

ERGONOMICS DEMONSTRATION PROJECT



Wood Feathers

Roofing Materials Distribution

October 2003



Wood Feathers

Ergonomics demonstration project report

Introduction

In June 2003, Wood Feathers and the Washington State Department of Labor and Industries (L&I) conducted an ergonomics demonstration project. The project reviewed current job site delivery / roof top stocking operations, and documented existing use of risk reduction equipment, methodologies, etc.

The purpose of the project was to collect ideas for further risk reduction that could be considered for possible prototyping or tryout in the future. The focus of the ergonomics principles and ideas presented here is the prevention of work-related musculoskeletal disorders (WMSDs).

Members of the project group were:

Wood Feathers: Jason Roe (Safety)

L&I: Gary Davis, Ernesto Carcamo (Ergonomics), Steve Poppe (Safety).

AGC-Oregon: Chris Miller

About Wood Feathers

Wood Feathers is a leading distributor of building materials in Washington State, distributing from warehouses located in Vancouver, WA, Portland, and Beaverton OR.

Wood Feathers trains its employees on safe and effective means of performing roofing materials delivery. This project was a discussion of some possible ideas for reducing the lifting and carrying requirements of the rooftop stocking task.

Rooftop Stocking

This project reviewed an example of job site delivery of roofing materials to houses in a new residential subdivision (new construction), and to an individual residence (re-roofing) near Vancouver, WA.

Rooftop stocking using flatbed trucks with powered conveyors was observed. Tasks included driving to/between worksites, positioning the conveyor, loading roofing materials onto the bottom end of the conveyor, and unloading materials at the top of the conveyor.

The primary tasks of concern were the loading/unloading of roofing shingle bundles. The weight of the bundles, and the frequency with which they are loaded and unloaded from

the conveyor during that portion of the day when workers are actively stocking materials onto the roof, results in large amounts of lifting for both the “bottom man” and the “top man” using the conveyor. 4-5 bundles per minute (12-15 seconds between lifts), or more, are commonly loaded onto the conveyor.

A previous WISHA demonstration project report (Allied Building Products, December 2002, <http://www.lni.wa.gov/wisha/ergo/demofnl/AlliedDemoFinal.pdf>) suggested that limiting the loading rate of shingle bundles onto the conveyor to 2-3 bundles per minute (a lift every 20 to 30 seconds) would significantly reduce the potential for overexertion lifting injuries. As described above, this rate is often exceeded during typical conveyor use.

Wood Feathers’ practice of using powered conveyors for rooftop stocking of building materials is a standard industry practice that reduces manual handling of materials and reduces the time required for rooftop stocking. This project reviewed the lifting demands of this standard practice and identified possible means for further lifting reductions.

Note: An alternative technique – use of an articulating arm boom truck to lift and suspend pallet loads of shingle bundles over the roof top for unloading – was not observed as part of this demonstration project. The boom truck features greater reach of materials up and over roofs, but is generally only used for delivery to new construction, with unfinished driveways, because the truck’s outriggers require additional width to set up and they may cause damage to finished driveways. The boom truck hauls less roofing material than standard conveyor trucks, and results in more rapid lifting for the “top man” when unloading material onto the roof. Thus the boom truck was not included in this project and would need to be evaluated separately.

The following tables summarize the results of this demonstration project that examined rooftop delivery using a standard powered conveyor:

[Table 1.](#) Risk reduction methods currently in use.

[Table 2.](#) Ergonomics-related risk factors
(for delivery of roofing materials to rooftops on residential sites)

[Table 3.](#) Risk reduction ideas (brainstorm ideas from on-site project group)

Table 1: Risk reduction methods currently in use

Risk Reduction	Benefit
Equipment	
Truck with powered conveyor	<ul style="list-style-type: none"> • Reduces lifting and carrying compared to manual roof stocking
Knuckle boom truck – suspended pallet*	<ul style="list-style-type: none"> • Eliminates bottom man position Reduces carrying distance for top man (however unloading rate for top man is increased)
Work Methods	
Rotate bottom man and top man	<ul style="list-style-type: none"> • Reduces the more lifting-intensive bottom man task (bottom man lifts a lot of bundles from low to waist heights onto the conveyor, top man lifts all bundles off the conveyor from about waist height)

* Not observed as part of this demonstration project

**Table 2. Ergonomics-related risk factors
(for delivery of roofing materials to rooftops on residential sites)**

Job/Task	Risk Factor Observed	Possible Risk Reduction
Bottom Man – Loading shingle bundles onto the conveyor	Heavy, frequent, awkward lifting. Carrying	<ul style="list-style-type: none"> • Limit lifting rate for standard bundles to approximately 2-3 lifts per minute (a lift every 20 to 30 seconds). • Rotate bottom man and top man (reduces the more lifting-intensive bottom man task) • Consider use of light weight shingle bundles (approx 12 shingles per bundle instead of 16) – but do not increase lifting rate to more than 4-5 lifts per minute (a lift every 12 to 15 seconds): • Use boom truck / suspended pallet delivery where possible, with rotation of boom truck operator and rooftop unloader where possible, to reduce total workload of unloader. (unloader works at a higher rate than with a conveyor)
Top Man – Unloading shingle bundles from the conveyor	Heavy, frequent, awkward lifting. Carrying	<ul style="list-style-type: none"> • Same as listed above for Bottom Man • Use 2 top men, where appropriate

Table 3. Risk reduction ideas (brainstorm ideas from on-site project group)

Lifting	Comments
<p><i>1. Generic lifting reduction</i></p> <ul style="list-style-type: none"> • Knuckle boom – suspended pallet (certain cases – see comments) • Reduced bundle weight – less shingles packaged per bundle (e.g. 12 shingles instead of the standard 16 reduces the bundle weight to approximately 50+ lbs) 	<ul style="list-style-type: none"> • Outriggers on knuckle boom trucks may damage existing driveways – use is primarily limited to new construction (before driveways completed), or for existing homes where a damage waiver is obtained from the property owner • Smaller bundles weigh less but the number of bundles increases by about 1/3. • Smaller bundles are more flexible, making handling more difficult, but can be lifted onto the conveyor with less apparent effort
<p><i>2. Leaving full pallets in place on the truck</i></p> <ul style="list-style-type: none"> • Tip bundles over knee before lifting • Use extra empty pallet(s) to raise the level of the bundles • Rail mounted boom crane 	<ul style="list-style-type: none"> • Lifting one end of bundle is approximately ½ the weight of the bundle. Workers strength is greater for lifts above the knee than below the knee. • Extra empty pallet(s) could be placed under full pallets to raise the overall height of bundles (especially lower bundles) • Rail mounted boom crane could be used to move individual bundles from a pallet to the conveyor without lifting
<p><i>3. Moving full pallets to base of conveyor</i></p> <ul style="list-style-type: none"> • Scissor lift • Tip bundles over knee before lifting • Extra empty pallet(s) placed under full pallet loads • Fixed boom crane 	<ul style="list-style-type: none"> • A single scissor lift could be located at the base of the conveyor to raise the height of bundles as pallets are unloaded • A fixed boom crane could be used to move individual bundles from a pallet at the base of the conveyor onto the conveyor without lifting

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Carrying	Comments
<ul style="list-style-type: none"> • Winch at rear of truck bed / skids under pallets • Rollers on truck bed • Raised roller table (adjustable or non-adjustable – height, location) • Fixed or rail-mounted boom crane 	<ul style="list-style-type: none"> • Winch could be used to move full pallets to the base of the conveyor to reduce the carrying distance for bundles. Skids placed under pallets, or rollers on the truck bed could be used to help move the pallets. • A raised roller table could be considered to reduce/eliminate the carrying distance for bundles.

Summary

Rooftop stocking of commonly available shingle bundles exposes workers who are loading and unloading powered rooftop conveyors to heavy, frequent, and awkward lifting and carrying of shingle bundles.

Current practices have been reviewed, and suggestions made, for possible modifications to the rooftop stocking task that could reduce the amount of lifting and carrying required by this task.

Roofing industry employers may want to try some of these ideas, or other methods they feel would be effective, to determine if any of them would be useful for reducing the lifting and carrying required for this task.