

## **Break Requirements**

In Section 26. 199(d)(2) replace (ii) and (iii) which provide for a 24-hour break in any 7-day period and a 48-hour break in any 14-day period with the following approach.

1. During normal Operations:
  - a. For a crew in a predominately 12-hour work schedule, provide each individual an average of two days off per week over the nominal rotation cycle.
  - b. For a crew in a predominately 8-hour or 10-hour work schedule, provide each individual an average of one day off per week over the nominal rotation cycle.
  - c. The nominal rotation cycle shall be between 4 and 6 weeks.
  - d. A day off is a contiguous 24-hour period.
  - e. Individuals are exempt from this requirement for the first 10 weeks of an outage.
2. During outage:
  - a. Provide each individual a 24-hour break in any 7-day period.

## Work Hour Schedule Examples November 3, 2005

### **Problem with focus on days off in 8-hour and 12-hour shift rotations.**

A review of a typical operations 12-hour and 8-hour rotation schedule demonstrates the industry's concerns.

1. Basic parameters:
  - a. Operations crew schedule
  - b. 24 hour per day coverage—either two 12-hour, or Three 8-hour shifts.
  - c. 4 days of training per cycle—9 hour days.
  - d. 5 Section rotation, cycle repeats every 35 days.
  - e. Average hours worked over cycle is between 40 and 41.
2. **There are 10 days off for 8-hour rotation:**
  - a.  $[35 \text{ (days in cycle)} \times 3 \text{ (shifts per day)}] / 5 \text{ sections} = 21 \text{ (Days per cycle)}$
  - b. Days of training = 4 Days per cycle.
  - c. Days off is  $35 \text{ (days in cycle)} - 21 \text{ (days per cycle of watch)} - 4 \text{ (days of training)} = 10 \text{ days off per cycle.}$
3. **There are 17 days off for 12-hour rotation:**
  - a.  $[35 \text{ (days in cycle)} \times 2 \text{ (shifts per day)}] / 5 \text{ sections} = 14 \text{ (Days per cycle)}$
  - b. Days of training = 4 Days per cycle.
  - c. Days off is  $35 \text{ (days in cycle)} - 14 \text{ (days per cycle of watch)} - 4 \text{ (days of training)} = 17 \text{ days off per cycle.}$

A single approach to breaks that focuses only on days off will generate reduced flexibility for the 8-hour rotation.

No matter how you split shifts up, there are not enough days off in the 8 hour cycle to allow rational application of the limits. The 24/7 and 48/14 requires an individual to have at least 3 days off every 14 days. Thus over the 35 day cycle the absolute minimum time would be 7.5 days off in a 35 day cycle(5 weeks). Actually it would be 8 days one cycle, 7 days the next.

None of the 8-hour rotation schedules reviewed would meet the current 24/7 and 48/14 criteria. One option considered by the industry was averaging the requirements over a four week period. Even with that approach, schedules provide would provide no flexibility. One day of overtime at certain periods of the cycle would violate the break requirements.

Thus with the proposed break requirements of an average of 1 day off over a cycle for 8-hour shifts and 2 days off over a cycle for 12-hour shifts, the flexibility in the schedule is 7-days on 12 hour shifts and 5-days on 8-hour shifts over a 5 week period:

1. 12-hour rotation.
  - a. Required breaks  $2 \text{ (days per week)} \times 5 \text{ (weeks per cycle)} = 10 \text{ Days per cycle.}$
  - b. Scheduled days off = 17
  - c. Flexibility  $17 - 10 = 7 \text{ days.}$
1. 8-hour rotation.
  - a. Required breaks  $1 \text{ (days per week)} \times 5 \text{ (weeks per cycle)} = 5 \text{ Days per cycle.}$
  - b. Scheduled days off = 10
  - c. Flexibility  $10 - 5 = 5 \text{ days.}$

A similar calculation for an 8-hour, 6 section crew rotation would provide 6 days flexibility in a 42 day cycle.

The actual schedule used by licensees also considers the goals of providing at least one long break during a rotation cycle and conduct of training during the Monday through Friday period.

**Operations Department—5 crew rotation, 12-hour shifts, 9-hour training.**

Crew/Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35		
	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S		
A	T	T	T	T				D	D	D				N	N	N	N								D	D	D	D							N	N	N
B	D	D	D				N	N	N	N								D	D	D	D					N	N	N		T	T	T	T				
C	N	N	N								D	D	D	D				N	N	N				T	T	T	T			D	D	D				N	
D				D	D	D	D	D				N	N	N		T	T	T	T				D	D	D			N	N	N	N						
E				N	N	N		T	T	T	T				D	D	D					N	N	N	N									D	D	D	D

**Operations Department—5 crew rotation, 8-hour shifts, 9-hour training.**

Crew/Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	
	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	
A	D	D	D	D	D					T	T	T	D	D	T			S	S	S	S	S	S	S	S			N	N	N	N	N	N	N		
B			T	T	T	D	D	T			S	S	S	S	S	S	S			N	N	N	N	N	N	N			D	D	D	D	D			
C	T			S	S	S	S	S	S	S			N	N	N	N	N	N	N				D	D	D	D	D				T	T	T	D	D	
D	S	S	S			N	N	N	N	N	N	N			D	D	D	D	D					T	T	T	D	D	T			S	S	S	S	
E	N	N	N	N	N			D	D	D	D	D					T	T	T	D	D	T			S	S	S	S	S	S	S	S			N	N

**Operations Department—6 crew rotation, 8-hour shifts, 9-hour training.**

Crew/Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42		
	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S		
A	D	D	D	D	D					T	T	D	D	T			S	S	S	S	S	S			N	N	N	N	N	N			R	R	R	R	R			R	R	R	R	
B			T	T	T	D	D	T			S	S	S	S	S			N	N	N	N	N	N					R	R	R	R	R			D	D	D	D						
C	T			S	S	S	S	S	S	S			N	N	N	N	N	N	N				R	R	R	R	R			D	D	D	D	D					T	T	T	D	D	
D	S	S				N	N	N	N	N	N	N			R	R	R	R	R				D	D	D	D	D			T	T	T	D	D	T			S	S	S	S	S		
E	N	N	N	N	N			R	R	R	R	R			D	D	D	D	D				T	T	T	D	D	T			S	S	S	S	S	S	S	S	S			N	N	
F	R	R	R	R	R			D	D	D	D	D					T	T	T	D	D	T			S	S	S	S	S	S	S	S			N	N	N	N	N	N	N			

**Outage manning—Super Crew, 12-hour shifts.**

Days	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S
D1	D	D	D	D	D	D		D	D	D	D	D	D		D	D	D	D	D	D		D	D	D	D	D	D	
D2	D	D	D	D	D		D	D	D	D	D	D		D	D	D	D	D	D		D	D	D	D	D	D		D
D3	D	D	D	D		D	D	D	D	D	D		D	D	D	D	D	D		D	D	D	D	D	D		D	D
D4	D	D	D		D	D	D	D	D	D		D	D	D	D	D	D		D	D	D	D	D	D		D	D	D
D5	D	D		D	D	D	D	D	D		D	D	D	D	D	D		D	D	D	D	D	D		D	D	D	D
D6	D		D	D	D	D	D	D		D	D	D	D	D	D		D	D	D	D	D	D		D	D	D	D	D
D7		D	D	D	D	D	D		D	D	D	D	D	D		D	D	D	D	D	D		D	D	D	D	D	D
Night																												
N1	N	N	N	N	N	N		N	N	N	N	N	N		N	N	N	N	N	N		N	N	N	N	N	N	
N2	N	N	N	N	N		N	N	N	N	N	N		N	N	N	N	N	N		N	N	N	N	N	N		N
N3	N	N	N	N		N	N	N	N	N	N		N	N	N	N	N	N		N	N	N	N	N	N		N	N
N4	N	N	N		N	N	N	N	N	N		N	N	N	N	N	N		N	N	N	N	N	N		N	N	N
N5	N	N		N	N	N	N	N	N		N	N	N	N	N	N		N	N	N	N	N	N		N	N	N	N
N6	N		N	N	N	N	N	N		N	N	N	N	N	N		N	N	N	N	N	N		N	N	N	N	N
N7		N	N	N	N	N	N		N	N	N	N	N	N		N	N	N	N	N	N		N	N	N	N	N	N

In the super crew there is maximum work continuity between shifts. Individuals are scheduled for 72 hours per week. As a result there is a 12 hour break between each shift, allowing adequate opportunity for sleep. Deviations from the schedule cannot be made without writing an exemption or providing time off before the individual works extra time. As shown below, the day off actually represents a 36 hour period, allowing for two sleep periods. An individual can not be rotated from day to nights or nights to days after only a 24-hour break without violating the 72-hour per week limit.

Day	1		2		3		4	
Shift	Day	Night	Day	Night	Day	Night	Day	Night
Day Crew	Day		Day				Day	
Night Crew		Night		Night				Night

## Maintenance:

There is no standard schedule for maintenance personnel. In general most maintenance personnel are scheduled for four 10-hour days or five 8-hour days. However, a variety of schemes are used to provide needed coverage on backshifts and weekends.

**Example 1:** In the following example, the licensee schedules for 20 % maintenance coverage over each weekend. As a result, each individual would work one weekend in a five week period, while still getting two days off per week. The week averages to a 40 hour week.

Crew/Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S
A	D	D	D	D	D	D	D			D	D	D			D	D	D	D	D			D	D	D	D	D			D	D	D	D	D		
B	D	D	D	D	D			D	D	D	D	D	D			D	D	D			D	D	D	D	D			D	D	D	D	D			
C	D	D	D	D	D			D	D	D	D	D			D	D	D	D	D	D	D			D	D	D			D	D	D	D	D		
D	D	D	D	D	D			D	D	D	D	D			D	D	D	D	D			D	D	D	D	D	D			D	D	D			
E			D	D	D			D	D	D	D	D			D	D	D	D	D			D	D	D	D	D			D	D	D	D	D	D	D

To meet the 24/7 and 48/14 requirements the schedule would have to be changed. One approach would be to split the break around the weekend work period. The schedule would be as shown below.

Crew/Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	
	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	
A	D	D	D	D		D	D			D	D	D	D			D	D	D	D	D			D	D	D	D	D			D	D	D	D	D		
B	D	D	D	D	D			D	D	D	D	D	D			D	D	D	D			D	D	D	D	D			D	D	D	D	D			
C	D	D	D	D	D			D	D	D	D	D			D	D	D	D		D	D			D	D	D	D			D	D	D	D	D		
D	D	D	D	D	D			D	D	D	D	D			D	D	D	D	D			D	D	D	D		D	D			D	D	D	D		
E			D	D	D	D			D	D	D	D	D			D	D	D	D	D			D	D	D	D	D			D	D	D	D		D	D

There are several possible issues. The day off will generate turnover problems as a result of the Friday break since there will be no continuity between Friday and the weekend work. By splitting the break, the 48/14 limit becomes a problem the following weekend if there any unplanned work. It is also unlikely that the work force would endorse this approach.

Another approach would be to only work each individual one day on a weekend. This would meet the 48/14 and 24/7 requirements but would require each individual to work some part of twice as many weekends, a much more disruptive schedule.

Crew/Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35		
	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S		
A	D	D	D	D	D	D				D	D	D	D			D	D	D	D	D			D	D	D	D	D	D			D	D	D	D			
B		D	D	D	D		D			D	D	D	D			D	D	D	D			D	D	D	D	D			D	D	D	D	D	D			
C		D	D	D	D			D	D	D	D	D	D			D	D	D	D			D	D	D	D	D			D	D	D	D	D	D	D		
D	D	D	D	D	D			D	D	D	D	D		D		D	D	D	D			D	D	D	D	D			D	D	D	D	D				
E	D	D	D	D	D			D	D	D	D	D			D	D	D	D	D	D			D	D	D	D	D			D	D	D	D	D			

From these examples the industry concluded that compliance with the 48/14 and 24/7 break requirements does not necessarily provide a better work schedule when all factors were considered.

**Example 2:**

The following schedule shows the complexity of the process. In this case individuals are rotated thorough 12-hour day or night shifts to provide on shift coverage, but spend most of their time working on a day shift routine.

MECHANICAL MAINTENANCE																												
A= 0700 TO 1730														D=0700 TO 1900														
C=0700 TO 1530														N=1900 TO 0700														
CT= 8 HRS TRAINING														H= HOLIDAY														
REV. 1 12/15/04														DEC, 25, 2004 THRU JAN. 21, 2005														
DAY	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F
DATE	25	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
EMPLOYEE NAME /HPID																												
				N	N	N			A	A	A	A				A	A	A	A					A	T	T	T	
				N	N	N			A	A	A	A				T	T	T	T					A	A	A	A	
				D	D	D			A	A	A	A				T	T	T	T					A	A	A	A	
				D	D	D			A	A	A	A				T	T	T	T					A	T	T	T	
	D	D	D	D								N	N	N		A	A	A	A	A					T	T	T	A
	D	D	D	D								N	N	N		A	A	A	A	A					A	A	A	A
	N	N	N	N								D	D	D														
	N	N	N	N								D	D	D														
			H	C	C	C	H	D	D	D	D								N	N	N				A	A	A	A
			H	C	C	C	H	D	D	D	D								N	N	N				A	T	T	T
			H	P	P	P	H	N	N	N	N								D	D	D				A	T	T	T
			H	C	C	C	H	N	N	N	N								D	D	D				A	T	T	T
			H	P	P	P	H			A	A	A	A		D	D	D	D								N	N	N
			H	P	P	P	H			A	A	A	A		D	D	D	D								N	N	N
			H	P	P	P	H			A	A	A	A		N	N	N	N								D	D	D
			H	P	P	P	H			A	A	A	A		N	N	N	N								D	D	D
			H	P	P	P	H			A	A	A	A						T	T	T	T		D	D	D	D	
			H	P	P	P	H			A	A	A	A	A					T	T	T	T		D	D	D	D	
																			A	A	A	A		N	N	N	N	
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A
																			A	A	A	A			A	A	A	A