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| **Inventory of Work Activities** | | | | |
| **Reference Number:**  **(please refer to S&H RA Repository for next running number)** | | **22-0196** | **Division** | **POD** |
| **Title** | **[RaPID Project] Design and Development of Frozen Foodstuff Storage Box** | | | |

| Ref | Location | Process | Work Activity | Remarks |
| --- | --- | --- | --- | --- |
| 1 | RaPID Latitude (DV-AP-SRB1D) | System Design & Procurement | 1. CAD Drawing - System Architecture & Partitioning   Parts Acquisition.   1. Hardware fabrication and system integration 2. Soldering Operations |  |
| 2 | Collaborator’s Premises | Prototyping & Testing | 1. Installation of nitrogen (N2) Valve & Piping 2. Installation of Sensors & Controller 3. Hardware fabrication and system integration 4. Soldering operation 5. Assembly, testing and troubleshooting 6. Move and work in logistic area |  |
| \*add more rows if necessary.  \*\* Examples: Contents will be automatically deleted when new content is typed into the rows. | | | | |

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| **RISK ASSESSMENT** | | | | | | | |
| **[Reference Number](https://sitsingaporetechedu.sharepoint.com/sites/SH/Safety-Health-Management/Lists/RiskAssessmentTracker/AllItems.aspx" \o "Reference number generated from Central RA Repository)** | **22-0196** | | | **RA Leader:** | Kang Kiat Chuan | **Approved by:** | Daniel Mok |
| **Title:** | Design and Development of Frozen Foodstuff Storage Box | | | **RA Team:** | Lee Xiang Ting  Darryl Lam Wei Cheng  Aw Kok Seng | **Signature:** |  |
|  |  | | |  |  | **Designation:** | **Head of RaPID Centre** |
| **Division:** | POD | **Location:** | RaPID Latitude (DV-AP-SRB1D) & Collaborator’s Premises |  |  |  |  |
| **Last Review Date:** | **14/11/22** | **Next Review Date:** | **13/11/2025** |  |  | **Date** | **14/11/22** |

|  | **Hazard Identification** | | | **Risk Evaluation** | | | | **Risk Control** | | | | | | | |
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| **Ref** | **[Activity](#Activity" \o "Transfer activity listed from the Activity Form )** | **[Hazard](#Hazard" \o "Physical (e.g fire, manual handling), Mechanical (e.g. moving parts), Electrical (e.g. voltage), Chemcial (e.g. toxic), Biological (e.g. virus), Psychosocial (e.g. Fatigue) )** | **[Possible injury / ill-health](#Injury" \o "List all possible injuries/ ill-health (e.g. Musclo-Skeletal Disorder))** | **[Existing risk controls](#Exisiting" \o "Measures that are already in place, or required to be implemented to carry out the work activity. (Elimination, Subsitution, Engineering Controls/ Isolation, Administrative Control, PPE) )** | **[S](#Severity" \o "Severity Rating (1-5))** | **[L](#Likelihood" \o "Likelihood (1-5))** | **[RPN](#RPN" \o "Risk Prioritisation Number (RPN = S x L))** | **[Additional controls](#Additional" \o "Additional measures to be implemented to reduce the risk based on the risk evaluation. (Elimination, Subsitution, Engineering Control/ Isolation, Administrative Control, PPE))** | [**S**](#Severity) | [**L**](#Likelihood) | [**RPN**](#RPN) | **[Implementation Person](#Implementation" \o "Person incharged of the implementation of the additional controls)** | [**Due date**](#Date) | **[Remarks](#Remarks" \o "May highlight residual risk -  Remaining risk after implementation of risk controls, such risk should be acceptable and manageable.)** | |
| 1. System Design & Procurement (@ DV-AP-SRB1D) | | | | | | | | | | | | | | | |
| 1a | CAD Drawing - System Architecture & Partitioning  Parts Acquisition. | Ergonomic – prolonged computer usage. | Eye and muscle fatigue. | * Take periodic breaks to rest eyes and stretch legs. * Work in adequately lighted spaces. | 2 | 1 | 2 (L) | NlL | NA | NA | NA | NIL | NA | \*\*Residual Risk: To be constantly vigilant on the surrounding | |
| 1b | Hardware fabrication and system integration | Physical – high speed machine motion and chip formation. | Cuts and lacerations. | * Ensure that the safety guards of the rotating spindles or chucks are activated before operating. * Do not wear gloves when machine is operating. * Handle sharp materials and tools with anti-cut gloves. | 3 | 1 | 3 (L) | NlL | NA | NA | NA | NIL | NA |  | |
|  |  | Physical – loose workpiece clamping. | Cuts and Flying Debris impacts. | * Ensure that the workpiece is securely clamped. * Ensure that the vice or chuck keys are removed before starting. * Ensure that the chip guards are in position. * Wear safety goggles. | 3 | 2 | 6 (M) | 1. Designated work area with proper vice for securing work piece. 2. Ensure staff are brief of the PPE required (Eye, hand and foot personal protection) | 3 | 1 | 3 (L) | Site SIT representation. | On site |  | |
|  |  | Physical – sharp edges from tools and workpieces. | Eye injuries, cuts and abrasions. | * Wear Eye and Hand Personal Protective Equipment. * Use deburring tools. | 3 | 1 | 3 (L) | NlL | NA | NA | NA | NIL | NA |  | |
| 1c | Soldering operation | Physical – heat from soldering  . | Burns | * Ensure that the power supply is switched off during the setup. * Ensure that the soldering iron, the rework station and the hot air tube are resting in the holder when not in use. * Ensure that the soldering tools and electrical components are not wet. * Hold the solder tool only at the handle like a pen. * Hold the soldering iron with tweezers. * Turn off the rework station and the hot air tube when not in use. * Remove any excess soldering iron using the provided sponge. * Do not wear gloves. * Wear safety goggles. | 3 | 1 | 3 (L) | NlL | NA | NA | NA | NIL | NA |  | |
| 1. Prototyping & Testing (Collaborator’s Premises) | | | | | | | | | | | | | | | |
| 2a | Installation of liquid nitrogen (LN2) valve & piping | Physical – thermal burns due to extreme cold temperature | Skin injuries due to frostbite or cryogenic burns | * Installation to be done at well ventilated area * Operator/project staff to wear proper PPE including safety glasses w/ side shields, cryogen gloves, closed-toe shoes, long pants (no cuffs), lab coat or long sleeved shirt. * Thermally insulated hand tools to be used * Operator/project staff to be briefed of standard work procedure (SOP) before handling of valve and piping connection | 3 | 1 | 3(L) | NlL | NA | NA | NA | NIL | NA |  | |
| 2a | Installation of nitrogen (N2) valve & piping | Oxygen deficiency | Suffocation / Asphyxiation | * Oxygen deficiency monitoring device shall be installed within the project area. * Proper shut down of nitrogen source prior to start work. * Room air ventilation system or open-air work condition. | 3 | 1 | 3(L) | NlL | NA | NA | NA | NIL | NA |  | |
| 2b | Installation of sensors & controller | Electrical –  Defective or exposed electrical components. | Electrical shocks and electrical  Burns. | * Ensure that the power supply is switched off before conducting pre-use checks. * Conduct pre-use checks for defects or exposures before using electrical components. * Report any defective or exposed electrical components to the lab staff immediately. | 3 | 1 | 3 (L) | NlL | NA | NA | NA | NIL | NA |  | |
|  |  | Electrical – overloading circuits. | Fires. | * Do not use multi-plugs on power cords to prevent overloading. * Ensure that the power supply is switched off after using electrical equipment. | 3 | 1 | 3 (L) | NlL | NA | NA | NA | NIL | NA |  | |
|  |  | Electrical – short circuits. | Electric shocks. | * Conduct visual checks to ensure that no damage to the electrical insulations. * Cut off the power supply in the event of water spillage over electrical equipment. | 3 | 1 | 3 (L) | NlL | NA | NA | NA | NIL | NA |  | |
| 2c | Hardware fabrication and system integration | Physical – high speed machine motion and chip formation. | Cuts and lacerations. | * Ensure that the safety guards of the rotating spindles or chucks are activated before operating. * Do not wear gloves when machine is operating. * Handle sharp materials and tools with anti-cut gloves. | 3 | 1 | 3 (L) | NlL | NA | NA | NA | NIL | NA |  | |
| 2c | Hardware fabrication and system integration | Physical – loose workpiece clamping. | Cuts and Flying Debris impacts. | * Ensure that the workpiece is securely clamped. * Ensure that the vice or chuck keys are removed before starting. * Ensure that the chip guards are in position. * Wear safety goggles. | 3 | 2 | 6 (M) | 1. Designated work area with proper vice for securing work piece. 2. Ensure staff are brief of the PPE required (Eye, hand and foot personal protection) | 3 | 1 | 3 (L) | Site SIT representation. | On site |  | |
| 2d | Hardware fabrication and system integration | Physical – sharp edges from tools and workpieces. | Eye injuries, cuts and abrasions. | * Wear Eye and Hand Personal Protective Equipment. * Use deburring tools. | 3 | 1 | 3 (L) | NlL | NA | NA | NA | NIL | NA |  | |
| 2e  2e | Soldering operation  Soldering operation  **(Continue)** | Physical – heat from soldering  .  Physical – Heat from soldering | Burns  Burns | * Ensure that the power supply is switched off during the setup. * Ensure that the soldering iron, the rework station and the hot air tube are resting in the holder when not in use. * Ensure that the soldering tools and electrical components are not wet. * Hold the solder tool only at the handle like a pen. * Hold the soldering iron with tweezers. * Turn off the rework station and the hot air tube when not in use. * Remove any excess soldering iron using the provided sponge. * Do not wear gloves. * Wear safety goggles. | 3 | 1 | 3 (L) | NlL | NA | NA | NA | NIL | NA |  | |
| 2e |  | Physical – flammable materials. | Fires and explosions. | * Keep flammable materials away from the rework station. * Work on fireproof and/or fire-resistant surfaces. | 3 | 1 | 3 (L) | NlL | NA | NA | NA | NIL | NA |  | |
| 2e |  | Chemical – presence of toxic fumes and exposure via inhalation. | Toxication and Eye irritation. | * Switch on the fume extractor unit during the soldering. * Open area with good ventilation * Use only non-leaded soldering iron. * Wear safety goggles. | 3 | 1 | 3 (L) | NlL | NA | NA | NA | NIL | NA |  | |
| 2e | Soldering operation  (Continue) | Chemical – presence of deposit fumes and exposure via lead ingestion. | Toxication / Poisoning. | * Wash hands and arms with soap after the soldering. | 3 | 1 | 3 (L) | NlL | NA | NA | NA | NIL | NA |  | |
| 2e |  | Ergonomic – prolonged soldering. | Eye and muscle fatigue. | * Take regular breaks. * Change body postures during the soldering and conduct stretching exercises when resting. * Conduct the soldering under proper lighting and magnification. | 2 | 1 | 2 (L) | NlL | NA | NA | NA | NIL | NA |  | |
| 2f | Assembly, testing and troubleshooting | Physical – sharp edges and abrasive surfaces from cutting, smoothing, fastening, tapping and wiring tools. | Cuts and abrasions. | * Wear safety glasses, gloves and covered footwear. * Ensure that the workpiece is securely clamped. * Trained and experienced worker. | 3 | 1 | 3 (L) | NlL | NA | NA | NA | NIL | NA |  | |
| 2f |  | Physical – flying chips from hammering tools. | Bruises. | * Wear safety glasses and safety gloves. * Inspect the hammer head and ensure that it is firmly attached to the handle before using. | 2 | 1 | 2 (L) | NlL | NA | NA | NA | NIL | NA |  | |
| 2g | Move and work in logistic area | Contact with forklift, Pallet jack, EPJ, Reach truck | Bodily injuries | * Comply to warehouse safety requirement. * High visibility vest / Reflective vest. * Move in designated safe work path. * Proper barricade in work area. | 4 | 1 | 4 (M) | 1. Site familiarization before start work. 2. Obtain site supervisor approval before start work to ensure no vehicle will enter area. | 4 | 1 | 4(M) | Site SIT representation. | On site |  | |
| \*add/ delete rows if necessary.  \*\* Examples: Contents will be automatically deleted when new content is typed into the rows. | | | | | | | | | | | | | | | |

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| Level | Severity | Description |  | Level | Likelihood | Description |
| 1 | Negligible | Not likely to cause injury or ill-health. |  | 1 | Rare | Not expected to occur but still possible. |
| 2 | Minor | Injury or ill-health requiring first-aid only (includes minor cuts and bruises, irritation, ill-health with temporary discomfort). |  | 2 | Remote | Not likely to occur under normal circumstances. |
| 3 | Moderate | Injury or ill-health requiring medical treatment (includes lacerations, burns, sprains, minor fractures, dermatitis and work-related upper limb disorders). |  | 3 | Occasional | Possible or known to occur. |
| 4 | Major | Serious injuries or life-threatening occupational diseases  (includes amputations, major fractures, multiple injuries, occupational cancers, acute poisoning, disabilities and deafness). |  | 4 | Frequent | Common occurrence. |
| 5 | Catastrophic | Death, fatal diseases or multiple major injuries. |  | 5 | Almost certain | Continual or repeating experience. |

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| **Risk score** | **Acceptability of risk** | **Recommended actions** |
| Low  1-3 | Acceptable | No additional risk control measures may be needed.  Frequent review and monitoring of hazards are required to ensure that the risk level assigned is accurate and does not increase over time. |
| Medium  4-12 | Tolerable | A careful evaluation of the hazards should be carried out to ensure that the risk level is reduced to as low as reasonably practicable (ALARP) within a defined time period.  Interim risk control measures, such as administrative controls, may be implemented while long term measures are being established.  Management attention is required. |
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| High  15-25 | Not acceptable | High Risk level must be reduced to at least Medium Risk before work commences.  There should not be any interim risk control measures and risk control measures should not be overly dependent on personal protective equipment.  If practicable, the hazard should be eliminated before work commences.  Management review is required before work commences. |
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