# Revision history

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| --- | --- | --- |
| Date | Changes/Notes | Initial |
| 19/3/2019 | Initial version | AB |
| 20/3/2019 | Revised risks | AB |
| 21/3/2019 | Added ‘injury as a result of falling tools’ | AB |
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# Risks:

## Repetitive strain from typing

Method: Control banding

Hazard class: Manual handling

Risk before controls: Typing is a low effort task with a minor consequence (D) ranking with poor posture and negligible consequence (E) with good posture. Due to this project involving large amounts of programming the likelihood ranking is 2.

Actions to be taken: Reinforce the importance of good posture and take breaks throughout the day

Risk after controls: Good posture gives negligible consequence rating (E), regular brakes improves the likelihood ranking to 3 through decreased activity duration.

Is the risk after controls acceptable: Yes

Are emergency measures required: No

## Injury as a result of moving equipment

Method: Control banding

Hazard class: Manual handling

Risk before controls: Moderate effort for one person, small-moderate between 2 people (C-D consequence rating). Moving of equipment will be a very infrequent task (5 likelihood ranking

Actions to be taken: Ensure that any awkward bulky or heavy equipment is moved by 2 people, especially when the equipment is heavy enough to pose a risk when dropped (as stated later)

Risk after controls: Using 2 people will reduce the effort required reducing the Consequence rating to D/E

Is the risk after controls acceptable: Yes

Are emergency measures required: No

## Eye damage from lasers

Method: Risk Assessment

Hazard class: Physical – Lasers

Risk before controls: optical communications lasers used can be up to 100mW in power, this is enough to cause instant and lasting eye damage making it the most significant risk of this document despite it being an unlikely event. Hence the consequence rating of this risk is severe.

Actions to be taken:

Firstly all laser devices must be off before changes made and covered when disconnected to ensure no stray beams are present.

Secondly as per laser safety class 2 [1], we will consider safe levels to be <1mW. Thus when making changes the following safe distance calculation to laser sources should be adhered to;

Assuming uniform power spread from beam divergence we will require a spot area at a safe distance to be 100 x the cross section of the fibre with an additional safety factor of 10.

Thus spot diameter is required to be 56 x the fibre diameter ()

Using the gaussian divergence from here [2], the safe distance can be found from:

Risk after controls: If distance to optical sources is followed the exposure level will be at minor to negligible levels and the risk of any exposure will be very unlikely.

Is this risk acceptable: when procedure is followed this risk is acceptable

Are emergency measures needed to be taken: In the event of a laser transmitting when disconnected/into air the device must be shut down immediately.

## Electrical shock

Method: Control Banding

Hazard class: Physical – Electrical

Risk before controls: Devices used for project operate at voltages low enough to not pose a direct risk

Action to be taken: Voltages required are low risk and do not require additional safety measures

Risk after controls: N/A

Is this risk acceptable: yes power levels used pose no direct safety risk

Are emergency measures needed to be taken: Lab power cut-off buttons are in place in the case on an electric shock

## Injury as a result of falling tools

Method: Control Banding

Hazard class: Physical-general

Risk before controls: worst case scenario of falling equipment is lacerations or crushing injury’s to feet. To prevent this there is a closed shoes policy in place, this reduces the consequence of such an event with small weighing equipment.

Action to be taken: when working at the laboratory benches tools should be kept away from edges of the benchtop to reduce the likelihood of an accident, Also as previously stated bulky equipment heavy enough to injure despite closed shoes shall be moved by 2 people

Risk after controls: These controls reduce the consequence of an accident to a discomfort and reduce its likely hood

Is this risk acceptable: yes

Are emergency measures needed to be taken: no

# References

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| [1] | “Laser safety - Limits,” [Online]. Available: http://www.optique-ingenieur.org/en/courses/OPI\_ang\_M01\_C02/co/Contenu\_08.html. |
| [2] | J. F. B. Andrew M. Kowalevicz, “Beam Divergence from an SMF-28 Optical Fiber,” Naval Research Laboratory, 6 October 2006. [Online]. Available: https://pdfs.semanticscholar.org/0dc8/fd04ab67b2c5b7deb525437d5d2031bffb7d.pdf. |