

Taper Gluer & Stitcher Machines

General Data

Staffing:	Usually 1-3 workers per crew (1 operator, 1 assistant, 1 helper)
Shift length:	8 or 12 hours
Breaks:	1 lunch and/or dinner, 2 or 3 10-minute coffee breaks
Issues:	Neck and shoulder strains, hand, wrist, arm, leg, foot discomfort

Tasks Descriptions

Operator's primary tasks

- set up and adjust in-feed guides
- make adjustments to machine
- adjust taper unit and tape/glue dispenser; adjust stitcher bobbin
- install full roll of tape when required; install bobbin of wire
- add glue pellets to glue hot box as required
- adjust in-feed rollers
- perform quality checks and troubleshoot jam-ups
- push units or lift / flip boxes onto the in-feed table (1) (2)
- bend / fold box flaps and push / guide boxes into machine
- enter data into computer system

The application of ergonomic principles in the workplace is essential to the prevention of work-related musculoskeletal disorders—MSDs

Assistant's primary tasks

- manual stacking, piling, strapping, or packaging of processed boxes (3)
- clean up around taper gluer / stitcher
- on occasion assist with operator tasks

Helper's primary tasks

- assist operator with folding flaps on the largest / heaviest boxes (4)

Note: the Assistant may perform or assist with Operator's tasks.

Identified Risk Factors for Musculoskeletal Disorders

The key risk factors for work-related musculoskeletal disorders that are associated with the tasks performed at a taper gluer and/or stitcher are documented on the following pages. (5)

References

(1) – some workplaces deliver flat boxes to the taper glue on roller conveyors, most un-powered. Others use carts / wagons or wood / plastic pallets

(2) – flat boxes are often manually transferred from carts or pallets onto the in-feed table. Often the boxes must be flipped over by two workers

(3) – based on observations of 3 different taper gluers in two different work locations

(4) – larger and heavier boxes with very long flaps may require a second worker to lift and fold the flap over before the box is fed into the machine

(5) – based on observations of 3 different taper gluers in two different work locations



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Risk Factor 1: Pushing / pulling of stacks of boxes on roller conveyors

Flat boxes are may be delivered to the taper gluer via roller conveyors. If the conveyors are not powered, then a worker must manually push the unit of flat boxes to the taper gluer. Depending on the design of the machine and the conveyor system, the worker may be required to push the boxes directly onto the adjustable in-feed table or they may have to manually lift and/or flip the boxes onto the in-feed table. Even when the roller conveyors are powered the worker may have to exert high push forces because the conveyor is not powerful enough or capable of pushing the boxes all the way onto the in-feed table. Factors that may increase the risk of injury include:

- force required to units of flat boxes (15 – 60 kg)
- condition of roller conveyors
- method used when pushing boxes
- frequency of pushing/pulling

Risk Factor 2: : Lifting and flipping flat boxes onto conveyor and/or in-feed table (2)

Boxes are often manually moved from a cart or pallet to a conveyor located in front of or beside the in-feed table, or directly onto the in-feed table. Because of the way the sheets are produced there is often a need to flip these boxes over before they are fed into the machine. Factors that may increase the risk of injury include:

- weight of boxes being handled
- height the top of the stack of boxes
- height of the bottom of the stack of boxes
- method used to lift / handle the boxes
- frequency of handling boxes
- number of boxes grasped/lifted/flipped at any time



Risk Factor 3: : Awkward postures of neck, shoulders and arms when setting-up/adjusting machine

Workers must adopt awkward postures when making the many and various adjustments to the taper gluer and/or stitcher. The design of the taper gluer and/or stitcher typically requires the worker to reach up and over the shoulder / head to adjust rollers, supports, tape and/or wire dispensers, etc. Workers do not usually hold these postures for a significant duration. The frequency that workers adopt these postures will depend on the product mix being processed and the make, model and year taper gluer / stitcher. Factors that may increase the risk of injury include:

- duration of time awkward postures are held
- frequency of adopting awkward postures
- number of extreme postures adopted
- accessibility to adjustment areas (machine design)



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Risk Factor 4: Repetitive, awkward, and forceful tasks with hands, wrists and shoulders when feeding the taper gluer / stitcher

Feeding flat boxes into the taper gluer and/or stitcher requires repetitive use of the hands, wrist, arms, and shoulders. Small, pre-folded boxes must be gripped and pushed into the machine. Larger boxes or those that are not pre-folded require repetitive gripping of box flaps with arm and shoulder movements. The weight of the heaviest box flaps increases the risk of injury. In some instances, a second worker may be used to help with the flaps of the very largest boxes. Awkward arm and shoulder postures, and forceful pushing/gripping are concerns. Factors that may increase the risk of injury include:

- repetitive gripping and arm / shoulder movements
- extreme shoulder postures
- awkward wrist and hand postures
- high force gripping / exertions
- standing for long periods of time
- awkward trunk postures
- force required to lift boxes up to in-feed if adjustable in-feed table is not aligned correctly



Risk Factor 5: Manual stacking / strapping of boxes

In many workplaces, workers are required to manually handle small boxes that have been processed through the taper gluer. Often, larger boxes are run through the stitcher machine and these boxes are automatically stacked, although they may also be manually handled. Boxes come out of the taper gluer and fall onto a table or conveyor. Workers will grasp and align the small boxes, lift and stack them up on a pallet or conveyor. It is common for workers to strap the boxes together into bundles before stacking them. When larger boxes are automatically piled up the worker may have to push the finished unit from the machine onto a conveyor. Factors that may increase the risk of injury include:

- weight of flat boxes
- height of flat boxes when picked up
- height of top of stack of boxes
- frequency of handling
- number of boxes grasped
- height of bottom of stack of boxes
- method used to handle flat boxes
- force to push unit from machine



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Risk Factor 6: Manual handling of rolls of tape, boxes of glue and wire bobbins

The stitcher machine will use one or two bobbins of wire. The weight of the bobbin will vary from ~ 10 – 18 kg, depending on the type of wire and the make of the stitcher. The top bobbin must be loaded onto a high spindle. Awkward trunk postures can be required when loading the lower bobbin onto the lower spindle. Some taper gluer operators state that installing a full roll of tape and handling a full box of glue pellets is difficult. Factors that may increase the risk of injury include:

- weight of the wire bobbin and wire
- height of top bobbin spindle
- access / free space around lower bobbin spindle
- weight of roll of tape
- weight of full box of glue pellets
- height of tape dispenser
- height of boxes of glue pellets
- technique used when handling bobbins, tape, glue boxes
- frequency of handling

Risk Factor 7: Design of work stands / foot pedals

Workers at both the taper gluer and stitcher will spend long periods of time standing on a raised work platform. Often these workers will use a foot pedal to trigger the machine. The static postures and repetitive use of the foot pedal may result in foot, leg, hip and back discomfort. Factors that may increase the risk of injury include:

- height of work platform
- use of anti-fatigue matting on work platform
- size and space on the work platform
- adjustability of height of work platform
- position and height of foot pedal
- time before a significant change of posture



Recommendations

Recommendation 1:

Pushing / pulling of stacks of boxes on roller conveyors

Consider the following to reduce the forces required to load stacks of boxes onto the in-feed tables at taper gluers and/or stitchers:

- Provide well-designed, powered roller conveyors with enough power to move a full stack of the largest / heaviest boxes
- Ensure that the conveyors and the in-feed table are correctly aligned and level
- Ensure that roller conveyors are maintained and that all rollers move freely
- Use forklifts to load material directly onto the in-feed lift table
- Provide help to push the boxes onto the in-feed table

Recommendation 2:

Lifting and flipping flat boxes onto conveyor and/or in-feed

Consider the following to improve reduce the risk of injury from lifting / flipping boxes:

- Provide adjustable height tables to keep lifts above knee and below shoulder height
- Install unit inverters after the production equipment to eliminate the need for box flipping
- Train workers to grip a small number of boxes when they are lifting / handling them
- Educate workers about risks to the low back related to material handling and twisting
- Ensure that help is provided for handling heavy / large boxes

Recommendation 3:

Awkward postures of neck, shoulders and arms when setting-up/adjusting machine

Consider the following to improve work postures when setting-up / adjusting machines:

- Design levels, knobs, etc. with extensions to allow for improved postures
- Ensure that adequate space is provided for workers to access areas
- Provide steps, hand holds, etc. to allow workers work at less stressful work heights
- Provide tools, equipment, larger hand wheels, etc. to reduce forces when workers are required to adopt awkward postures.

Recommendation 4:

Repetitive, awkward, and forceful tasks with hands, wrists and shoulders when feeding the taper gluer / stitcher

Consider the following to reduce repetitive, awkward and forceful tasks when feeding the machines:

- Provide hydraulic arms to assist with the flipping up of larger / heavier flaps
- Educate workers about the risk of repetitively adopting awkward postures
- Ensure workers are trained to recognize awkward postures and to look for ways to change work methods to reduce these postures
- Redesign the in-feed on these machines so that the worker does not have to carefully guide and position the joint as they push the box into the machine
- Ensure that the in-feed rollers are designed to actually grip and pull the box into the machine
- Ensure that machines that produce the boxes are set-up to put the fold scores in the correct location on the box
- Consider frequent rotation between the operator and assistant work tasks

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Recommendations cont'd

Recommendation 5:

Manual stacking / strapping of boxes

Consider the following to reduce risk from manual stacking / strapping of boxes:

- Educate workers about the extra risk / strain associated with using a wide pinch grasp
- Encourage workers to handle a smaller number of boxes at one time
- Use automatic strappers to reduce the need for repetitive handling of boxes
- Provide height adjustable pallet stands / areas for stacking boxes
- Use load formers or automatic stackers to eliminate manual stacking of boxes

Recommendation 6:

Manual handling of rolls of tape, boxes of glue and wire bobbins

Consider the following to reduce the strain on workers when handling rolls of tape, boxes of glue and wire bobbins:

- Provide lifting assists for heavy rolls, bobbins and boxes especially for high and low lifts
- Move the position of the tape dispenser and wire bobbin spindles to above knee and below shoulder height
- Position boxes, rolls and bobbins as close to the work area as possible to reduce the need for carrying
- Store boxes, rolls, bobbins on height adjustable platforms to eliminate the need for lifting from below knee height

Recommendation 7:

Improve work stands / foot pedals

Consider the following to reduce the need to repetitively use foot pedals and to improve the design of the work stands:

- Re-design work stands to make them height adjustable and to provide space for free movement
- Fix anti-fatigue matting to the standing surface of the work stand
- Ensure that the steps on the stand are well designed (deep enough, no more than 7" between the steps, equal distance between steps)
- If a foot pedal is required, inset the foot pedal into the platform to reduce the need for workers to repeatedly lift the toes of the foot to activate the pedal

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www.pphsa.on.ca

690 McKeown Ave.
North Bay, ON P1B 9P1
(705) 474-7233

