

# **OVERTIME COST REDUCTION WITH ALTERNATIVE WORK SCHEDULES**

Executive Leadership

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## **ABSTRACT**

This research project evaluated different types of firefighter work schedules and the advantages and disadvantages of each. The identified problem involved the fact that excessive overtime spending was persistent for the agency. This issue was compounded by city officials believing that the operational correction for this problem be the implementation of twelve hour shift schedules. The purpose of the project was to determine if changing to a twelve-hour shift would save in employee overtime cost.

Employment of evaluative research allowed (a) to determine if twelve-hour shift schedules would reduce overtime spending and (b) the advantage and disadvantage comparison of the twelve-hour shift in contrast to the twenty-four hour shift. These two items served as questions imposed for research evaluation.

Three procedures were involved. These procedures included both internal and external surveys, literature review and data capturing. Data was gathered from the surveys and literature review was compiled, reviewed, and compared to survey data. Review of agency overtime records provided valuable data that led to an unexpected finding.

Results provided answers to the research questions. It was concluded that a twelve-hour shift schedule can reduce overtime cost. Comparisons of characteristics between a twelve and twenty-four hour shift were easily identifiable. An unexpected finding indicated that the majority of overtime spending was possibly due to poorly monitored sick leave usage.

Three recommendations stemmed as a result of research. The first is that disregard be given to a twelve hour type shift and that a ten-fourteen hour shift be pursued. Secondly, the agency's sick leave policy was in need of review and revision. The third recommendation involved the review of schedule types by a team composed of department management and labor personnel.

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## **INTRODUCTION**

### **Problem Statement**

The City of Longwood's Fire and Rescue Division currently utilizes a traditional fire service work schedule: twenty-four hours working and forty-eight hours off duty. Excessive overtime spending is an ensuing problem for the division. City officials indicate that a solution to this problem lies in changing the current work schedule to facilitate twelve hour shifts.

### **Purpose Statement**

The purpose of this research is to determine if changing to a twelve-hour work schedule will eliminate the problem of excessive overtime spending. Evaluative research is chosen to investigate this problem.

There are two questions to receive answers as a result of this research. These questions are:

1. Does research provide proof that the implementation of twelve-hour shift schedules will reduce overtime expenditures?
2. What are advantages and disadvantages of a twelve-hour shift schedule in comparison to the traditional twenty-four hour shift schedule?

## **BACKGROUND AND SIGNIFICANCE**

Longwood's city officials continually express concern that the fire division's overtime spending is too high. The budgeted amount for this line expenditure for 1997-98 totals \$62,000.00. All aspects of overtime are covered by this line item. These aspects include scheduled and unscheduled overtime, as well as over-time allowed for part-time positions. This equates to a little more than 5% of the division's annual budget of 1.2 million dollars.

This amount has not shown a marked increase from past years; however, it is high in comparison to overtime budgets for other various city departments. Unlike other divisions within the city, fire services must hire overtime to maintain minimal staffing in order to respond to emergencies. The police division also utilizes overtime, but in comparatively less amounts. They operate with more personnel; greater flexibility in the number of people absent at a given time is allowed.

Serious employee fear exists in knowing that city officials may elect to change work schedules without properly determining the validity or impact of such a decision. This might lend a devastating effect on the future morale and effectiveness of the fire division. Proof must be ready to either promote or sway any decision that would adversely effect the organization.

Assistance in exploring resolution to this problem is given by practicing core principle management techniques, presented in the Executive Leadership Course, provided by the National Fire Academy. Two areas that are indisputably related involve managing change and developing influential skills. In order to direct a desired outcome, the obstacles must be foreseen and alternative solutions prepared. This type of insight is provided by understanding change management and providing systematic thought processes to provide influential direction.

## **LITERATURE REVIEW**

### **History of Firefighters' Work Schedules**

Firefighters' schedules are rarely similar to those of other public services. Persons not familiar with the operations and traditions of the fire service can be easily confused by the kinds of duty schedules used by fire and rescue personnel. Little is more puzzling to an individual from outside the fire service than attempting to understand the work week of firefighters.

Fire combat personnel have traditionally worked twenty-four hour shifts. This is a carryover from the days when firefighters worked seven days straight, with an eighth day off for visits with family. During the seven day work period, firefighters were permitted to visit home for a limited time each day.

The eighty-four hour duty week proceeded this type of schedule . This schedule is based on two shifts. This type of shift work involves one twenty-four hour period on and one twenty-four hour period off duty. In seven days, this accumulates to eighty-four hours. Further variations of the two-shift system developed and resulted in sixty-seven hour and sixty-three hour duty schedule, with selected days off commonly known as “kelly days.”

The next revision in shift schedules involves a fifty-six hour duty week and this is based on three twenty-four hour shifts. This “traditional” type schedule is what the City of Longwood’s fire division currently utilizes.

### **Scheduling Elements**

One must be familiar with certain elements used in fire service scheduling before attempting to understand how schedules are comprised. A “duty cycle” is a repeating pattern of on and off duty days, an example is the twenty-four hours on and forty-eight hours off cycle. The time spent working during this period is referred to as a “shift”. Using the above for example, a shift consists of twenty-four hours. The total number of days in the duty cycle is referred to as the “duty cycle length”; again, using the example above, this equates to three days.

It is necessary to denote shift schedules repeatedly in research. A schedule that refers to twenty-four hours working and forty-eight hours off is denoted as 24/48 or a 24/72 if seventy-two hours are off duty. When a shift comprises ten and fourteen hour shifts to be worked, it is a 10/14 schedule.

The people who work the shifts are divided into groups. Each of these groups is referred to as a “platoon”. Three platoons are needed to cover a three day duty cycle that has three twenty-four hour shifts. Each platoon works a 24/48 schedule. Platoons are given a designation such as A,B, or C. If “A” platoon is working, then both “B” and “C” platoons are off duty. This rotates concurrently allowing each platoon a twenty-four period to work and a forty- eight hour period off (Institute for Public Program Analysis, 1979).

In addition to these elements is what is referred to as “pay cycles.” The Fair Labor Standards Act (FLSA) requires that overtime be paid for hours worked in excess of what is outlined by the Fair Labor Standards Act (IAFF, 1985). Cycles can range from seven to twenty-eight days. Further clarifying, any hours worked in excess of fifty-three in a seven day pay cycle must be compensated, as overtime, to the firefighter at one and a half times his normal hourly rate. Overtime is either scheduled or it is unscheduled. Scheduled overtime refers to those hours automatically worked as a result of working a required shift schedule. Unscheduled overtime refers to hours worked that are outside of the firefighter’s normal shift hours.

### **Popular Shift Variations**

Two prevalent variations of the traditional 24/48 hour work schedule are found in literature review. One common type of schedule involves the application of kelly days. The other type of schedule frequently found in discussion is the 10/14 schedule.

In order to reduce the number of hours worked by firefighters in a given period, many departments periodically excuse firefighters from working a shift. This reduces their average duty week. This day off is a kelly day. Normally, only a few members of a platoon receive a kelly day, at the same time, assuring adequate fire department staffing remains in effect. Literature review also reflects that in

order to increase their average duty week, some departments require personnel to work on their scheduled day off duty. This is commonly known as a payback day. Both kelly days and payback days lend the advantage of allowing changes in the average duty week without requiring a change in the basic duty cycle being used.

Similar to payback days are debit days. This is a type of work schedule is performed by Houston, Texas firefighters (Fire Service labor Monthly, 1995). On each work day all firefighters from one platoon are on duty as well as a number of firefighters from another platoon serving a “Debit Day”. Each firefighter is assigned to one of nine debit day sections. An individual fire fighter must work a debit day once every 24 calendar days. This process produces a 46.7 hour average work week which meets the standard established by Texas statute.

There are other large municipal departments found to be using a system of kelly days and sometimes debit days: Seattle, Washington; Cleveland, Ohio; and Kansas City, Missouri. These all represent non-traditional work weeks in the fire service as described in the reference, Fire Service Labor Monthly, 1995.

The other prevalent schedule found in articles regarding fire department schedules is the 10/14 schedule. “To make the fire department more effective and productive, fire administrators should consider abandoning the 24-hour shift in favor of a 10 hour day/14 hour night schedule” (Rule, 1997). The ten hour day starts at 0800 hours and ends at 1800 hours. There is a twenty-four hour off period at the end of the day cycle prior to beginning the night shift. Both the fifty-six hour work week and a three platoon manning are maintained by this type of schedule. One source review indicates that in order for a 10/14 schedule to be implemented, four platoons are



required to operate (Clark, 1991). This is contradicted by review of other literature and in information provided later in the result's section of this research.

Points of advantage and disadvantage of the 24 hour shift are abundant in literature review. These points provide answers for both research questions. A great deal of information is also available on a 10/14 type of work schedule.

Advantages of the 24 hour shift include: unit cohesion, more control of the firefighter's day, holidays, fewer sick and personal days, and a shorter work week. Unit cohesion refers to teamwork that is built by firefighters. Nurturing this teamwork is the fact that firefighters plan their meals together, know one another better, and trust each other more. This is an advantage in that teamwork is a key issue on the fireground. More control of the firefighter's day refers to firefighters beginning their day rested and not exhausted by a second job. Holiday time off is easier to distribute. The short work week always firefighters to put an entire week's work into two days. This gives more time away from the job to handle personal responsibilities and to spend time with family.

The disadvantages of the twenty-four hour shift are few, but surmountable (Maurno, 1996). An extensive number of calls, compounded by problems inherent to different regions - brush fires, blizzards, flooding, and hurricanes - can make a twenty-four hour shift long and difficult. Safety becomes a concern as firefighters become tired and weary. A second disadvantage is that overtime can be expensive. The Fair Labor Standards Act requires that overtime be paid for any more than 53 hours worked in a seven day period. It is not uncommon for firefighters to exceed this hour limit when working a 24 hour shift schedule.

Six key advantages can be identified when discussing a 10/14 hour shift schedule. A variation of this type of schedule is the twelve hour shift (Rule, 1997). Those with non-job-related illnesses are

absent from duty for either 10 or 14 hours, instead of twenty four hours. Overtime is reduced. When employee absence requires the hiring of off-duty personnel, overtime is paid for only 10 or 14 hours, rather than twenty-four hours. Fire personnel involved in a physically intense alarm early in a twenty-four hour shift might experience the same later in the same day. This increases the chances of a fatigue related injury. The 10/14 shift provides for more rest and energy restoration than a twenty-four hour shift. Family contact, project management, and productivity all receive increased continuity in a 10/14 hour type work schedule.

The 10/14 hour shift schedule disadvantages include both the changing of status quo and an increase in employee commute demands. Major changes are traumatic. A change of shift schedules from the traditional twenty-four hours to a 10/14 type of shift meets resistance.

Employee commute increases as a result of a 10/14 type of shift. Many firefighters working a twenty-four hour shift are not concerned about the distance they travel to and from work. They only make the commute perhaps twice a week. This is not the case with a 10/14 type of work schedule.

The problem statement of this research includes a reference to what city officials feel is a solution to a monetary problem. Literature review reveals that local governments have begun subjecting traditional fire duty scheduling practices to closer scrutiny. Many local governments, faced with increasing costs and decreasing or static tax revenues, are emphasizing the need for efficiently operated public services.

This has created a pressure for change. In addition, firefighters have placed effort in increasing their salaries while maintaining or lowering their work hours. Also contributing to the pressure for change is an increase in the number and complexity of calls. In concern of this area, the desirability of long work weeks and shift lengths are being questioned. Review of literature has prompted the

comparison of Longwood's current twenty-four hour schedule to that of others described. Results will give a reflection of both the advantages and disadvantages of what is currently used compared to what has been discovered.

## **PROCEDURES**

Three elements given application in these procedures explore the founding purpose of this research. The purpose statement inquires if changing to a twelve hour work schedule would eliminate excessive overtime spending; procedures are directed towards finding information that will provide insight to prove or disprove this statement. These elements include internal and external surveys, review of literature, and the capturing of data from the agency's overtime records.

### **Surveys**

Formal external surveys are completed on sight at the National Fire Academy (Appendix A). This involves a screening of different agencies from all across the country. This is a single page survey totaling five questions. A total distribution of 50 surveys yielded a return survey count of 31. A survey of this type provides for a variety of demographically represented agencies to be evaluated.

A survey is conducted within the agency. This survey simply asks if firefighters would favor a change to 12 hour shift schedules and why or why not. This survey is conducted by the utilization of department electronic mail. Firefighters are given the option to respond anonymously. All 24 combat personnel responded to this question. This is a survey return rate of one hundred percent.

Surveys may have a tendency to yield a subjective opinion and are not always completed honestly. This limitation must be kept in mind when preparing the survey and in evaluating its outcome.

### **Review of Literature**

This is perhaps the most substantiating procedure utilized. Many people associated with the purpose and problem of this research have concern that any answers are biased. Literature review lends outside information independent of any possible subjectivity from within the agency. The review of this literature gives the ability to provide comparison to different types of schedules and the cost effectiveness of each. One limitation is that a mass amount of information is available. The focus must be narrowed to maintain effectiveness in both time restrictions and comprehension for the reader.

### **Data Capturing**

The final procedure involves the review of the agency's overtime records. These records are hand-written and must receive manual review. Records for a three month period, ranging from November of 1998 through January of 1999, are evaluated to determine any patterns in overtime spending. Any patterns found as an outcome of this procedure is held for discussion in the result's section and later provides for recommendations to be made. Manual review provides for limitations in data collection: Inaccurate data may be caused by human error.

## **RESULTS**

Results from each procedure are presented sequentially. Each procedural area process gives both direct fact and insight into the existing problem.

### **Survey Results**

Survey outcome indicates that 61% of the agencies responding to the survey currently work a 24 hour on duty and 48 hour off duty type of shift. This confirms expectation that this is the most

popular work schedule. A table provides reference for the remaining percentage breakdown of types of shift work.

***Table 1: Shift Schedule Results***

<b>Type of Shift Worked</b>	<b>Survey Results</b>
24 hours on duty/48 hours off duty	61%
24 hours on duty/72 hours off duty	16%
10 hours on duty/14 hours off duty	12%
Kelly Day Application	10%

A second issue given perspective by the survey regards the reason for hiring overtime. Of agencies returning surveys, thirty indicate that the main reason for overtime application is personnel who call in sick. The remaining survey indicates a lack of work force as the reason.

Thirdly, very little information presents on alternative work schedules that agencies might try. One response indicates that their department did change two years ago from a 24/48 type schedule to a 24/72 schedule. This is a large, metro size department. Inconclusive results indicate this questions wording strives for improvement.

Internal survey demonstrates that effected personnel are not in favor of changing to twelve hour shifts. The primary reason for this is part-time job commitments. Personnel responses indicate that 17 of the 24 firefighters work a part-time job or own a business. This is 70% of the work force. No personnel elected to remain anonymous.

The first research question regards inquiry as to determining if twelve hour shifts will reduce overtime spending. Survey results alone do not directly answer this question. Results do conclude that overtime spending is directly related to sick leave usage. This result gives cause to evaluate Longwood's data regarding overtime and sick leave usage.

### **Results of Literature Review**

Literature review summary allows provision of answers for both research questions. The first question asks if research will lend proof that the implementation of twelve hour shift schedules would reduce overtime spending. The direct answer, as a result of the literature studied, is yes. The 10/14 type of shift is comparable to a twelve hour schedule. A key advantage of this type of shift is a reduction in overtime spending. The second question requires a comparison of advantages and disadvantages of the twelve versus the twenty-four hour shift. Many elements of these shifts are identical in their pros and cons. The twelve hour shift provides for three major advantages in relationship to the twenty-four hour shift. These advantages include lessened overtime expense, use of fewer sick days, and an increase in firefighter safety.

### **Data Collection**

This third result area found its origin in the response gathering of surveys. A large percentage of the surveys indicate sick leave usage as a primary reason for hiring overtime. This prompts review of the agency's overtime and sick leave usage records.

Personnel action request forms receive manual review for a three month period. Twenty-seven sick leave requests receive processing and sixty-seven percent of these require overtime to be hired. The average overtime hourly rate is \$14.22 per hour. Eighteen firefighters, representing the 67%, receive overtime for covering these outages totaling 432 hours. This results in an overtime cost of \$6,

143.04. Using this to estimate the overtime cost for twelve months, unscheduled overtime expense exceeds \$24,000.00 per year. This equates to nearly one-half of the agency's total annual overtime budget.

The procedures have provided results that allow the two research questions to be answered.

As previously identified, these questions are:

1. Will research provide proof that the implementation of twelve hour shift schedules will reduce overtime expenditures?
2. What are the advantages and disadvantages of a twelve hour shift schedule in comparison to the traditional twenty-four hour schedule?

Literature review provided a "yes" response to the first question and provided for a comparison of twelve and twenty-four schedules, which is necessary to answer question number two. Survey results do not provide a direct answer to either question. Surveys indirectly provide guidance that the reason for excessive overtime spending must be determined in order to provide recommendation for problem resolution. This finding is unexpected. Data collection results determine that the excessive overtime spending is directly related to the use of sick leave by personnel.

## **DISCUSSION**

Research data collection results provide information on Longwood's average overtime cost. A firefighter on overtime for twenty-four hours has an average cost of \$ 341.28 per shift. To hire the same firefighter who works a 10/14 schedule, the maximum cost would be \$199.08 per shift. All literary research confirms that overtime expense is reduced when utilizing a shift schedule that does not involve a twenty-four hour shift. These types of schedules are 10/14, 12/12, and 11/13. In a poll conducted by

Dann Maurno, freelance writer for Factory Mutual, it is noted that overtime can be expensive when utilizing a twenty-four hour shift. Overtime reduction, with a 10/14 shift or similar type schedule, is possible due to the fact that employee absence requires hiring personnel back for only ten or fourteen hours (Rule, 1997).

Conclusive interpretation is that overtime can be reduced by applying a shift schedule different than a twenty-four shift.

Satisfaction of the original research questions occur as a result of literature review, survey results, and data collection. There are advantages of a twelve-hour shift over a twenty-four hour shift. Overtime expense reduction is one of these advantages, but interpretation indicates that it is not the most important. Firefighter's safety is increased by lessening the fatigue factor (Glazner, 1996). This should take the highest priority when considering a change in the type of schedule worked. Internal data collection uncovers information about sick leave application. Longwood firefighter's sick leave use, on the surface, appears to be excessive. If this is true, excessive overtime expense may be the result of a poorly written sick leave policy. Further study must be given to this before using overtime reduction as a defense for changing employee shift schedules.

It must be realized that organizational impact is tremendous when discussion involves the changing of firefighter's shift schedules. This type of change effects their work and their lifestyle. Every effort must be made to assure "buy in" by the employees when this type of organizational change is intended. The bargaining table is where this issue receives first mention by Longwood city officials. Its mention is made without any administrative planning, organizational input, impact implication study, or written explanation. This breeds an immediate resistance by personnel and decreases morale. Retired Fire Chief Charlie Rule states "of course, a change in the duty schedule can be traumatic for firefighters.



They may resist or even sabotage such efforts. Much thought and justification should go into the decisions; it shouldn't be a change simply for the sake of change" (Rule, 1997, p.46). To counter a defensive reaction by firefighters, the reasons for the resistance to the change must be pre-identified. Planning for resistance factors gives the foundation for a smoother transition and demonstrates proactive management. It should also be mentioned that any change be presented with intended implementation on a trial basis. It seems seldom, once personnel become accustomed to a change and its advantages, that employees want to migrate back to the "old way" of doing something (Burton, 1995).

## **RECOMMENDATIONS**

The first recommendation stems from information gathered in the review of literature regarding shift schedules. The 10/14 schedule should be presented to firefighters for discussion as an alternate to the twenty-four hour shift. The main reason for this, supported by study, is an increase in safety due to less fatigue. More emphasis should be given on reviewing a 10/14 type of schedule rather than a 12/12. The 10/14 is the most popular alternative to the twenty-four hour shift in literature review. Its advantages are numerous documented. Overtime expense reduction is accomplished by a 10/14 or a 12/12 type of schedule. This directly answers one of the research questions. The problem statement indicates that officials believe that the implication of a 12/12 shift will reduce overtime. This recommendation basis itself on that fact with more emphasis on the fact that changing to a popularly known 10/14, rather than a 12/12, promotes safety. A guide on how this type of shift is applied is outlined for review (Appendix B). If properly presented, positive change may result in both the areas of safety and morale.

The second recommendation results from information found in the review of data and requires further study to be accomplished. Longwood's current sick leave policy should be evaluated. Sick leave usage appears to be high. This has a direct effect on the amount of overtime funding required. A comparison should be made to policies of other agencies and the amount of sick leave used and acquired by employees. It may be found that changing this policy, in lieu of or combination with a schedule change, will reduce overtime expenditure. This directly relates to both the problem and purpose statements of this research. This lends insight to the problem combined with the possible development of a better policy. This positively effects all of those involved.

The third recommendation involves the formation of a team comprised of both administration and firefighters to review the types of schedules available. This team should develop a position paper to present to city officials explaining what type of shift is preferred and why. This paper must address the problem of excessive overtime spending.

These recommendations could be applied by any agency seeking a solution to the same type of problem introduced by this research. The most conducive to maintaining positive working relationships is number three. If both line and staff team up to find solutions, harmony is better guaranteed.

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**APPENDIX A**  
**EXTERNAL SURVEY**

**EFOP Survey  
9/98**

Please take a few moments to answer the questions below. When complete, please gather and leave in the classroom. If you have any questions, please contact me at room # A133 or the Executive Leadership Classroom on the 2nd floor.

**1. What is the population number served by your agency? \_\_\_\_\_**

**2. What type of shift does your agency currently work? (Please Circle)**

**24/48      24/72      12/12      Other \_\_\_\_\_**

**3. Does your agency utilize overtime?    Yes    No**

**If yes, what if the primary reason for hiring overtime?**

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**4. Has your agency attempted to change the work schedule in the past ten years?**

**Yes    No**

**If yes, please explain.**

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Your name and organization are optional.

NAME:	
ORGANIZATION:	
PHONE/FAX:	

Sincere Thanks for Your Time,

Leeanna Mims, Battalion Chief  
EFOP  
lm/efos98

**APPENDIX B****48 HOUR WORKWEEK PLANNER**

# 48 HOUR AVERAGE WORKWEEK IN A HOUR WEEK CYCLE

F

10 Hour Day 14 Hour Night

GPS	FIRST WEEK							SECOND WEEK							THIRD WEEK							FOURTH WEEK						
	SU	MO	TU	WE	TH	FR	SA	SU	MO	TU	WE	TH	FR	SA	SU	MO	TU	WE	TH	FR	SA	SU	MO	TU	WE	TH	FR	SA
1	D	D	N	N	OFF	OFF	D	D	N	N	OFF	OFF	D	D	N	N	OFF	OFF	D	D	N	N	OFF	OFF	OFF	OFF	OFF	OFF
2	OFF	OFF	D	D	N	N	OFF	OFF	D	D	N	N	OFF	OFF	D	D	N	N	OFF	OFF	D	D	N	N	OFF	OFF	OFF	OFF
3	OFF	OFF	OFF	OFF	D	D	N	N	OFF	OFF	D	D	N	N	OFF	OFF	D	D	N	N	OFF	OFF	D	D	N	N	OFF	OFF
4	OFF	OFF	OFF	OFF	OFF	OFF	D	D	N	N	OFF	OFF	D	D	N	N	OFF	OFF	D	D	N	N	OFF	OFF	OFF	OFF	N	N
5	N	N	OFF	OFF	OFF	OFF	OFF	OFF	D	D	N	N	OFF	OFF	D	D	N	N	OFF	OFF	D	D	N	N	OFF	OFF	D	D
6	D	D	N	N	OFF	OFF	OFF	OFF	OFF	OFF	D	D	N	N	OFF	OFF	D	D	N	N	OFF	OFF	D	D	N	N	OFF	OFF
7	OFF	OFF	D	D	N	N	OFF	OFF	D	D	N	N	OFF	OFF	D	D	N	N	OFF	OFF	D	D	N	N	OFF	OFF	N	N
8	N	N	OFF	OFF	D	D	N	N	OFF	OFF	D	D	N	N	OFF	OFF	D	D	N	N	OFF	OFF	D	D	N	N	OFF	OFF
9	D	D	N	N	OFF	OFF	D	D	N	N	OFF	OFF	D	D	N	N	OFF	OFF	D	D	N	N	OFF	OFF	OFF	OFF	D	D
10	OFF	OFF	D	D	N	N	OFF	OFF	D	D	N	N	OFF	OFF	D	D	N	N	OFF	OFF	D	D	N	N	OFF	OFF	N	N
11	N	N	OFF	OFF	D	D	N	N	OFF	OFF	D	D	N	N	OFF	OFF	D	D	N	N	OFF	OFF	D	D	N	N	OFF	OFF
12	D	D	N	N	OFF	OFF	D	D	N	N	OFF	OFF	D	D	N	N	OFF	OFF	D	D	N	N	OFF	OFF	OFF	OFF	D	D
13	OFF	OFF	D	D	N	N	OFF	OFF	D	D	N	N	OFF	OFF	D	D	N	N	OFF	OFF	D	D	N	N	OFF	OFF	N	N
14	N	N	OFF	OFF	D	D	N	N	OFF	OFF	D	D	N	N	OFF	OFF	D	D	N	N	OFF	OFF	OFF	OFF	OFF	OFF	D	D

PLAN IS REDUCED TO 7 GROUPS BY USING ONLY GROUPS 1, 3, 5, 7, 9, 11, and 13

# 48 HOUR AVERAGE WORKWEEK IN A HOUR WEEK CYCLE

G

10 Hour Day 14 Hour Night

GPS	SU	MO	TU	WE	TH	FR	SA	SU	MO	TU	WE	TH	FR	SA	SU	MO	TU	WE	TH	FR	SA
1	D	D	N	N	OFF	OFF	D	D	N	N	OFF	OFF	D	D	N	N	OFF	OFF	OFF	OFF	OFF
2	OFF	OFF	OFF	OFF	D	D	N	N	OFF	OFF	D	D	N	N	OFF	D	D	N	N	OFF	OFF
3	N	N	OFF	OFF	OFF	OFF	OFF	OFF	D	D	N	N	OFF	OFF	D	D	N	N	OFF	OFF	OFF
4	OFF	OFF	D	D	N	N	OFF	OFF	OFF	OFF	OFF	OFF	D	D	N	N	OFF	OFF	OFF	D	D
5	D	D	N	N	OFF	OFF	D	D	N	N	OFF	OFF	OFF	OFF	D	D	N	N	OFF	OFF	N
6	N	N	OFF	OFF	D	D	N	N	OFF	OFF	D	D	N	N	OFF	D	D	N	N	OFF	OFF
7	OFF	OFF	D	D	N	N	OFF	OFF	D	D	N	N	OFF	OFF	D	D	N	N	OFF	OFF	D

NOTES: (1) Each vertical column 2 D's and 2 N's 2 Groups Working At All Times

(2) 7 Man Company — 2 on duty at all times; 14 man company — 4 men on duty at all times

(3) Restricting to 4 week cycle = Group No. 1 (no Sundays off)  
 Group No. 2 (works only 1 Sunday)  
 Group No. 3 (works three Sundays)  
 Group No. 4 (works two Sundays)  
 Group No. 5 (works two Sundays)  
 Group No. 6 (works three Sundays)  
 Group No. 7 (works only 1 Sunday)

(4) Each group has "1 six day period" off duty in the 4 week cycle

(5) Each group works 8 10-hr. days (80) and 8 14-hr. nights (112) Total Hours = 192

192.4 = 48 hr. average

(6) To break up the six-day stretch off, variables can be substituted: (a) DDNNXXDDNNXXDDNNXXDDNNXXXX  
 (b) DDNNXXDDNNXXDDNNXXDDNNXXDDNNXXXX