleeping schedule is reestablished. (The same is also true for body temperature patterns.)

Long-term consequences remain unknown but there is speculation. Studies conducted in 1971 on laboratory animals subjected to forced weekly "shift" changes showed a 20% shorter life span than in animals allowed to maintain balanced 24-hour cycles of sleeping and waking. Some researchers have recently suggested there may be a link between shiftwork and cardiovascular disease. The effects of medications on a desynchronized body are another area of concern. Some drugs, like digitalis (heart medication), are usually more effective when administered at night, but this is no longer true if the patient's rhythms are disrupted.

And what effect do toxic substances have on a desynchronized organism? There is currently no information on the subject, but if medication can be more or less effective depending upon whether certain body rhythms are at their high or low points, it seems likely that chemicals may be more or less toxic at different times during the body's cycles. And if a worker is in a general state of fatigue due to shiftwork, then he or she is more susceptible *in general* to disease, illness, and the health effects of workplace toxics. There is a need for more research in these areas.

DISRUPTED LIVES

Workers' social and family lives are also negatively affected by shiftwork. Such disruptions are primarily due to night shifts (both swing and graveyard.)

Many social activities occur in the early evenings, and night shifts reduce the worker's ability to take part in them. Even the rotating worker, who may have evenings free occasionally, cannot make ongoing commitments to evening classes, meetings, sports or cultural events because the shifts are not always the same. A certain amount of social isolation results, and it is a common complaint among shiftworkers.

Night shifts separate couples and interfere with sexual and emotional relationships. The mood swings and fatigue that result from shiftwork can affect relationships with family and friends who may not understand the shiftworker's physiological upsets, edginess, tiredness, moodiness, or depression.

Unsympathetic families and friends, ignorant of the harmful consequences of shiftwork, can make the situation even less endurable both for the shiftworker and for themselves. A spouse may begin to feel ignored and disliked; children may begin to feel as though they have an occasional second parent who doesn't care about them enough to be around more often. In my experience, divorce among shiftworkers was very common. So was the loss of friends. It's no wonder, then, that shiftworkers share close bonds with each other and tend to form friendships among themselves; this is one of the few ways in which the pain of their social isolation can be lessened.

DRUG AND ALCOHOL ABUSE

In the refinery where I worked shifts, a significant number of workers had serious drug and/or alcohol problems. A drink, a pill, or a hit of cocaine can alter how one is feeling physically and mentally during the wee hours of the night when you'd rather be in bed with your spouse and not at work. And where else can shiftworkers go to hang out together after the shift besides a bar? Close bonds formed between shiftworkers are many times ritualistically sealed by the use of drugs and alcohol before, during, and after the shifts—especially the graveyard shifts.

But alcohol and drug abuse at the worksite are generally not approached as problems related to working conditions. Instead, most management personnel in this country insist that such abuse is the *individual's* problem, unconnected to social factors such as the worksite. Other difficulties that arise from shiftworking (which is a working condition) are also treated as personal problems by most employers. Many employers have policies which say: if you don't like shiftwork, quit; if you can't kick drugs or alcohol with the "help" of a management sponsored and controlled program, then you deserve to be fired. Such rehabilitation programs often mandate a recovery period set by the company in accordance with its own needs (what it is willing to give), and return workers to the very job and working conditions which may well have driven them to drink (or drugs) in the first place.

At the refinery where I worked, a 12-year employee who was well-known, well-liked, and much relied upon for his expertise was addicted to cocaine. When he began to miss work due to drug-related problems, the company gave him an ultimatum to enter the Employee Assistance Program (EAP) or be fired. He joined the program and after four weeks was back on shiftwork. After his first graveyard shift he started using cocaine again. He couldn't stay awake all night without it, and he couldn't stand the way he felt, working all night without the coke. He was fired about a month later. This is an all too common problem, yet shiftworkers are not given options such as being transferred to day jobs in

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these cases, since management refuses to acknowledge that shiftwork can be part of the problem.

COMPUTERIZATION

Computerization is making shiftwork more prevalent in our society. Computers control many necessary 24-hour processes with minimal (although still some) human staffing. But they also allow many ambitious, hard-driving employers to operate their businesses on a 24-hour basis when such businesses don't *need* to be run 24 hours a day.

Continuous operations such as power plants, refineries, sewage facilities, etc. usually cannot be shut down for the night. Nor can emergency services stop at 5 p.m. But canneries, supermarkets, and numerous other businesses provide no essential services that we as a society must have at 3 a.m.

THE PROFIT MOTIVE

Employers clearly profit from running their operations around the clock. Production is increased and equipment is better utilized. Also, it is well known in some industries that night shifts make it easier to "bend the rules." Fewer eyes are watching. Some companies engage in illegal dumping of toxic chemicals on the night shifts. And, at the refinery where I worked, the graveyard shift was frequently used to force workers to perform unsafe, dangerous work.

American shiftworkers are left with narrow choices. Studies show that more than 20% of shiftworkers will *never* adapt to shiftwork, and for those who cannot tolerate it, the only alternative is to find another job that does not involve shifts. But for shiftworkers, changing jobs usually means a drastic cut in pay, loss of seniority rights, possibly non-union work, and usually less job security. It's not an easy choice: a choice between one's health and one's financial well-being.

ALTERNATIVES

With these restrictions in mind, what *can* be done? Unions must continue to push for decent hours of work. At the very least, unions should be pressing employers and policy makers to restrict shiftwork so that shifts follow the sun and rotate gradually (no more often than every six weeks). Workers and their families should be educated about the hazards of shiftwork and informed about precautions they can take to lessen those hazards. There should be laws to govern shiftwork, protecting workers from excessive work hours.

There should be a centralized data bank that gathers information on shiftwork schedules and their relationship to workplace illnesses, accidents, and injuries. Shiftworkers should be tracked for health problems, especially those that are known or suspected to result from shiftwork.

Unions should be fully involved at all levels in designing shift schedules, and should call in their own health specialists for advice. A union might want to press for establishment of a right to transfer to daytime work without loss of pay and benefits. Shifts should be scheduled on a yearly basis so workers can plan their lives. If weekend and holiday work are incorporated into shift schedules, employees should be compensated in such a way that working those days causes minimal hardship on their family and social relationships.

Unions might suggest to employers that humane shiftwork policies (such as less rotation) could boost productivity. Some studies have found increases of over 20%. (Of course, any specific proposals for shift redesign considered by a union are likely to be controversial among the membership, and such disputes should be resolved before approaching the employer with a plan, so the union can present a united front.)

These types of reforms are possible and are worth pursuing. But we have a long way to go.

Truck drivers' irregular work schedules can produce a variety of health problems. (Photo: Ken Light.)

SHIFTWORK POLICIES ABROAD

We can look to other industrialized nations for leadership and guidance on how to approach the complex problem of shiftwork.

Sweden is one of the most progressive countries when it comes to improvements in the work environment. In Sweden there is a strong commitment to ergonomics (the science of fitting the workplace to the worker's needs) and to safety and health. Swedish society is keenly aware of stress issues and takes measures to limit stressful working conditions. It is also very much aware of the interrelationships among work, family, and society as a whole. Modern technology is used to improve the workplace environment for workers. Consideration for the worker is a high priority in Sweden.

and this shows up clearly in Swedish policies concerning shiftwork.

In 1980, Swedish researchers did a nationwide study of bus, tram, and suburban train drivers on shiftwork. They found a number of problems among these workers including excessive fatigue, insomnia, stomach disorders, high absenteeism, high turnover rates, and disruption of family and social lives. Consequently, the following recommendations were made and implemented:

- **Shorten the work week to 33 hours;**
- **Make shift patterns regular;**
- **Mix permanent fixed schedules with alternating schedules to reduce the number of alternating ones;**
- **Use a "work load time" rule (for example, every hour worked between 10 pm and 6 am is counted as two hours worked.)**

Holland and West Germany conducted similar studies among train drivers and came up with similar results. West Germany was especially interested in the extent of safety hazards that could result from drivers' fatigue and upset circadian rhythms. After this study, it was concluded that, for safety reasons, shifts had to be shortened and rest periods between shifts should be well over 16 hours. The West German researchers also recommended that shifts be made flexible, tailored to the individual to suit each worker's particular needs, since there is some individual variation in normal circadian rhythms.

Norway and Sweden have shortened the work week in a number of factories to 28 hours *with no loss of pay* due to shiftwork hazards. England, Germany, France, and Switzerland created government agencies to regulate the working conditions of shift workers *at the turn of the century*!

Belgium, Norway, Sweden, Poland, and Denmark have banned night work in all but continuous process industries and essential services. In Poland there are frequent, longer break periods for night workers, including hour-long "naps" for those on the graveyard shift. Finland has even suggested that workers be allowed to follow a 25-hour clock (with 8 hours, 20 minutes on shift and 16 hours, 40 minutes off), slowly rotating an hour forward every day, if that proves more compatible with circadian rhythms. (This idea, however, was generally unacceptable to workers due to the disruption it caused to family life.)

The fact is that all European countries have been actively involved in studying shiftwork problems and developing policies to regulate shiftwork for a long time, especially over the past 30 years as shiftwork has dramatically increased. In European countries, these concerns are shared by unions, health professionals, and policy makers.

There is also concern in countries as diverse as Israel, Pakistan, India, Canada, Australia, and Japan. In Australia, where 57% of the labor force is unionized, union workers at a Kodak plant insisted on designing their own schedules if shiftwork were to be introduced. To avoid turmoil, management agreed. The workers were finally able to negotiate a schedule consisting of two 12-hour shifts and one eight-hour shift each week (i.e. a three-day work week). In Canada, the hazards of shiftwork are taken seriously enough that the provincial government of Ontario established a commission last year to investigate hours of work and overtime in relation to health and safety issues.

In Japan, shiftwork increased dramatically after World War II. In 1976, a Shift Work Committee with members drawn from 19 different medical institutions began extensive studies because of alarm about "the spread of ill effects" caused by "high-rate economic growth" and Japan's "production-first policy." The committee recommended reducing night and other shiftwork by all possible means. It also produced a series of recommendations for alleviating the effects of shiftwork, including rest periods between shifts of at least 16 hours; soundproof and air conditioned resting rooms at the workplace; day nurseries for parents on shifts; hot meals on shifts; better transportation facilities for shiftworkers; limitations on overtime; and limitations on the frequency of graveyard shifts. It also recommended better soundproofing of residences and creation of "quiet zones" in residential neighborhoods. Other recommendations included monitoring of shift workers, regular medical exams, and health and safety training on the hazards of working nights and other shifts. Finally, the study concluded that only socially necessary and public service shiftwork should be permitted, not shiftwork implemented for "economic reasons."

CONCLUSION

Japan, like many of the other countries I researched, showed a real concern for the health and well-being of its workers. A major reason is that cooperative efforts are being made which involve unions, health professionals, social scientists, business, and policy makers. Although such cooperative efforts are slowly beginning to emerge in the U.S., at this point only a few people are aware of shiftwork issues and little has been done to address them. The fact that workers in America are largely unorganized is a serious problem too. In 1985, only 18% of the American workforce was unionized. Without strong unions, health and safety issues like shiftwork cannot and will not be addressed.

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NEWS SERVICE

April 1990

SHIFT WORK AND BODY RHYTHM

WASHINGTON, D.C.—(INS)—Every 24 hours, our body processes go through a rhythmic, tide-like rising and falling pattern set by our circadian rhythm.

Changes brought about by this ebb and flow correspond to the day-night cycle and influence a number of body functions, including temperature, blood pressure, pulse rate, and hormone level.

These body functions reach a peak during the day and drop to their lowest point at night. That suits the human organism fine, because man, by nature, is not a nocturnal animal. Normally, we work during the day and rest at night.

But what happens if we turn this pattern upside down—turn night into day, in a manner of speaking—as shift work does for many people.

For most of these workers (not all), the low point of their biological rhythms, normally a time of reduced activity and rest, now comes at a time of peak work demands. Later, when the shift ends, they have to try to sleep when their internal activity is on the upswing.

Shift workers—especially those on the night shift—on the average get one or two hours less sleep than day workers. Furthermore, the quality of the sleep and its effectiveness in refreshing the workers is less than nighttime sleep.

Sleep disorders and gastrointestinal illnesses are the most widespread and commonly identified health problems among shift workers. Ulcers and constipation are also more common among shift workers, according to researchers.

Switching shifts can also cause problems. Some workers may lose their appetites. Others may react by overeating. These problems are often aggravated by irregular meals, poorer food in many cases, and eating when the body's digestive system is at a low point.

Fatigue and disruption of the central nervous system, often brought on by a lack of sound sleep, can also have adverse effects on digestion.

When the body is out of rhythm and under stress, it also may be more susceptible to the effects of physical agents such as noise, vibration and radiation, as well as to chemical agents such as fumes, gases and dusts.

One survey of accidents at a medium-sized steel mill showed a lower rate on the night shift, but the accidents that did occur were more serious than on the morning and evening shifts.

(All three shifts, incidentally, worked under the same intensity of artificial lighting.)

Not all workers, of course, dislike shift work, even preferring the night or graveyard. For some, it may be the incentive of the extra pay. Others just feel they come alive after dark.

Greater adaptability to night work also has been found among those with an extroverted nature whose circadian rhythms follow an evening pattern.

Clinical observations have shown a relationship between an inability to adapt to shift work and the early-to-bed, early-to-rise type.

-more-

Although we can't change circadian rhythms, here are some ideas about making shifts a better deal for everybody:

- Give workers a greater voice in designing flexible work and shift rosters, and a choice of shifts.
- Reduce hours of work on shifts and schedule more breaks.
- Keep first aid and medical facilities available at all hours.
- Provide better meal and transportation facilities for the odd-hour shifts.
- Provide management-paid medical checkups every six months.

Article by: Phillip L. Polakoff, M.D., Director, Western Institute for Occupational/ Environmental Sciences. If you have any questions, or suggestions for future articles, write to Dr. Polakoff at WIOES, 5655 College Ave., Suite 310, Oakland, California 94618.

# # #

Alaska State Legislature

Please enter into the record my testimony to the LABOR & COMMERCE
committee name

committee on H.B. 68, dated 1-29-97.
bill/subject

As a construction worker of over twenty years in Alaska I am opposed to any law which would eliminate overtime for ~~over~~ any hours worked in excess of eight hours in one day.

Signed: Donald B Weber
Testifier

MEMBER LOCAL 341
Representing (Optional)

P.O. BOX 671196 CHUGIAK AK
Address

688-0485
Phone No.

9/88 Legislative Information Office

Post-it™ brand fax transmittal memo 7671 | # of pages ▸ 12

To Rep. Rokeberg	From Anch LIO
Co. (H) L & C	Co.
Dept.	Phone # 258-8111
Fax # 465-2040	Fax #

Alaska State Legislature

Please enter into the record my testimony to the Labor & Commerce Committee
committee name

committee on HB 68 , dated 1-29-97 .
bill/subject

Policys That favor an employer working a 12 hour workday will only lead to a higher accident and death rate due to mental fatigue by the worker. The insurance industry and jobsite safety engineers will agree that this can be substantiated.

If this legislation is passed, it will lead to more Non Alaskans employed at Fort Knox. Alaskans realize that at these wages, overtime is necessary to maintain payments of Alaskan cost of living.

Most construction workers realize that coersion exists on the job most everyday. Those "volunteering" or aligning themselves with the employer's proposals feel that they will continue to be employed. Resistance will have a layoff slip soon. Volunteering = 's a job

Signed: David Ford
Testifier

Ironworkers #751 and its employers
Representing (Optional)

650 W. International Suite 101 Anchorage, AK 99518
Address

563-4766 (home 6930 Crawford Anch AK 99502)
Phone No.

Alaska State Legislature

Please enter into the record my testimony to the Labor & Commerce Comm.
committee name

committee on HB68, dated Jan. 29, 1997.
bill/subject

See attached

Signed: Daniel Repasky
Testifier

IBEW Local 1547
Representing (Optional)

2702 Denali Street 99503
Address

(907) 272-6571
Phone No.

716 w uth
3:00pm

International Brotherhood of Electrical Workers, LU 1547

POSITION PAPER
ON
HB 68

The International Brotherhood of Electrical Workers, Local Union 1547, represents nearly 5,000 men and women throughout the State of Alaska, all of whom are paid an hourly wage in exchange for their work. On behalf of those five-thousand represented Alaskan workers, and indeed all Alaskan workers, represented or not, we would like to state our emphatic opposition to this proposed change in state wage and hour law. To adopt this proposed change would return the Alaskan worker to a pre-twentieth century standard, effectively undoing one-hundred years of progressive reform.

We are especially offended by the concept that, as a voluntary work plan, this change in state law is initiated at the behest of workers. Wage and hour laws were established in response to employer coercion. There is a strong motive for an employer to subtly, or even overtly, suggest workers "voluntarily" give back two hours of overtime per day. One must seriously consider the realistic chances of an employee risking his job by refusing to accommodate his employer and thereby facing the prospect of being replaced by someone a little hungrier who is willing to work under the "voluntary" plan. This is exactly why the provision exists in State law for workers to develop a bona fide voluntary flex-plan within a collective

bargaining agreement. The employee is shielded from coercion by the nature of the collective bargaining process and the mutually agreed upon, negotiated result.

Corporate benefit is the issue at hand in this legislation. We are not convinced ~~in the least~~ that this reduction in compensation is being brought before the Legislature "on behalf" of workers. We are doubtful that any employer would selflessly hire not one, but four lobbyists, to promote legislation purely for the benefit of their workers. The underlying motivation for this legislation is the desire on the part of the employer's to reduce expenses by eliminating a shift and to avoid paying ~~his~~ his employees two hours of overtime compensation that ~~he~~ it would be entitled to, under current law. The consequence of this legislation, a reduction in shifts results in the exact opposite effect than contemplated as the purpose of overtime statutes; inducing employers to spread employment through the pressure of extra costs[1].

Fort Knox can, and should, accommodate employee shift and commute concerns within the confines of current Alaska law. Nothing precludes them from adopting a twelve-hour schedule. They, as nearly every other Alaskan employer would be obligated to pay for hours worked, including compensation for overtime.

[1] Janes v. Otis Engineering Corporation, 757 P.2nd 50, Alaska 198

Following on the heels of the 1996 legislation giving the mining industry a complete rewrite of the limitation on the period of employment in underground mines and granting them two additional hours for work to be performed at the face of a mine[2], we are concerned that incremental assaults on wage and hour and safety legislation will continue to erode the protections for Alaskan workers that have been built into law.

We urge the committee to reject this shameless assault on Alaskan workers and their right to earn a living wage.

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[2] Sec. 23.10.410

HB

68

File 3

Letters of Opposition
Distributed to Labor and Commerce Committee

FEB 0 3 1997

General Teamsters Local 959 State of Alaska

Affiliated with the International Brotherhood of Teamsters

ANCHORAGE, ALASKA 99504, 4300 BONIFACE PKWY. (907) 269-4122 FAX (907) 337-6668 GERALD L. HOOD Secretary/Treasurer

FAIRBANKS, ALASKA 99707, P.O. Box 70609 (907) 452-2959 FAX (907) 452-5051
JUNEAU, ALASKA 99801, 306 Willoughby (907) 586-3225 FAX (907) 586-1227

January 30, 1997

Representative Norman Rokeberg
State Capitol, Room 24
Juneau, Alaska 99801-1182

Re: House Bill No. 68

Dear Representative Rokeberg:

As Safety Director of Teamsters Local 959 and Safety Representative for the Western Alaska Building and Trades Council, I am writing to express our concern regarding twelve (12) hour day compressed work schedules. I have attached a report prepared by Roger R. Rosa, National Institute of Occupational Safety and Health. The report addresses some of the concerns we have raised, such as excessive fatigue, increased injuries both on and off the job, and long-term health effects.

Although the report references one study that shows no differences in incident rates for miners working twelve (12) hour shifts versus eight (8) hour shifts, it is important to note the study was conducted at a remote site where workers stayed on site during the work period. There are good reasons to be concerned about the negative effects on workers who have to commute to work each day and are exposed to the additional routine distractions of family life. Workers who stay on site are part of a controlled environment and would not be subject to off-site distractions that could result in additional stress, fatigue, and sleep deprivation.

The reports I have reviewed for all industries generally show an increase injury events, poor job performance, sleep deprivation, and overall decline in mental acuity. At the very least, the State should carefully examine the epidemiology of long, shift compressed work weeks before proceeding with this legislation.

I hope this information is useful. Please let me know if I can be of further assistance.

Respectfully,

TEAMSTERS LOCAL 959

Steve Trosper
Safety Director

Enclosure
pg\alive\rokeberg.ltr

J. Sleep Res. (1995) 4, Suppl. 2, 51–56

Extended workshifts and excessive fatigue

ROGER R. ROSA
National Institute for Occupational Safety and Health, Division of Biomedical and Behavioral Science, Cincinnati, Ohio, USA

SUMMARY Studies of overtime have pointed to fatigue as a potential factor producing, for example, a three-fold increase in accident rate after 16 h of work, increases in back injuries, hospital outbreaks of bacterial infection, or nuclear-power plant safety compromises. Fatigue has been measured more directly in studies of scheduled long workshifts, where performance decrements in both work-related tasks and laboratory-type behavioural tests have been observed, and significant loss of sleep and increases in subjective sleepiness have been reported. Analyses of accidents or injuries during scheduled extended workshifts, however, have produced equivocal results. Factors which could compound the fatiguing effects of extended workshifts, such as workload, noise or chemical exposure, or duties and responsibilities outside of the workplace, rarely have been studied systematically. It is concluded that extended workshift schedules should be instituted cautiously and evaluated carefully, with appropriate attention given to staffing levels, workload, job rotation, environmental exposures, emergency contingencies, rest breaks, commuting time, and social or domestic responsibilities.

KEYWORDS accidents, long work hours, overtime, performance decrements, sleep loss, work scheduling.

INTRODUCTION

Socio-economic developments in industrialized countries over the past two decades have produced a trend toward increasing use of workdays or workshifts longer than the typical 8 h. Some schedules compress the workweek by completing a 36–48 h week in 3 or 4 days instead of 5. Other situations require frequent bouts of overtime work because of impending deadlines (e.g. in construction), understaffing (e.g. in nursing), or emergency contingencies (e.g. in firefighting). Other industries, such as shipping, mining, or oil drilling, formally schedule long periods of work, followed by long rest periods, because the difficulty with travel to a remote site makes frequent staff turnover impractical. The degree to which the jobs in any of these contexts can be performed safely and efficiently has been the subject of considerable debate. In Europe, such debate has intensified recently as a current directive on working time proposes, with some exceptions, a minimum daily rest period of 11 consecutive hours, and a maximum of 8 h of night work (Harrington 1994). The concern of this directive, and the debate in general, is the avoidance of excessive fatigue and the possible risks of accident and injury in the short term, or deterioration of health in the long term. The purpose of this review is to characterize the state of knowledge on long work hours and their association with fatigue, and point to some factors which might produce fatigue or deterioration of performance and alertness in the worker. Studies of extended workshifts can be divided roughly into those concerned with scheduled long workshifts, such as the 10- or 12-h shifts used in compressed workweeks, and those concerned with unscheduled or sporadic long workshifts, which collectively can be termed as overtime.

Correspondence: Dr Roger R. Rosa, NIOSH, Taft Laboratories, Mail Stop C-24, 4676 Columbia Parkway, Cincinnati, OH 45224, USA. Fax: +1 513 533 8510.

OVERTIME

Survey and questionnaire studies have associated overtime mostly with health outcomes or with outcomes which are both health- and safety-related. Overtime has been associated least with outcomes which are primarily within the domain of safety, such as accidents or acute traumatic injuries. An exception is a recent analysis of a national occupational-injury database where a constant accident/injury rate was observed through nine consecutive hours of work, followed by a progressive increase to three times that rate at 16 h of work (Åkerstedt 1994). That report is preliminary, however, so it is not clear whether those rates

are associated with overtime vs. scheduled extended shifts, or whether the effects are concentrated in specific occupations or industries.

In the health or health/safety domain, overtime has been associated with lower self-ratings of health status (Broadbent *et al.* 1985), lower birth weight or gestational age in children of women working overtime (Marbury 1992), and increased presence of corticosteroids (in women) possibly indicative of a stress response (Härenstam and Theorell 1990; Lundberg and Palm 1989). Increased triglycerides and cholesterol (risk factors for cardiovascular disease) were observed in construction managers who frequently worked overtime (Sutherland and Davidson 1993). This group also reported higher levels of job dissatisfaction and poor psychological health. Frequent overtime work was associated with heavy and problem-drinking in men (Kawakami *et al.* 1993), higher suicide rates in both men and women (Starrin *et al.* 1990), and cardiovascular mortality in women (Starrin *et al.* 1990). In all of these studies, the possibility of a role for fatigue as one of the underlying factors producing health compromises at least should be considered, but such a possibility is highly speculative given that no attempt was made to measure fatigue.

A few reports raise the possibility of a more direct role of fatigue from working overtime. In a case-control study, overtime was identified as a risk factor for occupational low back injury in mail handlers (Daltroy *et al.* 1991), while another study reported that complaints of low back pain were more frequent in those who worked less overtime (Svensson and Andersson 1983). In the latter study, the authors suggested that workers with low back pain had limited their working hours because of their condition.

Two reports identified increased staff overtime as a factor contributing to separate outbreaks of *Staphylococcus aureus* infection in hospitals (Arnow *et al.* 1982; Russell *et al.* 1983). In both incidents, an unanticipated combination of high patient load and understaffing resulted in extensive use of overtime to meet demands for patient care and treatment. The infectious outbreaks associated with these periods of overtime were attributed by the investigators both to time pressure from the high patient load, and to high levels of fatigue from long work hours, which resulted in inadequate compliance with aseptic practices (i.e. skipping steps or rushing through procedures). While perceived time pressure or fatigue levels were not assessed directly in these studies, the fatigue interpretations given by the authors are consistent with our laboratory study demonstrating increased errors and faster response times (a speed-accuracy tradeoff) in an externally-paced reasoning task during 12-h work days compared to rest days (Rosa and Colligan 1988).

Operator fatigue from working overtime was also suggested as a factor that is detrimental to safety performance in nuclear-power plants (Baker *et al.* 1994). In a plant-level analysis of operator, technical, and maintenance staff overtime, safety incidents were associated most strongly with operator average annual overtime, which ranged from 300 to 1200 h. These results were attributed operator fatigue, rather than overall plant inefficienc because no strong association was observed between safe incidents and technical staff or maintenance staff overtime

Worksite studies taking behavioural measures of fatig (e.g. performance tests or self-report scales) in associatic with overtime are rare. In a cohort study of automoti industry workers, however, recent experience with overtin was associated with poorer performance on neuropsychol gical tests, such as trailmaking and card sorting, which a sensitive to fatigue-related deficits in attention or cogniti function (Proctor 1992).

In summary, cross-sectional studies have associat overtime work with a handful of health and safety outcom which may be related to fatigue. In most of these studies, was recognized that the fatigue effects of overtime occurr in combination with other personal, occupational, organizational factors and that, because of the cro sectional designs, clear directions of causality could not determined. The putative role of sleep loss, excessi fatigue, or their combination, usually was not explicit. O one study attempted to quantify fatigue deficits usi behavioural measures. No studies were identified wh were able to prospectively measure safety- or health-rela effects of overtime. The irregular and often unschedu nature of overtime work, however, would make such a stu difficult to conduct.

SCHEDULED EXTENDED WORKSHIFTS

Surveys of on-the-job fatigue effects of scheduled extend workshifts have considered efficiency and productiv accidents, absenteeism, and subjective reports. Regardless the outcome variables tested, there are no consistent tren With respect to productivity, there were, for example, eq numbers of oil refineries reporting increases, decreases, no change after the introduction of 12-h shifts (Campl 1980). Nevertheless, a major US electronics manufactu and a majority of US government sites abandoned l workshifts because of reductions in productivity (Tepas Tepas 1981). Studies of absenteeism have also produ equivocal results (Campbell 1980), as have surveys accidents and injuries. No change in accident frequency severity, for example, was observed in 57 oil refineries, increase was observed in five refineries, and a decrease observed in eight refineries (Campbell 1980). Another st reported no increases in accidents, or in violations occupational health and safety regulations, in a sample o oil refineries (Northrup *et al.* 1979). The adequacy of survey approach used in these studies is open to quest however, as the investigators reported only *manag* impressions in response to brief, general questions determine the frequency of accidents or safety violati Since the cause of most of these incidents involv multiplicity of factors, a more fine-grained analysis than gained from one or two brief questions is required

determine the contributory role of long workshifts. Such an approach was used in a long-term study of accidents over 10-y periods of 8-h and 12-h shifts in a yarn manufacturer (Laundry and Lees 1991). In that study, lower rates of the most minor injuries on the job, but higher rates of more major injuries off the job, occurred during the 10-y period of 12-h shifts.

Despite the fact that some studies of scheduled extended workshifts have reported little or no effect on gross indices of health and safety, there still are persistent concerns about excessive fatigue. Such concerns were given as a primary reason for not adopting the compressed workweek by 800 members of the American Management Association (Wheeler *et al.* 1972). In Singapore, 12-h shift systems in several industries were abandoned because of their adverse impact on worker health and social life (Kogi *et al.* 1989). The reported health factors associated with fatigue included insufficient sleep and weight loss, while other factors potentially associated with fatigue included lower productivity, high turnover, and more frequent part-time work on off-duty days. Even among industries using long workshifts, the subjective impression of increased fatigue is acknowledged. Studies have shown that the primary source of worker dissatisfaction with compressed workweeks was increased fatigue (Hodge and Tellier 1975). Despite the fatigue, however, employees generally were more satisfied with the compressed schedule.

Attempts at more direct assessments of fatigue have analysed job factors or administered laboratory-type performance tests and self-report scales. With a standard nursing-care job analysis, Mills *et al.* (1983) concluded that 12-h shifts had no adverse impact. Todd *et al.* (1989), on the other hand, concluded that overall nursing care was adversely affected by 12-h shifts, while direct physical care was not affected. Reid *et al.* (1993), however, reported that nurses' direct care time with patients was reduced on 12-h shifts as more unscheduled rest breaks were taken. In his analysis of truck-driver accidents, Hamelin (1. 37) reported that accident risk was particularly high after 11 h of work, especially if work occurred at night.

Behavioural assessment of extended workshifts with standard performance tasks and self-report scales have indicated some improvements and some decrements associated with these shifts. Volle *et al.* (1979) reported decreased grip strength and decreased critical flicker fusion frequency in a factory on 10-hour shifts compared to a similar factory on 8-h shifts. Peacock *et al.* (1983) reported increased sleep, improved subjective alertness and cardiovascular fitness in police officers after a switch from 8-h to 12-h shifts, and no effect on critical flicker-fusion frequency or grammatical reasoning performance. Mills *et al.* (1983) reported increased subjective fatigue in nurses across a 12-h shift, and more frequent errors in a grammatical reasoning task and a medical record reviewing task. Daniel and Potasova (1989) concluded that chemical workers on 12-h shifts performed more poorly on reasoning, visual search, reaction time and tapping tasks when compared to 8-h shift workers. They suggested, however, that differences in the capabilities of the workers selected for each shift system contributed to these results.

The United States National Institute for Occupational Safety and Health has conducted two worksite evaluations of extended workshifts using standard performance tests and self-report scales. In the authors' first study (Rosa *et al.* 1989), decreased reaction time and grammatical reasoning performance and increased subjective fatigue were observed after 7 months of 12-h shifts as compared to the previous 8-h shift schedule. Daily sleep logs indicated a 1-h sleep debt by the end of the 12-h/3–4 day workweek. Performance did not deteriorate across the workweek, however, indicating that the shorter workweek compensated somewhat for the longer workshift. After 3.5 y on the 12-h shift schedule, declines in alertness with time on-shift and reductions in total sleep time were still apparent, and few improvements were observed relative to the 7-month test phase (Rosa 1991). In a second worksite study at a natural gas utility, there were decrements in reaction time performance and subjective alertness 10 months after the change to the 12-h shift schedule (Rosa and Bonnet 1993). There were also reductions in sleep across the workweek which were most apparent on 12-h night shifts. The declines in alertness observed in the authors' studies were most apparent at night when lowered circadian arousal added to fatigue resulting from hours of work (see also Hamelin 1987).

TWO SPECIAL CASES OF LONG WORK HOURS

The 'on-call' schedules of hospital-resident physicians in training and the part-time work of adolescents who also attend school constitute two special cases of long work hours which do not fit neatly into the overtime or scheduled extend workshift categories. The average 80-h workweek of resident physicians has received substantial study over the last three decades because the potential for functional impairment from the combination of long work hours and sleep deprivation might compromise patient care. Behavioural studies of resident physician fatigue, however, have met with equivocal results. Several of these studies have been reviewed recently and tabulated in detail by Leung and Becker (1992). These authors attribute the lack of consistent results to three methodological domains including differences in test methodology, variations in the definition of sleep deprivation, and failures to distinguish between acute and chronic sleep loss. With respect to differences in test methodology, some studies used standard neuropsychological or laboratory performance tests, other studies used work-related tasks, and a third set of studies used medical examination results. Definitions of experimental (sleep-deprived) and control (rested) conditions by different studies varied by several hours. Deaconson *et al.* (1988), for example, defined sleep-deprived subjects as those receiving

less than 4 h of sleep and control subjects as those receiving more than 4 h of sleep in the 24 h prior to testing. Rubin *et al.* (1991), on the other hand, defined the sleep deprivation condition as less than 2 h of sleep and the rested condition as more than 6 h of sleep in the previous 33 hours. Many studies did not define the rested condition at all. While some attempt was made to define acute sleep loss in the previous 24–48 h, little effort was made to quantify chronic sleep debt or circadian-rhythm disruptions which may have accumulated over several days. In addition to the methodological concerns highlighted by Leung and Becker (1992), the consecutive number of hours worked (as opposed to simply resting at the hospital) was considered rarely, which may have contributed further to the variable results. A notable exception concerning work hours is an early study by Wilkinson *et al.* (1975), who reported that greater numbers of hours worked within the on-call duty period were associated with lower self-reported levels of work efficiency. Despite a failure to observe fatigue or sleep-loss effects in some studies, the number of studies observing such effects has prompted recent review and revision of resident physician work schedules, both within hospital systems and at the government or professional-association level (American College of Physicians 1989; Leung and Becker 1992; Scott 1992).

A second special case of long work hours involves adolescents engaged in part-time employment. If the primary 'job' of adolescents is schoolwork (in the USA, approximately 35 h of school attendance plus homework), then any additional employment can be construed as within the domain of extended work hours. Based on a survey of over 3900 students, Steinberg and Dornbusch (1991) reported that approximately half had part-time employment, and that half of those employed worked more than 20 h per week. Increasing hours of employment was associated with poorer school performance, higher psychological stress, more frequent substance abuse, and reduced parental supervision. Those students working the most hours tended to obtain the least sleep and were the most sleepy during the day based both on electroencephalographic assessment (the Multiple Sleep Latency Test), and on subjective reports of intrusive sleepiness while driving or frequent inattention during class (Carskadon 1989/90; Carskadon 1990). From these studies, it can be asserted that schoolwork plus 20 or more hours of employment places a significant number of students at acute risk of accident or injury (from sleepiness, possibly combined with substance use), and also presents a developmental disadvantage because of poor school performance (if they attend school at all) and increased stress.

FACTORS PRODUCING FATIGUE

A multitude of factors can contribute to the level of fatigue or performance efficiency observed during extended workshifts. These factors can be divided roughly into those related to work-rest scheduling, job tasks and workload, t environment (both within and around the workplace), a social/domestic demands and support. Of these factors, o work-rest scheduling has been examined with any freque and only in its broadest terms, i.e. considering si parameters as number of hours worked, day work vs. ni work, number of consecutive days worked, or opportur for sleep/recovery. When increased fatigue is observed, a our own worksite studies, then fatigue, sleepiness, performance loss, will increase with number of ho worked. This effect will be higher on night shift compare day shift and may be compounded by partial sl deprivation, but may be tempered by a shorter workwee

Virtually no worksite research has compared different tasks or workloads under the same extended works schedules, and environmental or social elements have b recognized but not studied systematically in terms of ! they might affect fatigue (see Carskadon 1989/90, for exception). With respect to job tasks, it appears scheduled extended workshifts have been applied r frequently in jobs that are sedentary, automated, or req relatively more cognitive as opposed to physical act (e.g. control room monitoring, computer operatic Almost no studies have examined extended workshift jobs with high physical workloads. One notable exceptic a study of 12-h workshifts in underground mining where associated fatigue was judged to be no different from seen on 8-h shifts. That study was conducted at a re mine site where the workers stayed at the site for se days (Duchon *et al.* 1994). Such a practice also occur off-shore oil rigs using extended workshifts. Environm factors and support systems are quite different in t situations because non-work activities are restr (e.g. prohibition of alcohol, no access to a second job) food and housing needs are provided at the site (P 1994).

In addition to physical workload, other job factor affect fatigue observed on long workshifts. Job pacing example, has been examined only rarely . alth worker-paced jobs afford, and externally-paced jobs f the opportunity for unscheduled rest breaks to r fatigue (Reid *et al.* 1993).

Environmental and social effects have been recog but not studied systematically. As mentioned abo workers are separated from the demands and distracti home and community then long workshifts migl manageable. Such observations lead to questions abo compounding fatigue effects of a long commuting ti heavy traffic, or the fatigue effects of a high do workload, such as in the care of small children. For exa if the individual working long shifts is the primary car in the home, then that person's own rest and recover be sacrificed for the needs of the children.

Other environmental exposures in the job can fatigue but there are few standards for work periods than 8 h. Chemical solvents cause drowsiness (Dick

and noise, vibration, or heat may produce performance decrements (Hockey 1983, reviews), yet little is known about the influence of an additional 2–4 h of daily exposure to any of these agents.

CONCLUSION

In conclusion, research demonstrating increased fatigue with long workshifts, and a lack of substantial research on other factors which may modulate fatigue, indicates that schedules requiring long workshifts should be instituted with caution. If such schedules are used they should be evaluated carefully. While many jobs allow a wide margin of error, any situation where increased fatigue, decreased sleep, or performance loss can be demonstrated is a situation where the margin for error is reduced, albeit by some unknown amount.

If experts in a certain occupation or industry already consider a job to be dangerous on an 8-h shift, then extended workshifts probably should be avoided. When extended workshifts are used, it is conservative to assume *a priori* that the margin for error will be reduced and contingency plans should be devised accordingly. A primary concern is having sufficient personnel to cover all working hours, because an individual required to work an additional 6–12 h overtime following their usual 12-h shift may push fatigue past acceptable limits.

In addition, workloads should be distributed to account for critical time periods when fatigue is assumed to be high. From our own studies, the final 4 h of a 12-h night shift was identified as a critical time because the fatigue from extra hours of work combines with the circadian low-point in arousal to produce the highest amount of subjective sleepiness and fatigue, and the lowest efficiency in performance.

Where demand permits, breaks should be distributed liberally throughout the shift to provide temporary recovery from the task at hand. Job rotation also becomes more critical as repetitive work, or long, monotonous tasks can induce boredom and loss of attention. The risk of fatigue-related mishaps off the job must also be anticipated because institutionalized safety procedures at the worksite will be absent. A critical time in this regard is the commute to and from the worksite as excessive fatigue can compromise the quick response time occasionally needed to drive in dense urban traffic, and also increase the potential for drowsiness during long monotonous drives in unpopulated areas.

Studies of long workshifts at remote worksites point to the influence of domestic obligations adding to work-related fatigue. Especially when children are involved, day-to-day home duties may not change just because additional hours are worked each day. Therefore, if a substantial number of single parents of small children comprise the workforce, then use of long workshifts may not be advisable.

Beyond the initial anticipation and rectification of factors which may exacerbate extended workshift fatigue, periodic quantitative evaluation of the work schedule is strongly advised for continued prevention of undue risk. Evaluation efforts should extend beyond the initial 'honeymoon' or 'Hawthorne' period, when the mere act of change is viewed positively, into the time of potential complacency when a relaxed state of vigilance could allow problems to arise.

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ALASKA STATE LEGISLATURE

PLEASE ENTER INTO THE RECORD MY TESTIMONY TO THE Labor & Commerce
COMMITTEE NAME

COMMITTEE ON HB 68 DATED 1-31-97
BILL/SUBJECT

I oppose H.B. 68 It is a step Backward for all working people I & the Employees at Ft. Knox mine want Hours all they have to do by a unanimous aproval is to Sign a Waiver on Overtime Hours this way it does not become a condition of Employment nor does it serve just a select few persons

SIGNED _____
TESTIFIER

_____
REPRESENTING (OPTIONAL)

Box 61018 FBKS AK 99706
ADDRESS/PHONE NUMBER
907 488-8311

ALASKA STATE LEGISLATURE

PLEASE ENTER INTO THE RECORD MY TESTIMONY TO THE Labor & Commerce
COMMITTEE NAME

COMMITTEE ON HB No 68 DATED 1/15/97
BILL/SUBJECT

I AM AGAINST HB No 68.
OUR FOREFATHERS' ENACTED LEGISLATION
TO PROTECT WORKING CONDITIONS OF INDIVIDUALS.
THIS WAS DIRECTED TO CHILD LABOR ABUSE
& "SWEAT SHOP" CONDITIONS. OVERTIME
WAS ALSO INCLUDED IN THIS CONSIDERATION.
I DO NOT FEEL THAT IT IS A GOOD
THING TO BREAK DOWN CONDITIONS FOR
A SPECIAL GROUP CONTRARY TO EXISTING
STATE LAW. WHO WOULD BENEFIT
& WHERE DOES IT END?

SIGNED L.D. "Corky" Corkran
TESTIFIER

RETIRED
REPRESENTING (OPTIONAL)

POB73324 FAIRBANKS, AK 99707-3324
ADDRESS/PHONE NUMBER (907) 456-5405

ALASKA STATE LEGISLATURE

PLEASE ENTER INTO THE RECORD MY TESTIMONY TO THE Labor & Commerce
COMMITTEE NAME

COMMITTEE ON HB68 DATED 1/31/97
BILL/SUBJECT

I oppose HB68. Why are we even contimplating this bill. Workers rights are in place to protect the workers from things like this. It would be the first step in eroding workers rights and conditions. If this gets started, where would it end. Everyone would feel that they fell under the "me too" clause

Dont pass HB68!

SIGNED Wade Williams (Wade Williams)
TESTIFIER

voter
REPRESENTING (OPTIONAL)

510 Hagelbarger Ave Fbks AK 99712
ADDRESS/PHONE NUMBER

ALASKA STATE LEGISLATURE

PLEASE ENTER INTO THE RECORD MY TESTIMONY TO THE Labor & Comm.
COMMITTEE NAME

COMMITTEE ON HB - 68 DATED 1-31-97
BILL/SUBJECT

I oppose HB-68. It would be a giant step backwards for all working people the Law should not be changed because a select few are not happy with work schedule.

SIGNED Bill L. Williams
TESTIFIER

REPRESENTING (OPTIONAL)

P.O. Box 45014 Hughes, Ak. 99745
ADDRESS/PHONE NUMBER 889-2228 - 452-4240

ALASKA STATE LEGISLATURE

PLEASE ENTER INTO THE RECORD MY TESTIMONY TO THE Labor + Commerce
COMMITTEE NAME

COMMITTEE ON H.B. 68 DATED 1-31-97
BILL/SUBJECT

Why would we ~~would~~ won't to go backwars for the working Man or woman union or Non union, secretary of Bob Kinzer

Period no Question Marks

I Oppose this Bill Please Vote NO !!!

SIGNED Claude Ray Stanley Jr.
TESTIFIER

Tax Payer / Voter
REPRESENTING (OPTIONAL)

P.O. Box 81542 302 16th Ave Fairbanks AK 99708
ADDRESS/PHONE NUMBER

(907) 388-9889

ALASKA STATE LEGISLATURE

PLEASE ENTER INTO THE RECORD MY TESTIMONY TO THE Labor & Commerce
COMMITTEE NAME

COMMITTEE ON HB 68 DATED 1/30/97
BILL/SUBJECT

I oppose the Bill and feel it would not be fair for the majority of workers and should not be changed to meet just a few workers Schedual.

SIGNED _____
TESTIFIER

_____
REPRESENTING (OPTIONAL)

PO Box 58426 Fairbanks 99711 907 488 1427
ADDRESS/PHONE NUMBER

ALASKA STATE LEGISLATURE

PLEASE ENTER INTO THE RECORD MY TESTIMONY TO THE Labor + Commerce
COMMITTEE NAME

COMMITTEE ON H.B. 68 DATED 1-31-97
BILL/SUBJECT

I strongly oppose H.B 68. This is a step backward for all working men and women. This bill shouldn't even have been presented it strictly for a small group of People who most have not even lived here very long. Our representatives should be working for the majority of the people in their district not a special interest group such Fort Knox mine. We need mining in this State and I don't feel we shouldn't support all mining groups large + small. Fairbanks Gold Knew the laws when they decided to open the mine and why should they try to change them as soon as the mine is open. Please vote against H.B. 68

SIGNED R A Dudoit
TESTIFIER

Tax Payer / Voter
REPRESENTING (OPTIONAL)

456-7400 P.O. Box 10908 Fairbanks AK 99710
ADDRESS/PHONE NUMBER

ALASKA STATE LEGISLATURE

PLEASE ENTER INTO THE RECORD MY TESTIMONY TO THE LABOR & COMMERCE
COMMITTEE NAME

COMMITTEE ON HB 68 DATED 1-30-97
BILL/SUBJECT

I OPPOSE HB 68

SIGNED _____
TESTIFIER

_____
REPRESENTING (OPTIONAL)

PO Box 72657 FBKS, AK 99707 456-2577
ADDRESS/PHONE NUMBER

ALASKA STATE LEGISLATURE

PLEASE ENTER INTO THE RECORD MY TESTIMONY TO THE Labor Committee
COMMITTEE NAME

COMMITTEE ON House Bill 68 DATED 1-31-17
BILL/SUBJECT

[illegible]

SIGNED Scott Carlson
TESTIFIER

REPRESENTING (OPTIONAL)

[illegible]
ADDRESS/PHONE NUMBER

ALASKA STATE LEGISLATURE

PLEASE ENTER INTO THE RECORD MY TESTIMONY TO THE Labor + Commerce
COMMITTEE NAME

COMMITTEE ON HB68 DATED 1/31/97
BILL/SUBJECT

I believe HB68 should be defeated because it would be a step backwards for the working person. The eight hour day should be standard.

SIGNED _____
TESTIFIER

IUOE Local 302
REPRESENTING (OPTIONAL)

195 "C" St. Fairbanks, AK 99701
ADDRESS/PHONE NUMBER

907-452-1340

Mr. Tim D Renner
719 HERNING RD.
FAIRBANKS AK 99712

FEB 13 1997

My name is Tim D Renner. I am 23 yrs old, single, born and raised in Fairbanks, Alaska. I am opposed to House Bill 68. I attended the public Hearing held on monday, Jan. 27th 3:00 PM at the U. F.O. in Fbks. I heard all arguments for and against.

Let me give you a little working background. I am now an apprentice carpenter and a member of Local 1243. I have worked non union construction for 3 yrs, until I realized I would get nowhere following that road. A great opportunity came about for me with the apprenticeship program. I am LEARNING a trade now. Pay and benefits are an added bonus, thanks to my union and all union members who fought before me, for me and others. I have worked varied shifts, including 8, 10, and 12 hours, I even worked four 9 hr days and one 4 hr day. Rarely was I payed overtime for those hours exceeding 8 in one day, mostly I was compensated O.T. pay for those hrs exceeding 40 in a week. If I was approached to VOLUNTARILY work extra hours a day, I accepted, for fear of losing face with my employer, or perhaps losing my job. 12 hour day are very demanding on a persons body, even if only for 3 or 4 ~~hrs a~~ days a week, I for one am not fond of those long hrs. I sympathize with those with family, being single, I have only parents and friends in town, I dont see much of them either. Working construction, or many other careers for that matter, it is a fact of life.

Ft. Knox employees pointed out that this is not a union controversy, I believe it is, union members spoke out in force against this bill with good reason. Directly it will not

have an effect on me, but it will affect other industries to move in the same direction, creating a domino effect. Eventually leading to unions to do the same to stay competitive, jeapardizing wages and benefits. I stand to lose substantially if this Bill were to pass and become law, as do others, not only union members but all working Alaskans. I urge all of the house members to vote no on this proposed bill.

Jim D Renne

FEB 0 3 1997

Alaska State Legislature

Please enter into the record my testimony to the Labor and Commerce
committee name

committee on CSHB 68, dated 1-27-97.
bill/subject

I DO NOT SUPPORT THIS BILL AS A ALASKA WORKER VOTER RESIDENT.

Signed: [signature]
Testifier

ALASKA WORKER'S
Representing (Optional)

3310 SHAMROCK ANCH 99504
Address

338-4604
Phone No.

9/86 Legislative Information Office

Alaska State Legislature

FEB 0 3 1997

Please enter into the record my testimony to the Labor and Commerce
committee name

committee on CSHB 68 . dated 1-27-97 .
bill/subject

I am adamantly opposed to this or any other legislation which undermines the hard fought rights of working men and women. The idea that a 12 hr shift should thought of and treated as acceptable or fair is outrageous The 8hr day was a battle working people won 70 years ago and it ain't about to be given away now!

Signed: Eric M Wasserman
Testifier

Representing (Optional)

13441 Spenlow Dr
Address

345 2120
Phone No.

ALASKA STATE LEGISLATURE

PLEASE ENTER INTO THE RECORD MY TESTIMONY TO THE Labor & Commerce
COMMITTEE NAME

COMMITTEE ON HB68 DATED 1/31/97
BILL/SUBJECT

I believe HB68 should be defeated because it would be a step backwards for the working person. The eight hour day should be standard.

SIGNED [signature]
TESTIFIER

IUOE Local 302
REPRESENTING (OPTIONAL)

198 "C" St Fairbanks, AK 99701
ADDRESS/PHONE NUMBER
907-452-1340

ALASKA STATE LEGISLATURE

PLEASE ENTER INTO THE RECORD MY TESTIMONY TO THE Labor + Commerce
COMMITTEE NAME

COMMITTEE ON H.B. 68 DATED 1-31-97
BILL/SUBJECT

I strongly oppose H.B 68. This is a step backward for all working men and women. This bill shouldn't even have been presented it strictly for a small group of People who most have not even lived here very long. Our representatives should be working for the majority of the people in their district not a special interest group such Fort Knox mine. We need mining in this State and I don't feel we shouldn't support all mining groups large + small. Fairbanks Gold Knew the laws when they decided to open the mine and why should they try to change them as soon as the mine is open. Please vote against H.B. 68

SIGNED R.A. Dulois
TESTIFIER

Taxpayer / voter
REPRESENTING (OPTIONAL)

456-7400 P.O. Box 10908 Fairbanks AK 99710
ADDRESS/PHONE NUMBER

ALASKA STATE LEGISLATURE

PLEASE ENTER INTO THE RECORD MY TESTIMONY TO THE Labor & Commerce
COMMITTEE NAME

COMMITTEE ON HB 68 DATED 1/30/97
BILL/SUBJECT

I oppose the Bill and feel it would not be fair for the majority of workers and should not be changed to meet just a few workers Schedual.

SIGNED _____
TESTIFIER

REPRESENTING (OPTIONAL)

PO Box 58426 Fairbanks 99711 ph 907 488 1424
ADDRESS/PHONE NUMBER

ALASKA STATE LEGISLATURE

PLEASE ENTER INTO THE RECORD MY TESTIMONY TO THE Labor + Commerce
COMMITTEE NAME

COMMITTEE ON H.B. 68 DATED 1-31-97
BILL/SUBJECT

Why would we ~~want~~ won't to go backwars for the working man or women union or non union, secretary or Bell Ringer

Peiord no question marks

I opose this Bill Please Vote NO!!!

SIGNED Claude Roy Stanley Jr.
TESTIFIER

Taxpayer / voter
REPRESENTING (OPTIONAL)

PO Box 81593 362 16th Ave Fairbanks AK 99708
ADDRESS/PHONE NUMBER
(907) 388-9889

ALASKA STATE LEGISLATURE

PLEASE ENTER INTO THE RECORD MY TESTIMONY TO THE Labor + Comm.
COMMITTEE NAME

COMMITTEE ON HB-68 DATED 1-31-97
BILL/SUBJECT

I oppose HB-68. It would be a giant step backwards for all working people the Law should not be changed because a select few are not happy with work schedule.

SIGNED Bill L. McIlcains
TESTIFIER

REPRESENTING (OPTIONAL)

P.O. Box 45014 Hughes, Ak. 99745
ADDRESS/PHONE NUMBER
889-2228 - 452-4240

ALASKA STATE LEGISLATURE

PLEASE ENTER INTO THE RECORD MY TESTIMONY TO THE Labor & Commerce
COMMITTEE NAME

COMMITTEE ON HB 68 DATED 1/31/97
BILL/SUBJECT

I oppose HB68. Why are we even contimplating this bill. Workers rights are in place to protect the workers from things like this. It would be the first step in eroding workers rights and conditions. If this gets started, where would it end. Everyone would feel that they fell under the "me too" clause

Dont pass HB68!

SIGNED Wade Williams (Wade Williams)
TESTIFIER

voter
REPRESENTING (OPTIONAL)

510 Wheelbarger Ave Fbks AK 99712
ADDRESS/PHONE NUMBER

ALASKA STATE LEGISLATURE

PLEASE ENTER INTO THE RECORD MY TESTIMONY TO THE Labor & Commerce
COMMITTEE NAME

COMMITTEE ON HB No. 68 DATED 1/15/97
BILL/SUBJECT

I AM AGAINEST HB No 68.
OUR FOREFATHERS ENACTED LEGISLATION
TO PROTECT WORKING CONDITIONS OF INDIVIDUALS.
THIS WAS DIRECTED TO CHILD LABOR ABUSE
& "SWEAT SHOP" CONDITIONS. OVERTIME
WAS ALSO INCLUDED IN THIS CONSIDERATION.
I DO NOT FEEL THAT IT IS A GOOD
THING TO BREAK DOWN CONDITIONS FOR
A SPECIAL GROUP CONTRARY TO EXISTING
STATE LAW. WHO WOULD BE NEXT
& WHERE DOES IT END?

SIGNED L. D. "Corky" Corkran
TESTIFIER

Retired
REPRESENTING (OPTIONAL)

POB 73324 FAIRBANKS, AK 99707-3324
ADDRESS/PHONE NUMBER
(917) 456-5405

ALASKA STATE LEGISLATURE

PLEASE ENTER INTO THE RECORD MY TESTIMONY TO THE Labor & Commerce
COMMITTEE NAME

COMMITTEE ON HB 68 DATED 1-31-97
BILL/SUBJECT

I oppose H.B. 68 It is a step Backward for all working people I & the Employees at Ft. Knox mine Want Hours all they have to do by a unanimous aproval is to sign a waiver on Overtime Hours this way it does not become a condition of Employment nor does it serve just a select few persons

SIGNED [signature]
TESTIFIER

REPRESENTING (OPTIONAL)

Box 61018 FBKS AK 99706
ADDRESS/PHONE NUMBER
907 488-8211

Letters of Opposition
Distributed to Labor and Commerce Committee

Alaska State Legislature

(H) Labor + Commerce

Please enter into the record my testimony to the LEGISLATIVE INFORMATION
committee name

committee on H.B. 68 . dated 1-29-97 .
bill/subject

AS A CONSTRUCTION WORKER OF OVER 20 YEARS IN ALASKA I OPPOSE H.B. 68 IN THAT I FEEL IT WOULD EVENTUALLY TEND TO ERODE THE VERY WORK CONDITIONS WE STRUGGLED SO LONG TO ACHIEVE

Signed: D. R. Faucher
Testifier

Representing (Optional)

4411 EDINBURGH DR. ANCH AK.
Address

248-3367
Phone No.

Alaska State Legislature

Please enter into the record my testimony to the Labor & Commerce committee name

committee on HB 68 bill/subject, dated 1-27-97.

Rep. Rokeberg -

There are two issues here that can and should be resolved by Fort Knox management.

1. Schedule - establish a schedule desired by the employees.
2. Pay rates - establish a pay schedule conducive to increased productivity and under current labor laws.

This issue should not be before our legislators - when in fact AMAX can and should resolve their problems through their own management structure. Over the lifetime projected for this project - AMAX will gross some 12 - 15 billion dollars - AMAX seeking financial release from some 243 working men and women is an embarrassment to the industry they represent and their own shareholders. Give this bill the deserving boot,

Signed: Thomas G. Evans
Testifier

working Alaskans and self
Representing (Optional)

200 W 34th #95 Anchorage 99503
Address

562-0533
Phone No.

Alaska State Legislature

Please enter into the record my testimony to the Labor / Commerce committee name committee on House Bill 68 bill/subject . dated 1-29-97 .

I HAVE WORKED IN ALASKA FOR 25 YEARS AND 17 YEARS WAS IN THE MINING IND. ON FISH CREEK outside of FAIRBANKS. ALSO IN THE NOME AREA. THE AVERAGE WAGE IN MINING IS by MOST STANDARDS NOT A LIVING WAGE but if you ADD THE OVERTIME you CAN make A LIVING. DRIVING TO A JOB SITE is PART of LIVING IN ALASKA. We START with MINING AND WHERE DOES IT END.

Signed: Curtis Hall
Testifier

Representing (Optional)

2430 W 70th Circle
Address

Anchorage AK 99502-
Phone No.

248-9859

2/96 Legislative Information Office

Alaska State Legislature

Please enter into the record my testimony to the Labor & Commerce
committee name

committee on HB 68 (C.S.), dated 1/29/97.
bill/subject

Chairman Rokeberg & committee members, thank you for this chance to testify.

I am speaking against H.B. 68 (C.S.)

I do appreciate Rep. Therriault's narrowing down the bill, to only cover open pit metal minning. However any changing of current state labor laws opens up a pandoras box of possibilities.

I understand why the employees want a change of shift. Because of company design this is a horrible one they are working. The 12 hr. straight time shift is only slightly better for 241 employees. It has the chance of harming 1000's of others.

If Rep. Therriault realy wants to do something for his district, he would pressure the company for a better shift for their employees under the current law. It can be done.

Thank you.

Signed: Phillip A. [signature]
Testifier

Carpenters Local 1281
Representing (Optional)

407 Denali Suite #100
Address

276-3533
Phone No.

Alaska State Legislature

Please enter into the record my testimony to the H.B. 68
committee name

committee on Voluntary Flexible work plan, dated Jan 29th 1997.
bill/subject

Typed testimony on following page

JAN 30 1997

Signed: J R Hank Langman SS# 387-28-6505
Testifier

The working public of Alaska
Representing (Optional)

3934 Astro Circle Anch. AK. 99517
Address

907-243-4355
Phone No.

James R. (Hank) Langman - Member of Labor Force in the state of Alaska 47 years.

I oppose HR Bill #68 for the reason that Amex Corp., Alaska Gold Company, Fort Know Mine knew the rules of labor laws in the state of Alaska when they came to stake the claims and mine the gold from Alaska land. Now they would like to change the state laws to up their profits at the expense of the Alaska labor force.

If allowed to make this change to the labor laws of Alaska they will be setting precedent for all labor forces forever after, be it the fishing, or logging other types of mining, construction service industires such as building supply or even food service.

It can be pointed to by any organization that hires common labor unskilled labor as a reason to not pay overtime for long hours worked.

Then we will be back to the sweat shops of old with their 16 hour work days.

Signed
J.R. Hank Langman
SS# 387-28-6505

Alaska State Legislature

Please enter into the record my testimony to the HOUSE LABOR AND COMMERCE COMMITTEE
committee name

committee on C.S. H.B. 68 , dated 1-27-97 .
bill/subject

I STRONGLY OPPOSE THIS BILL AS A DIRECT ATTACK AGAINST THE RIGHTS OF WORKING ALASKANS. AND, I URGE THIS COMMITTEE TO NOT ALLOW THIS BILL TO GO FORWARD.

Signed: Linda McLean
Testifier

Representing (Optional)

P.O Box 872856 WASILLA, AK 9965
Address

(907) 373-0802
Phone No.

Alaska State Legislature

Please enter into the record my testimony to the HOUSE LABOR AND COMMERCE COMMITTEE
committee name

committee on C.S. H.B. 68 , dated 1-27-97
bill/subject

I STRONGLY OPPOSE THIS BILL AS A DIRECT ATTACK AGAINST THE RIGHTS OF WORKING ALASKANS. AND, I URGE THIS COMMITTEE TO NOT ALLOW THIS BILL TO GO FORWARD.

Signed: _____
Testifier

_____
Representing (Optional)

_____
Address

_____
Phone No.

9/86 Legislative Information Office

Alaska State Legislature

Please enter into the record my testimony to the HOUSE LABOR AND COMMERCE COMMITTEE
committee name

committee on C.S. H.B. 68 , dated 1-27-97 .
bill/subject

I STRONGLY OPPOSE THIS BILL AS A DIRECT ATTACK AGAINST THE RIGHTS OF WORKING ALASKANS. AND, I URGE THIS COMMITTEE TO NOT ALLOW THIS BILL TO GO FORWARD.

Signed: Debbie Taylor
Testifier

Representing (Optional)

2151 Minerva Way 99515
Address

Phone No.

9/86 Legislative Information Office

Alaska State Legislature

Please enter into the record my testimony to the HOUSE LABOR AND COMMERCE COMMITTEE
committee name

committee on C.S. H.B. 68 , dated 1-27-97 .
bill/subject

I STRONGLY OPPOSE THIS BILL AS A DIRECT ATTACK AGAINST THE RIGHTS OF WORKING ALASKANS. AND, I URGE THIS COMMITTEE TO NOT ALLOW THIS BILL TO GO FORWARD.

Signed: Janet L Jones (Janet L. Jones)
Testifier

Representing (Optional)

1734 Wickersham Drive . A.A. 99507
Address

(907) 563-9950
Phone No.

9/86 Legislative Information Office

Alaska State Legislature

Please enter into the record my testimony to the HOUSE LABOR AND COMMERCE COMMITTEE
committee name

committee on C.S. H.B. 68 , dated 1-27-97 .
bill/subject

I STRONGLY OPPOSE THIS BILL AS A DIRECT ATTACK AGAINST THE RIGHTS OF WORKING ALASKANS. AND, I URGE THIS COMMITTEE TO NOT ALLOW THIS BILL TO GO FORWARD.

Signed: Dennis C. Dow
Testifier

Representing (Optional)

1541 W. 12th Ave
Address

Anch. AK. 99501

Phone No. 272-6075

Alaska State Legislature

Please enter into the record my testimony to the HOUSE LABOR AND COMMERCE COMMITTEE
committee name

committee on C.S. H.B. 68 , dated 1-27-97 .
bill/subject

I STRONGLY OPPOSE THIS BILL AS A DIRECT ATTACK AGAINST THE RIGHTS OF WORKING ALASKANS. AND, I URGE THIS COMMITTEE TO NOT ALLOW THIS BILL TO GO FORWARD.

Signed: Robin Ellis ROSE KALAMARIDES
Testifier

Me and all over worked Alaskans!
Representing (Optional)

1543 Bannister Dr 99508
Address

907-279-5972
Phone No.

9/86 Legislative Information Office

Alaska State Legislature

Please enter into the record my testimony to the HOUSE LABOR AND COMMERCE COMMITTEE
committee name

committee on C.S. H.B. 68 , dated 1-27-97 .
bill/subject

I STRONGLY OPPOSE THIS BILL AS A DIRECT ATTACK AGAINST THE RIGHTS OF WORKING ALASKANS. AND, I URGE THIS COMMITTEE TO NOT ALLOW THIS BILL TO GO FORWARD.

Signed: Carole R. Roesler
Testifier

Representing (Optional)

11301 Forest Drive Anchorage, AK 99516
Address

(907) 349-1474
Phone No.

9/86 Legislative Information Office

Alaska State Legislature

Please enter into the record my testimony to the HOUSE LABOR AND COMMERCE COMMITTEE
committee name

committee on C.S. H.B. 68 , dated 1-27-97 .
bill/subject

I STRONGLY OPPOSE THIS BILL AS A DIRECT ATTACK AGAINST THE RIGHTS OF WORKING ALASKANS. AND, I URGE THIS COMMITTEE TO NOT ALLOW THIS BILL TO GO FORWARD.

Signed: Shirley L. Bush
Testifier

Representing (Optional)

7141 Arlene St. Anchorage AK 99502
Address

907-248-0350
Phone No.

9/86 Legislative Information Office

Alaska State Legislature

Please enter into the record my testimony to the HOUSE LABOR AND COMMERCE COMMITTEE
committee name

committee on C.S. H.B. 68 , dated 1-27-97 .
bill/subject

I STRONGLY OPPOSE THIS BILL AS A DIRECT ATTACK AGAINST THE RIGHTS OF WORKING ALASKANS. AND, I URGE THIS COMMITTEE TO NOT ALLOW THIS BILL TO GO FORWARD.

Signed: Darcy Adamson
Testifier

Representing (Optional)

400 W 12lst Ave., Anchorage AK 99515
Address

907 349-5875
Phone No.

Alaska State Legislature

Please enter into the record my testimony to the HOUSE LABOR AND COMMERCE COMMITTEE
committee name

committee on C.S. H.B. 68, dated 1-27-97.
bill/subject

I STRONGLY OPPOSE THIS BILL AS A DIRECT ATTACK AGAINST THE RIGHTS OF WORKING ALASKANS. AND, I URGE THIS COMMITTEE TO NOT ALLOW THIS BILL TO GO FORWARD.

Signed: [illegible]
Testifier

Representing (Optional)

12446 Summer Circle
Address Anch, AK. 99516

345-6734
Phone No.

9/80 Legislative Information Office

Alaska State Legislature

Please enter into the record my testimony to the HOUSE LABOR AND COMMERCE COMMITTEE
committee name

committee on C.S. H.B. 68 , dated 1-27-97 .
bill/subject

I STRONGLY OPPOSE THIS BILL AS A DIRECT ATTACK AGAINST THE RIGHTS OF WORKING ALASKANS. AND, I URGE THIS COMMITTEE TO NOT ALLOW THIS BILL TO GO FORWARD.

Signed: James White
Testifier

Representing (Optional)

PO Box 221964 Anchorage AK 99522
Address

248-1461
Phone No.

9/88 Legislative Information Office

Alaska State Legislature

Please enter into the record my testimony to the HOUSE LABOR AND COMMERCE COMMITTEE
committee name

committee on C.S. H.B. 68 , dated 1-27-97 .
bill/subject

I STRONGLY OPPOSE THIS BILL AS A DIRECT ATTACK AGAINST THE RIGHTS OF WORKING ALASKANS. AND, I URGE THIS COMMITTEE TO NOT ALLOW THIS BILL TO GO FORWARD.

Signed: James M Clark
Testifier

Representing (Optional)

10250 Transistown DR B-24
Address

Anchorage ALASKA 99507

Phone No. 907-349-7774

9/86 Legislative Information Office

Alaska State Legislature

Please enter into the record my testimony to the HOUSE LABOR AND COMMERCE COMMITTEE
committee name

committee on C.S. H.B. 68, dated 1-27-97.
bill/subject

I STRONGLY OPPOSE THIS BILL AS A DIRECT ATTACK AGAINST THE RIGHTS OF WORKING ALASKANS. AND, I URGE THIS COMMITTEE TO NOT ALLOW THIS BILL TO GO FORWARD.

Signed: Calvin Y Stroble
Testifier

Representing (Optional)

2432 Brook Hill Cir Anch. Ak. 99516
Address

907-269-4266
Phone No.

9/86 Legislative Information Office

Alaska State Legislature

Please enter into the record my testimony to the HOUSE LABOR AND COMMERCE COMMITTEE
committee name

committee on C.S. H.B. 68 , dated 1-27-97 .
bill/subject

I STRONGLY OPPOSE THIS BILL AS A DIRECT ATTACK AGAINST THE RIGHTS OF WORKING ALASKANS. AND, I URGE THIS COMMITTEE TO NOT ALLOW THIS BILL TO GO FORWARD.

Signed: Gary W. Fabus
Testifier

Representing (Optional)

18970 Jamie Dr Eagle River Ak
Address

694-3672
Phone No.

Alaska State Legislature

Please enter into the record my testimony to the HOUSE LABOR AND COMMERCE COMMITTEE
committee name

committee on C.S. H.B. 68 , dated 1-27-97
bill/subject

I STRONGLY OPPOSE THIS BILL AS A DIRECT ATTACK AGAINST THE RIGHTS OF WORKING ALASKANS. AND, I URGE THIS COMMITTEE TO NOT ALLOW THIS BILL TO GO FORWARD.

Signed: LELAND R. RAMSEY
Testifier

Representing (Optional)

POBx 91695 ANC AK 99509
Address

907-248-1786
Phone No.

9/86 Legislative Information Office