AN EVALUATION OF MANUAL MATERIALS HANDLING OF DRYWALL MATERIALS USING DRYWALL CARTS AT TAMARACK MATERIALS, INC.

By
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A Field Problem

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ABSTRACT

The purpose of this study is to analyze the process associated with using drywall carts at Tamarack Materials, Inc. The company paid almost $500,000 between 2001 and 2004 in worker compensation costs. The goals of the study were to observe the practices that employees follow as it relates to the transfer of materials using drywall carts at customer facilities, analyze the design/condition of carts used by Tamarack Materials, Inc. employees to transport drywall and analyze accident histories/costs of incidents involving the use of drywall carts. The final goal of the study was to analyze employee training practices with regard to transporting drywall at customer facilities. By identifying areas where there is a potential of injury, Tamarack Materials, Inc. can work to engineer out the hazard or put in place administrative controls that would reduce the potential of injury. The results of this study indicated that there are deficiencies in the areas of drywall cart maintenance and employee training.

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Chapter I: Introduction

Worker compensation losses in Minnesota cost business and industry $1.585 billion in 2004 (Minnesota Department of Labor and Industry, 2006). While these loss-related figures may appear to be startling, it should be noted that this amount of dollar loss was the result of a higher total injury and illness case rate than the average United States injury and illness case rate (Minnesota Department of Labor and Industry, 2006). Throughout the 20th century, manual material handling (i.e. moving product by hand) has accounted for between 20 and 25 percent of all occupational injuries (United States Department of Labor, Bureau of Labor Statistics, 2000). This amount does not include other costs associated with an accident, such as delayed production, product damage, hiring and training new workers, pain and suffering, and economic losses to workers and their families that are not covered by worker compensation (Zaidman, 2003. From a productivity standpoint, this means that hundreds of millions of dollars that come directly out of profits could be saved by Minnesota businesses by reducing or eliminating injuries related to manual materials handling.

Tamarack Materials Inc., a construction-based firm based in Bloomington, Minnesota, has experienced worker compensation losses which were approximately $142,779, $135,114, $104,271 and $96,013 in calendar years 2001, 2002, 2003 and 2004 respectively. While such loss figures indicate there is a desired downward trend, there are still a significant amount of dollars spent each year on injured employees. An analysis of loss-based data indicates a significant amount of these losses are due to injuries involving the transfer of material using drywall carts at customer facilities. Consequently, it is likely that the current use of drywall carts at Tamarack Materials Inc.

is a major contributing factor as it relates to the occurrence of employee-oriented medical treatment injuries and the subsequent monetary losses that they elicit.

Purpose of the Study

The purpose of this study is to analyze the process associated with using drywall carts at Tamarack Materials, Inc.

Goals of the Study

The goals of the study are to:

1. Observe the practices that employees follow as it relates to the transfer of materials using drywall carts at customer facilities.
2. Analyze the design/condition of carts used by Tamarack Materials employees to transport drywall.
3. Analyze accident histories/costs of incidents involving the use of drywall carts.
4. Analyze employee training practices with regard to transporting drywall at customer facilities.

Background and Significance

According to the Minnesota Workplace Safety Report: Occupational Injuries and Illnesses, 2001, the most common types of injuries in Minnesota were:

1. sprains, strains and tears of muscles, joints and tendons (44 percent);
2. soreness and pain (8 percent); and
3. fractures (8 percent).

The majority of Tamarack Materials Inc. worker compensation losses fall into these three categories (Operations Coordinator, 2004), many of which are a result of manual

materials handling injuries. Along with the worker compensation losses, Tamarack Materials Inc. periodically experiences product damage, project down-time due to product replacement, and other general liability losses. Many of these losses are associated with accidents from the use of drywall carts for materials handling. With known areas of loss for any company, it is critical to identify the specific causes of the loss and implement any changes that could eliminate or at least minimize the extent of these losses.

Limitations

1. The lack of documentation of "self-handle" General Liability claims to help determine the actual losses due to accidents and injuries resulting from the use of drywall carts.
2. The lack of detailed accident investigation reports to determine all accidents that involved the use of drywall carts.
3. Limited ability to determine project downtimes due to the product or site damage as a result of an accident involving the use of drywall carts.

Chapter II: Literature Review

Introduction

The purpose of this study was to analyze the process associated with using drywall carts at Tamarack Materials, Inc. The objectives were to observe the practices that employees follow as it relates to the transfer of materials using drywall carts at customer facilities. This included the condition of the carts, employee training on the use of the carts and the companies accident histories/costs of incidents involving the use of drywall carts. The review of literature will support that injury to employees while handling materials by hand is a major concern for companies. Every dollar spent on a worker compensation claim is a dollar directly out of the company profits. By identifying hazardous or high risk work activities and working to modify the work activities to reduce or eliminate the risk, a company can lower the potential for injuries in the workplace.

Manual Materials Handling

A recent antecedent-oriented analysis of a large sample of worker compensation claims, including all injuries and illnesses, indicated that claims attributed to manual materials handling (MMH) accounted for 32% of the claims and 36% of the costs (Murphy et al. 1996). MMH claims were the single largest source of claims. The sample represented claims reported during 1990 to a large workers' compensation insurer. Surprisingly, cumulative trauma disorders of the upper extremity, which have been the focus of much recent research and standards activities, represented only 2% of the claims and 3% of the costs.

Few analyses of injuries associated with MMH are available in the literature. The Bureau of Labor Statistics (BLS) analyzed approximately 900 low-back injuries associated with lifting (BLS 1982). While this survey provided a great deal of information related to occupation, anthropometric characteristics and work history of the injured workers, and descriptions of the injuries, the survey only encompassed the low back and lifting specifically. Likewise, the limited sample size requires that considerable caution is taken when making inferences about the results.

David (1985) analyzed MMH injuries resulting in at least 3 days absence from work for the 5 years between 1976 and 1980. He reported that MMH injuries accounted for between 25.5 and 31.5% of all injuries in the UK manufacturing industry, and between 23.4 and 28.4% of all injuries in the UK construction industry. For the same period, the percentage of injuries attributed to MMH in various other industries was between 24.8 and 30.1%. Another analysis presented by David (1985) indicated that strains and sprains represented almost 50% of a sample of 61,227 injury reports associated with MMH, followed by contusions which accounted for 16% of the reports. The MMH cases represented 29.7% of all reported injuries.

Nicholson (1985) reported the results of accident and injury data analysis from various British industries. MMH accounted for between 24.1 and 35.3% of all injury reports for the telecommunications, electrical and construction industries. These values are similar to the value of 32% reported by Murphy et al. (1996) and the values reported by David (1985). For MMH injuries, the back/spinal column was the most frequently affected body part (54.4 and 42.8% for the electrical and construction industries, respectively), followed by the hand/wrist (16.4 and 20.2% for the electrical and

construction industries, respectively). The results of studies, such as those previously reported, which can be viewed as passive surveillance on a large scale and may be used to guide epidemiological studies, suggest exposure assessment techniques for risk assessments, and to prioritize interventions. For example, a significant proportion of MMH research has focused on the low-back region of the body. One reason for performing the analysis reported here was to determine if the low back should be the primary focus of MMH research, or if other body parts should also be considered. Little MMH research has addressed body parts other than the low back. Similarly, the nature of claims associated with MMH may indicate that overexertion claims (e.g. strains) are not the only significant source of losses associated with MMH. Thus, significant sources of losses that are not being addressed by current research or risk assessment techniques may be discovered.

The methodology used to extract manual material handling-related claims occurred in recent studies of low-back pain claims (Webster and Snook 1994b) and upper-extremity cumulative trauma disorder claims (Webster and Snook 1994a) filed with a large workers' compensation insurer. In this study, one group of claims included all those which were initiated during 1994 and were associated with MMH as identified by proprietary cause codes. The claims were further classified using National Council on Compensation Insurance (NCCI) body part codes and nature of injury codes. NCCI job classification codes were used to summarize the industry types from which the claims originated. The second group of claims included all claims for occupational illnesses and injuries initiated during 1994. Finally, summary statistics were run for MMH claims

initiated between 1990 and 1995 to determine if the number and cost of the claims for 1994 was representative of recent years.

Briefly, the above claims data which was examined are those that were initiated with a first report of injury. The waiting periods (number of disability days occurring before initiation of payment) for the claims range from 0 to 7 days, depending upon jurisdiction. When disability extends beyond the waiting period, retroactive payments are made for the waiting period. Thus, depending upon jurisdiction, there is a minimum number of disability days before indemnity costs are incurred.

Data for the Webster and Snook studies were retrieved after allowing at least 2 years for each claim to settle. At that time, 3% of the cases were still open (i.e. had not been settled). Open claims are those claims that continue (or are expected to continue) to incur cost or which are being contested. Claims costs were taken from the paid-to-date total for each closed claim, and the estimated final cost for those claims that remained open. The recorded costs are comprised of medical, indemnity (payment for lost time) and expense (including legal fees incurred by the insurer) payments. All analyses were performed using the SAS/STAT(R) software package (SAS Institute 1990).

Using the selection method described above, over 36% of the claims reported to a large workers' compensation insurer during a 6-year period were identified as MMH claims. Figure 1 shows the percentages of claims and cost of these claims for each of the years 1990 to 1995, relative to all claims. There have been no significant increases or decreases in the relative number and cost of MMH claims during these six years. Thus, the claims examined from 1994 for the present study are assumed to be representative of recent history with respect to the magnitude of the relative number and cost of MMH

claims. An examination of the NCCI job classification code categories from which the claims originated indicated that approximately 30% of the claims did not have job classification codes. Of the claims with valid codes, there was an approximately equal distribution of claims from manufacturing (durable and non-durable), storage and transportation, and the retail/service sectors (SAS Institute 1990).

Figure 1: Percentage of MMH Claims and Costs to All Claims

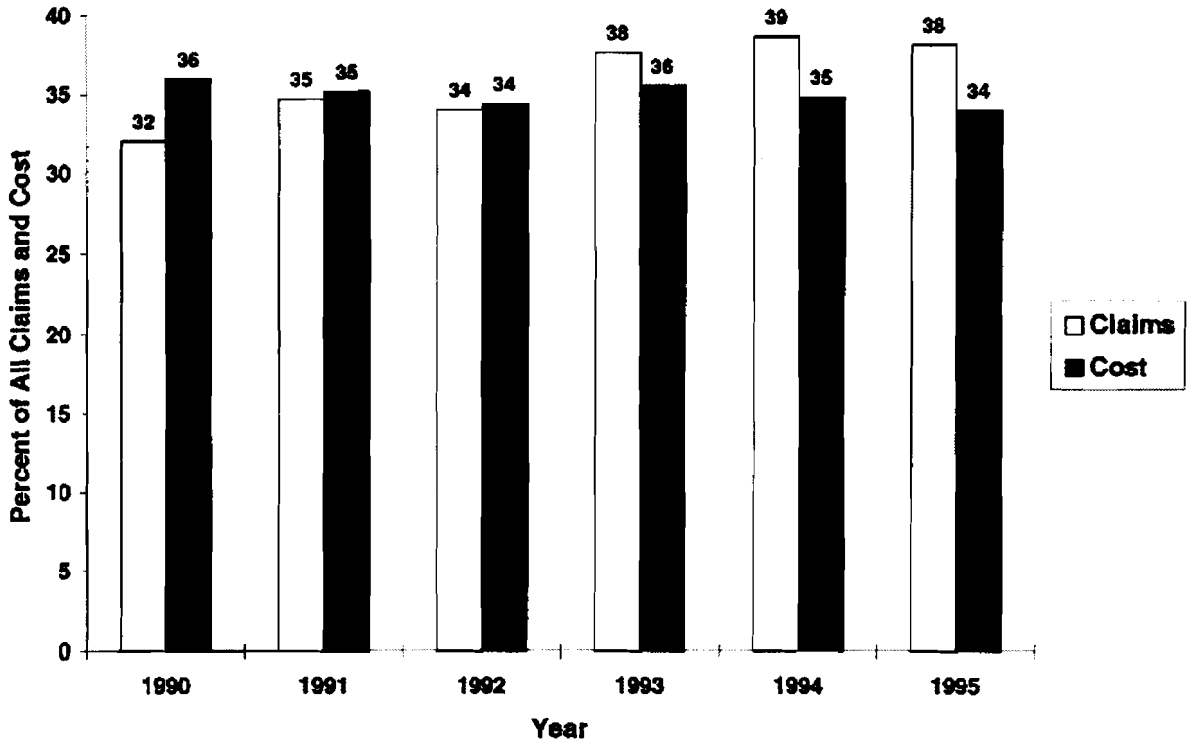

Figure 1. Relative percentage of MMH claims and costs for 1990 through 1995 compared to all claims.

Source: SAS INSTITUTE INC. 1990, SAS/STAT(R) User's Guide, Version 6, 4th edn, Vols. 1 and 2 (Cary, NC: SAS Institute Inc.).

During 1994, over 225,000 MMH claims were made which accounted for 39% of all workers' compensation claims and 35% of all claims costs. The total cost of MMH

claims was greater than $750,000,000. The cost distribution was considerably skewed with a mean cost per claim being 16 times the median cost. The distribution of MMH claims by cost is presented in Figure 2. A disproportionately small percentage of MMH claims were responsible for a large percentage of the total cost, as has been reported for other types of claims such as compensable low-back pain (Webster and Snook 1994b). Approximately 10% of the claims accounted for 88% of the costs. In contrast, 79.7% of the claims cost $1000 or less and 71% of the claims cost less than $500. For 18.3% of the claims, no costs were incurred.

Figure 2: Distribution of 1994 Claims Costs.

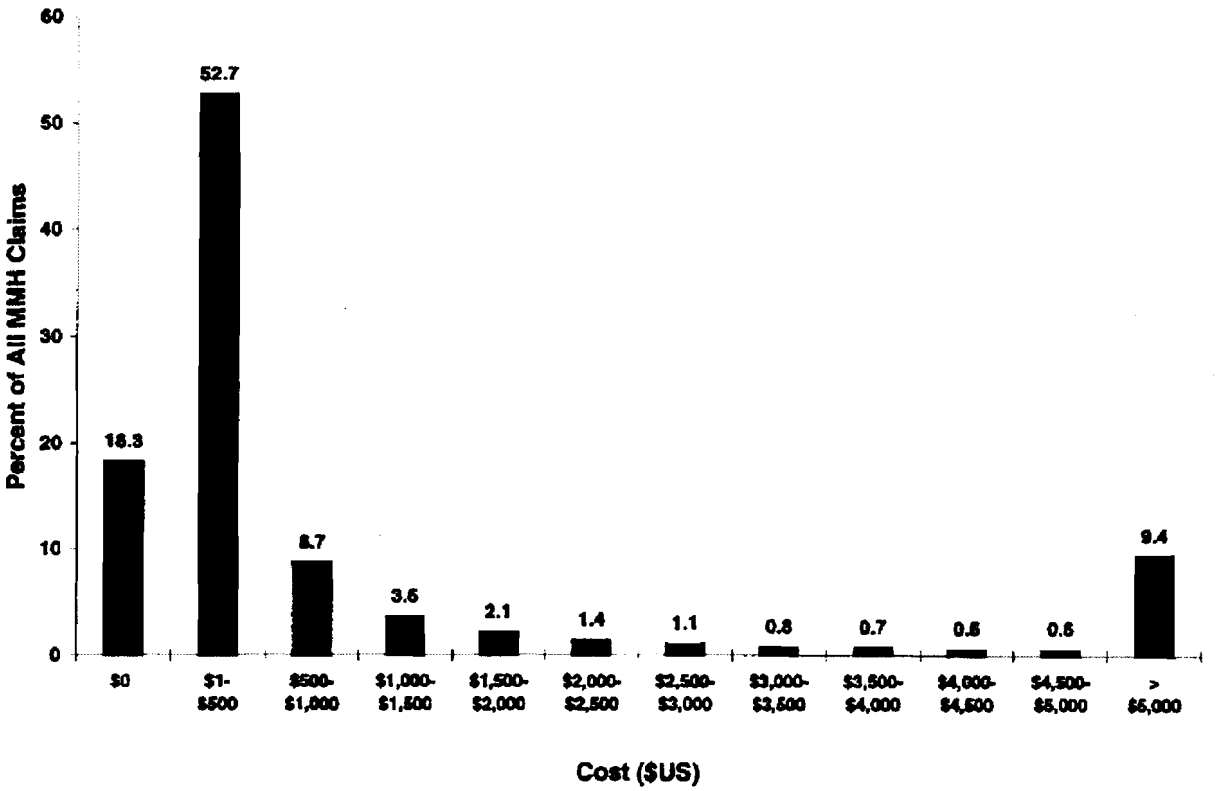

Figure 2. Distribution of 1994 MMH claims by cost.

Source: SAS INSTITUTE INC. 1990, SAS/STAT(R) User's Guide, Version 6, 4th edn, Vols. 1 and 2 (Cary, NC: SAS Institute Inc.).

Figure 3 provides a summary of the costs associated with low-back claims. The "All Back" category includes all MMH claims affecting the low back, using Webster and Snook's (1994b) low-back categorization. The distributions for strains, sprains, and ruptures affecting the low back are also included.

Figure 3: Distribution of 1994 MMH Low-back Claims by Cost.

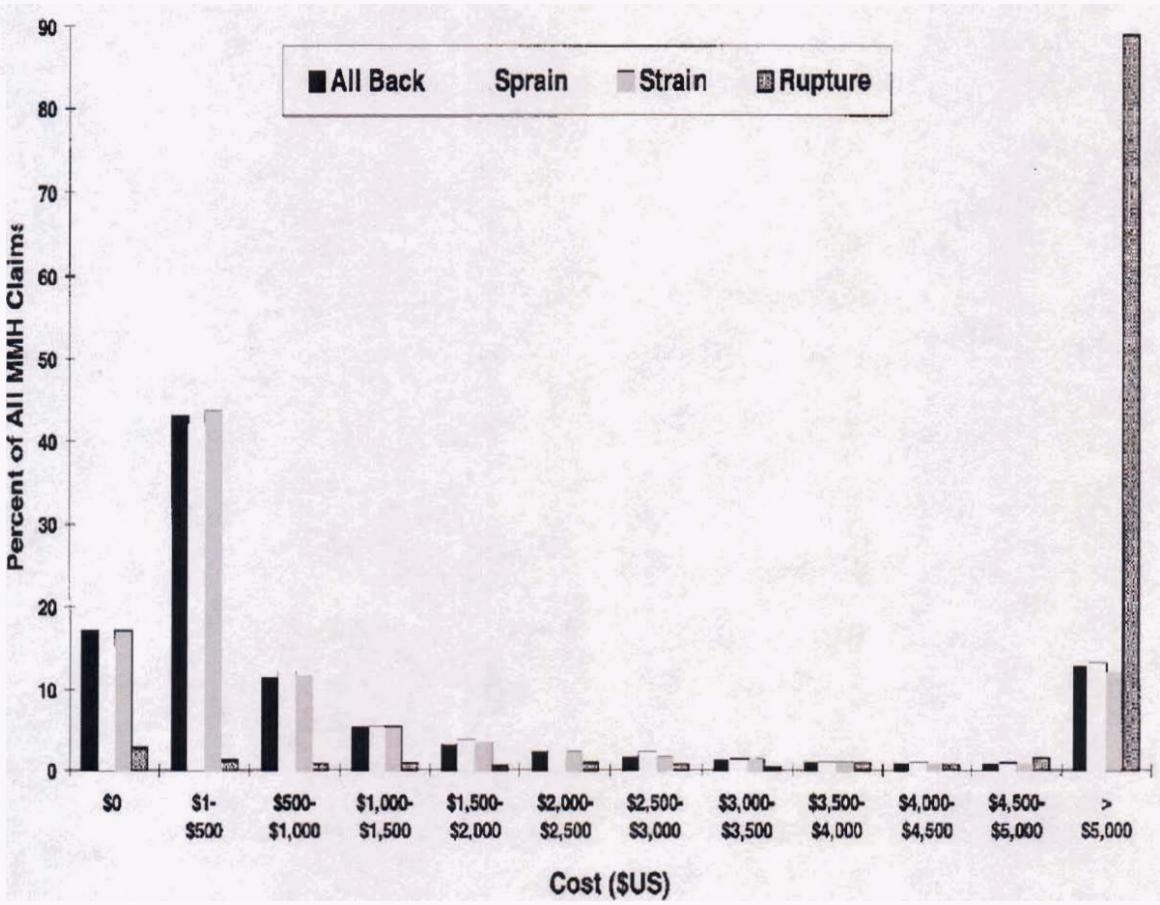

Figure 3. Distribution of 1994 MMH low-back claims by cost.

Source: SAS INSTITUTE INC. 1990, SAS/STAT(R) User's Guide, Version 6, 4th edn, Vols. 1 and 2 (Cary, NC: SAS Institute Inc.).

The following analysis will present, in detail, data which analyzes human loss-related information. Tables 1-3 present the most frequently reported NCCI body part, nature of injury, and body part-nature of injury combination categories, respectively. The tables present those categories representing 1% or greater of the claims. For Table 1, and all subsequent tables, the results are presented in descending order of the dependent measure (i.e. frequency or severity measures). Tables 4-6 present the NCCI body part, nature of injury, and body part-nature of injury combination categories, respectively, with the highest percentages of MMH claims costs. Those categories representing at least 1% of the total costs are reported. Also, the percentages of MMH claims for each category are presented. When the percentage of MMH claims costs exceed the percentage of claims, this indicates above average claims costs, and vice versa. Tables 7-9 present the NCCI body part, nature of injury, and body part-nature of injury combination categories, respectively, with the highest median claims costs relative to the overall median cost of all MMH claims. The percentages represent the median cost of a claim for a specific category divided by the median cost of all MMH claims in the sample. The categories with the 10 highest relative median costs are presented in Tables 7-9.

The analysis of body parts most frequently affected (Table 1) revealed that the lower back area was the most frequently affected NCCI body part category, with almost three times as many claims as the next most frequently affected body part (fingers). It should be noted that the total percentage of low-back claims is slightly higher than represented by the lower back area category, as the NCCI disc (trunk) and multiple trunk injury categories include some low-back claims. When the claims associated with body

parts belonging to the upper extremity (fingers), upper arm, hand, wrist, thumb, lower arm, and elbow) are summed, the result is 38.9%. Thus, the frequency analysis presented in Table 1 indicates that the low back and upper extremities account for approximately 70% of MMH-related claims.

Table 1. Body parts most frequently affected.

Body part	% MMH claims
Lower back area[a]	29.5
Finger(s)	10.8
Upper arm[b]	7.9
Hand	6.6
Wrist	5.1
Eyes	4.0
Thumb	3.3
Lower arm	3.2
Knee	3.0
Pelvis	2.5
Foot	2.4
Multiple body parts	2.3
Chests [c]	2.1
Elbow	2.0
Upper (thoracic) back area	2.0
Multiple trunk	1.4

Lower leg	1.4
Toe(s)	1.2
Ankle	1.1
Multiple neck injury	1.0

a) Includes lumbar and lumbo-sacral spine; b) includes clavicle and scapula; c) includes ribs, sternum, and soft tissue.

The analysis of nature of injury categories most frequently reported (Table 2) indicates that strains are the most common type of claim associated with MMH. Strains and sprains account for 57% of the claims, indicating that the majority of claims associated with MMH are related to overexertion. However, there are also many injuries associated with MMH such as lacerations, contusions, punctures, and fractures that are not necessarily caused by overexertion. For example, these cases could also be caused by sharp edges or slipping and/or falling while handling materials.

Table 2. Nature of injury categories most frequently reported.

Nature of injury	% MMH claims
Strain	51.3
Laceration	12.8
Contusion	11.6
Sprain	5.7
All other	4.8
Foreign body	3.3
Burn	2.4
Puncture	2.0
Fracture	1.8

Inflammation	1.1
Hernia	1.0

Table 3 presents the body part and nature of injury combinations accounting for the largest percentage of claims. Strains of the lower back area (27.2%) accounted for over four times the number of claims as the next highest category (strain of the upper arm). Overall, the combinations show a large number of strains and sprains to various body parts, followed by injuries involving lacerations and contusions.

Table 3. Body part and nature of injury combinations most frequently reported.

Body part	Nature of injury	% MMH claims
Lower back area[a]	Strain	27.2
Upper arm[b]	Strain	6.1
Finger(s)	Laceration	5.8
Eye(s)	Foreign body	2.8
Wrist	Strain	2.5
Hand	Laceration	2.3
Pelvis	Strain	1.8
Fingers	Contusion	1.7
Upper (thoracic) back	Strain	1.7
Thumb	Laceration	1.6
Hand	Contusion	1.4
Lower back area[a]	Sprain	1.4
Knee	Strain	1.3

Foot	Contusion	1.3
Chests[c]	Strain	1.3
Multiple trunk	Strain	1.2
Lower arm	Strain	1.1
Wrist	Sprain	1.1
Elbow	Strain	1.0

a) Includes lumbar and lumbo-sacral spine; b) includes clavicle and scapula; c) includes ribs, sternum, and soft tissue.

The analysis of body parts associated with the highest percentage of claims costs is presented in Table 4. The claim costs indicate that the lower back area and upper extremity are the body parts with the two largest percentages of costs. However, the disparity between the percentage of claims costs and percentage of claims indicates that claims associated with the low back are more expensive than average, particularly trunk discs, and that the costs of claims associated with the upper extremity tend to be below average (e.g. finger(s)) or slightly above average (e.g. upper arm). This is related to the fact that more upper extremity injuries tend to be contusions or lacerations versus overexertion injuries. Summed together, claims involving the upper extremities and low-back (including discs) account for over 72% of MMH claims costs.

Table 4. Body parts with highest percentages of MMH claims costs.

Body part	% MMH claim costs	% MMH claims
Lower back area[a]	41.6	29.5
Upper arm[b]	10.9	7.9
Disc (trunk)	6.1	0.3

Knee	4.6	3.0
Multiple body parts	4.1	2.3
Wrist	4.1	5.1
Finger(s)	2.5	10.8
Hand	2.4	6.6
Pelvis	2.0	2.5
Upper (thoracic) back	2.0	2.0
Elbow	1.6	2.0
Lower arm	1.6	3.2
Multiple upper extremities	1.5	0.9
Multiple trunk	1.3	1.4
Foot	1.3	2.4
Lower leg	1.3	1.4
Disc (neck)	1.2	0.1
Multiple neck	1.2	1.0
Internal organs	1.1	0.8

a) Includes lumbar and lumbo-sacral sine, b) includes clavicle and scapula.

It should be noted that Figure 3 above provides a more in-depth examination of low-back claims costs. The figure indicates that strains and sprains follow the cost distribution for all MHH claims. However, approximately 90% of "rupture" claims cost more than $5,000, due to the surgery costs associated with intervertebral disc claims. This is a rather significant finding in that these types of claims should be investigated

further. In particular, it would be beneficial to determine if the cause of these claims is different from other low-back claims such as strains and sprains. Significant cost savings would be realized by preventing these types of claims.

The nature of injury categories representing the highest percentage of MMH claims costs presented in Table 5 shows that strains are by far the leading source of MMH-related costs. Strains and sprains account for 68.5% of MMH-related costs, indicating that overexertion claims represent the most significant source of MMH claims costs. The table also indicates that ruptures are the second leading source of claims costs (7.2%), while representing only 0.4% of the claims. The primary contributor to the costs of ruptures is intervertebral disc claims.

Table 5. Nature of injury categories with highest percentages of MMH claim costs.

Nature of injury	% MMH claims costs	% MMH claims
Strain	62.1	51.3
Rupture	7.2	0.4
Sprain	6.4	5.7
All other	5.1	4.8
Contusion	5.0	11.6
Fracture	3.6	1.8
Laceration	2.7	12.8
Hernia	1.7	1.0
Burn	1.0	2.4

Table 6 presents the body part and nature of injury combinations associated with the highest percentages of MMH claims costs. Lower back area strains were most

expensive, followed by upper arm strains. Lower back area strains represent nearly five times the cost of the next highest combination. In general, strains and sprains are clearly the most predominant nature of injury categories in Table 6. The table indicates that strains and sprains to body parts other than the low-back are also significant sources of loss.

Table 6. Body part and nature of injury combinations with highest percentages of MMH claims costs.

Legend for Chart:

A - Body part
B - Nature of injury
C - % MMH claims cost
D - % MMH claims

A	B	C	D
Lower back area[a]	Strain	37.9	27.2
Upper arm[b]	Strain	7.7	6.1
Trunk (disc)	Rupture	5.8	0.3
Knee	Strain	2.3	1.3
Lower back area[a]	Sprain	2.0	1.4
Wrist	Strain	1.8	2.5
Upper (thoracic) back	Strain	1.7	1.7
Multiple body parts	Strain	1.5	0.9
Neck (disc)	Rupture	1.2	0.1
Upper arm[b]	Sprain	1.2	0.6
Multiple body parts	All other	1.1	0.8
Multiple trunk	Strain	1.1	1.2

Finger(s)	Laceration	1.0	5.8
Pelvis	Strain	1.0	1.8

a Includes lumbar and lumbo-sacral spine, b includes clavicle and scapula.

Table 7 provides the most expensive relative median costs of claims associated with body parts. The most striking result in the table is the high costs of intervertebral disc claims for the trunk and neck. Following these claims, the median costs of the other claim categories quickly approach the overall median. It should be noted that a sample of the heart claims indicated that these claims were typically related to myocardial infarctions or angina pectoris that occurred while performing MMH tasks.

Table 7. Body parts with highest median costs relative to overall median MMH claim cost.

Body part	% MMH median claim cost
Disc (trunk)	19,271
Disc (neck)	17,459
Internal organs	991
Spinal cord	245
Larynx	169
Heart	148
Lower back area[a]	147
Multiple upper extremities	139
Neck (soft tissue)	133
Multiple neck injury	131

a) Includes lumbar and lumbo-sacral spine.

Table 8 presents the relative median costs of the nature of injury category claims. The disparity between the incidence percentages and cost percentages for ruptures indicates the high relative costs of these claims. The median cost of a rupture is approximately 179 times greater than the overall median of MMH-related claims. Although one might expect that angina pectoris cases would be less expensive than myocardial infarction cases, the results showed the opposite trend. However, the small number of claims for both classes ($n < 0.006\%$) precludes the drawing of any conclusions. In general, most of the natures of injury categories with very high relative median costs are associated with traumatic injuries such as severances. However, there are claims such as carpal tunnel syndrome, which are not typically caused by blunt trauma but rather by cumulative micro trauma, that are also relatively expensive. Note that there was very few cumulative trauma disorder claims (CTDs) associated with MMH, which is not surprising. CTDs are more commonly associated with short cycle, highly repetitive, tasks rather than MMH tasks, which are often performed at a much lower frequency.

Table 8. Nature of injury categories with highest median costs relative to overall median MMH claim cost.

Nature of injury	% MMH median claim cost
Rupture	17,931
Angina pectoris	7,721
Severance	4,301
Carpal tunnel syndrome	3,926
Amputation	3,276
Hernia	2,091

Myocardial infarction	1,330
All other cumulative injury	646
All other occupational diseases	404

Table 9 presents the body part and nature of injury combinations with the highest relative median costs. The table indicates that there are extremely expensive traumatic injuries, including amputations and crushing incidents, associated with MMH. Fortunately, these injuries are uncommon (n < 0.06% of all MMH claims for all categories except neck (disc) ruptures, which accounted for 0.28% of all MMH claims). Owing to the small number of claims, the costs are probably highly variable. Therefore, inferences drawn from the costs should be made cautiously.

Table 9. Body part and nature of injury combinations with highest median costs relative to overall median MMH claim costs.

Legend for Chart:

A - Body part
B - Nature of injury
C - % MMH median claim costs

A	B	C
Lower leg	Amputation	121,803
Vertebrae	Crushing	54,992
Hip	Crushing	30,898
Multiple neck injury	Rupture	30,084
Foot	Severance	20,983
Trunk (disc)	Rupture	20,847
Brain	Contusion	20,041

Neck (disc)	Rupture	19,155
Multiple trunk	Fracture	14,215
Hip	Fracture	13,992

Several of the claims categories listed in Table 9 are rarely discussed or researched, as overexertion injuries are the typical focus of MMH field and laboratory research. The preventive measures for traumatic injuries will probably not be suggested by MMH criteria based on biomechanics, psychophysics, or physiology. More traditional safety programs address these types of injuries. The study of the causes of such injuries requires retrospective case studies or in-depth accident analysis techniques. The analysis indicates that the prevention of only one or a few injuries of this nature can represent a significant source of loss reduction. Further surveillance efforts will be required to examine the occurrence of these injuries over time to determine if they occur year-to-year, albeit infrequently, or if they are just an artifact in this particular analysis.

The results presented above compare reasonably well to some of the other results discussed earlier. The results of this study and the other studies (David 1985, Murphy et al. 1996, Nicholson 1985) indicate that MMH injuries tend to account for between 23.4 and 39% of all work-related injuries and/or illnesses. Given the disparities between the data recording systems, such as classification variable definitions and case definitions, it is not surprising that the percentages vary by up to approximately 15%. All the sources of data indicate that MMH-related injuries are a significant source of loss to industry.

The percentage of MMH-related claims classified as strains or sprains in this study was 57%, which is close to the value of 49.5% from David's (1985) study. In spite

of the different recording systems, these numbers are very similar. Likewise, contusions represented 11.6% of the claims from this study, versus 16% for David's (1985) study.

The relative percentage of claims and related costs attributed to MMH has been fairly steady during the 6-year period summarized in Figure 1. While this indicates that the relative contribution of MMH injuries to worker compensation costs was fairly steady during the period, no conclusions can be made concerning incidence rates (the denominator data for calculating incidence rates was not available). Overall, the results of this study and previous studies indicate that MMH tasks continue to generate significant losses. Perhaps the fact that new processes are continually being developed and old processes are changing may explain why MMH continues to generate fairly steady losses in spite of increasing implementation of ergonomics globally. Alternate arguments would be that ergonomics is not being implemented widely enough or that the ergonomic implementations are not successful.

The primary limitation of the Webster and Snook study is that the data was not collected for the purpose of surveillance. The NCCI coding system is not specific enough in some instances, such as the upper arm category that also includes the shoulder. Similarly, body part categories such as `multiple trunk' are not specific enough to attribute the claim to a specific spinal region. Finally, characteristics of the claim occurrence (e.g. weight of object, housekeeping conditions, lighting, etc.) are not coded. Knowledge of this information would permit the generation of more hypotheses concerning potential causative agents in the workplace. In spite of the limitations, the authors feel that the results provide a great deal of useful information. Likewise, no analysis of MMH injuries found in the literature included such a large sample or such a

comprehensive analysis. The data are from a wide variety of work settings in the USA, and the sample was not biased by workers' compensation legislation in any single jurisdiction.

The coding system used requires that a cause code be assigned to each claim. The cause codes assigned to the claims summarized were related to MMH injuries. For some of the claims reported, particularly some of the low-back disorders without a discrete onset, it is questionable whether or not MMH was truly the cause of the claims versus a contributing factor in the decision to seek worker compensation benefits. As Frank et al. (1996:2908) have pointed out, "it often is almost impossible to distinguish back pain 'caused' by work from pain of uncertain origin that makes the patient's work impossible to carry out". Thus, MMH should not be considered to be the cause of all the claims reported, but rather one factor in the multifactor disability process.

Summary

With MMH claims accounting for 32% of claims and 36% of costs for worker compensation (Murphy et al. 1996), companies with employees that have job tasks requiring a large amount of MMH need to review these positions to try to reduce or eliminate the potential for injury. By analyzing the job task, it is possible to either engineer out the MMH risks of the process or else place administrative controls on the task to reduce the risk to the employee. This study will look at the job tasks of a drywall delivery crew in order to make recommendations to eliminate or reduce the potential exposures.

Chapter III: Methodology

Introduction

The purpose of this study was to analyze the process associated with using drywall carts at Tamarack Materials, Inc.

Goals of the Study

The goals of the study were to:

5. Observe the practices that employees follow as it relates to the transfer of materials using drywall carts at customer facilities.
6. Analyze the design/condition of carts used by Tamarack Materials employees to transport drywall.
7. Analyze accident histories/costs of incidents involving the use of drywall carts.
8. Analyze employee training practices with regard to transporting drywall at customer facilities.

The methods and procedures used to identify risk and appropriate control systems are explained under the headings a) method of study, b) population and samples, c) data collection techniques, d) procedures followed, and e) method of analysis.

Method of Study

A review of literature was competed to provide information on recent manual materials handling related losses. The significance of the losses associated with MMH indicates a need for further research efforts to enhance prevention of the claims. This information was used to evaluate potential risks associated with MMH of drywall products at Tamarack Materials, Inc.

Population and Samples

The population for the study was current drivers and stockers at Tamarack Materials, Inc. The employees consisted of 53 males ranging from 19 – 45 years old, and height ranging from 5' 4" to 6' 5". The employees' work experience ranged from under 1 month to 25 years of stocking drywall. Subjects were chosen randomly from three of the Tamarack Materials locations in Minnesota (Bloomington, Cedar, and Rochester). The drivers and stockers were chosen for the study because they performed the majority of the MMH task for Tamarack Materials, Inc.

Data Collection Techniques

An information survey was completed at several jobsite locations (both residential and commercial) where the selected drivers and stockers were delivering on the day of selection. The survey covered cart manufacturer and caster size, condition and maintenance of the carts, operating surfaces where the carts were used, employee handling based practices with the carts and employee training. The information gathered by this study was tabulated by hand. The results of the study were used to evaluate the current practices used by Tamarack Materials, Inc.

Procedures Followed

Following are the steps followed in this study.

1. The researcher met with the Safety Manager for Tamarack Materials, Inc. to discuss the observation process and scheduling of the observations.
2. The researcher met with the dispatcher for Tamarack Materials, Inc. to set up the observations over a 2 week period.

3. The researcher followed or met the stocking team at the jobsites (residential and commercial).
4. The researcher explained the goals and procedures of the observation to the employees and had them sign the observation consent form.
5. The researcher observed and documented the information gathered during the survey.

Method of Analysis

The information documented from the observations was tabulated by hand. A total of eight observations were completed from three Tamarack Materials, Inc. locations in Minnesota (Bloomington, Cedar and Rochester). Visual observations and discussions with employees were both documented and compared from each observation. Chapter IV will present the data collected and conclusions that were developed from that data.

Chapter IV: Results and Discussion

Introduction

The purpose of this study was to analyze the process associated with using drywall carts at Tamarack Materials, Inc. The objectives are to observe the practices that employees follow as it relates to the transfer of materials using drywall carts at customer facilities. This will include the condition of the delivery location, condition of the drywall carts and employee training on the use of the carts.

General Delivery Information

A total of eight jobsites were surveyed in order to collect the intended data for this study. Of the jobsites surveyed, five were residential and three of the jobsites were commercial. All but one of the jobsite surveys utilized two employees. The other jobsite had a three-man crew. This is due to the fact that the boom operator/driver had a past injury that limited his lifting capability. Standard company-issued drywall carts were utilized on each of the jobsites.

Drywall Carts

The two basic manufacturers of drywall carts used by Tamarack Materials, Inc. are Adapa and Sonny. Of the three Tamarack Materials yards observed, the Rochester, MN facility uses the Sonny carts with 8" casters. The Bloomington and Cedar, MN yards use the Adapa carts which are equipped with 6" casters. An example of the drywall cart can be found in Figures 4 and 5. The figures show a Sonny cart equipped with the 6" casters. This specific assembly wasn't observed during the observations, but shows some of the components used. The Bloomington yard recently changed manufacturers to Sonny, but stayed with the 6" casters.

Figure 4: Drywall Cart Side

Figure 5: Drywall cart Front

Operating Surfaces

During the observations, all of the floor surfaces were in favorable condition in that there was very little debris, cords or hoses that could cause problems with the carts rolling smoothly. Also, the floors were either poured concrete floors in the commercial sites or the basements of residential sites or solid plywood floors (also referred to as sub-floor or sturdy-floor sheeting) in the first and second floors of the residential sites. Through discussions with the employees, these favorable floor conditions aren't always the case. With commercial jobsites, they are frequently required to roll the cart wheels over cords and hoses that are being used by construction contractors on the sites. During residential deliveries, the employees periodically deal with weak plywood floors due to less expensive flooring being installed in certain areas and/or or wood that has been wet in the past and has lost a certain degree of its integrity.

Handling of Cart

During the observations, two employees were used for loading, unloading and moving the carts at all times. This observed practice aligns with the company policy that requires that a minimum of two employee handle the cart and materials due to the excessive weight of the sheetrock and steel. The cart reduces much of the lifting and bending that would be required without the use of the cart. With the use of the cart, the employees can slide the drywall off the forks of the boom and onto the cart, roll the cart to the stocking location, and then set each bundle off the cart. During one of the deliveries, the employees had to perform a flat stock. This is when the drywall is laid flat on the floor as opposed to leaning against the studs of a wall. Laying the drywall on the floor requires a significant amount of bending for the employees. The majority of

stocking being performed in Minnesota is by leaning the drywall on the stud walls as seen in Figure 6, although a portion of the commercial jobsites still require flat stocking as indicated in Figure 7.

Figure 6: Drywall Stocking Leaning

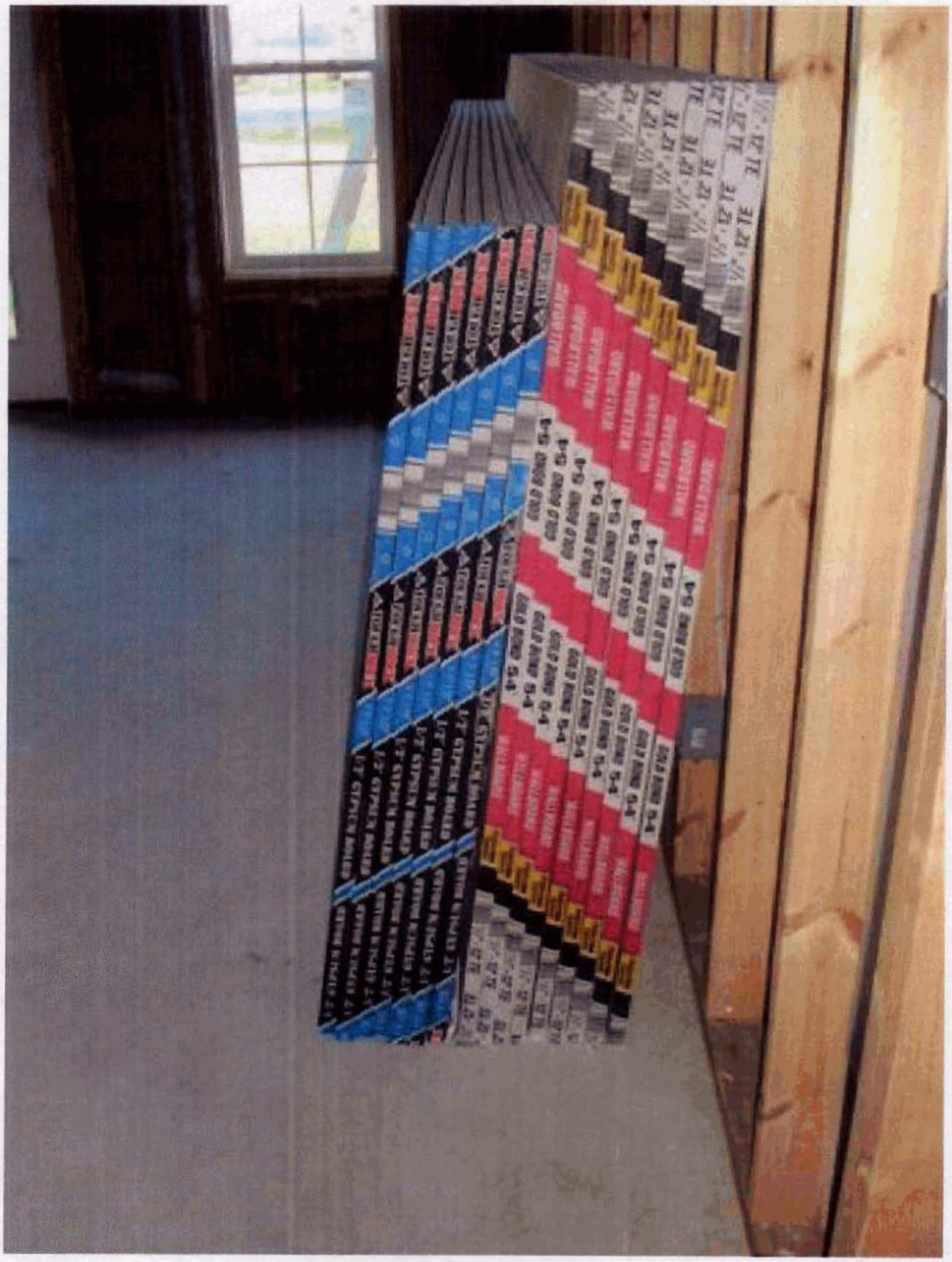

Figure 7: Drywall Stocking Flat

Cart Maintenance

During the discussions with the employees, there are varying procedures from yard to yard on how maintenance is performed. Each yard has access to grease-guns which can be used to grease the casters. The employees stated that there are no procedures on how often they are required to grease the casters. It was noted that the employees grease the cart wheels/casters when they feel it is necessary.

One of the main differences in procedures from each yard is the replacing of parts on the carts. In Rochester, the employees have access to the Teflon pads and casters. If the employee feels it is necessary to replace any parts on the cart, they are provided the opportunity to change them. It was noted that the replaced parts are inspected by management to ensure this policy isn't abused. At both the Bloomington and Cedar

locations, the employees have to request parts from either the either the shop mechanic in Bloomington, the dispatcher or else the manager in the Cedar yard. The employees from the Cedar yard indicated that the system works for them because they are rarely denied parts. The Bloomington employees stated that it is extremely difficult to obtain parts from the mechanic and carts can be in very poor condition before they can get parts replaced. An example of damage to the carts is shown in Figure 8. This cart is no longer in use, but shows some of the damage the carts receive before being placed out of service.

Figure 8: Damaged Drywall Cart

Drywall carts that are in poor condition increase the risk of injury to the employees or damage to the product or delivery site. From the discussions with the employees, it was noted that poorly maintained casters can increase the force required to move the load and/or possibly lock up and cause the load to tip. A warped or worn Teflon sliding pad can make loading and unloading the drywall more difficult. The surface is designed to reduce the friction/resistance when the employees load the carts. If the pad is warped or worn, the pad can cause extra force to be used to load instead of reducing the force. In addition to being vigilant for problems associated with the sliding pad, the welds on the cart also need to be inspected regularly. If the weld is rusted or cracked, the integrity of the cart is severely diminished and could cause the load to fall or tip.

Of the eight surveys that were completed, a total of ten separate carts were used to transport wall-board construction materials. Of these ten carts, six were in good to excellent shape, three were in average shape, and one was in poor condition. The drywall cart that was in poor condition was from the Bloomington yard, which requires the employees to go through the shop mechanic in order to initiate required maintenance/repair-based activities.

Training on Cart Usage

The results of the employee survey on the training on the usage of the carts were the same for every observation in that the employees received minimal classroom training on handling sheetrock and the usage of the drywall carts. The majority of the employee training was performed via a hands-on technique on at the jobsites. This training was informal and performed by the driver/boom operator with the new employee that happens to be present at such time. The trainer is typically an employee with a moderate amount

of experience, but this is not always the case. It was noted by some of the employees surveyed that not all stockers are properly instructed on how to handle the sheetrock and drywall carts. The employees stated that the hands-on training is the best way to learn how to properly handle the drywall and the carts. It is interesting to note that the employees' felt that a video, pictures or diagrams would not help much in training a new employee.

Summary

The survey of employees during delivery of drywall products at residential and commercial construction sites demonstrates that there are significant environmental differences that exist from one building construction site to another, that the maintenance of the drywall carts is less than desirable, and gaps in the training of new employees are present. Consequently, the combination of these three uncontrolled risk factors is likely to be placing the employees at substantial risk of incurring immediate as well as long-term musculoskeletal injuries. Chapter V will review the data and make recommendations for modifications to current policies.

Chapter V: Recommendations

Introduction

The purpose of this study was to analyze the process associated with using drywall carts at Tamarack Materials, Inc.

Goals of the Study

The goals of the study were to:

- Observe the practices that employees follow as it relates to the transfer of materials using drywall carts at customer facilities.
- Analyze the design/condition of carts used by Tamarack Materials employees to transport drywall.
- Analyze accident histories/costs of incidents involving the use of drywall carts.
- Analyze employee training practices with regard to transporting drywall at customer facilities.

A literature review was performed to determine industry standards and histories of loss related to manual materials handling. This information was used to compare against Tamarack Materials', Inc. standards as well as loss histories. A Drywall Cart Survey was used to evaluate the normal drywall delivery conditions at both residential and commercial jobsites. This included cart manufacturers, caster size, cart condition, condition of operating surfaces (flooring), employees handling of the cart, cart maintenance and employee training on the use of the carts.

Conclusions

The data from the drywall cart survey indicate that several areas of opportunity exist with regard to improving the drywall handling practices for the organization. One opportunity relates to the observation that the drywall maintenance programs varied from yard to yard. The yard in which employees had access to the replacement casters and sliders had carts that were in the best shape, while the yard that required the employees to go through the mechanic had carts that were in relatively worse condition.

An additional observation is that the training of employees on the use of the carts is informal and therefore may be placing such individuals at significant risk of musculoskeletal injury. In addition, the requirements of the training are not documented and related to the employees. Each employee is expected to train new employees on the drywall carts and general manual materials handling of the drywall products, but these expectations aren't known to all employees.

Recommendations

Tamarack Materials, Inc. should develop and implement a company drywall cart maintenance program. The program should include scheduled greasing of the caster to help ensure longevity. This would reduce costs on replacing the casters in the long term. It would also help keep the casters from locking up as well as causing more force to be applied to the loads by the employees, which would reduce the potential for injury-related risk during drywall cart usage. The program should set standards on the conditions of the casters and Teflon pads. The benefits of a properly working drywall cart compared to the potential for injury from a substandard drywall cart would likely outweigh the cost of replacing the parts as needed.

It would be recommended that Tamarack Materials, Inc develop a drywall cart training program for the new employees. As discussed with the employees, a formalized hands-on training system would be an effective approach towards eliminating the potential for employees to perform sheetrock handling activities in a substandard manner. It would be recommended that each yard have one or two experienced employees that would take the new employees for their initial training. This would ensure consistent training for all new employees. Proper training during the early stages of employment can help reduce the development of poor manual materials handling techniques that can otherwise become habitual and increase the risk of injuries over time.

Areas of Further Research

An area of further research at Tamarack Materials would be to focus specifically on the development of an internal system which permits the tracking of injuries by body part as well as the cause of the injury. Over the past two years, the injury reports have become more detailed and specific, and therefore, the use of such a system can help identify the presence of trends for specific body part injuries and their likely causation, so that such loss-producing situations can be better eliminated. An additional area of research would be to identify the possibility of improving the substandard building worksite flooring conditions that were observed during the data collection process.

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Appendix A: Consent to Participate In UW-Stout Approved Research

Consent to Participate In UW-Stout Approved Research

Title: Analysis of Material Handling in the Drywall Distribution Industry

Investigator:

Jason Sie
Regional Safety Manager
Bloomington, MN
952-250-5030

Research Sponsor:

Brian Finder
715-232-1422
UW Stout, Menomonie, WI

Description:

This research will include an observation of the employee using a drywall cart to move product at a commercial or residential jobsite. The observation will note the types and quantities of products loaded onto the carts, how the cart is moved (number of employees, body positioning, etc.), the condition of the floor surfaces traveled on, they style and the condition of the carts.

Risks and Benefits:

The employees will be performing there normal work duties. There will be no additional hazards presented with the observations.

The observations may assist in identifying work practices that can be changed or improved to reduce future risk exposures in the material handing of drywall products during delivery.

Time Commitment and Payment:

The observation will be conducted during the employees normal work duties. No additional time commitments will be required on the employee's part and no payments will be provided to employees who participate in the study.

Confidentiality:

Your name will not be included on any documents. We do not believe that you can be identified from any of this information. This informed consent will not be kept with any of the other documents that are associated with this project.

Right to Withdraw:

Your participation in this study is entirely voluntary. You may choose not to participate without any adverse consequences to you. Should you choose to participate and later wish to withdraw from the study, you may discontinue your participation at this time without incurring adverse consequences.

Date:_____

Employee Name (print):_____

Employees Signature:_____

IRB Approval:
This study has been reviewed and approved by The University of Wisconsin-Stout's Institutional Review Board (IRB). The IRB has determined that this study meets the ethical obligations required by federal law and University policies. If you have questions or concerns regarding this study please contact the Investigator or Advisor. If you have any questions, concerns, or reports regarding your rights as a research subject, please contact the IRB Administrator.

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Appendix B: Drywall Cart Survey

This project has been reviewed by the UW-Stout IRB as required by the Code of Federal Regulations Title 45 Part 46

Drywall Cart Survey

Date: _____

Jobsite (circle): Residential / Commercial

Number of Employees on site: _____

Cart Model: _____
_____

Caster Size: _____
_____

Cart Condition:
_____
_____
_____

Operating Surface Condition:
_____
_____
_____

Handling of cart (body position/number of employees):_____
_____
_____

Cart Maintenance:
_____
_____
_____

Training on Cart Usage:

Hands On or Classroom?_____

Frequency?_____