Motion is Money®
Helping increase productivity and reduce risk.

CONSTRUCTION

We can show you more.®
Wasted motion decreases your workers’ production and increases their risk of injury. This booklet will give you strategies, methods and ideas to enhance your workers’ productivity and reduce risk factors. For every one percent reduction in risk, you can gain one percent improvement in productivity.

- Spend 30 to 60 minutes observing your workers walking, bending, reaching and climbing.
- Remember, unnecessary movement affects productivity and efficiency.
- Don’t criticize during this time, but learn and then coach.
Key Questions to Ask Yourself

- How much walking did you see?
- How many bends are occurring?
- How much climbing is occurring?
- How many employees are walking to get materials and tools?
- What are the distances employees are walking?
- What percentage of materials/tools can be staged off of the floor or ground?
- How do we get materials/tools off of the floor or ground?
- Was the best type and size of ladder/lift used?
- What is the distance from the point of installation to the gang box or staging location?
- Where are the portable restrooms located?
Observations

Key factors:

Number of trips, number of minutes, per observation.

Annualize all measurements:

- Treasure hunting (looking for tools and materials)
- Distance walked (to and from gang box, lay down yard, trailer, staging point)
- Frequency of trips
- Use of ladders
- Mechanical lift
- Bending over to the floor or ground, and lifting
- Working overhead, reaching
- Body posture on ladder/lift (twisted)

Typical times it takes to:

- Bend to the floor – 3 seconds
- Walk 50 paces – 30 seconds
- Climb up/down 8’ ladder – 10 seconds
Example #1
Bending Observation on a Typical Job

Bending:

Number of work days per year = 250

Number of bends performed in 1 hour = 50

\[
50 \text{ bends} \times 3 \text{ seconds} = 150 \text{ seconds}
\]
\[
150 \text{ seconds} \times 8 \text{ hours} = 1,200 \text{ seconds/60 minutes}
\]
\[
= 20 \text{ labor minutes}
\]

\[
20 \text{ labor minutes} \times 250 \text{ days} = 5,000 \text{ labor minutes}
\]
\[
5,000 \text{ /60 minutes} = 83 \text{ labor hours}
\]

Total number of employees on the job = 100

\[
83 \text{ hours} \times 100 \text{ employees} = 8,300 \text{ labor hours/year}
\]

Gang rate = $40

\[
8,300 \text{ labor hours} \times $40 = $332,000 \text{ cost of bending}
\]
Worksheet #1
Bending Observation on a Typical Job

Bending:
Number of work days per year =
Number of bends performed in 1 hour =

bends x 3 seconds = seconds
seconds x 8 hours = seconds/60 minutes

= labor minutes

labor minutes x days = labor minutes
/60 minutes = labor hours

Total number of employees on the job =
hours x employees

= labor hours/year

Gang rate = $

labor hours x$

= $ cost of bending
Example #2
Walking Observation on a Typical Job

Walking:

Number of work days per year = 250
Number of minutes walking = 10

10 labor minutes x 250 work days = 2,500 minutes / 60
= 42 labor hours

Total number of employees on the job = 100
42 labor hours x 100 employees = 4,200 labor hours per year

Gang rate = $40
4,200 labor hours x $40 gang rate = $168,000 cost of walking
Worksheet #2

Walking Observation on a Typical Job

**Walking:**

Number of work days per year  = 

Number of minutes walking  = 

\[ \text{labor minutes} \times \text{work days} = \text{minutes/60} = \text{labor hours} \]

Total number of employees on job  = 

\[ \text{labor hours} \times \text{employees} = \text{labor hours per year} \]

Gang rate  = $ 

\[ \text{labor hours} \times \$ \text{gang rate} = \text{cost of walking} \]
Example #3
Reaching in a Standing Position

Reaching with Arm Extended to 20”:
Number of workdays per year = 280
Number of reaches performed in one hour = 100

100 x .78 of a second = 78 seconds x 8 hours = 624 seconds/60 = 10.4 labor minutes

10.4 labor minutes x 280 work days = 2,912 labor minutes/60 = 48.5 labor hours

Total number of employees reaching = 50
48.5 labor hours x 50 employees = 2,426 labor hours per year

Gang rate = $40 per/hour
2,426 labor hours x $40 gang rate = $97,040 cost of reaching in a standing position
Worksheet #3
Reaching in a Standing Position

Reaching with Arm Extended to 20”:
Number of workdays per year = 
Number of reaches performed in one hour = 

\[ \text{seconds} \times 0.78 \text{ of a second} = \text{seconds} \times 8 \text{ hours} \]
\[ = \text{seconds/60} \]
\[ = \text{labor minutes} \]

\[ \text{labor minutes} \times \text{work days} = \text{labor minutes/60} \]
\[ = \text{labor hours} \]

Total number of employees reaching = 

\[ \text{labor hours} \times \text{employees} = \text{labor hours per year} \]

Gang rate = $ \text{per/hour}

\[ \text{labor hours} \times \$ \text{gang rate} = \$ \text{cost of reaching in a standing position} \]
Example #4  
Climbing Ladders

Climbing Ladders:
Number of workdays per year = 280
Number of times ascending and descending per hour = 25

\[25 \times 8 \text{ seconds} = 200 \text{ seconds} \times 8 \text{ hours} = 1,600 \text{ seconds}/60 = 26.7 \text{ labor minutes}\]

\[26.7 \text{ labor minutes} \times 280 \text{ work days} = 7,476 \text{ labor minutes}/60 = 124.6 \text{ labor hours}\]

Total number of employees climbing ladders = 50

\[124.6 \text{ labor hours} \times 50 \text{ employees} = 6,230 \text{ labor hours per year}\]

Gang rate = $40 per/hour

\[6,230 \text{ labor hours} \times $40 \text{ gang rate} = $249,200 \text{ cost of climbing ladders}\]
Worksheet #4
Climbing Ladders

Climbing Ladders:
Number of workdays per year =
Number of times ascending and descending per hour =

\[ \text{\text{\#} x 8 \text{ seconds}} = \text{\text{\#} seconds x 8 \text{ hours}} = \text{\text{\#} seconds/60} = \text{\text{\#} labor \text{ minutes}} \]

\[ \text{\text{\#} labor \text{ minutes} x \text{\#} work \text{ days}} = \text{\text{\#} labor \text{ minutes/60}} = \text{\text{\#} labor \text{ hours}} \]

Total number of employees climbing ladders =

\[ \text{\text{\#} labor \text{ hours} x \text{\# employees}} = \text{\text{\#} labor \text{ hours per year}} \]

Gang rate = \$\text{\# per/hour}

\[ \text{\text{\#} labor \text{ hours} x \$\text{\# gang rate}} = \$\text{\# cost of climbing ladders} \]
Spaghetti Chart

A Spaghetti Chart is a method of focusing on the movement of your employees and determining if there is excess walking or movement. This is a visual method of showing wasted motion.

1 Point of Installation
2 Material Storage
3 Tools
4 Gang Box
Spaghetti Chart

Use this space to observe workplace movement.
Spaghetti Chart

Use this space to observe workplace movement.
Key Points to Remember

• Remember to annualize all numbers.
• Pre-planning must include the human interface.
Common Conversions

60 seconds = 1 minute

3,600 seconds = 1 hour

28,800 seconds = 8-hour day

60 minutes = 1 hour

480 minutes = 8-hour day

19,200 minutes = 40-hour week

10 bends = 30 seconds

50 paces walking = 30 seconds

Up/Down 8’ ladder = 10 seconds
For more information, visit www.cna.com/riskcontrol.

The information, examples and suggestions presented in this material have been developed from sources believed to be reliable, but they should not be construed as legal or other professional advice. CNA accepts no responsibility for the accuracy or completeness of this material and recommends the consultation with competent legal counsel and/or other professional advisors before applying this material in any particular factual situations. This material is for illustrative purposes only and any loss prevention formulas contained herein represent estimated calculations. The content is not intended to constitute a contract. Please remember that only the relevant insurance policy can provide the actual terms, coverages, amounts, conditions and exclusions for an insured. All products and services may not be available in all states and may be subject to change without notice. CNA is a registered trademark of CNA Financial Corporation.

Copyright © 2013 CNA. All rights reserved.

MIM CON 121012M