PREVENTING AMPUTATIONS AT WORK

Solutioning Session on 24 May 2017

WSH Institute

Solutioning Session on Preventing Amputations at Work

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CONTENT

Solutioning Session on Preventing Amputations at Work 24 May 2017, 12:00PM

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EXECUTIVE SUMMARY

In 2016, amputation was the second highest type of major injury, after crushing, fracture and dislocation. There was a 22% increase in amputation cases – from 117 in 2015 to 143 in 2016. 61.2% of the 660 amputation cases from 2012 – 2016 were from the following sectors:

- Construction;
- Metalworking;
- Food Manufacturing; and
- Marine

The Workplace Safety and Health Institute (WSH Institute) in collaboration with the Ministry of Manpower (MOM) and supported by the Workplace Safety and Health Council (WSHC) conducted the WSH Institute Solutioning Session – Preventing Amputations at Work on 24 May 2017.

The objective of the session was to identify the root causes of amputation injuries and to collectively brainstorm on possible solutions to reduce such accidents.

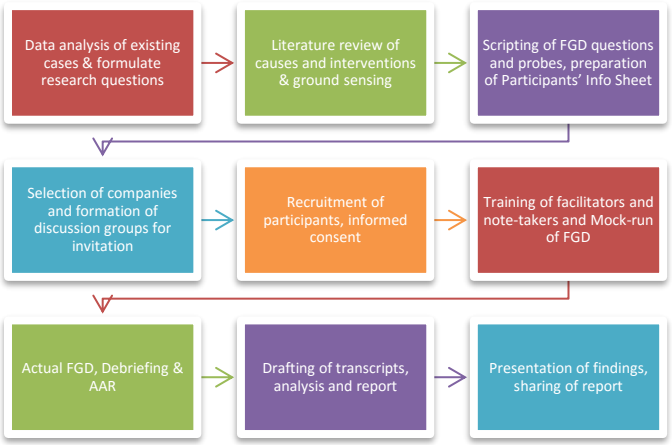
25 participants from 18 organisations were involved in the session. The participants represented management, WSH professionals, Union members, trainers, and members from the WSHC Metalworking and Manufacturing Committee and Crane Safety Taskforce.

The participants were divided into four groups, one for each of the four most common activities which contributed to 50% of these 660 amputation cases. These were:

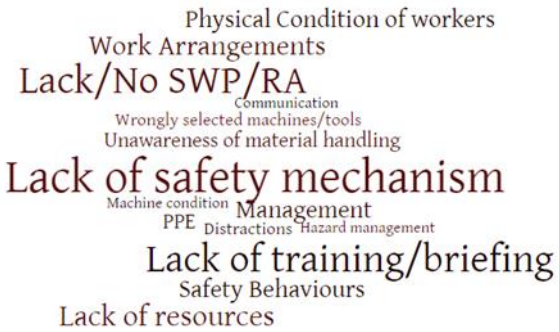
- Cutting;
- Lifting;
- Repair & maintenance; and
- Manual handling.

Each group worked through actual cases to identify the potential causes and possible solutions. For each proposed solution, participants provided further input on its potential impact and effort.

Methodology



Causes



Using the "5 Whys technique", the root causes for amputations were likely to be:

- lack of compliance of Safe Work Procedures (SWP);
- ineffective training;
- unguarded machines;
- poor identification of amputation hazard; and
- mindset that accidents would not happen to themselves.

Solutions

Participants concurred that the following measures would be both effective and practical in reducing amputation injuries:

1. On risk assessments:
   - consider amputation risk for all hazardous work activities; and
   - conduct Last Minute Risk Assessment (LMRA)
2. On Safe Work Procedures (SWPs):
   - include requirement to check that machines have proper safety fittings e.g. guards, laser sensors;
   - ensure that the correct tool is used for the job;
   - include instructions to keep hands clear from points of operation;
   - develop SWPs together with staff to instill ownership and develop a positive WSH culture;
   - use SWPs which are easy to follow e.g. pictorial instead of words; and
   - provide closer work supervision to ensure compliance of SWPs
3. On communication of amputation risk:
   - effectively communicate risks of amputation during training and safety briefings on a regular basis
4. Heavier punitive actions on companies violating safety rules and incentives for companies which abide.

The industry may consider these findings to identify control measures to minimise the risk of amputation injuries.

INTRODUCTION

According to data from the Workplace Safety and Health Report 2016, National Statistics, the number of major injury cases which were attributed to amputations[1] rose by 22%, from 117 major injury cases in 2015 to 143 major injury cases in 2016. In 2016, amputation was the second highest type of major injury, after crushing, fracture and dislocation.

61.2% of the 660 cases reported from 2012 to 2016 were from these four sectors:

- Construction;
- Metalworking and manufacturing;
- Food and Beverage; and
- Marine

The top four work activities that led to nearly 50% of amputations were:

- Cutting;
- Lifting;
- Repair & Maintenance; and
- Manual Handling

The analysis also revealed that 55% of the cases were contributed by unsafe workplaces or inadequate safety provisions. These included unguarded machines, improper equipment or lack of safe work procedures. 36% of cases were attributed to workers' unsafe acts such as clearing machines while it was still running.

[1] These workers suffered from complete loss or loss of use of any member/part of a member of the injured person's body

PURPOSE OF SESSION

The session was to seek key stakeholders' views on measures to prevent amputations in four sectors where such injuries were most prevalent i.e. Construction, Metalworking and manufacturing, Food and Beverage and Marine.

METHODOLOGY

To achieve this, the WSH Institute applied qualitative research methods. Fig. 1 illustrates how the entire qualitative study was planned out.

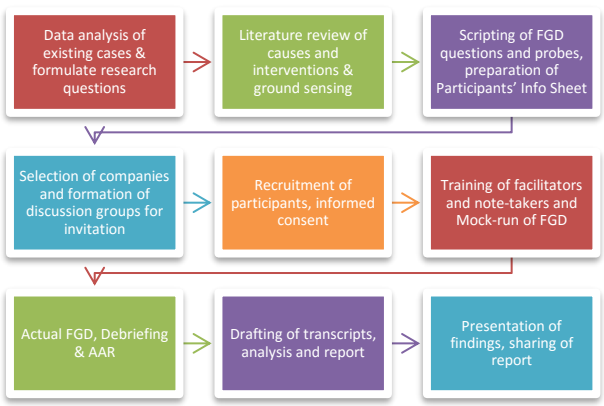


Fig.1: Overview of study methodology

25 participants from 18 organisations participated in the session, representing management, WSH professionals, Union members and WSH course trainers from the four sectors. Members of the WSHC (Metalworking) Committee and WSHC Crane Taskforce also participated.

Participants were assigned to one of four discussion groups, with each group consisting of at least one representative from each stakeholder group.

Fig.2: FGD in session

Each group discussed causes and solutions to prevent amputations arising from one work activity. The activities covered included lifting, cutting, repair and maintenance, and manual handling. The session was moderated by 8 trained in-house facilitators and note takers from the Occupational Safety and Health Division (OSHD), MOM. For the first half of the session, the "5 Whys technique" was used to draw out the root causes for the following factors:

- Management;
- Man;
- Machine;
- Method; and
- Materials

In the second half, participants brainstormed on possible solutions, guided by the Hierarchy of Controls[2]. They were then asked to rank the solutions into a 2 by 2 matrix, taking into consideration the effort needed and its potential impact.

All participants were provided with a Participant's Information Sheet (in English) and their roles were explained to them before the start of the session. Consent was also sought for audio recordings during the session.

[2] List of control measures, in priority order, to eliminate or minimise exposure to the hazard. Accessed on 19 Oct 2017 at http://www.saunions.org.au/ohs/hierarchy_of_controls.htm

FINDINGS

1. PROBABLE CAUSES OF AMPUTATIONS AT WORK

The following table captures the discussion on the probable causes leading to amputations at work.

Table 1: Probable causes of amputations at work

Causes	Views
Management	
Weak risk management	Risk assessment (RA) may either not be conducted or not translated adequately into Safe Work procedures (SWPs). SWPs may also not be available. Where RA is conducted and SWPs are available, the amputation risk may not be identified for prevention.
Focus on business targets	If workers were asked to focus on meeting companies' tight businesss timelines and key performance indicators (KPIs), this may lead to workers rushing to complete their tasks, potentially working overtime and experiencing fatigue, thus increasing their amputation risk. The US Department of Labor[5] had also stated that a majority of amputation cases were because workers were rushing.
Lack of communication on amputation risk	There was a possibility that workers may not have been informed of the amputation risk resulting in them failing to recognize the risk when performing their tasks. The group opined that effective and regular communication of such risks would lead workers to embrace a safety-conscious mindset, leading to a safety-conscious culture in the organisation.
Poor supervision	Poor supervision was viewed as one potential attributable cause. Supervisors may not closely monitor whether their workers are fatigued or complying with the SWPs.
Man	
Unsafe behaviours	Complacency was identified as one potential cause for amputations, especially for organisations which had not experienced an accident previously. This may result in workers taking shortcuts when performing their tasks.

Ineffective training	If workers were not effectively trained or briefed on the hazards that were present around their work area or when performing tasks, they would be at higher risk. As high quality training is important, there would be a need to ensure that there is no potential conflict of interest when assessing competency following training. It was identified that for courses organised by some Approved Training Providers, there was a potential conflict of interest as the trainer was also the assessor.
Distractions and carelessness	Other potential risks are workers not being focused on the task at hand and carelessness. This would be compounded if workers are fatigued due to long working hours and rushing.
Machine	
Unguarded machines	Participants viewed that unguarded machines were an important cause of amputations. In some cases, workers may feel that the safety guards impede their work and thus remove them.
Poor machine design	The group cited that existing machines may lack safety features such as: 1. Secure clamp; 2. Guards; 3. Safety switches or emergency stop switches; and 4. Interlocking devices. In some cases, existing machine designs may have guards that could be easily removed and safety devices which can easily be immobilised.
Poor machine maintenance	Participants also shared that workers could have been asked to work with machines which were in poor condition or were poorly maintained. For example, the machine may stop and start suddenly, increasing the frequency for trouble-shooting, thus translating to increased risk of amputations if SWP is not complied with.
Lack of consideration on man-machine compatibility	Mismatch between the anthropometry of the worker and the machine may result in wrong postures which could result in loss of balance, and poor hand grip which could result in slipping, thus causing the body to be at risk if there are moving machine parts nearby.
Method	
Inappropriate material handling	Inappropriate handling of materials and lack of use of suitable aids when handling materials could potentially cause amputations.

	The reasons behind this could include the lack of awareness of a hands-free solution, insufficient numbers of lifting devices to meet demand or ineffective training or supervision on the correct handling technique.
Inappropriate personal protective equipment (PPE) issued	For certain tasks, inappropriate gloves could have been provided e.g. using cotton gloves instead of chainmail gloves during cutting. When working with moving machine parts, gloves should not be worn.
Wrong tool	Wrongly selected or improper tools used for the task could be one cause for amputations. For example using band saws to make small cuts instead of using slicers. It could also be attributed to non-compliance with SWP or poor quality SWP, poor supervision and ineffective training.
Materials	
Poor grip	Workers were sometimes provided with materials that were slippery in nature or irregularly shaped causing workers to lose their grip.

The word cloud generated from the notes of the FGD depicts the discussions on causes of amputations. The size of the word provides an indication of the frequency the various terms were mentioned by the discussion groups.

The top three issues highlighted by participants were:

1. poor risk management;
2. use of unsafe or improper machines/tools; and
3. lack of training of workers.

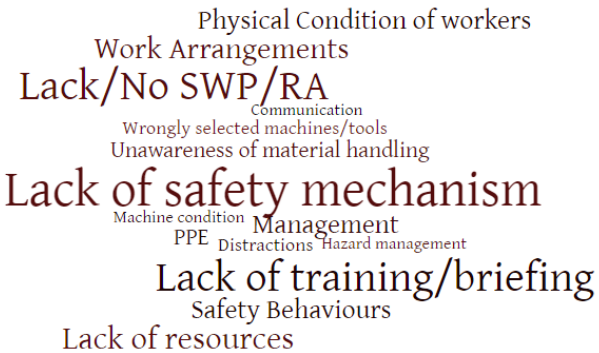


Fig.3: Word cloud on causes of amputations

Using the "5 Whys technique", the following were identified as the likely root causes for amputation injuries:

- Lack of compliance of Safe Work Procedures (SWP);
- Ineffective training;
- Unguarded machines;
- Poor identification of amputation hazard; and
- Mindset that accidents would not happen to themselves.

2. SOLUTIONS TO REDUCE OR ELIMINATE AMPUTATIONS AT WORK

The following table captures the discussion on possible solutions to reduce amputation injuries, guided by the Hierarchy of Controls.

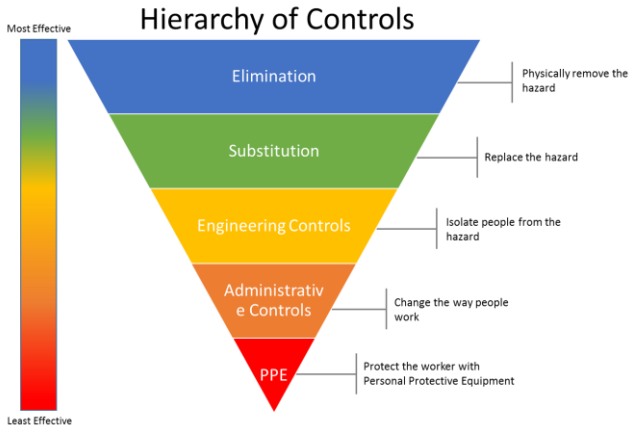


Fig.4: Hierarchy of Controls

Table 2: Solutions to reduce or eliminate amputations at work

	Solutions
Substitution	Machinery manufacturers could ensure that their machines are safe for use, either by not selling one without safety features or having a low pricing differential between a basic machine and one with safety features. This would then encourage companies to purchase machines with safety features. When designing machines, manufacturers could also ensure that guards cannot be removed easily and do not impede work, and safety features also cannot be easily disabled.
Engineering Controls	Companies could: ▪ incorporate safety features into existing machines e.g. auto clamp, auto lock and/or two hand switches, light sensors, laser sensors and safety guarding ▪ automate or re-organise processes to reduce interaction between human and machines

	▪ make use of simple inexpensive mechanical aids e.g. use of jigs when cutting. ▪ where none are available, companies can encourage their workers to design suitable solutions.
Administrative Controls	Proper supervision is important to ensure that workers use the correct equipment for their job task e.g. when making small precision cuts, to use slicers instead of saw machines which are meant for making big cuts. Management should recognise that a safe organisation would lead to better business. They could do the following to develop a positive WSH culture: ▪ require the conduct of Last Minute Risk Assessment (LMRA) before the start of every job, contextualised to that day's work conditions; ▪ involve workers and senior management in accident investigations and development of risk assessments and SWPs; and ▪ encourage feedback from workers on unsafe work practices and unsafe conditions. SWPs to include health advisory which highlights that workers who are unwell e.g. feeling giddy should inform their supervisors. Instead of wordy SWPs, SWPs could be pictorial and in different languages to increase compliance. Management could also consider in-house training for new workers, supplementing general safety training courses. Machine operation training and manuals should include information on possible safety hazards during use. Safety awareness briefing should be conducted to familiarise new employees even if they have used the same machine in their previous jobs. Allocate sufficient resources to ensure that workers need not take short-cuts or sacrifice sleep to attain their job targets. Monitor workers' behaviour to ensure that they are not engaging in activities such as problem gambling, drinking etc. To reduce distractions and to enhance the physical work environment: ▪ remove sources of distraction such as mobile phones (which can be placed in their lockers) to enable workers to focus on their work; ▪ implement job rotation to prevent boredom; ▪ provide sufficient time for rest; ▪ ensure adequate lighting in work zone; and ▪ ensure floors are not slippery. Penalties could be imposed on employees who violate safety rules and/or incentives could be given to encourage safe behaviour.

PPE	Ensure gloves are not used when working with moving machine parts. Check with PPE supplier for the correct type of PPE e.g. chainmail gloves when operating cutting machines.
Others	Government could explore tax incentives e.g. ▪ tax rebates when meeting pre-determined KPIs; ▪ tax rebates for use of technologies in accident prevention. Stricter enforcement by Government (i.e. more inspection presence) would also be helpful, while recognising the limitations. For sustainable change, to encourage companies to build WSH ownership, focusing on companies which still engage in unsafe practices despite being aware of safety requirements. It was also viewed that there was a lack of clarity in the Approved Codes of Practice (ACOP) e.g. the maximum weight one can carry a load would need to be clearer. (Based on pre-FGD analysis, there were cases where workers' fingers were crushed when they dropped the load they were carrying, resulting in amputations.) To de-conflict the roles of trainer and assessor in approved training courses so as to improve confidence on the quality of training.

The word cloud generated from the notes of FGD depict the discussion points on the possible solutions to prevent amputations. The size of the word provides some indication of the frequency the various terms were mentioned in the discussion.

It shows that training, leveraging technology, changing and improving machine design as well as reviewing RA and SWP are areas to focus on to prevent amputations at work.

Fig.5: Word cloud on solutions to amputations

RANKING OF SOLUTIONS

After listing out the solutions, participants were asked to group and rank the solutions taking into consideration the impact and effort needed in a 2 by 2 matrix (See Annex A)

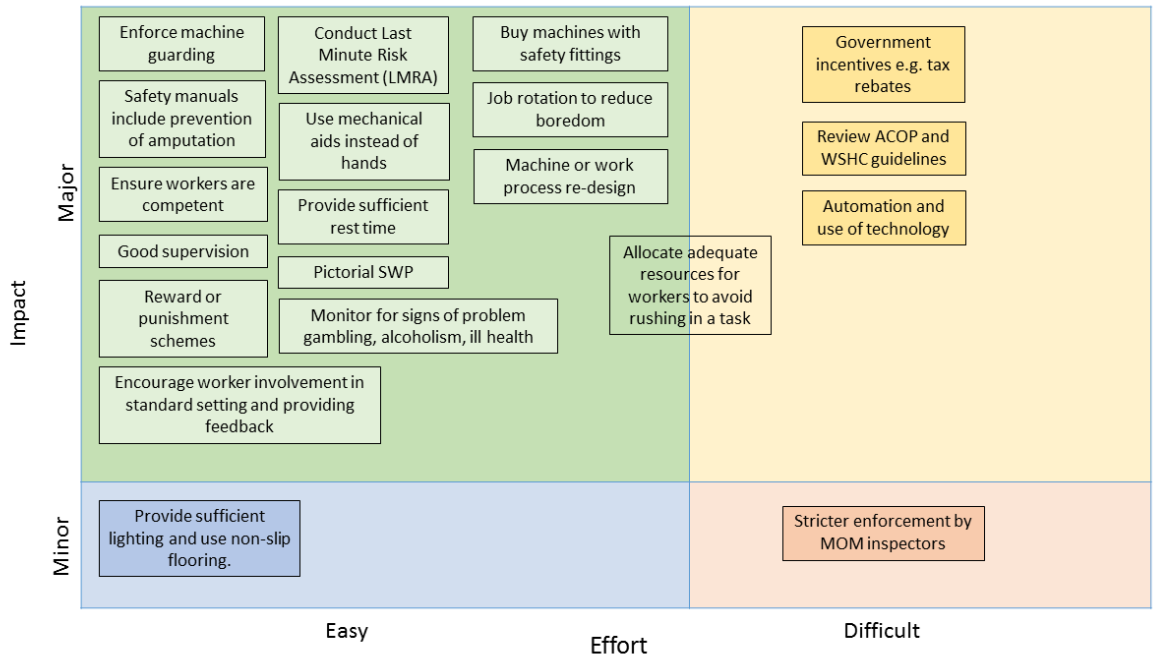


Fig.6: Convergence of solutions

DISCUSSION AND CONCLUSION

Prevention of amputation injuries starts with the recognition of the risk. One root cause which the participants identified was the failure to identify the amputation risk. This lack of awareness would translate into a lack of implementation of preventive measures, thereby increasing the risk of amputation injuries.

Another root cause identified was unguarded machines, consistent with a report from the US Department of Labor which stated that 25% (n=861) of amputations were caused by absence of guarding on the machines. Besides not purchasing machines with guards, participants opined that unguarded machines could be a consequence of poorly designed guards, guards which impede work and/or guards that can be easily removed.

Aside from the safety design of the machine, participants also viewed that inadequate training, lack of compliance of SWPs, and the mindset that accidents cannot happen to themselves were other root causes for amputations.

As part of the discussion, participants were also asked to brainstorm for solutions, referencing the case studies provided. 14 out of the 20 (70%) solutions identified were assessed to require low effort but able to deliver high impact outcomes. Among these, included solutions to improve compliance of SWPs, conducting last minute risk assessments (LMRA), improving supervision, etc. See Figure 6.

Participants also highlighted that companies could make use of readily available and simple mechanical aids such as trolleys or portable vacuum lifts. Potential reasons for the low usage of such equipment was the lack of awareness of these devices or the perception that such tools would substantially increase operational costs.

Participants recognised that to effectively prevent amputations, it requires the concerted effort of everyone in the value chain - workers, employers, WSH Officers, machinery manufacturers, trainers and enforcers, each working on areas within their circle of influence. By bringing all relevant parties together in this Solutioning Session, we had provided a platform for all parties in the value chain to exchange opinions, share experience and provide ideas, all focused on identifying solutions to prevent amputation injuries.

We hope that employers, workers, WSH Officers, machinery manufacturers, trainers and enforcement officers find the proposed solutions suitable for implementation to prevent amputations at work.

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ACKNOWLEDGEMENTS

WSH Institute would like to thank the following organisations and persons for their contributions to this Solutioning Session.

Participating Organisations

18 organisations from the following sectors took part in this session. Numbers in brackets indicate the number of companies which took part.

1. Construction and Landscape (6)
2. Food, Beverages and Tobacco (2)
3. Marine (5)
4. Metalworking and Manufacturing (4)
5. Professional Organisation (1)

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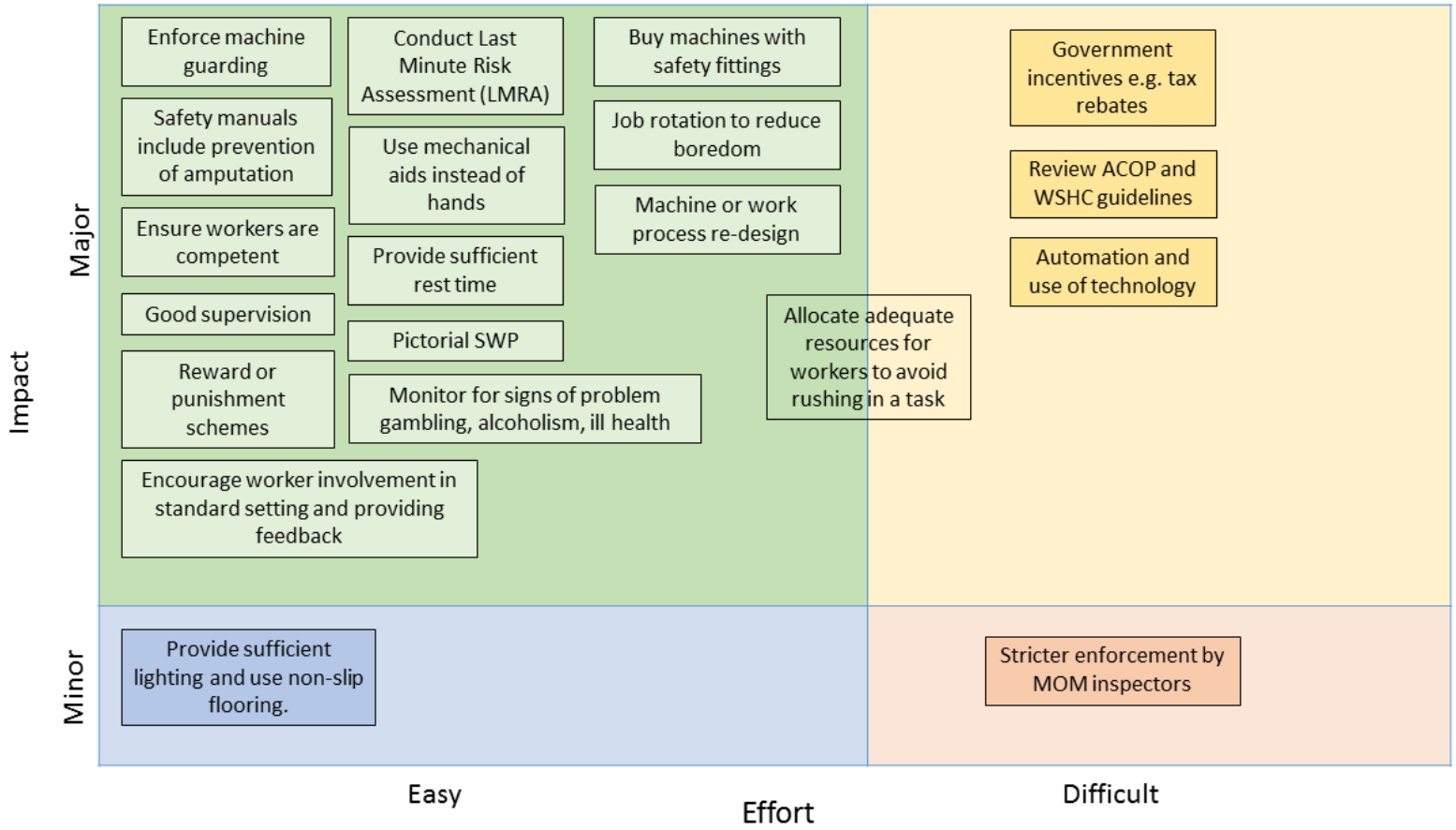
Annex A – RANKING OF SOLUTIONS USING 2 BY 2 MATRIX



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