## 

**3D PRINTER***CNC Additive Manufacturing*

## Scope

This document is to be completed for staff and student use of machinery, plant and equipment as a part of a school curriculum activity or program.

Refer to the [ITD Guidelines](http://education.qld.gov.au/health/pdfs/healthsafety/itd-staff-guidelines.pdf) for further staff advice on the risk management process for practical ITD curriculum activities in schools.

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| Plant/Equipment Description: | |
| Teachers/Leaders: | |
| Room Locations: | |
| Assessment Date: | Review Date: |

*N.B. This assessment can remain active for up to 5 years. However, an annual monitoring and review process should be undertaken and recorded – refer to the last page of this document.*

*Below are the details of the manufacturing or production processes attributed to this item of equipment categorised by their assessed inherent risk levels (refer to the Equipment/Process Risk Matrix). The actions required for approval for each level of inherent risk are mandatory.*

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| **Inherent Risk Level** | | **Details of Processes** | **Action Required/Approval** |
| 🗹 | **Low** | * + - * Computer numerical control (CNC) machining makes certain manufacturing processes easier by automating complex commands and speeding up the rate at which the equipment completes machining tasks. * The range of programming commands typically includes the accurate vector control of an extrusion printing head with ABS plastic filament material heated for the purpose of “fused deposition modelling”. The extrusion process uses an electrically element within the printer head - (temperatures approx. 230-270ºC) * The head travel mechanism contains slow moving directional drive components. * Scaffold material is typically removed by hand or by using a variety of hand tools (e.g. side cutters, paint scraper or tweezers, etc.) | * Manage through regular planning processes |

Minimum standards

| Minimum qualifications and experience *Listed below are the general “minimum” recommendations for the management of this Plant/Equipment.*  🗹 *Indicate the minimum management controls.* |
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| Registered teachers with experience, ability and competency in the safe use of this plant/equipment  *(indicate one or more of the following):*  Specific knowledge of the safe and correct use of this plant/equipment  Experience (i.e. previous involvement and familiarity) in the safe use of this plant/equipment  Demonstrated expertise, ability and competency with this plant/equipment  Documented qualifications relating to the use of this plant/equipment (e.g. in a staff profile)  **OR**  An adult staff member or leader, other than a registered teacher, with:  Expertise in the safe and correct use of this plant/equipment  Documented qualifications that demonstrate experience, ability and competency in the safe use of this plant/equipment. |
| Will any ITD staff require initial and/or ongoing training for the safe use of this plant/equipment?  If yes, give details: |
| Will students be operating this plant/equipment?  If yes, state how student use of this plant/equipment will be managed (e.g. Workshop Safety Induction)  Give details: |
| Further information if required: |
|  |
| Minimum control requirements |
| Supporting documentation available in the school on this plant/equipment includes:  Operators Manual  Safe Operating Procedures (SOP)  Equipment Maintenance Records (EMR)  A process for recording student safety induction e.g. Student induction register  A process for recording staff training and experience, e.g. ITD Staff induction register |
| All guards are in place and in good working order for this plant/equipment |
| Safe Working Zones are defined for this plant/equipment (e.g. yellow lines and/or appropriate signage) |
| Suitable personal protective equipment (PPE) is available to be used by all operators |
| This plant/equipment complies with relevant safety standards |
| Further information if required: |

Hazards and control measures

*Listed below are indicative hazards/risks and suggested control measures. These are by no means exhaustive lists. Add details of any other hazards/risks or additional controls you intend to implement.*

🗹 *Indicate the control measures adopted. Detail their implementation and any additional controls required.*

| **Hazards/Risks** | **Hierarchy of Recommended**  **Control Measures** | **Yes** | **No** | **Details of how this will be implemented***(and any additional controls)* |
| --- | --- | --- | --- | --- |
| **Exposure to Rotating**  **or Moving Parts:**   * **Entanglement and**   **Entrapment**  Could hair, clothing, ties, jewellery or other materials become entangled with moving parts of the equipment?   * **Impact and Striking**   Could anyone be struck by the unexpected or uncontrolled movement of the equipment?  **Note:** CNC robotics may move in a direction not anticipated or planned, at high speed in linear or rotary directions.  The CNC may also eject work-pieces, off-cuts or molten metal. Workers are at risk from being hit by the robotics or parts of the work piece. | 1. Where possible, potentially hazardous 3D Printer equipment is substituted or replaced with less hazardous alternatives. |  |  |  |
| 1. All necessary 3D Printer safety guarding and constraints are in place protecting workers from all internal moving parts, hot surfaces and possible toxic fumes. |  |  |  |
| 1. Staff and student training is provided to minimise exposure to these hazards and risks. |  |  |  |
| 1. Safe operating procedures (SOPs) are available and clearly displayed. |  |  |  |
| 1. Warning “Danger” tags (or similar) are affixed to the 3D Printer when under repair or maintenance preventing workers from using the equipment. |  |  |  |
| 1. “Safe Working Zones” are clearly defined in all workspaces where the 3D Printer is to be used. |  |  |  |
| 1. All approved personal protective equipment (PPE) is used where required. |  |  |  |
| **Slips, Trips, Falls**  **and Abrasions:**  Can anyone using the plant or in the vicinity of the plant, slip, trip or fall due to the working environment or other factors?  e.g. Poor housekeeping, slippery or uneven work surfaces, power cables across work areas causing injuries and abrasions? | 1. Slip resistant flooring is encouraged. Regular checks are made for unsafe wear and damage. Inspections are made for any power leads, etc. |  |  |  |
| 1. Procedures are in place for the disposal of all waste materials around all work spaces where 3D Printer activities are to be performed. |  |  |  |
| 1. Staff and student training is provided to minimise exposure to these hazards. |  |  |  |
| **Environmental:**   * **Dust, Fumes and Vapours**   Is it likely there will be airborne dust particles, toxic fumes or volatile vapours produced and therefore be present in the workspace? | 1. 3D Printer equipment is regularly maintained to help minimise the risk of exposures to these hazards. |  |  |  |
| 1. All 3D Printer maintenance is documented in an EMR. |  |  |  |
| 1. Staff and student training is provided to minimise exposure to these hazards. |  |  |  |
| 1. Sufficient natural ventilation is provided to the work area around the 3D Printer. |  |  |  |
| 1. All approved personal protective equipment (PPE) is used where required. |  |  |  |
| **Electrical:**  Can workers be injured by electrical shock due to working near or contacting with damaged or poorly maintained live electrical conductors such as power outlets, extension leads, safety switches, starters and isolators or casual water on the floor near the equipment? | 1. Visual checks are made of the power leads, switches and plugs on the 3D Printer. Internal electrical wiring and/or switches should be isolated and guarded. |  |  |  |
| 1. Electrical safety inspections, testing and tagging, etc. are completed regularly as per guidelines for all corded power equipment. |  |  |  |
| 1. Warning “Danger” tags (or similar) are affixed when the 3D Printer equipment under repair or maintenance preventing workers from using it. |  |  |  |
| 1. 3D Printer electrical maintenance is documented in an EMR. |  |  |  |
| **Exposure:**   * **Heat, Burns and** **Scalds**   Could the operator be exposed to heated elements or hot surfaces, exposed flame, molten material or hot fluids likely to cause scalding or burning?   * **Toxic Gases, Fumes and  Smoke**   Is it likely that the operator or others nearby could be exposed to hazardous or toxic chemicals such as volatile gases or airborne particulates such as dusts, smoke and fumes? | 1. 3D Printers are regularly cleaned and maintained to help minimise the risk of exposures to these hazards. |  |  |  |
| 1. Hazardous substance risk assessments are completed for potentially toxic moulded plastic materials and for any toxic gasses and fumes resulting from the heating process. |  |  |  |
| 1. Staff and student training is provided to minimise exposure to these hazards. |  |  |  |
| **Ergonomics and**  **Manual Handling:**  Can the plant be safely operated, in a suitable location, providing clear and unobstructed access and preventing awkward postures? | 1. The CNC 3D Printer and work bench is planned and adjusted to a comfortable work height (where possible) thus minimising any unsafe or excessively strenuous manual tasks. |  |  |  |
| 1. Staff training is provided with regard to manual handling techniques and procedures to minimise exposure to these hazards. |  |  |  |

| **Other Hazards/Risks** | **Additional Control Measures** *These would relate to the specific student needs, locations and conditions in which you are conducting your activity.* |
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| **Approval** | | | |
| Submitted by: | | | Date: |
|  | Approved as submitted. | | |
|  | Approved with the following condition(s): | | |
|  | Not Approved for the following reason(s): | | |
| By: | | Designation: | |
| Signed: | | Date: | |

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| ITD staff members involved in the use of this risk assessment and the associated plant and equipment: | |
|  | *Signature:*  ……………………………….. *Date:*  *Signature:*  ……………………………….. *Date:*  *Signature:*  ……………………………….. *Date:*  *Signature:*  ……………………………….. *Date:*  *Signature:*  ……………………………….. *Date:*  *Signature:*  ……………………………….. *Date:*  *Signature:*  ……………………………….. *Date:*  *Signature:*  ……………………………….. *Date:* |

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| **Monitoring and Review** *This Plant and Equipment Risk Assessment is to be monitored and reviewed annually for a further four (4) years.* |

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| **Review 1:** | | **Yes** | **No** |
| * Are allocated risk levels and “Actions required” unchanged over the past 12 months? * Are Minimum Standards and Recommended Control Measures unchanged over 12 months? * ITD staffing details at this school have remained unchanged over the past 12 months? | |  |  |
| If the responses are “NO” for any question, record current details here, and list all staff changes *(with signatures)* | | | |
| Reviewed by: | Designation: | | |
| Signed: | Review Date : | | |

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| **Review 2:** | | **Yes** | **No** |
| * Are allocated risk levels and “Actions required” unchanged over the past 12 months? * Are Minimum Standards and Recommended Control Measures unchanged over 12 months? * ITD staffing details at this school have remained unchanged over the past 12 months? | |  |  |
| If the responses are “NO” for any question, record current details here, and list all staff changes *(with signatures)* | | | |
| Reviewed by: | Designation: | | |
| Signed: | Review Date : | | |

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| **Review 3:** | | **Yes** | **No** |
| * Are allocated risk levels and “Actions required” unchanged over the past 12 months? * Are Minimum Standards and Recommended Control Measures unchanged over 12 months? * ITD staffing details at this school have remained unchanged over the past 12 months? | |  |  |
| If the responses are “NO” for any question, record current details here, and list all staff changes *(with signatures)* | | | |
| Reviewed by: | Designation: | | |
| Signed: | Review Date : | | |

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| **Review 4:** | | **Yes** | **No** |
| * Are allocated risk levels and “Actions required” unchanged over the past 12 months? * Are Minimum Standards and Recommended Control Measures unchanged over 12 months? * ITD staffing details at this school have remained unchanged over the past 12 months? | |  |  |
| If the responses are “NO” for any question, record current details here, and list all staff changes *(with signatures)* | | | |
| Reviewed by: | Designation: | | |
| Signed: | Review Date : | | |