

Safety Recommendation Report

Sample Manufacturing Inc.

New Lenox, IL

Sample Production Line



Quad Plus®

Prepared For:

John Doe

General Manager

Sample Manufacturing Inc.

New Lenox, IL

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| Document | Safety Recommendation Report |
| Revision | 1.0 |
| Date | 07/01/2022 |



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Document Type:

Safety Recommendation
Report

Revision:

1.0

What follows is the pre-validation safety recommendation report by Quad Plus Safety for the Sample Manufacturing line in operation at Sample Manufacturing New Lenox, IL. Included are the initial Task-based Peer Risk Assessment and a list of specific recommendations provided by Quad Plus Safety.

Safety Review Team:

The Quad Plus Safety project team included the following personnel:

Michael Kielar, Safety Analyst, Project Manager

Zachary Silberman, Safety Analyst

Scope of Work:

This Risk Assessment Document applies to the Sample Manufacturing Line while it is in operation at the New Lenox, IL facility.

Facility Name and Address:

Sample Manufacturing Inc.
1019 Business Rd.
New Lenox, IL
60451

Owner Name and Address:

Sample Headquarters Intl.
2200 Ellis Rd.
New Lenox, IL
60451

Machine Identification:

[OEM], Production Line
Date of mfg: 20XX

The scope of work for this Risk Assessment is limited to the equipment described above. This document reviews the guarding and the function of the safety systems installed on the machinery, as well as the corresponding control systems for these protection systems. The individual mechanical and electrical components of these systems were not individually inspected as part of this review.

| Item | Task | Hazard | Initial Scoring | | | | SIL | Mitigation |
|--|--|---|-----------------|---|---|---|-----|--|
| Risk Assessment Report: Sample Manufacturing Line, Joliet IL | | | S | F | P | A | | |
| Loading Bulk Roll | | | | | | | | |
| 100 | Preparing bulk roll with hand knife | Mechanical - Cutting - Putty knife is used to prep splice | 2 | 5 | 4 | 5 | 2 | PPE: Cut resistant gloves, Proper technique. SOP for Proper tools: Putty knives are limited in their sharpness. |
| 101 | Disengage web brakes | No Associated Hazard | | | | | | |
| 102 | Operator opens chucks | No Associated Hazard | | | | | | |
| 103 | Operator opens chucks - if drum is stuck, operator may have to dislodge it with hammer | Mechanical - Strike - Drum could fall clear of saddle when dislodged | 3 | 5 | 2 | 3 | 1 | Training and proper technique: ensure that operator stands clear of area where roll might fall while dislodging drum |
| 104 | Clearing empty drum with putty knife | Mechanical - Cutting - Putty knife is sharp | 2 | 5 | 3 | 5 | 1 | PPE: Cut resistant gloves, Proper technique. SOP for Proper tools: Putty knives are limited in their sharpness. |
| 105 | Clearing empty drum with putty knife | Ergonomic - Strain - Resistance from unwind motor makes drum hard to turn | 1 | 5 | 1 | 5 | OM | Consider addition of jog button to assist in turning unwind drum while clearing empty drum |
| 106 | Unloading empty drum | Ergonomic - Strain - Drum weighs 50-70 lbs | 1 | 5 | 3 | 5 | OM | SOP to include two operator task, training for proper lifting technique |
| 107 | Unloading empty drum | Mechanical - Pinch - Between drum and rack when storing drum | 2 | 5 | 3 | 5 | 1 | SOP to include two operator task, training for proper lifting technique, PPE to include leather gloves to protect hands |
| 108 | Unloading empty drum | Mechanical - Pinch - Improper grip on drum could lead to pinch between drum and chuck | 2 | 5 | 4 | 5 | 2 | SOP to include two operator task, training for proper lifting technique, PPE to include leather gloves to protect hands, training to not grab drum by end in a way that exposes hands to pinch |
| 109 | Web guide must be centered before delivery | No Associated Hazard | | | | | | |

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| 110 | Roll is delivered to unwind saddle area by crane | Mechanical - Strike - Operator struck by crane or roll in motion | 3 | 5 | 2 | 3 | 1 | AOPD: Light curtains monitor perimeter of area, disabling crane motion if crane is outside pod area. Manual reset required, crane set to manual mode when light curtains are broken. Existing area scanner to now be utilized to check for area clear before crane can be reset. |
| 111 | Roll is delivered to unwind saddle area by crane | Mechanical - Crush - Roll lowered by crane into saddle | 4 | 5 | 2 | 1 | 2 | AOPD: Light curtains monitor perimeter of area, disabling crane motion if crane is outside pod area. Manual reset required, crane set to manual mode when light curtains are broken. Existing area scanner to now be utilized to check for area clear before crane can be reset. |
| 112 | Roll is delivered to unwind saddle area by crane | Mechanical - Crush - Roll dropped by crane | 4 | 5 | 3 | 5 | 3 | Proximity switches in use to monitor crane hook angle to detect if crane is out of alignment and may have picked up roll incorrectly. Consider safety hardware upgrade. AOPD: Light curtains monitor perimeter of area, disabling crane motion if crane is outside pod area. Manual reset required, crane set to manual mode when light curtains are broken. Existing area scanner to now be utilized to check for area clear before crane can be reset. |
| 113 | Roll is delivered to unwind saddle area by crane | Mechanical - Pinch - Operator could be pinched between drum and saddle | 3 | 5 | 2 | 1 | 1 | AOPD: Light curtains monitor perimeter of area, disabling crane motion if crane is outside pod area. Manual reset required, crane set to manual mode when light curtains are broken. Existing area scanner to now be utilized to check for area clear before crane can be reset. |

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| 114 | Operator engages chucks | Mechanical - Pinch - Operator could have hands caught between drum and chucks | 3 | 5 | 2 | 1 | 1 | Currently hold to close, manual only, operator consoles on both sides of machine but limiting to one side may reduce hazard |
| 115 | Operator engages chucks - Occasionally drums are bent - Using hammer to attempt to make chucks fit | Ergonomic - Strain - Excessive force may be required to get drum to align | 1 | 5 | 1 | 5 | OM | Proper technique, Training. Tool use: hammer reduces force needed to align chucks |
| 116 | Operator engages chucks - Occasionally drums are bent - Put crane in manual and unload roll | Mechanical - Pinch - Between crane hooks and drum | 3 | 5 | 2 | 1 | 1 | AOPD: Light curtains monitor perimeter of area, disabling crane motion if crane is outside pod area. Manual reset required, crane set to manual mode when light curtains are broken. Existing area scanner to now be utilized to check for area clear before crane can be reset. |
| 117 | Attach new web to old web | No Associated Hazard | | | | | | |
| 118 | Disengage centering/web guide to automatic | No Associated Hazard | | | | | | |
| 119 | Pull new web to scrap winder | No Associated Hazard | | | | | | |
| 120 | Engage scrap winder clamp | Mechanical - Pinch - Rolls coming together creates pinch point | 1 | 5 | 1 | 5 | OM | AOPD: Consider use of Load/Unload crane scanner to also monitor whether or not operator is potentially in the way of scrap winder clamp |
| 121 | Cut web with putty knife | Mechanical - Cutting - Putty knife is sharp | 2 | 5 | 2 | 5 | OM | PPE: Cut resistant gloves, Proper technique. SOP for Proper tools: Putty knives are limited in their sharpness. |
| 122 | Attach new web to old web again at splice table | No Associated Hazard | | | | | | |
| 123 | Disengage scrap winder clamp | No Associated Hazard | | | | | | |
| 124 | Forward material to rewinds | No Associated Hazard | | | | | | |
| 125 | | No Associated Hazard | | | | | | |
| 126 | Removing Butt roll - Disengaging chucks - May become stuck causing roll to be pulled off center | Crane may attempt to lift unwind assembly if roll is not properly centered | 4 | 5 | 5 | 1 | 3 | Re-chucking may fix misalignment issue |

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| 127 | Removing Butt roll - Disengaging chucks - May become stuck causing roll to be pulled off center - Crane may not correctly recover roll | Mechanical - Crush - Improperly lifted roll has higher chance of slipping from crane | 4 | 5 | 5 | 1 | 3 | Proximity switches in use to monitor crane hook angle to detect if crane is out of alignment and may have picked up roll incorrectly. Consider safety hardware upgrade. AOPD: Light curtains monitor perimeter of area, disabling crane motion if crane is outside pod area. Manual reset required, crane set to manual mode when light curtains are broken. Existing area scanner to now be utilized to check for area clear before crane can be reset. |
| 128 | Removing Butt roll with crane | Mechanical - Strike - Operator struck by crane or roll in motion | 3 | 5 | 2 | 3 | 1 | AOPD: Light curtains monitor perimeter of area, disabling crane motion if crane is outside pod area. Manual reset required, crane set to manual mode when light curtains are broken. Existing area scanner to now be utilized to check for area clear before crane can be reset. |
| 129 | Removing Butt roll with crane | Mechanical - Crush - Operator could be crushed by dropped roll | 4 | 5 | 3 | 5 | 3 | AOPD: Light curtains monitor perimeter of area, disabling crane motion if crane is outside pod area. Manual reset required, crane set to manual mode when light curtains are broken. Existing area scanner to now be utilized to check for area clear before crane can be reset. |
| 130 | Removing Butt roll with crane | Mechanical - Crush - Operator could be crushed by lowering of roll | 4 | 5 | 2 | 1 | 2 | AOPD: Light curtains monitor perimeter of area, disabling crane motion if crane is outside pod area. Manual reset required, crane set to manual mode when light curtains are broken. Existing area scanner to now be utilized to check for area clear before crane can be reset. |

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| 131 | Removing Butt roll with crane | Mechanical - Pinch - Operator could be pinched between drum and saddle | 3 | 5 | 2 | 5 | 2 | Consider removal of second ops console |
| 132 | During load/unload, new bulk roll in suspended over operator walkway while removing butt roll | Mechanical - Crush - Operator could be crushed by dropped roll while in pit walkway area. | 4 | 5 | 1 | 5 | 3 | AOPD: During load/unload cycle, scanner monitors area to prevent automatic crane movement, preventing movement into area and putting crane in manual mode |
| Unloading Finished Rolls | | | | | | | | |
| 201 | If there is a knife setup, disengage knives | No Associated Hazard | | | | | | |
| 202 | Jog machine to clear web | No Associated Hazard | | | | | | |
| 203 | Rewind Carriages Move to Outward Position | No Associated Hazard | | | | | | |
| 204 | Separate web with putty knife | Mechanical - Cutting - Putty knife is sharp | 2 | 5 | 3 | 5 | 1 | PPE: Cut resistant gloves, Proper technique. SOP for Proper tools: Putty knives are limited in their sharpness. |
| 205 | Separate web with putty knife - Some operators may stand on platform during web separation. Stepping up presents a hazard. | Ergonomic - Trip/fall - Stepping up and standing on platform | 3 | 5 | 2 | 3 | 1 | External side has installed a hand rail between the trim chute cylinders that may aid in stabilizing operator during step up. |
| 206 | Separate web with putty knife - Some operators may stand on platform during web separation. Stepping down presents a hazard | Ergonomic - Trip/fall - Stepping down from platform | 3 | 5 | 3 | 5 | 2 | Handrails, crossbar, and step to be utilized to ease transition from floor to ledge. See full explanation in Safety Recommendation Report section 7.0 |
| 207 | Operators call trolley in for both front and back rewinds | Mechanical - Bump - Cart could bump into operators while in motion | 2 | 5 | 3 | 1 | OM | Audible alarms and bump strips in place to stop cart movement if tripped |
| 208 | Operators call trolley in for both front and back rewinds | Mechanical - Pinch - External side, if cart overshoots track, there is a pinch point between cart and air cabinet | 3 | 5 | 3 | 3 | 2 | Audible alarms and bump strips in place to stop cart movement if tripped. Blocks in place on track end to prevent cart moving past that point. |
| 209 | Operator starts unload cycle | No Associated Hazard | | | | | | |

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| 210 | Interior: arm lowers rolls to cart | Mechanical - Crush - Rolls on arbor coming down toward cart present crushing hazard | 4 | 5 | 2 | 3 | 2 | AOPD: Area scanner to be used to flash check area before auto cycle is allowed to begin. Area scanner being obstructed will leave HMI fault showing issue clearly. |
| 211 | Interior: Bearing side of arbor raises back out of the way | No Associated Hazard | | | | | | |
| 212 | Interior: Once arbor is clear, cart moves clear of machine | Mechanical - Bump - Cart could bump into operators while in motion | 2 | 5 | 3 | 1 | OM | Audible alarms and bump strips in place to stop cart movement if tripped. Blocks in place on track end to prevent cart moving past that point. |
| 213 | Interior: Remove spacer cores from cart | Mechanical - Pinch - Individual rolls could fall over, impacting operator's hands or fingers | 2 | 5 | 2 | 1 | OM | SOP: Narrow rolls (considered by 3:1 or greater ratio diameter to width) should be handled by two operators to prevent rolls from falling over. |
| 214 | Interior: Reinstall stripper onto arbor | No Associated Hazard | | | | | | |
| 215 | Interior: Load new cores onto arbor from core tray | Ergonomic - Strain - Combined twist/push movement is potentially harmful | 1 | 5 | 3 | 1 | 0 | PM includes electrical realignment of arbor, mechanical checking off mountings to ensure that they are still tightly secured. |
| 216 | Interior: Load new cores onto arbor from core tray | Mechanical - Pinch - Between the core tray and the arbor | 2 | 5 | 1 | 5 | 1 | Training: Hands to remain clear of arbor when lowering core tray, or raising core tray after loading new set of cores. |
| 217 | Interior: Load new cores onto arbor from core tray - Chain supporting counterweight has broken, leaving tray out of position. Must be repaired to run machine. | Mechanical failure - Component knocked loose | | | | | | |
| 218 | Interior: Close arbor bearing | Mechanical - Pinch - Between arbor lifter and arbor | 3 | 5 | 2 | 5 | 2 | Investigate alternative arbor lift head that would combine lifting and applying pressure to end core, removing need for operator to leave hand exposed to arbor lift. |

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| 219 | Interior: Close arbor bearing | Mechanical - Pinch - Live center closing presents pinch point | 3 | 5 | 1 | 5 | 2 | Investigate alternative arbor lift head that would combine lifting and applying pressure to end core, removing need for operator to leave hand exposed to live center pinch point. |
| 220 | Exterior: Arm lowers rolls to cart | Mechanical - Crush - Rolls on arbor coming down toward cart present crushing hazard | 4 | 5 | 2 | 3 | 2 | AOPD: Area scanner to be used to flash check area before auto cycle is allowed to begin. Area scanner being obstructed will leave HMI fault showing issue clearly. |
| 221 | Exterior: Bearing Side of arbor raises back out of the way | No Associated Hazard | | | | | | |
| 222 | Exterior: Operator must hit "trolley out" to resume cart movement | No Associated Hazard | | | | | | |
| 223 | Exterior: Cart moves clear of machine | Mechanical - Bump - Cart could bump into operators while in motion | 2 | 5 | 3 | 1 | OM | Audible alarms and bump strips in place to stop cart movement if tripped |
| 224 | Exterior: Remove spacer cores from cart | Mechanical - Pinch - Individual rolls could fall over, impacting operator's hands or fingers | 2 | 5 | 3 | 1 | OM | SOP: Narrow rolls (considered by 3:1 or greater ratio diameter to width) should be handled by two operators to prevent rolls from falling over. |
| 225 | Exterior: Reinstall stripper onto arbor | No Associated Hazard | | | | | | |
| 226 | Exterior: Load new cores onto arbor from core tray | Ergonomic - Strain - Combined twist/push movement is potentially harmful | 1 | 5 | 3 | 1 | 0 | PM includes electrical realignment of arbor, mechanical checking off mountings to ensure that they are still tightly secured. |
| 227 | Exterior: Load new cores onto arbor from core tray | Mechanical - Pinch - Between the core tray and the arbor | 2 | 5 | 1 | 5 | 1 | Training: Hands to remain clear of arbor when lowering core tray, or raising core tray after loading new set of cores. |
| 228 | Exterior: Close arbor bearing | No Associated Hazard | | | | | | |
| 229 | Exterior cart moves along slat conveyor to staging position near interior cart | Mechanical - Bump - Cart could impact operators | 2 | 5 | 3 | 1 | OM | Audible alarms and bump strips in place to stop cart movement if tripped |
| 230 | Operator manually triggers exterior cart moving remaining distance to meet interior cart | Mechanical - Pinch - Between rolls on carts, but not body of carts | 2 | 5 | 2 | 1 | OM | Audible alarms and bump strips in place to stop cart movement if tripped |

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| 231 | Operator manually triggers exterior cart moving remaining distance to meet interior cart | Mechanical - Pinch - Between body of carts if rolls are not present | 2 | 5 | 2 | 1 | OM | Audible alarms and bump strips in place to stop cart movement if tripped |
| 232 | Rolls are transferred manually from interior cart to exterior cart - 15k roll size presents additional problems. Could dislodge core tray from machine. | Mechanical - Strike - Core tray jostled loose from machine | 2 | 4 | 3 | 1 | OM | Training: During run of 15k rolls, operators and packer need to be aware of not lowering roll tray while carts are in motion. Audible alarm on cart will make it easier to determine if cart is moving. |
| 233 | Rolls are transferred manually from interior cart to exterior cart - 15k roll size presents additional problems. Could dislodge core tray from machine. | Mechanical failure - Component knocked loose | | | | | | Consider method to prevent overlapping movement of core tray and cart |
| 234 | Rolls are transferred manually from interior cart to exterior cart | Ergonomic - Strain - Potential excessive force required to move rolls | 1 | 5 | 4 | 5 | 1 | Training: Proper technique, also help is available if necessary. |
| 235 | Rolls are transferred manually from interior cart to exterior cart | Mechanical - Strike - Rolls can overshoot exterior cart and fall from far side | 3 | 5 | 2 | 3 | 1 | Training: Stand clear of potential roll movement when rolls are being transferred between carts, Training: clear level of force to be learned to avoid overshooting cart. |
| 236 | Exterior cart moves back toward Pesmel system to unload rolls | Mechanical - Bump - Cart could impact operators | 2 | 5 | 3 | 1 | OM | Audible alarms and bump strips in place to stop cart movement if tripped |
| 237 | Core tray movement may impact operator | Mechanical - Strike - Potential for core tray to strike operator while in movement | 2 | 5 | 2 | 5 | 1 | Core trays are padded with foam wrapper to limit impact. Training: visually confirm location of other operator and packer before lowering tray. |
| 238 | Core tray counterweight chain has broken in past, tray is heavy without counterweight. | Mechanical failure - Component knocked loose | | | | | | |
| 239 | Manual operation of the unload cycle: Operator can trigger movement on both sides of machine from the main console. However, operator does not have clear line of sight to the Exterior side of machine | No Associated Hazard | | | | | | |

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| 240 | During movement of slat conveyor, there is a potential for draw-in of operator clothing, shoes, or extremities | Mechanical - Nip - In-running nip presented by end of slat conveyor | 2 | 5 | 2 | 5 | 1 | Guards currently in place with ~2mm clearance. No further potential for harm exists. |
| Knife Setup | | | | | | | | |
| 301 | Operator steps up onto machine frame platform | Ergonomic - Slip/fall - Platform is narrow | 3 | 5 | 2 | 3 | 1 | Handrails, crossbar, and step to be utilized to ease transition from floor to ledge. See full explanation in Safety Recommendation Report section 7.0 |
| 302 | Set female knife position (external side) | Ergonomic - Slip/fall - Platform is narrow | 3 | 5 | 1 | 3 | 1 | Handrails, crossbar, and step to be utilized to ease transition from floor to ledge. See full explanation in Safety Recommendation Report section 7.0 |
| 303 | Inflate female knife shaft | No Associated Hazard | | | | | | |
| 304 | Operator steps down off of machine frame platform | Ergonomic - Slip/fall - No handrail and distance is far enough to be unwieldy | 3 | 5 | 3 | 5 | 2 | Handrails, crossbar, and step to be utilized to ease transition from floor to ledge. See full explanation in Safety Recommendation Report section 7.0 |
| 305 | Trim chutes move to trim cutting position | Mechanical - Pinch - Between trim chutes and hard stop | 2 | 5 | 2 | 1 | OM | Training: Hands to remain clear of path of Trim Chutes. |
| 306 | Operator turns off internal rewind | No Associated Hazard | | | | | | |
| 307 | Operator steps up onto machine frame platform | Ergonomic - Slip/fall - Platform is narrow | 3 | 5 | 2 | 3 | 1 | Handrails, crossbar, and step to be utilized to ease transition from floor to ledge. See full explanation in Safety Recommendation Report section 7.0 |
| 308 | Inflate male knife shaft | Mechanical - Cutting - Hands can reach area where knives engage, could lead to cut if not aware of hand placement | 2 | 5 | 2 | 3 | OM | Inflate male knife shaft button to be removed from external side of machine |

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| 309 | Set individual male knife positions (internal side) | Ergonomic - Awkward Position - If carriage is not in out position, operator must reach at an uncomfortable angle to make adjustments | 1 | 5 | 2 | 5 | 1 | Step revision strategy detailed in Safety Recommendation Report section 7.0 will allow operators to access air lines without climbing fully onto raised step, and standing further back will enable them to access lines without awkward angle. |
| 310 | Set individual male knife positions (internal side) | Ergonomic - Slip/fall - Platform is narrow | 3 | 5 | 3 | 5 | 2 | Handrails, crossbar, and step to be utilized to ease transition from floor to ledge. See full explanation in Safety Recommendation Report section 7.0 |
| 311 | Operator steps down off of machine frame platform | Ergonomic - Slip/fall - No handrail and distance is far enough to be unwieldy | 3 | 5 | 3 | 5 | 2 | Handrails, crossbar, and step to be utilized to ease transition from floor to ledge. See full explanation in Safety Recommendation Report section 7.0 |
| 312 | Jog machine from external side | Mechanical - Nip - Draw-in possible when machine is jogged between arbor and winding drum | 3 | 5 | 3 | 5 | 2 | No longer allow two operators on platform |
| 313 | Trim webs and feed even webs to internal side | Mechanical - Cutting - Putty knife is sharp | 2 | 5 | 3 | 5 | 1 | PPE: Cut resistant gloves, Proper technique. SOP for Proper tools: Putty knives are limited in their sharpness. |
| 314 | Tape tails to cores on external side of machine | Ergonomic - Awkward motion - Having to twist cores to align for taping may be stressful on wrists | 1 | 5 | 2 | 5 | 1 | Training: Align cores properly in core tray to eliminate need to reorient while on arbor |
| 315 | Trim excess material from core | Mechanical - Cutting - Putty knife is sharp | 2 | 5 | 3 | 5 | 1 | PPE: Cut resistant gloves, Proper technique. SOP for Proper tools: Putty knives are limited in their sharpness. |
| 316 | Carriage in external side | Mechanical - Pinch - Between drum and rolls | 3 | 5 | 2 | 1 | 1 | If the operator does not carriage out, this is not a possible hazard. However, carrying out makes line 98/99 task easier. |
| 317 | Operator reactivates internal rewind | No Associated Hazard | | | | | | |
| 318 | Tape even side tails to cores on internal side of machine | Ergonomic - Awkward motion - Having to twist cores to align for taping may be stressful on wrists | 1 | 5 | 2 | 5 | 1 | Training: Align cores properly in core tray to eliminate need to reorient while on arbor |

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| 319 | Trim excess material from core | Mechanical - Cutting - Putty knife is sharp | 2 | 5 | 3 | 5 | 1 | PPE: Cut resistant gloves, Proper technique. SOP for Proper tools: Putty knives are limited in their sharpness. |
| 320 | Carriage in internal side | Mechanical - Pinch - Between drum and rolls | 3 | 5 | 2 | 3 | 1 | Training: Stay clear of area, do not activate carriage in if any operators are in area. Clear line of sight from controls. |
| Threading empty machine | | | | | | | | |
| 401 | Feed web into pit | Ergonomic - Awkward position - Kneeling to pass web into pit while pulling web | 1 | 4 | 2 | 3 | 0 | Kneeling mat might be good to utilize, could be stored on machine frame in easy access |
| 402 | Remove 18"x12" plate to access pit area | No Associated Hazard | | | | | | |
| 403 | Movement around pit area while pit access plates are removed | Ergonomic - Trip/Fall - Tripping over or into edge of pit access while moving through pit area | 2 | 4 | 3 | 5 | 1 | Plate covers to be recolored a high-visibility color to make it easier to differentiate when plates are removed. |
| 404 | Reach through access plate opening and pull slack to continue pushing web toward splice table area | Ergonomic - Awkward position - Kneeling while both pulling web to create slack and then pushing it forward | 2 | 4 | 3 | 3 | OM | Kneeling mat might be good to utilize, could be stored on machine frame in easy access |
| 405 | Kneel to retrieve web on back side of splice table | Ergonomic - Awkward position - Kneeling to retrieve web is done on hard floor | 2 | 4 | 2 | 3 | OM | Kneeling mat might be good to utilize, could be stored on machine frame in easy access |
| 406 | Feed web under splice table back to front of splice table | Mechanical - Pinch - Tight area between rolls while feeding web | 3 | 4 | 1 | 5 | 2 | Rear nip roll function seems to be in a grey area. Consider roll removal? |
| 407 | Feed web under splice table back to front of splice table - | Ergonomic - Awkward position - Must kneel to pass web through machine | 1 | 4 | 2 | 3 | 0 | Kneeling mat might be good to utilize, could be stored on machine frame in easy access. 2 operator task. |
| 408 | Feed web under splice table - pulling from front side of machine | Mechanical - Pinch - Tight area between rolls while feeding web | 3 | 4 | 2 | 5 | 2 | AOPD: Consider use of Load/Unload crane scanner to also monitor whether or not operator is potentially in the way of scrap winder clamp. SOP: 2 operator task. |
| 409 | Feed web under splice table - pulling from front side of machine | Ergonomic - Awkward position - Must kneel to receive web from back side operator | 1 | 4 | 2 | 3 | 0 | Kneeling mat might be good to utilize, could be stored on machine frame in easy access. 2 operator task. |

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| Unloading Scrap Roll | | | | | | | | |
| 501 | Retrieve manual unload cart | No Associated Hazard | | | | | | |
| 502 | Place cart under scrap roll | No Associated Hazard | | | | | | |
| 503 | Opening scrap roll chuck assembly with manual crank | Ergonomic - Awkward position - Crank is mounted low to the ground | 1 | 5 | 2 | 5 | OM | Kneeling mat might be good to utilize, could be stored on machine frame in easy access |
| 504 | Opening scrap roll chuck assembly with manual crank | Ergonomic - Strain - Large amount of force can be required to turn crank | 1 | 5 | 2 | 5 | OM | Use of hammer to loosen first turn can reduce need for excessive force if crank is stuck |
| 505 | Front of roll drops onto cart as chuck assembly is opened | Mechanical - Pinch - Roll dropping onto cart could pinch foot | 3 | 5 | 1 | 5 | 2 | Training: Anyone who is not operating crank should stand clear of area. Clear line of sight available to area. Operator using crank is out of danger area. |
| 506 | Pull cart and roll away from machine | Ergonomic - Slip/fall - May have to lean at a sharp angle to get enough force to pull cart back | 1 | 5 | 2 | 5 | OM | Consider two anchor point system for handle line. Would distribute force better and allow for more secure anchor. |
| 507 | Pull cart and roll away from machine | Ergonomic - Strain - Excessive force required to pull cart away from machine | 2 | 5 | 2 | 5 | 1 | Training: Proper technique, use of two anchor point handle would assist in force distribution. |
| 508 | Install new core onto scrap winder spindle | Ergonomic - Awkward position - Difficult to brace core and manually crank spindle into position | 2 | 5 | 2 | 5 | 1 | Should be 2 operator task, but is not always done this way |
| 509 | Install new core onto scrap winder spindle | Mechanical - Pinch - Operator has to hold core in place while chuck closes | 1 | 5 | 1 | 1 | 0 | Consider use of tool to balance core without operator having to hold it manually, removing hazard. |
| Changing Male Knives | | | | | | | | |
| 601 | Releasing air line | Ergonomic - Awkward positioning - Overhead reach | 1 | 5 | 2 | 5 | 1 | Step revision strategy detailed in Safety Recommendation Report section 7.0 will allow operators to access air lines without climbing fully onto raised step, and standing further back will enable them to access lines without awkward angle. |


| Item | Task | Hazard | Initial Scoring | | | | SIL | Mitigation |
|--|--|---|-----------------|---|---|---|-----|---|
| Risk Assessment Report: Sample Manufacturing Line, Joliet IL | | | S | F | P | A | | |
| 602 | Loosen dovetail screw | Mechanical - Cutting - Edges of knife blades are near task area | 1 | 5 | 1 | 5 | OM | PPE: Cut resistant gloves. Training: Do not grip knife assembly by anything other than body of knife. |
| 603 | Remove knife from machine | Mechanical - Cutting - Edges of knife blades are sharp. | 1 | 5 | 1 | 5 | OM | PPE: Cut resistant gloves. Training: Do not grip knife assembly by anything other than body of knife. |
| 604 | Walk to knife changing table | No Associated Hazard | | | | | | |
| 605 | Unscrew 3 screws with allen wrench | Mechanical - Cutting - Edges of knife blades are near task area | 2 | 5 | 3 | 5 | 1 | PPE: Cut resistant gloves. Training: Do not grip knife assembly by anything other than body of knife. |
| 606 | Remove retaining ring | Mechanical - Cutting - Edges of knife blades are near task area | 2 | 5 | 3 | 5 | 1 | PPE: Cut resistant gloves. Training: Do not grip knife assembly by anything other than body of knife. If ring is stuck, knocking loose on edge of table rather than trying to remove by hand is safer option. |
| 607 | Remove Knife Blade and place in used knife container | Mechanical - Cutting - Edges of knife blades are sharp. | 2 | 5 | 3 | 5 | 1 | PPE: Cut resistant gloves. Training: Do not grip knife assembly by anything other than body of knife. |
| 608 | Place new knife into male knife holder | Mechanical - Cutting - Edges of knife blades are sharp. | 2 | 5 | 2 | 5 | 1 | PPE: Cut resistant gloves. Training: Do not grip knife assembly by anything other than body of knife. New knives are protected by plastic knife guard |
| 609 | Reattach retaining ring and 3 screws | Mechanical - Cutting - Edges of knife blades are near task area | 2 | 5 | 2 | 5 | 1 | PPE: Cut resistant gloves. Training: Do not grip knife assembly by anything other than body of knife. New knives are protected by plastic knife guard |
| 610 | Walk to slitter | No Associated Hazard | | | | | | |
| 611 | Reattach knife holder to dovetail | Mechanical - Cutting - Edges of knife blades are near task area | 1 | 5 | 1 | 5 | OM | PPE: Cut resistant gloves. Training: Do not grip knife assembly by anything other than body of knife. New knives are protected by plastic knife guard |
| 612 | Remove rubber coating | Mechanical - Cutting - Edges of knife blades are near task area | 2 | 5 | 1 | 5 | 1 | PPE: Cut resistant gloves. Training: Do not grip knife assembly by anything other than body of knife. |

| Item | Task | Hazard | Initial Scoring | | | | SIL | Mitigation |
|--|--|---|-----------------|---|---|---|-----|---|
| Risk Assessment Report: Sample Manufacturing Line, Joliet IL | | | S | F | P | A | | |
| 613 | Reattach air line | Ergonomic - Awkward positioning - Overhead reach | 1 | 5 | 2 | 5 | 1 | Step revision strategy detailed in Safety Recommendation Report section 7.0 will allow operators to access air lines without climbing fully onto raised step, and standing further back will enable them to access lines without awkward angle. |
| Cleaning Female Knives | | | | | | | | |
| 701 | Step onto machine platform | Ergonomic - Slip/Fall - Machine platform is narrow | 3 | 5 | 2 | 3 | 1 | Handrails, crossbar, and step to be utilized to ease transition from floor to ledge. See full explanation in Safety Recommendation Report section 7.0 |
| 702 | Ensure machine is in manual mode and not running | Mechanical - Draw-in - If machine was running, operator could get pulled into machine if contact made with moving rolls | 2 | 5 | 1 | 5 | 1 | Safety mat in place to prevent this in the event that an operator stepped onto platform without machine not in run mode |
| 703 | If knife setup is not completed (deflated bladder) use manual method (hand turning) to clean female knives by using the edge of a brass putty knife blade | Ergonomic - Awkward positioning - Tight space to complete work | 1 | 5 | 2 | 3 | 0 | Training: If at all possible, task to be done with inflated spindle. Operator option is given to clean knives without spindle inflated, but standard should be to clean inflated with jog pedal to avoid ergonomic hazard. |
| 704 | If knife setup is not completed (deflated bladder) use manual method (hand turning) to clean female knives by using the edge of a brass putty knife blade | Mechanical - Cutting - Manually rotating female knives presents cutting hazard | 1 | 5 | 2 | 5 | OM | PPE: Cut resistant gloves. Training: Do not grip knife assembly by anything other than body of knife. |
| 705 | Put carriage in the inward position | | | | | | | |
| 706 | If knife setup is completed (inflated bladder) use auto method (turning with jog pedal) to clean female knives using the edge of a brass putty knife blade | Mechanical - Cutting - Jogging the knives may cause laceration injury to operator | 2 | 5 | 2 | 5 | 1 | PPE: Cut resistant gloves. Training: Do not grip knife assembly by anything other than body of knife. |

| Item | Task | Hazard | Initial Scoring | | | | SIL | Mitigation |
|--|--|--|-----------------|---|---|---|-----|---|
| Risk Assessment Report: Sample Manufacturing Line, Joliet IL | | | S | F | P | A | | |
| 707 | If knife setup is completed (inflated bladder) use auto method (turning with jog pedal) to clean female knives using the edge of a brass putty knife blade | Ergonomic - Slip/Fall - Operator could trip over cable or pedal if not aware of surroundings | 3 | 5 | 3 | 5 | 2 | Handrails, crossbar, and step to be utilized to ease transition from floor to ledge. See full explanation in Safety Recommendation Report section 7.0 |
| | | | | | | | | |

Color Legend

| | |
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| | Identified Safety Concern |
| | Requires Information From Client |
| | Action Items |

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1.0 Quad Plus Safety has prepared a list of safety recommendations for the Sample Manufacturing line at the Sample Manufacturing facility in New Lenox, IL. What follows is documentation detailing several components of this initial action plan, to be approved by Sample Manufacturing personnel.


Across the full slitting line there are several areas that require combined efforts to realize the full benefit of a mitigation strategy. It is important that these areas are viewed as units, or at the very least care is taken to separate out an individual mitigation if absolutely necessary:

1.1 - The Saddle, Unwind, and Threading Pit Areas are treated very similarly for purposes of the scanners, as they all contain logic for the crane while utilizing multiple scanners to limit crane movement and the activation of Load/Unload multi-purpose cycles.

1.2 - The Threading Pit and Splicing Table areas utilize the scanner in front of the Splice Table to impact the splicing nips, the scrap winder, and the functionality of the threading mode.

1.3 - The Interior and Exterior winders will utilize their area scanners for multiple purposes as well, including threading, maintenance, and the actual winding cycle.

It is important to keep these groupings in mind when viewing the Risk Assessment and considering the rest of the Safety Recommendation Report.

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2.0 Recommended guarding upgrade to the Sample Slitter Area:

2.1 - The current fixed guarding strategies in place appear to be adequate. However, there are two areas that should be confirmed regularly to ensure that the guards are still in place:


2.1.1.- On the floor conveyors for the Transfer cart, there are concerns about a draw-in hazard that has caught operator feet in the past. This guard should be regularly checked to ensure that it is still firmly in place to limit this possibility.

2.1.2 - On the ends of the floor tracks for both the interior and exterior roll carts, there are wheel guards that are in place to stop the cart overshooting the track. These should also be regularly checked to ensure that they remain firmly in place to limit the chance of the carts overshooting their tracks and impacting operators.

2.2 - The bump strips on the exterior (Transfer) cart and the interior (Roll) cart, in conjunction with the use of audible and visual alarms will serve to limit the hazard of the carts bumping operators while they are in motion.

2.2.1 - The bump strips will stop the carts if they are contacted while the cart is in motion, and the audible/visual alarms will limit the chance of operators being caught unaware.

2.2.2 - This set of mitigations functions in relation to an SOP for operators to not stand between the carts during any portion of the cycle when the carts may be in motion. This will assist in mitigating the chance of operators becoming pinched or trapped between the two carts.

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3.0 Recommended functional safety system upgrades to the Sample Slitter Area:

3.1 - Although the crane and saddle area were determined to be outside the main scope of the initial Risk Assessment, it has been determined that the crane impacts operator tasks in other locations on the machine, particularly in the Unwind Area and the Splice Table/Threading Pit area. Because of these potential hazards, it has been deemed that the crane scanners and light curtains will be utilized to assist in mitigating these hazards, even if there is no further upgrading of hardware in this area.

3.1.1 - The crane area contains perimeter Light Curtains that will be used to monitor whether or not the crane strays unexpectedly from the saddle or loading area. If it does, a manual reset will be required, and the crane will automatically enter a manual-only mode.


3.1.2 - There are also concerns about the crane potentially dropping rolls due to an improper alignment of the hooks with a roll during a loading or load/unload cycle. There are proximity switches currently in place to monitor the crane hook angle to detect if the crane is out of alignment and may have incorrectly picked up a roll. Combined with this, the Area Scanner in the Splice Table/Threading Pit area will prevent the crane from performing a Load/Unload automatically if there are any operators in the area. If the Area Scanner detects an operator, the crane will automatically switch into manual mode and must be manually reset before automatic movement can resume.

3.2 - When the Scrap Winder spindle is raised, there is a concern about operators potentially having their hands or feet in the way of the spindle. Use of the Load/Unload Cycle crane Area Scanner is to be considered to mitigate this issue by flash checking to confirm if operator is in area before spindle is allowed to be raised.

3.3 - In both winder areas, there are concerns about crushing hazards when the finished rolls are being lowered onto the carts by the Roll Arbors. The Area Scanners that are currently in place will be used to monitor the area to stop movement if an operator unexpectedly enters the area adjacent to the cart. If the field is broken, the arm will need to stop immediately and a manual reset will be required.

3.4 - When feeding the web under the Splice Table, there is a concern about a pinch hazard in the nip when the operator must reach through rolls to thread. The Load/Unload Cycle crane Area Scanner can be utilized to flash check the area before these rolls are allowed to close to ensure that there are no operators present within the nip before the nip is allowed to close.

3.5 - When cleaning the Female Knives there is a concern about a draw-in hazard if contact was accidentally made with moving rolls. There are currently safety mats in place to mitigate this concern that are triggered when the operators step up onto the platform to reach the knives. These safety mats need to be regularly checked to ensure that they are not damaged and are still fully functional.

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4.0 Recommended awareness means changes to the Sample Slitter Area:


4.1 - The Core Loading Trays on the interior and exterior side of the winder area should both be regularly checked to ensure that their yellow safety coloring is not frayed or rubbed off, as appears to tend to happen due to regular movement and impact on the padded coating.

4.2 - All audible and visual alarms should have regular PM tasks to ensure that they are functioning properly.

5.0 Recommended training/procedure changes to the Sample Slitter Area:

5.1 - When dislodging a potentially stuck drum in the unwind area, potentially while using a hammer for assistive force, operators must be trained to stand clear of the area where the drum may fall. This will ensure that there is no injury to operator feet or legs from a dislodged drum falling to the floor.

5.2 - When loading cores onto the Interior or Exterior Arbors from the Core Trays, training should be implemented to ensure that operators hands remain clear of the arbor when lowering or raising the core trays to ensure that there is no chance of an operator pinching their hands or arms between the tray and the arbors.

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6.0 Standard Operating Procedures (SOPs) that must be created or updated:


6.1 - When removing the roll from the conveyor using the crane, an SOP needs to be developed that clearly states the crane is not to be left over the conveyor.

6.2 - When removing the roll from the conveyor using the crane, an SOP needs to be developed that clearly states that the arms should be left engaged.

6.3 - When opening the arms and removing the end boards, there are currently concerns about ergonomic issues. Communication between Sample Manufacturing and the supplier should be enacted to see if there is a way that the supplier can stop using these slotted end boards. An alternative delivery style would make this less of a concern.

7.0 Required Structural Changes:

7.1 - At this time Quad Plus Safety has no specific structural change recommendations. However, there will be new mounting points required for the replaced photo eye, and depending on safe stop distance calculations some of the fixed or non-separating guards may be need to be slightly relocated.


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8.0 Currently, there may be issues with non-safety-rated components and lack of redundancy within the safety circuit in use in the Sample Slitter area. We recommend utilizing several methods to combat this issue.

8.1 - When utilizing any sensing equipment anywhere in the Sample Slitter area or throughout the process, it is important that it is wired correctly; if a device is capable of failing in a particular state, then the failure should be such that a false indication of presence or misalignment is given. This result is much better than an indication of no presence or misalignment, because it will cause the system to prevent the machine from functioning in an unknown state.

8.2 - Also, in the event that a non-safety-rated component may be required redundancy must be created in order to ensure that a safe failure state is achieved. If one component were to fail physically, such as a proximity sensor breaking in such a way that it always reports a safe state, the secondary redundant component will either correctly report the condition of the machine, or the discrepancy between the two sensors will cause the machine to report a component failure. Either way, the machine will be clearly reporting the fact that there is a fault and it can easily be pinpointed after the area is cleared.

8.3 - The future use of a Safety PLC will ensure that the code remains tamper-proof and prevents any user error after the code has been finalized by the initial programmer and has been verified by Quad Plus Safety. This will provide a second layer of protection against any potential unexpected functionality by limiting access to machine logic. A safety PLC also allows for secure communication with any safety-rated hardware that will add another layer of tamper-proofing for individual components as well.

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9.0 Dictation of Sample Slitter Area Functional Logic through Functional Description:

9.1 - Due to the complex nature of an auto-reset AOPD mitigation system, Quad Plus Safety finds that it will be easier to convey the logical behavior of the Face Unwind Area in a Functional Description than in a set of Truth Tables. The final validation documentation will still revolve around a line-by-line approach utilizing a Truth Table and a Safety Device Validation Sheet, but for the initial explanation, it will be easier to convey using a written explanation.

9.2 - The area around the turret will be protected by a combination of fixed guarding and a SIL3 rating-appropriate light curtain that will replace the currently installed photo eye. There will also be a set of proximity switches that will assist in determining the location of the T-cart, one to detect the machine-side edge of the cart and one to detect the operator-side edge of the cart.

9.3 - If an object that is not the T-cart breaks the light curtain, the movement of the turret, the auto-splice knife, T-cart movement, and the motion of the outward spindle— both rotation and chucking motion— will be disabled. This limitation will persist until 3 seconds after an object is no longer detected.

9.4 - If the proximity switches detect the cart approaching the light curtain, its interlocking functionality will be different. Full rotation of the turret will be limited, allowing only for fine adjustment of roll alignment. Rotation speed of the outer spindle will also be limited to jog-only to prevent runaway acceleration. Similar to unexpected breaking of the light curtain, this limitation will reset after a 3 second period where the cart is no longer detected. This 3 second auto-reset period will eliminate the need for implementation of request access and request secure push buttons.

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10.0 Concluding Notes

10.1 - The previous information constitutes the body of Quad Plus Safety's recommended safety upgrades for the Sample Manufacturing Sample Slitter Area. The changes detailed within this document will need to be addressed in order to be in compliance with the recommendations of the Quad Plus Safety Risk Assessment and Safety Survey.

10.2 - This document constitutes the deliverable portion of the Risk Assessment and Safety Survey for the Sample Slitter Slitting Line and serves as a bridge to the design, installation, and validation portion of the process. Once the recommended changes are acted upon, the validation portion of the safety cycle can begin, and Quad Plus Safety will return to verify that all safety updates have been properly completed and are functioning appropriately.

10.3 - A Note about OSHA Compliance:

Quad Plus Safety works within the constraints of OSHA regulation when performing each step of the Risk Assessment and Field Validation processes, but is not responsible for OSHA Compliance Validation that is not related to Machine Safety. Quad Plus Safety is not responsible for OSHA standards that pertain to things such as:

- *Walkway Clearance and Labeling
- *Storage Facilities within the Warehouse section of the facility
- *Fire Exit Routes and Clearances
- *Stairway Width and Railing Regulations

The ANSI and ISO Standards for Machine Safety are more stringent than OSHA regulation, and will be observed to the letter when identifying, evaluating, and mitigating machine related risks at the New Lenox, IL location. However, it is the responsibility of Sample Manufacturing to evaluate the requirements of the OSHA standards in regards to the rest of the Sample Manufacturing New Lenox, IL facility.