RESEARCH REPORT

Development of hazardous manual task risk assessments

FOR USE IN AOTEAROA NEW ZEALAND

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Te Kāwanatanga o Aotearoa
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WORKSAFE
Mahi Haumaru Aotearoa

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EXECUTIVE SUMMARY

Background and purpose

There is a need to improve hazardous manual task risk management in New Zealand. The *Code of practice for manual handling* (2001) is over 20 years old and needs updating. Resources and tools are needed that to help businesses, inspectors, and professionals from across the work health and safety disciplines to easily identify musculoskeletal risks and controls (WorkSafe New Zealand, 2024i).

WorkSafe New Zealand (2024i) reviewed forty-one hazardous manual task risk assessment methods or tools. The report recommended adopting the suite of tools from the Health and Safety Executive (HSE), in the United Kingdom (UK). These tools were selected as they provide a comprehensive approach to address the risk factors associated with hazardous manual tasks.

A staged approach was used to develop the first set of tools for use in Aotearoa New Zealand. The purpose of this report is to outline the process undertaken at Stage 1. This involved the development of manual handling screening tools, a risk assessment tool, and a more detailed contributing factors checklist. It also aims to provide an important record of the logic behind why decisions were made during the development of these tools.

Method

The HSE confirmed that the tools could be adapted to make them relevant for New Zealand. A review of the HSE tools occurred and initial drafts developed. Two introductory sessions were held with internal and external stakeholders to check if the tools would be useful. The first was with WorkSafe Health Inspectors, and the second with a group of Occupational Health Nurses. This led to the tools being trialled at 6 workshops across New Zealand, with 203 work health and safety specialists. Feedback resulted in further tool development and the final versions published in August 2024.

Outcomes

The HSE simple manual handling risk filters (Health and Safety Executive, 2016b, 2016d) were adapted and became the New Zealand manual handling screening tools (WorkSafe New Zealand, 2024e). These can be used for lifting and lowering, carrying, pushing and pulling, and manual handling-while-seated. These are quick and easy to use to help identify tasks that are low-risk, or if further assessment is needed.

The New Zealand Manual Handling Assessment Charts (NZMAC) (WorkSafe New Zealand, 2024g) was developed from the HSE Manual handling assessment charts (MAC) (Health and Safety Executive, 2019). The NZMAC can be used to assess lifting and lowering, carrying, and team handling tasks. This is a detailed assessment method that identifies high-risk manual handling tasks.

The ‘Contributing factors for musculoskeletal risks checklist’ (WorkSafe New Zealand, 2024b) is a comprehensive approach that was developed to identify contributing factors that may not be covered in the NZMAC.

Conclusions

There was a clear need to provide New Zealand businesses, inspectors, and those working across the health and safety disciplines with up-to-date, quick and easy to use, but scientifically robust manual task risk assessment tools. Research showed that the HSE suite of tools from the UK would be the most suitable. Adaptation of these tools occurred, and effort was made to better include the range of contributing risk factors, particularly psychosocial risk factors, associated with WRMSDs. The risk assessment tools should be used as part of a health risk management approach and require worker engagement and participation.

Recommendations

There is still much to be done to provide additional resources to assist businesses to better manage the musculoskeletal risks that workers are exposed to. The development of online tool tools, case studies, additional resources and training are some of the proposed next steps. To ensure a full set of New Zealand resources the continued development of upper limb and pushing and pulling risk assessment tools (Stages 2 and 3) is necessary. This work needs to be supported by an updated or new *Code of practice for manual handling* and ongoing awareness and development of other tools.

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1.0
Background and purpose of this report

This report outlines the development process of the New Zealand manual handling screening and risk assessment tools. And it provides a record of the logic behind why specific changes to the HSE tools were made.

There is a need to improve hazardous manual task risk management in New Zealand. The *Code of practice for manual handling* (Department of Labour *et al*., 2001) is over 20 years old and needs updating. Resources and tools are needed to help businesses, inspectors, and professionals from across the work health and safety disciplines to easily identify risks and controls (WorkSafe New Zealand, 2024i).

Businesses have a primary duty of care under the Health and Safety at Work Act (2015) and this includes the management of musculoskeletal risks. Following the hierarchy of control measures will help businesses to manage their musculoskeletal risks. Where practical, higher order controls such as removing the risk altogether (elimination) should be considered first. If not possible, using substitution or engineering controls to minimise the risk will be the next most effective control. Within New Zealand we have depended on manual handling training as a control. But research indicates that relying solely on manual handling training as the only control is not effective. It does not reduce the exposure to the risk and is not effective in preventing musculoskeletal disorders. Risk assessments allow businesses to identify and focus on the areas where the risk is greatest to implement effective controls (Heads of Workplace Safety Authorities, 2022).

This report follows on from the work completed by WorkSafe New Zealand (2024i) that reviewed forty-one hazardous manual task risk assessment methods or tools. A shortlist was developed and included a range of tools from four different organisations and two independent tools. The shortlist was based on:

- coverage of the contributing risk factors for work-related musculoskeletal disorders – biomechanical/physical, work organisation, environmental, psychosocial, and individual factors
- the selection criteria – scientifically robust, quick and easy to use (intuitive), well established/familiar, immediately available, and training support and resources available
- a user trial, and
- professional experience.

WorkSafe New Zealand (2024i) recommended adopting the suite of tools from the Health and Safety Executive (HSE), United Kingdom (UK) as they provide a comprehensive approach to address the risk factors associated with hazardous manual tasks. One of the limitations of these tools is that they mainly focus on physical risk factors, with limited consideration of work organisation or psychosocial factors. The referencing to 'Manual Handling Operations Regulations 1992' (Health and Safety Executive, 2016b) could also be confusing for a New Zealand audience. Despite these limitations, they were viewed as the most suitable tools for use in New Zealand.

2.0
Using a staged approach to develop the tools

IN THIS SECTION:

2.1 Three key development stages were identified

There are many tools in the HSE suite that cover different manual tasks, so a staged approach was needed to adapt them for use in New Zealand. The priority was given to the types of activities that commonly occur in businesses:

- Stage 1 – manual handling activities:
  - HSE risk filters (lifting, carrying, pushing/pulling, manual handling-while-seated)
  - Manual handling assessment charts (MAC)
  - Full or detailed manual handling risk assessment tools (lifting, carrying, pushing/pulling).
- Stage 2 – repetitive upper limb activities:
  - Upper limb risk filter
  - Assessment of repetitive tasks (ART) tool
  - Detailed upper limb risk assessment.
- Stage 3 – manual handling activities (pushing and pulling):
  - Risk assessment of pushing and pulling (RAPP) tool
  - Detailed risk assessment for pushing and pulling.

There may also be future stages needed. For example, in 2023 the HSE developed the *Back Injury Risks in Driving (BIRD)* tool to help businesses consider and manage musculoskeletal disorders and whole-body vibration from driving (Health and Safety Executive, 2023). This report will only outline the development process for Stage 1 as these tools were completed and published on the WorkSafe website in August 2024.

2.2 Reasons for selecting the tools at the different stages

The HSE simple manual handling risk filters, MAC, and full manual handling risk assessment checklists, are referred to in the Manual Handling Operations Regulations 1992, (Health and Safety Executive, 2016b). These tools were selected for development first, in Stage 1. This was because manual handling tasks are the most easily recognised and are the source of the most harm. Of the HSE tools they are also the most established with recent updates of the Manual Handling Operations Regulations 1992 occurring in 2016 and MAC updated in 2019. Within New Zealand the *Code of practice for manual handling* (Department of Labour *et al*., 2001) is over 20 years old, is out of date with current legislation, and no longer reflects good practice in musculoskeletal risk assessment. To address the high rates of harm, better tools for New Zealand businesses to use was considered key.

Manual handling is a commonly used term in New Zealand. It refers to the transporting or supporting of a load by hand or bodily force. It includes lifting, lowering, pushing, pulling, moving or carrying a load (person, animal, or thing), (Health and Safety Executive, 2016b; Safe Work Australia, 2016). Safe Work Australia (2016) suggest that manual handling (or manual tasks) may be considered hazardous when one or more of the following characteristics are present:

- high, sudden, repetitive, or sustained forces
- repetitive movements
- sustained or awkward postures, or
- exposure to vibration.

For the purposes of the initial research and the tool development process, the manual handling tasks were split into two categories: lifting and carrying and pushing and pulling. This made it easier to identify risk assessments that focussed on each task type. The pushing and pulling screening tool was developed in Stage 1 because it was part of the HSE simple manual handling risk filters, and it made sense to develop these at the same time. The pushing and pulling risk assessment was selected for development last (Stage 3) because the HSE are currently reviewing the (RAPP). To make the best use of WorkSafe resources this was scheduled last. This meant that Stage 2 was the adaption of the upper limb screening and risk assessment tool (ART).

3.0
Stage 1: Developing the manual handling tools

IN THIS SECTION:

3.1 Adapting the HSE manual handling tools

At Stage 1 the manual handling tools from the HSE that were reviewed and adapted were the:

- simple manual handling risk filters (lifting/lowering, carrying, pushing/pulling, handling while seated) (Health and Safety Executive, 2016d)
- manual handling assessment charts (MAC), (Health and Safety Executive, 2019)
- full manual handling risk assessments: as outlined in the Manual handling operations regulations 1992 and available online (Health and Safety Executive, 2016a).

Figure 1 shows different types of manual handling and repetitive upper limb tasks, and the matching screening and risk assessment tools. These manual tasks could be considered hazardous if certain characteristics are present. For example, there are high, sudden, repetitive, or sustained forces, there are repetitive movements, sustained or awkward postures, or exposure to vibration. The figure shows Stage 1 tools (white boxes) and (in grey) those to be developed at later stages. It also shows the relationships between the screening tools (risk filters), risk assessment tools and the contributing factors checklist.

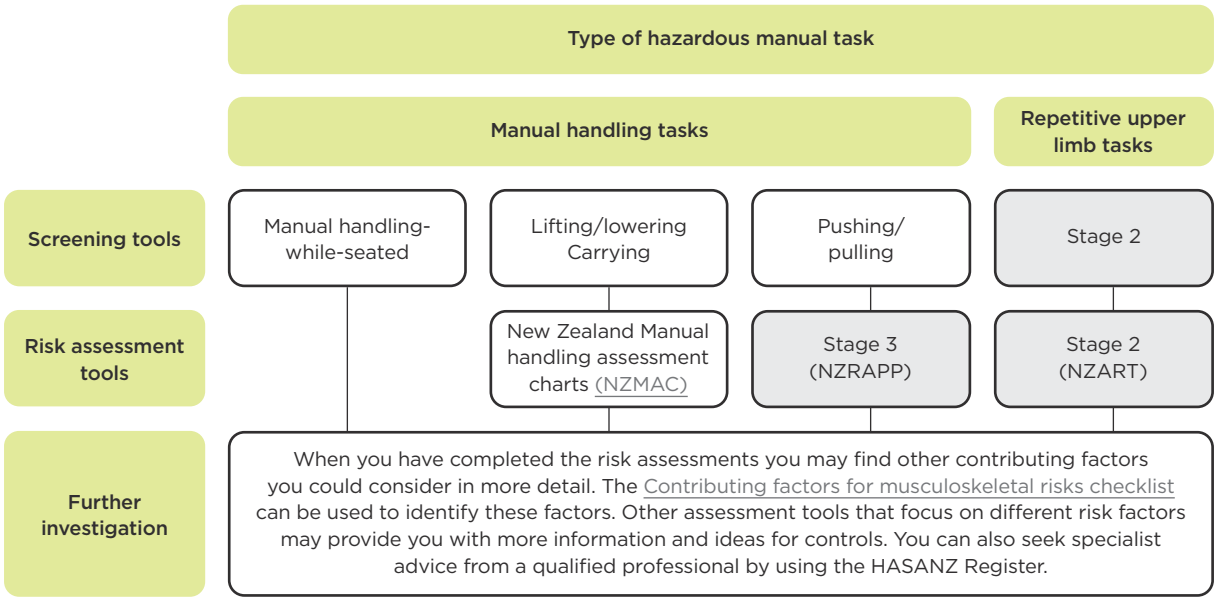


FIGURE 1: Hazardous manual task screening and risk assessment tools for completion in Stage 1, with Stage 2 and 3 plans

3.2 The development activities

Within Stage 1 several activities occurred (shown in Figure 2). These were:

- Initial tool development. To determine if the tools could be adapted, and the development of New Zealand prototypes Section 3.3
- Initial training development and delivery. To test with a small group of WorkSafe inspectors and occupational health nurses that the tools would be suitable for use in New Zealand Section 3.4
- Workshop delivery to occupational health professionals. This group were selected first as they were likely to have a good base level of knowledge about work-related musculoskeletal risk factors. The purpose was to trial the first drafts of the tools and gain feedback from participants, while simultaneously educating them in how to use the tools. Feedback informed further refinement and tool development Section 3.5

- Final review, editing, and publication of the tools. Following careful consideration of workshop feedback and further editing, the tools were ready to be published Section 3.6

The following sections will contain more detail about each of these activities.

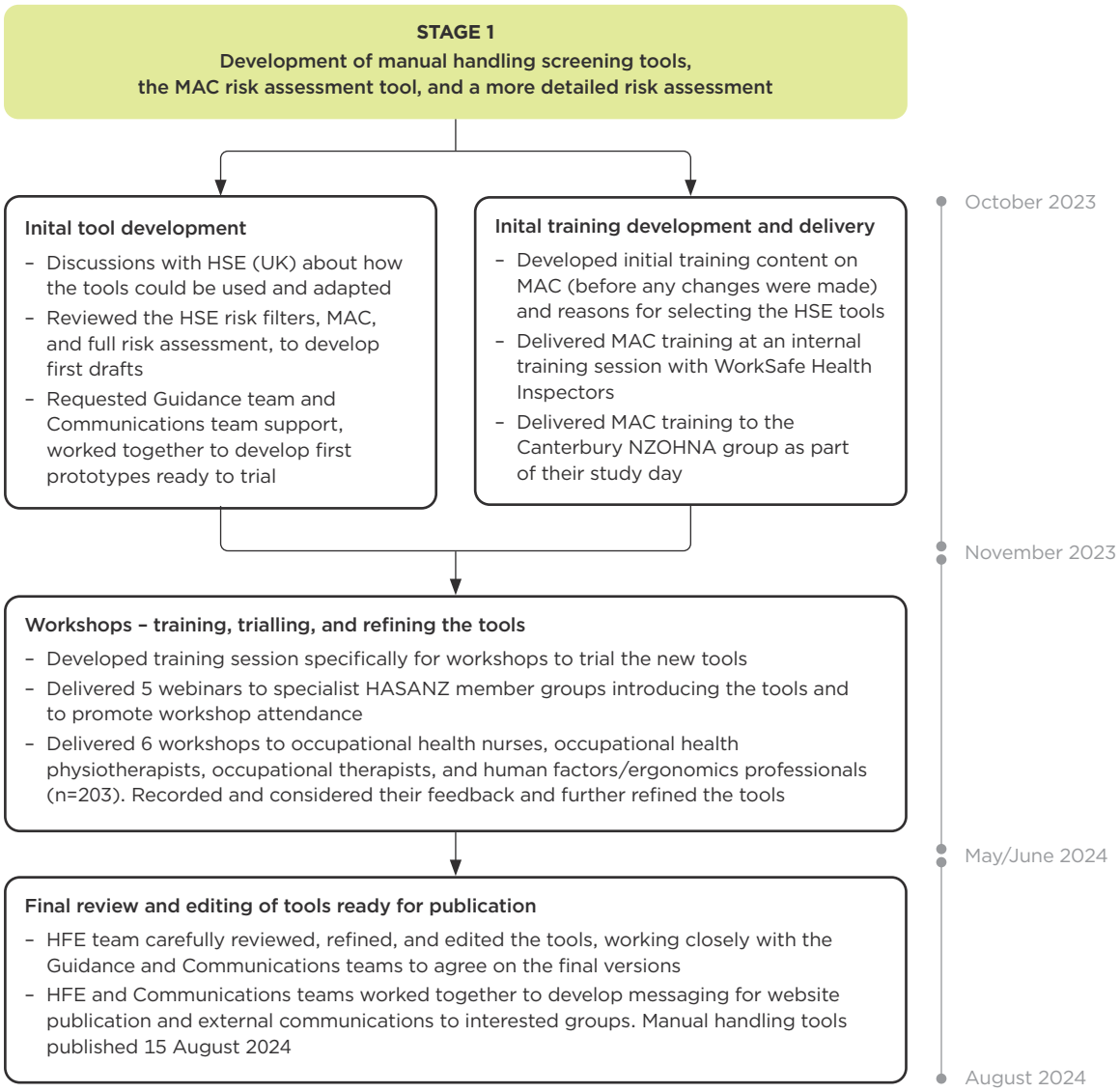


FIGURE 2: Outline of the Stage 1 manual handling tools – development process and timeline

3.3 Initial tool development

Discussions with the Health and Safety Executive (HSE)

The Human Factors/Ergonomics (HFE) team contacted the Human Factors Team Leader at the Health and Safety Executive (HSE) and held initial discussions with them about our plans to develop the HSE suite of tools. It was established that we could use and adapt the content from the tools under the terms of the Open Government Licence. We would also need to ensure that acknowledgement of the information was provided in our documents.

During the development of the New Zealand tools additional meetings were held and emails exchanged to refine parts of the assessments. This was mainly

on technical aspects of the MAC assessment. Before the workshops a meeting to review aspects of the MAC tool occurred, with a final review meeting after the workshops to check on new issues discovered during tool trials.

Review of the tools – the internal development process

The HFE team began reviewing and developing initial drafts for the 'Simple manual handling risk filters', Manual Handling Assessment Charts (MAC), and the 'Full risk assessment' (or checklists) referred to in the Manual Handling Operations Regulations 1992 (Health and Safety Executive, 2016b).

3.4 Initial training development and delivery

The WorkSafe Guidance team reviewed and edited the first drafts of each of the tools. This was an extremely valuable step, applying a fresh perspective from novice users. The HFE and Guidance teams worked together through several iterations of the tools until the first draft was ready to be trialled.

The main recommendation from the *Review of hazardous manual task risk assessment* report (WorkSafe New Zealand, 2024i) was to use the HSE suite of tools within New Zealand. To test this thinking the HFE team ran a 2-hour session with the WorkSafe Health Inspectors in October 2023. The session covered:

- a brief introduction about the tools and their selection
- an introduction to the HSE risk filters and MAC tool, and
- a practical session to try and use the MAC.

The purpose was to gain their feedback on the tools from a general health and safety perspective, to see if they could easily learn how to use them, and their thoughts on how useful they would be for use in New Zealand.

The feedback from this session was positive. The Inspectors could see the benefit of the tools and despite only having a short session learning how to use them, they quickly picked this up. This session gave us the confidence to move forward with the next steps.

The HFE team were offered an external opportunity to initially introduce the tools to the Canterbury chapter of the New Zealand Occupational Health Nurses Association (NZOHNA). We delivered a 3-hour MAC training session in November 2023. It followed the same format as what was given to the WorkSafe Health Inspectors but there was an extra hour allocated for practising different scenarios using the MAC. We also had general discussions about the tool and gained feedback from participants. We were interested to understand:

- if participants had heard of, or used the MAC before the session, and their experiences of using it
- their thoughts on the type of training they received and how quickly it was to learn and use, and
- if they would be likely to use the MAC in their work.

The feedback from the session was very positive. Some participants had heard of or used the tools before and all could see the benefits of having these types of tools. Many had also thought of tasks they wanted to assess using the MAC. This feedback reinforced our thinking, that the HSE suite of risk assessment tools will be a practical and useful addition for New Zealand health and safety professionals. Although we also recognised their limitations and that other tools are available and might be more suitable depending on the situation.

On completion of these two sessions, we progressed with the next steps to adapt and develop New Zealand versions of the HSE suite of tools.

3.5 Workshops – training, trialling, and refining the tools

In May and June 2024, the HFE team worked with the NZOHNA to deliver 6, 4.5-hour workshops to 203 participants from a number of the work health and safety disciplines. Workshops were in Auckland (x2), Wellington, New Plymouth, Christchurch, and Dunedin. The purpose of the workshops (labelled Workshop 1) was to introduce the draft New Zealand versions of the manual handling screening tools and the MAC tool. Introductory webinars were delivered to these groups prior to the workshops (except for the occupational medicine groups) to introduce the topic and promote attendance.

The HASANZ specialist health and safety groups were targeted first. Workshop participants were associated with:

- New Zealand Occupational Health Nurses Association (NZOHNA) – 35.67%
- Physiotherapy New Zealand (Occupational Health Physiotherapy Group) (PNZ) – 28.07%
- Occupational Therapy New Zealand (OTNZ) – 16.96%
- Human Factors and Ergonomics Society of New Zealand (HFESNZ) – 6.43%
- New Zealand Occupational Hygiene Society (NZOHNS) – 0%
- The Australasian Faculty of Occupational and Environmental Medicine (AFOEM) of the Royal Australasian College of Physicians (RACP) – 0%
- Australian/New Zealand Society of Occupational Medicine (ANZSOM) – 0%.

Members of the Moving and Handling Association of New Zealand (MHANZ) were also invited to attend and made up 12.87% of the participants. 11.07% of participants were associated with other groups (for example, New Zealand Institute of Safety Management, (NZISM)), and 3.51% did not know.

These groups were considered first as they were likely to be familiar with musculoskeletal risks and able to pick up the tools and use them immediately. The workshops allowed for:

- participants to learn how to use the tools and be involved in the feedback and development process
- the tools to be trialled to support an iterative design process where participant feedback (both good and bad) helped to refine the tools (and training material). All types of feedback were encouraged. For example, if there were errors in the tools or training content, if there was too much or not enough information, if there were areas that were confusing or needed more explanation, and if the training was too fast or too slow.

During the workshops the HFE team manually recorded feedback and suggestions from conversations with the participants. At the end of each workshop the feedback was considered and if needed, changes to the tools, or training content were made. The workshops were held over 3 weeks and the content and tools evolved slightly over this time.

When the workshops were completed the HFE team held a debrief session and worked through the feedback. This ensured all feedback was considered and the necessary changes were made.

A survey run by the Research and Evaluation team was used to gather formal feedback at the end of each workshop. This included five questions about participant demographics and five statements about the workshop. 171 out of 203 participants completed the survey (84% response rate).

The participants were mostly experienced health and safety professionals with 5 years or more experience. They provided services to a wide range of industries, including the four high risk sectors of agriculture, manufacturing, forestry, and construction, plus healthcare.

About three-quarters of the participants had not used any of the tools before. Overall, participants were satisfied with the workshop, with most rating it as 'good/very good'. The responses show that the content was relevant, easy to understand, and useful. Most people thought the workshops were well delivered but future opportunities for improvement were identified. For more information on the survey questions and findings refer to Appendix 1

3.6 Final review and editing of tools ready for publication

The HFE team worked with the WorkSafe Designer in the Communications team to further develop and refine the tools in line with the WorkSafe design guidelines. This process occurred over several weeks to carefully check for errors and that the tools were usable following any changes to wording or content. Further checks were made with the HSE on some of the technical aspects of the MAC that had been raised at the workshops. This resulted in several iterations of the tools over this time. A final review of each of the tools occurred, before they were published.

4.0 Development of the manual handling screening tools

IN THIS SECTION:

The New Zealand manual handling screening tools were developed from the HSE ‘simple manual handling risk filters’.

4.1 Initial tool development – reviewing the HSE risk filters and the development of the first draft of the New Zealand manual handling screening tools

The HSE risk filters were reviewed, and initial drafts were developed by the HFE team. An introductory document provided an overview of the screening tools and how to use them with tools to screen the following types of manual handling tasks:

- lifting and lowering
- carrying
- pushing and pulling
- handling-while-seated.

Initial conversations with the WorkSafe Guidance team found that the term ‘risk filter’ should not be used as it would be unlikely that novice users or non-experts would know what the term meant. This led to the use of the term ‘screening tools’ being used from an early stage and clearly describes the function of the tools. For example, screening the manual handling activity to determine if the task is low risk and no further action is needed, or, if the activity exposes some workers to a risk of injury and a more detailed assessment is needed.

The Guidance team reviewed and edited the initial drafts. At this stage the tools included instructions about how to use them, text outlining the screening conditions, and decision flowcharts to help users identify if the relevant conditions were met or not.

The conditions for each of the screening tools were made into flowcharts to help users decide if the conditions were met or not. The idea being that users work through conditions step by step. If the response to a question was ‘yes’, the user would carry on to the next question. If ‘yes’ is answered to all questions the risk of injury is considered low, and no further action is needed. If at any point the user answers ‘no’ the flowchart refers them to the recommended risk assessment they should use to better understand the musculoskeletal risk. The HFE and Guidance teams worked on each of the screening tools until they were ready to be trialled.

4.2 Workshop feedback – trialling and refining the manual handling screening tools

As outlined in Section 3.5 we delivered 6 interactive workshops to both educate users, and to trial the tools. Their practical nature allowed participants to discuss and use the tools in small groups. The HFE facilitators engaged with participants when working in the smaller groups and were available to answer questions. After the group work, discussions with the whole group occurred to raise any issues with the tools or how they might be used which gave us valuable information. For example:

- if several participants asked the same questions this indicated that the information provided was either missing, lacked detail, or was confusing
- participants agreed that the flowcharts and layout of the tools made sense (but some needed minor tweaks)
- participants identified if there were any errors with the tools, such as the weight error in the carrying tool. The initial draft used the weights when the load is held close to the body at the waist but did not account for the reduction in weight when carried on the shoulder.

4.3 Key differences between the HSE simple manual handling risk filters and the WorkSafe manual handling screening tools

A summary of the key changes made to each of the manual handling screening tools is shown in Table 1. The following sections provide more detailed explanations of why the changes were made.

CHANGES MADE	HSE SIMPLE MANUAL HANDLING RISK FILTERS	WORKSAFE MANUAL HANDLING SCREENING TOOLS
Title change	Title used the term 'risk filters'	Title changed to manual handling screening tools
Language changes	Negative statements For example, the load: 'does not obstruct the view of the person carrying it'	Changed to positive statements For example: 'Can the worker easily see where they are walking?'
Presentation of information	Bulleted list outlining the risk filter 'conditions'	Flowchart that directs the user to the action they need to take
Structure	Introductory text applies to all the risk filters	Introductory document explaining the tools with standalone screening tools
Vulnerable workers	Vulnerable workers only mentioned in the lifting and lowering risk filter	Step 1 in all the screening tools considers vulnerable workers 'Older workers' have been added into the vulnerable worker definition

TABLE 1: Summary of differences between the HSE simple manual handling risk filters and the WorkSafe manual handling screening tools

Title change

The first major difference between the HSE simple manual handling risk filters is the change in name to manual handling screening tools. The Guidance team initially had concerns about the term 'risk filters' and if non-expert users would know what it meant within New Zealand. We agreed that the term 'screening tools' was better and fitted with the activity occurring. For example, the tools are used to quickly screen a task to determine if further action or risk assessment is needed or not.

Language changes

The HSE risk filters (Health and Safety Executive, 2016d) use simple bullet pointed lists, but often used negative statements, particularly in the 'carrying' risk filter. For example, statements starting with 'does not prevent...'. The Plain Language Act 2022 requires public service agencies use plain language (Parliamentary Counsel Office, 2022). Positive statements are usually shorter and easier to understand, and the readability is improved. For example, the reader doesn't have to translate' the negative sentence to understand the meaning. Using simple words and sentences makes information more accessible and easier to scan particularly for those learning about unfamiliar topics. We turned the negative statements into positive ones in line with the Plain Language Standard (Parliamentary Counsel Office, 2024).

Presentation of information

In the New Zealand screening tools we took the reworded condition statements and developed them into questions presented in a flowchart. The flowcharts take the user through each of the conditions step-by-step. If you answer 'yes' to all questions, then the risk is considered 'low' for most people and no further action is needed. If at any point the user answers 'no' to any of the questions, the task is likely to expose workers to a risk of discomfort, pain, or injury and they are directed to complete the relevant risk assessment.

Structure of the screening tools

The HSE simple manual handling risk filters (Health and Safety Executive, 2016d) present the information and conditions in structured, bullet-pointed lists with images to help the user complete the assessment. The New Zealand screening tools largely followed this approach with some rewording and restructuring the tools into standalone documents. This may feel like we have made the screening tools overly complicated or lengthy, but the simplification of the language and the use of flowchart questions should help users to easily work through the conditions to determine if action needs to be taken or not.

Like the HSE simple manual handling risk filters, we developed an introductory document (WorkSafe New Zealand, 2024e) outlining the screening tools, how to use and interpret them, and the broad assumptions that the tools are based on. This also included an overview of the tools to help users decide which tool to use.

Consideration of vulnerable workers

The HSE simple manual handling risk filters only mentions vulnerable workers in the lifting and lowering risk filter. We have included vulnerable workers at Step 1 of all the New Zealand manual handling screening tools. The logic being that if there were vulnerable workers in the workplace, the user can skip the screening tool and go straight to completing a more detailed assessment instead (for example, NZMAC and/or use the 'Contributing factors checklist').

The New Zealand manual handling screening tools also expanded upon the HSE criteria of those considered as 'vulnerable workers' to include 'older' workers. The reason for this was to consider our 'aging population' and that people are likely to continue working later into life. This does not mean that older workers are unable to do physical jobs, or that a separate risk assessment is needed. It simply means that businesses need to consider the tasks older workers do as part of the overall risk assessment and should avoid assumptions. This is why worker engagement is important, so the risks can be controlled in a practical way (Health and Safety Executive, 2024a).

At this stage we have not defined what age 'older' refers to and internationally a consensus does not appear to have been reached (Peng & Chan, 2019). Some researchers indicate that 'older workers', can refer to those from age 40 (Cheung

& Wu, 2012) and others suggest over 65 (Fleming *et al*., 2007). Researchers most commonly define older workers as those aged over 50 or 55 years (Peng & Chan, 2019). In New Zealand the Ministry of Business, Innovation and Employment refer to older workers as people aged over 50 (Ministry of Business Innovation and Employment, 2024).

It was important to include older workers as vulnerable workers as research suggests that there is an average decline of 20% in physical work capacity that occurs between the ages of 40 and 60 years old (Kenny *et al*., 2008). This is due to decreases in both aerobic capacity and musculoskeletal capacity such as strength, endurance, flexibility, body composition, and balance. These declines can contribute to decreased work capacity and subsequent increases in work-related injuries and illness. Research suggests that between the ages of 51 and 62 years of age, the prevalence of musculoskeletal disorders can increase by as much as 15% among workers. Females and those who work in physically demanding occupations are at increased risk of musculoskeletal injury. But individual decline will vary significantly depending on factors such as genetics, lifestyle, and chronic disease (Kenny *et al*., 2008).

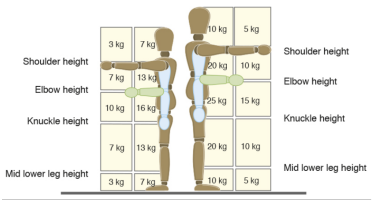
4.4 Specific changes made to individual screening tools

Lifting and lowering screening tool

In addition to the changes that were made to all the manual handling screening tools outlined in Section 4.3 there were two minor changes made to the lifting and lowering screening tool.

The first change, combined the points that outlined how to use the filter image (Figure 3) with the points under the heading *Lifting and lowering: Do I need to do a more detailed assessment?* (Figure 4). These were changed slightly to develop one set of questions in the flowchart.

Lifting and lowering risk filter



- The filter assumes that the load is easily grasped with both hands and is handled in reasonable working conditions, with the worker in a stable body position.
- Each box in the diagram contains a filter value for lifting and lowering in that zone. The filter values in the boxes are reduced if handling is done with arms extended, or at high or low levels, as that is where injuries are most likely to happen.
- Observe the work activity you are assessing and compare it to the diagram. First, decide which zone or zones the worker's hands pass through when moving the load. Then, assess the maximum weight being handled. If it is less than the value given in the matching box, it is within the guidelines.
- If the worker's hands enter more than one zone during the operation, use the smallest weight. Use an in-between weight if the hands are close to a boundary between zones.

FIGURE 3: Initial lifting and lowering risk filter conditions (Health and Safety Executive, 2016d)

Lifting and lowering: Do I need to do a more detailed assessment?

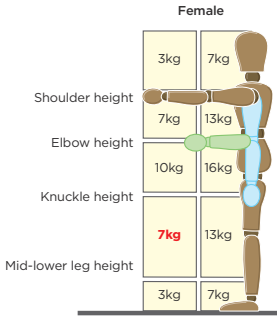
You will need to make a more detailed assessment using for example the MAC tool or full risk assessment checklists (PDF) (or equivalent) if:

- the handling operation must take place with the hands outside the filter zones
- the weight exceeds those in the filter
- the handling involves torso twisting
- the handling is more frequent than one lift every two minutes
- the handling is done by a team
- the handling is complex, for example the weights vary significantly or there are several start and finish locations
- the lift does not meet the conditions given for using the guidelines (for example if the load is difficult to grasp or handle)
- the person lifting may be at significant risk, for example new or expectant mothers, young workers, those new to the job, or those with a disability, significant health problem or recent injury

FIGURE 4: Lifting and lowering conditions if a more detailed assessment is needed (Health and Safety Executive, 2016d)

The second minor change was the inclusion of examples of how to use the lifting and lowering screening image correctly in different situations (Figure 5 shows one example). The aim was to provide examples to help users understand and apply the tool in various scenarios.

Example 2: The load weight reduces as it is held away from the body with arms outstretched or, at high or low levels



This is because there is a greater risk of developing discomfort, pain, or injury when lifting or lowering in these postures.

You have a female worker who is lifting and lowering loads at around knee height with their arms outstretched away from their body.

The screening value for this task is 7kg.

Using the tool, you see that most females should be OK to lift/lower 7kg or less.

But if your female workers are lifting loads greater than 7kg in this posture they may be at increased risk of injury, so you should complete a more detailed risk assessment.

FIGURE 5: Inclusion of examples to help users apply the lifting and lowering screening tool (WorkSafe New Zealand, 2024c)

Carrying screening tool

The biggest change with the New Zealand carrying screening tool is that it removes the need for users to refer to the HSE lifting and lowering risk filter image. (This is Figure 1 in the New Zealand lifting and lowering screening tool). The HSE carrying risk filter and lifting and lowering filter/screening tool is shown in Figure 6.

Carrying risk filter

You can apply the filter weights for lifting and lowering to carrying operations where the load:

- is held against the body
- is carried no further than about 10 m without resting
- does not prevent the person from walking normally
- does not obstruct the view of the person carrying it
- does not require the hands to be held below knuckle height or much above elbow height

Where you can carry the load securely on the shoulder without lifting it first (for example by sliding it onto your shoulder), you can apply the filter values up to 20 m.

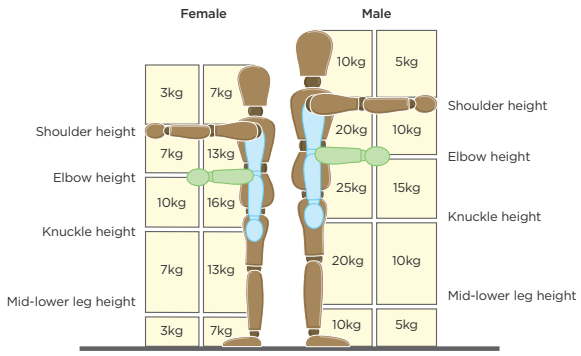


FIGURE 6: HSE carrying risk filter and lifting and lowering filter image (Health and Safety Executive, 2016d)

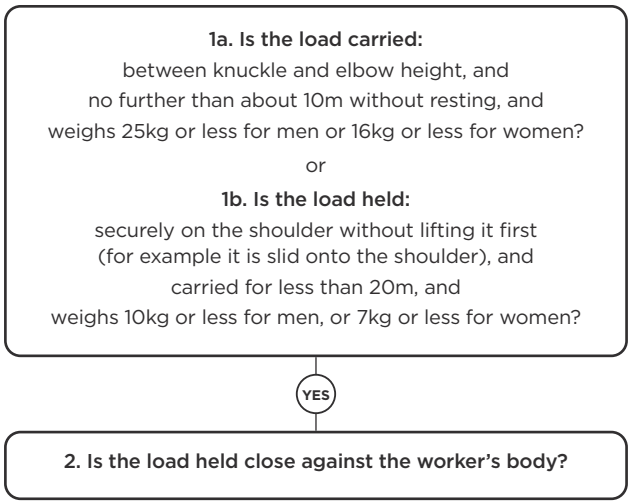
In the flowchart at Question 1a of the New Zealand carrying screening tool (WorkSafe New Zealand, 2024a) the need to use the (HSE) lifting and lowering filter is replaced with several sub-questions about the load. These are about the position it is carried in ('between knuckle and elbow height'), the 'carry distance', and 'the weight of the load'.

When carrying between knuckle and elbow height an upright posture is assumed. This is reinforced (NZ) by the inclusion of images to demonstrate this position. These are not in the HSE carrying risk filter (shown in Figure 7).

The stated 'weight of the load' handled of 16kg for women and 25kg for men also took into consideration (NZ) Question 2, 'is the load held close against the worker's body?' The logic was that if you looked at the lifting and lowering screening image and the worker was holding the load between knuckle and elbow height their posture is likely to be upright and the load will more than likely be held against the body. This would mean that only those screening values would apply. It may be possible that loads of more than 16kg or 25kg could be held away from the body while maintaining a grip of between knuckle and elbow height and could possibly underestimate the risk at (NZ) Question 1a. But if the load was held away from the body, then it would be picked up at (NZ) Question 2 and result in a more detailed assessment.

The same logic was applied to (NZ) Question 1b, carrying on the shoulder (Figure 7). The sub-questions about 'holding the load securely on the shoulder without lifting it first', 'carry distance of less than 20m', and 'load weights of 10kg or less for men and 7kg or less for women' apply. These screening weights came from the HSE lifting risk filter (Figure 1 in the lifting and lowering screening tool) which again, if combined with (NZ) Question 2 where the 'load is held close to the worker's body' means that only these screening weights are possible. This is also supported by the inclusion of images to demonstrate the carrying on the shoulder position which is not in the HSE carrying risk filter. In practice at (NZ) Question 1b the load may not be held close to the workers body when considering the hand position. This may slightly underestimate the risk, but if this was an issue then it would be picked up at Question 2 and direct the user to a more detailed assessment.

The carry distance was included at (NZ) Question 1 because it provides a quick check at the first step if a more detailed assessment is needed. For example, if carried more than 10m you would stop and go to a more detailed assessment. Distance was also considered at this point because of the different distances outlined for carrying between knuckle and elbow height or on the shoulder. So, it made sense to combine it at Question 1 with the other points to save duplicating the question later in the flowchart.



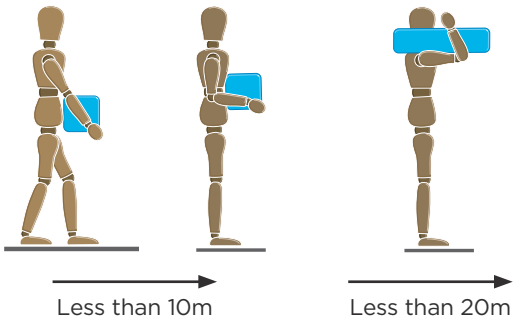


FIGURE 7:
New Zealand carrying screening tool showing question 1 and 2 and the introduced images (WorkSafe New Zealand, 2024a)

The New Zealand pushing and pulling screening tool (WorkSafe New Zealand, 2024h) remains largely unchanged from the HSE version. It is in flowchart form and uses the original images. This allows the user to observe the worker and compare the postures with the screening tool images.

Like the lifting and lowering screening tool, the pushing and pulling tool combined the points that outlined how to use the HSE filter images (Figure 8) with the points under the heading *Pushing and pulling: Do I need to do a more detailed assessment?* (Figure 9). These were changed slightly to develop one set of questions in the flowchart.

Pushing and pulling risk filter

In pushing and pulling operations, the load might be slid, rolled or moved on wheels. Observe the worker's general posture during the operation. If the load can be moved and controlled very easily, for example with one hand, you do not need to do a more detailed assessment. The diagrams show acceptable push/pull postures. The task is likely to be low risk if:

- the force is applied with the hands
- the torso is largely upright and not twisted
- the hands are between hip and shoulder height
- the distance moved without a pause or break is no more than about 20 m

FIGURE 8:
Initial lifting and lowering risk filter conditions (Health and Safety Executive, 2016d)

Pushing and pulling: Do I need to make a more detailed assessment?

You should make a more detailed assessment using for example the RAPP tool or full risk assessment checklists (PDF) (or equivalent) if:

- the posture shows that the task requires significant force, for example leaning
- there are extra risk factors like slopes, uneven floors, constricted spaces or trapping hazards

FIGURE 9:
Pushing and pulling conditions if a more detailed assessment is needed (Health and Safety Executive, 2016d)

Manual handling-while-seated

The most noticeable change with this tool is the name change from ‘handling while seated’ to ‘manual handling-while-seated’. Feedback from initial workshops found that this could mean different things to different users. The suggestion was to make it clear that this screening tool related to manual handling activities rather than repetitive upper limb tasks where very light loads might be handled. The name change was made to show the difference between manual handling tasks and light repetitive upper limb activities.

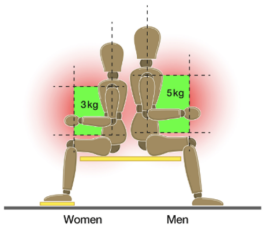
The HSE risk filter provides a simple set of instructions with an image to show the load filter values. Workshop feedback found that users assumed this image only referred to boxes being handled while seated, and some didn’t make the distinction between the ‘green zone’ and the red shaded area. This resulted in a slightly altered image to make these zones clearer and less like boxes.

The questions in the flowchart were developed directly from the original questions.

In the HSE version it states you should make a full assessment if handling beyond the green zone is unavoidable (Figure 10). In our version (WorkSafe New Zealand, 2024d) we have linked to the ‘contributing factors checklist’ but have also included a link to the ART tool in case the activity observed would fit better there (Figure 11).

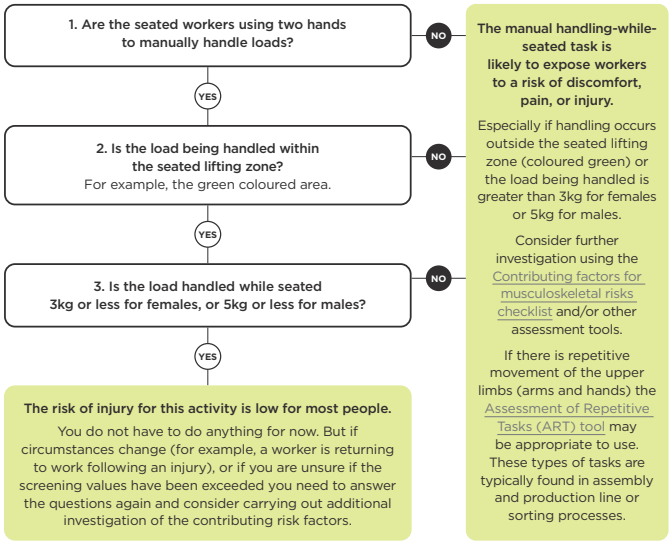
Handling while seated

The filter values for handling operations carried out while seated, as shown in the image, are **Men: 5 kg** and **Women: 3 kg.**



These values only apply for two-handed lifting and when the hands are within the green zone shown. If handling beyond the green zone is unavoidable, you should make a full assessment.

FIGURE 10:
HSE 'handling while seated' risk filter (Health and Safety Executive, 2016d)



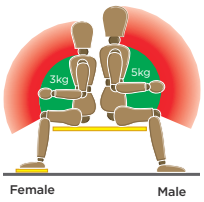


FIGURE 11:
WorkSafe 'manual handling-while-seated' screening tool (WorkSafe New Zealand, 2024d)

5.0 Development of the NZMAC

IN THIS SECTION:

The New Zealand Manual Handling Assessment Charts (NZMAC) were developed from the HSE Manual Handling Assessment Charts (MAC).

5.1 Initial tool development – reviewing the MAC and developing the first draft of the New Zealand version

The MAC (Health and Safety Executive, 2019) was reviewed, and an initial NZMAC draft was developed by the HFE team (WorkSafe New Zealand, 2024g). The intention was to make the supporting text within the MAC relevant for a New Zealand audience that reflected the Health and Safety at Work Act (HSWA), 2015. It was important that the assessments remained scientifically robust. We wanted to avoid making any large changes to the individual risk assessments for lifting, carrying, and team handling as this could alter the validity and reliability of the assessments.

The initial draft was reviewed and edited by the Guidance team who suggested some minor formatting changes. Once completed the initial draft was ready to be trialled at the workshops.

5.2 Specific workshop feedback on the MAC

Informal feedback came from conversations during the workshops and key points were manually recorded by the HFE team facilitators. These comments and suggestions were considered after each workshop. The HFE team held a final debrief session to make sure that all workshop feedback had been considered and necessary changes were made.

In addition, formal feedback came after the final workshop from the survey responses. The general feedback was presented in Section 3.5 and Appendix 1

Here we present specific feedback relating to the MAC.

Some participants expressed that using the MAC tool resulted in good discussions, but they:

- struggled with the subjectivity of the scoring system, stating it was open to individual interpretation
- found some of the scoring choices were uncertain and that additional information would be helpful
- would be interested to know how people would determine the weight of the objects handled.

Table 2 summarises the above points and outlines what we have done following the workshops or what we plan on doing in the future to improve the NZMAC.

This feedback was very helpful and confirmed some of our thoughts from the workshops where we had recognised areas for improvement. For example, where there were large discrepancies between participants scores, where the assessment criteria had been mis-interpreted, or there were lots of questions and debate on certain points.

WORKSHOP PARTICIPANT FEEDBACK	GENERAL COMMENTS AND HOW WE HAVE DEALT OR PLAN ON DEALING WITH THE CONCERNS
The scoring system is subjective and open to individual interpretation	– The tools are subjective and rely on the assessor to be as objective as possible. Careful reading of the assessment criteria, combined with observations and engaging with the workers during the assessment process, should help to guide decision making. This should also improve as assessors become more familiar with the assessments. – Video recording can help assessors to look more closely at postures following an assessment when they have more time, but we recommend they follow privacy guidelines. – We have had further discussions with the HSE on some of the points that participants struggled with the most (for example, where there was the greatest variability of responses) and have refined some of the wording in the assessments to help support understanding. – As we have continued to develop the NZMAC our understanding of some of the more complex points has improved. We hope that future training sessions will more clearly outline the subtleties of some of the assessment questions, so we can answer participant questions better.
The scoring choices were uncertain, additional information would help	– In some situations, we agree. As above, additional conversations with the HSE have helped us to refine some of the wording which should help assessor's decisions about what to score easier. – Potential future development of training material and updated case studies will be helpful to resolve some of these issues.
How do you determine the weight of the objects handled?	– There are several ways you can determine the weight of the objects handled. For example, weigh them, look at production information, individual product weights, ask the workers if they know. – Assessors may need to do some basic maths to calculate the weights if several items are handled at once. They may also need to work out the handling frequencies if these are unknown. One method is to observe the task for a period (5-10 minutes) and to manually count how many times the activity occurs. Then calculate an approximate frequency depending on how long they perform that task during the workday. – If the loads are very variable, assessors can use the Variable manual handling assessment chart (V-MAC), (Health and Safety Executive, 2024b). It provides an alternative graph to the load weight/frequency graphs for lifting and carrying assessments. It is used alongside the NZMAC tool.

TABLE 2: Summary of participant feedback, our general comments, and how we have dealt with them or plan on dealing with them in the future

5.3 General differences between the NZMAC and MAC

The result of the review and workshop trials was the development of the New Zealand Manual Handling Assessment Charts (NZMAC). The main differences between the MAC (Health and Safety Executive, 2019) and NZMAC (WorkSafe New Zealand, 2024g) are outlined here as 'general' differences. Section 5.4 outlines the key specific differences between MAC and NZMAC that are relevant to a particular assessment or to the score sheet.

Title change

When the New Zealand version of the MAC was being finalised, we found some of the text confusing. It was unclear if we were talking about the HSE MAC or our version. For simplicity, we made the decision to call our version the NZMAC.

Initially we are still relying on the HSE website for supporting resources and referring users to the HSE online MAC tool, so it was important to distinguish between the two.

Overall design

The overall design of the NZMAC assessment tools remains very similar to the MAC with the most significant changes occurring in the introductory section and with the score sheet.

The WorkSafe design guidelines were followed resulting in a slightly different overall look compared to MAC:

- at the initial stage only a PDF version was designed so we decided on an A4 sized document that could be printed easily
- slight changes were made to the colours used but they still follow the 'traffic light' system that MAC is based on
- the heading colour bands were changed slightly to help distinguish between lifting, carrying, and team handling assessments. The blue for lifting is very similar to MAC, the carrying was changed from the red to brown. This was because it was the same or very similar to the 'red' in the traffic light system in the assessments and we wanted to make it different. The original 'teal' colour for team handling was changed following the workshops as when it was printed some people found it difficult to distinguish, there were also concerns from a colour-blind perspective so was changed to a dark blue
- a contents page was developed that identifies the three different assessments and each of the risk factors assessed
- more space and 'spacing lines' were added in between each of the risk factors to make it easier to distinguish between them
- the instructions were broken into bullet points to help users identify and understand what needs to be done
- the references and score sheet was added to the appendices.

Introductory text

The NZMAC follows a similar layout in the introductory section with some slight re-ordering of content. The key differences are:

- we adapted the language and references to guidance, making it relevant for a New Zealand audience.
- some of the sections were presented in a different order compared to MAC.

- changed the *How to complete a MAC assessment* section to *Using the NZMAC* (Section 1.6):
  - introduced a numbering system, with bold text and a clear statement of what to do at each step.
  - added a table to show when to use, and not use the NZMAC (with links to other risk assessments)
  - added in a reference to the Privacy Act 2020 to make sure users are aware of their responsibilities if they record workers
  - added in 'Step 10' – further investigation. This will be discussed in more detail in Section 5.5

Risk assessment title changes

The NZMAC has changed the assessment headings, to simplify the language, opting for the word 'tasks' instead of 'operations'. For example, 'lifting tasks assessment guide' (WorkSafe New Zealand, 2024g) and 'lifting operations assessment guide' (Health and Safety Executive, 2019).

'Level of risk' criteria wording changes

It was necessary to make some minor wording changes to the level of risk criteria which uses a 'traffic light' system. The MAC and NZMAC risk levels are shown in Figure 12 and Figure 13. The changes were:

- Green – low level of risk. The NZMAC uses the criteria for vulnerable workers that is outlined in the WorkSafe manual handling screening tools (WorkSafe New Zealand, 2024e).
- Purple – unacceptable level of risk. The NZMAC needed to replace the text '... and must be improved.' to '...should be improved urgently.'. This was because in the HSWA (2015), the term 'must' means that a business has an obligation to act, whereas 'should' is considered as a recommendation. Because there are Manual Handling Operations Regulations 1992 (Health and Safety Executive, 2016b) in the UK they can refer to these, but in New Zealand we don't have specific regulations so can only say 'should'.

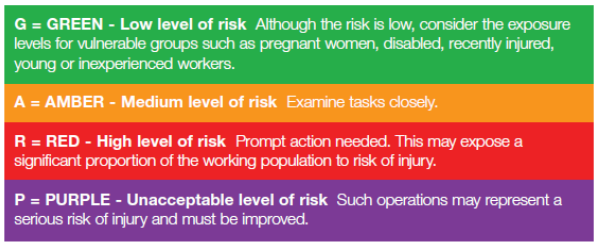


FIGURE 12: MAC risk levels
(Health and Safety Executive, 2019)

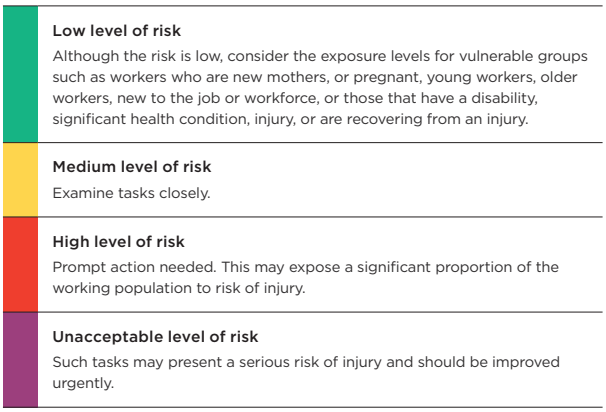


FIGURE 13: NZMAC risk levels
(WorkSafe New Zealand, 2024g)

5.4 Key changes made to specific assessments

This section outlines the changes made to specific assessments.

Load weight/frequency graphs for lifting and carrying assessments

Minor design changes to the lifting and carrying load weight/frequency graphs occurred. A larger change was made to the 'x' axis to try and make it easier to use. This was trialled at the workshops and participants agreed that having more information was helpful. Figure 14 shows the MAC lifting load weight/frequency graph 'x' axis (Health and Safety Executive, 2019) and Figure 15 shows the changes made in the NZMAC (WorkSafe New Zealand, 2024g). The frequency information remained the same, but a line was introduced to separate the 'one lift every' and 'lifts per hour' information. The same approach was adopted for the carrying graphs.

FIGURE 14: MAC lifting load weight/frequency graph showing the 'x' axis

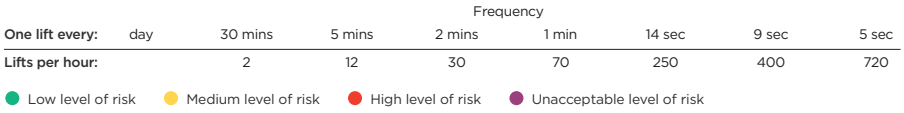


FIGURE 15: NZMAC lifting load weight/frequency graph showing the modified 'x' axis

A comparison of the lifting assessment graph is shown in Figure 16 (MAC) (Health and Safety Executive, 2019) and Figure 17 (NZMAC) (WorkSafe New Zealand, 2024g).

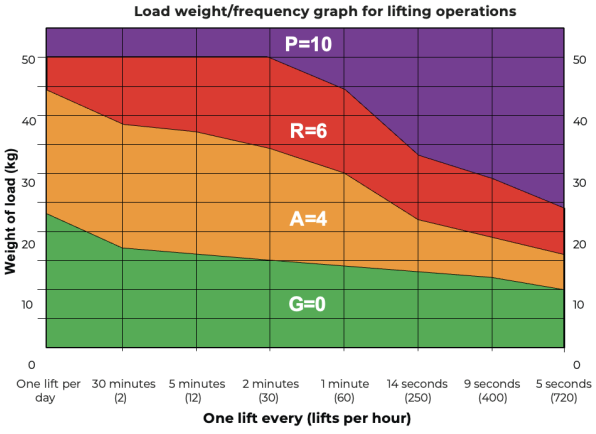


FIGURE 16: MAC lifting load weight/frequency graph

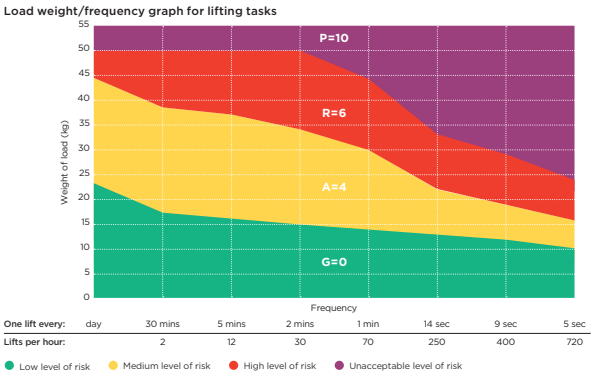


FIGURE 17: NZMAC lifting load weight/frequency graph

After the load weight/frequency graphs the text in the NZMAC was changed slightly (see the differences shown in Figure 18 and Figure 19). This was as a result of conversations with the HSE and the need to do a 'full risk assessment'. During the development process our thinking changed slightly around this issue and will be discussed in more detail in Section 5.5 when looking at the changes that have been made to the score sheet.

To assess lifting at more than once every five seconds you should carry out a full risk assessment.

To assess carrying at more than once every 12 seconds you should carry out a full risk assessment.

FIGURE 18: Text under the MAC load weight/frequency graphs for lifting and carrying assessments

- For more complex tasks, for example when lifting at more than once every five seconds, further investigation may be required. Consider using the Contributing factors for musculoskeletal risks checklist or other assessment tools, or seek specialist advice from a qualified professional.
- For more complex tasks, for example when carrying at more than once every 12 seconds, further investigation may be required. Consider using the Contributing factors for musculoskeletal risks checklist or other assessment tools, or seek specialist advice from a qualified professional.

FIGURE 19: Text under the NZMAC load weight/frequency graphs for lifting and carrying

Grip on the load – lifting, carrying, and team handling assessments

The same minor design changes occurred in the 'grip on the load' risk factor in all assessments. Figure 20 shows the original MAC version (Health and Safety Executive, 2019) and Figure 21 shows the NZMAC criteria (WorkSafe New Zealand, 2024g). We thought these minor layout changes made it clearer to identify the green, amber, or red risk factors.

There was also a minor wording change in the green risk factor category, changing the 'round' to 'around' for example, *Cylindrical handles or items the whole hand can wrap round comfortably* (MAC).

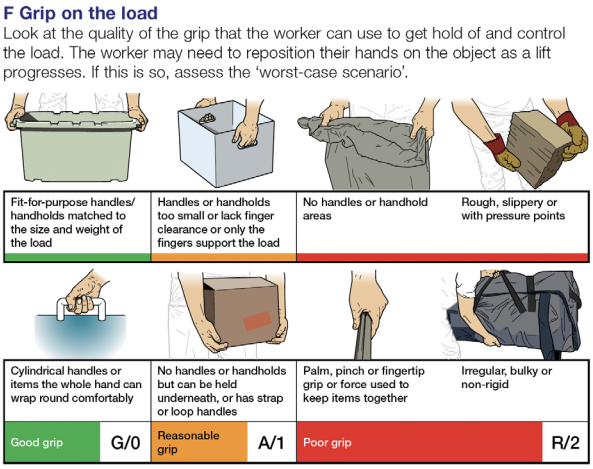


FIGURE 20: MAC 'grip on the load' assessment criteria

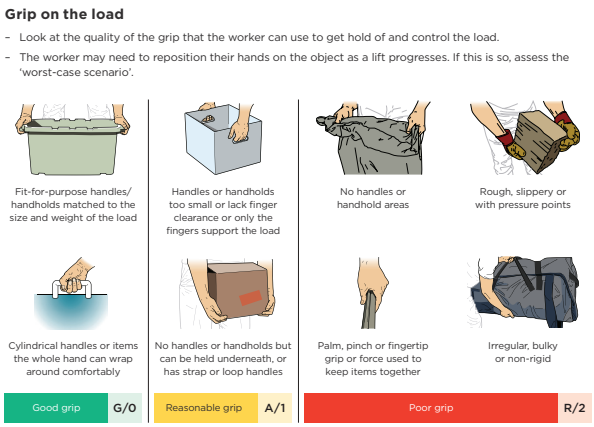


FIGURE 21: NZMAC 'grip on the load' assessment criteria

It is also worth noting here that there are differences in the 'amber' and 'red' scores for the 'grip on the load' risk factor.

- In the lifting and carrying assessments the scores are A/1 (reasonable grip) and R/2 (poor grip)
- In the team handling assessment, the scores are A/2 (reasonable grip) and R/4 (poor grip).

We checked that this was correct with the HSE, and not simply a 'typo'. Their response confirmed our suspicions of why there might be a difference. The HSE stated that in 2019 they reviewed the MAC tool (originally published in 2003 and revised in 2014) and increased the amber and red risk factors scores for team handling. The logic was that if workers are undertaking a team handling task they are at increased risk of injury. If one of the team unexpectedly loses their grip this will increase the risk to the remaining worker(s) as they suddenly are holding or supporting all the weight themselves.

Obstacles on route – carrying and team handling assessments

Compared to other sections the obstacles on route risk factor in the NZMAC had the biggest change compared to MAC. Interestingly since the original 2003 version this risk factor has undergone considerable changes in how it is assessed. It is also interesting to note that obstacles on route were only added into the team handling section in the most recent MAC revision in 2018. Previous versions, the 2003 original, and revision 2 in 2014 only included this risk factor in the carrying assessment.

The main reason for the changes to this risk factor was that workshop participants had difficulty in assessing it and it resulted in consistent discussions arising in all 6 workshops. The main issue was around the use of the phrase 'types of obstacles'.

Following the workshops we carefully considered this feedback and sought clarification from the HSE. We realised that by changing the wording slightly from 'types of obstacles' to just 'obstacles' that the NZMAC could be simplified. But this change may result in some instances where the NZMAC overestimates the risk compared to the MAC.

The MAC asks the assessor to count different 'types' of obstacles shown in Figure 22 (Health and Safety Executive, 2019). The NZMAC simply lists the types of obstacles and asks the assessor to 'count' how many of them the worker comes across when they are carrying or handling a load (Figure 22) (WorkSafe New Zealand, 2024g).

The obstacles when carrying a load in the NZMAC are the same (with minor tweaks) as those in the MAC:

- up or down a steep slope
- up or down steps
- through closed doors or narrow doorways
- around tripping hazards
- around bends or corners
- up or down ladders.

The scores have remained the same but the wording in the amber and red categories was changed in the NZMAC:

- Amber
  - MAC: one type of obstacle OR steep slope
  - NZMAC: one obstacle
- Red:
  - MAC: Ladders OR at least two types of obstacle
  - NZMAC: At least two types of obstacles OR a ladder is used

While this might seem like a significant change it will most likely lead to assessors coming to the same scores.

For example:

- If a worker carries a load up steps this is the only obstacle and would be scored as amber 2 using either the MAC or NZMAC.

- But if the worker carries a load up steps along a corridor and up another set of steps then MAC would score this as one type of obstacle scoring amber 2. The NZMAC would count these as two obstacles (even though they are the same type) and score red 3. Our reasoning is that they are at increased risk on two separate occasions when climbing the steps. Other factors (already assessed) could also affect their risk as such as the number of steps, if they can easily see the steps, how heavy the load is and how far they have carried it and their level of fatigue.
- If a worker carried a load up steps and then had to open a closed door, this would be two types of obstacles and would be scored as red 3. This is the same for the MAC and NZMAC.
- The MAC assessment criteria specify 'one type of obstacle **or** steep slope'. If a worker only carried a load up a steep slope the score would be an amber 2. The NZMAC would also score a steep slope as amber 2 as it is listed as 'one obstacle'.
- If a worker had to walk around one tripping hazard and down a steep slope this would be scored as a red 3 in both MAC and NZMAC (2 obstacles).
- But if a worker had to avoid three tripping hazards, MAC would score this as amber 2 as they are the same type of obstacle, compared to the NZMAC score of red 3. We think this is reasonable given that the worker may need to adjust the load or change direction which could increase their risk of injury.
- Ladders are considered an obstacle in the NZMAC but like MAC are specified in the scoring criteria. So, if a load was carried up or down a ladder a score of red 3 would be recorded if using either the MAC or NZMAC.

The NZMAC may occasionally overestimate the level of risk compared to MAC when the same obstacle is encountered along the carrying or handling route. In our opinion it is better to overestimate the risk rather than underestimate it and additional factors could be considered to reduce the risk.

H Obstacles on route

Count the number of different types of obstacle along the carrying route. If the person has to carry the load up or down a steep slope, up or down steps, through closed doors/narrow doorways or around tripping hazards or round bends and corners, the colour band is amber and the score is **2**. If the task involves carrying items up ladders or past two or more obstacles, the colour band is red and the score is **3**.

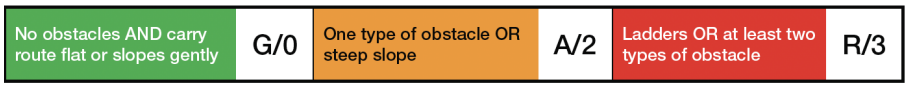


FIGURE 22:
MAC 'obstacles of route' risk factor criteria in the carrying assessment

Obstacles on route

- Count the number of obstacles along the carrying route.
- Obstacles include carrying the load:
  - up or down a steep slope
  - up or down steps
  - through closed doors/narrow doorways
  - around tripping hazards
  - around bends and corners
  - up or down ladders.
- The colour band is amber and the score is 2 if there is one obstacle.
- The colour band is red and the score is 3 if there are at least two obstacles **or** a ladder is used.

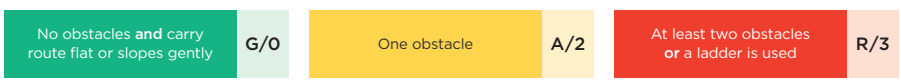


FIGURE 23:
NZMAC 'obstacles on route' risk factor criteria used in the carrying and team handling assessments

Load weight – team handling

The NZMAC uses the same weight criteria for team handling as the MAC. There was concern from some workshop participants that the load weight criteria are still quite high.

We discovered from the 2019 HSE review of MAC that the team handling load weight criteria had raised slightly from the previous 2014 version. Our understanding for the increase was that new evidence suggests that the previous team handling multipliers of either 0.5 or 0.66 were based on a single, early study of a small size. More recent studies have shown minimal effect on team size. The HSE made the decision based on the British Standard BS EN 1005-2:2003 to increase the load weight criteria slightly using a multiplier of 0.85. This information was obtained through email with the HSE and as yet, there is no publication or report outlining these changes.

Communication, coordination and control – team handling

A single phrase was changed in the communication, co-ordination and control risk factor in the NZMAC following the feedback from the first workshop.

The MAC suggests an example of good communication is where workers count 'one, two, three' before they lift (Figure 24) (Health and Safety Executive, 2019). Feedback from the first workshop suggested a better set of instructions would be 'ready, steady, lift' (Figure 25) (WorkSafe New Zealand, 2024g). This phrase is commonly used in healthcare but can be used in any industry or situation. The strength of this phrase is that it takes away any confusion about when the lift occurs. For example, does the lift occur on three, or do you say three and then lift? By using the word 'lift' it provides information about the activity (lift) that needs to occur.

Following the first workshop we tested the 'ready, steady, lift' phrase with participants who work across a range of industries, and all agreed that the wording change made sense.

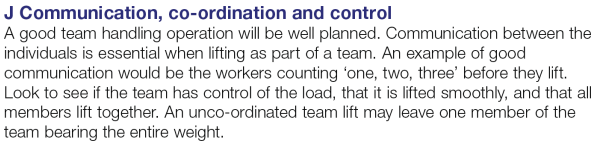


FIGURE 24: MAC, using the 'one, two, three' instructions

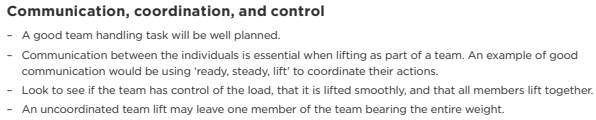


FIGURE 25: NZMAC showing the modified instructions 'ready, steady, lift'

Environmental factors – lifting, carrying, team handling

Feedback from one of the workshops was that some participants were used to using the term environmental factors when they consider what we call 'organisational' factors. Explanations were given that the 'environmental factors' category simply refers to the physical environment, temperature, wind, lighting, noise, etc. There are no differences between the MAC or NZMAC for this risk factor, but minor changes were made in the score sheet to better record organisational factors.

Flowcharts – lifting, carrying, team handling

The NZMAC flowcharts remain unchanged from the MAC, unless there were minor wording changes that occurred in the assessment, but the scores remain the same.

One addition was made on each of the three assessment flowcharts was in the last box after 'environmental factors'. This box instructs the assessor to 'Insert the colours and numerical scores on the score sheet and identify and implement suitable control measures'. (Health and Safety Executive, 2019), (Figure 26). In the NZMAC after that statement we added in 'Remember to consider any psychosocial or organisational factors that may be present'. (WorkSafe New Zealand, 2024g) (Figure 27). The aim was

to provide an additional prompt for assessors to remember to think about and ask workers about those factors. While the NZMAC still does not score these factors, we hope that by adding in this additional prompt it will help strengthen the tool and provide better coverage of the contributing risk factors for musculoskeletal injury.

Insert the colours and numerical scores on the score sheet and identify and implement suitable control measures

FIGURE 26: Instructional text in the last box of the MAC flowcharts

Insert the colours and numerical scores on the score sheet and identify and implement suitable control measures. Remember to consider any psychosocial or organisational factors that may be present.

FIGURE 27: Instructional text in the last box of the NZMAC flowcharts

5.5 Changes made to the NZMAC score sheet

The NZMAC score sheet largely follows the same structure as the MAC but has increased from 2 to 3 pages. The first page of both the MAC (Health and Safety Executive, 2019) and NZMAC (WorkSafe New Zealand, 2024g) are shown in Figure 28.

- The 'company/site details' remains unchanged.
- Some minor changes were made to the 'indications that the task is high risk' section. Mostly to make it relevant to New Zealand. For example, we don't have RIDDOR reports.
- MAC has a small box for recording 'psychosocial factors'. The NZMAC expanded this section to consider psychosocial and organisation risks, but simply labelled them as 'other factors'. Tick boxes were added to prompt assessors to consider common factors and space has been provided to write down additional factors or notes.
- The NZMAC includes a large 'notes' section.
- Like the MAC the NZMAC has a clear space for the assessor to complete the details and assessment date.

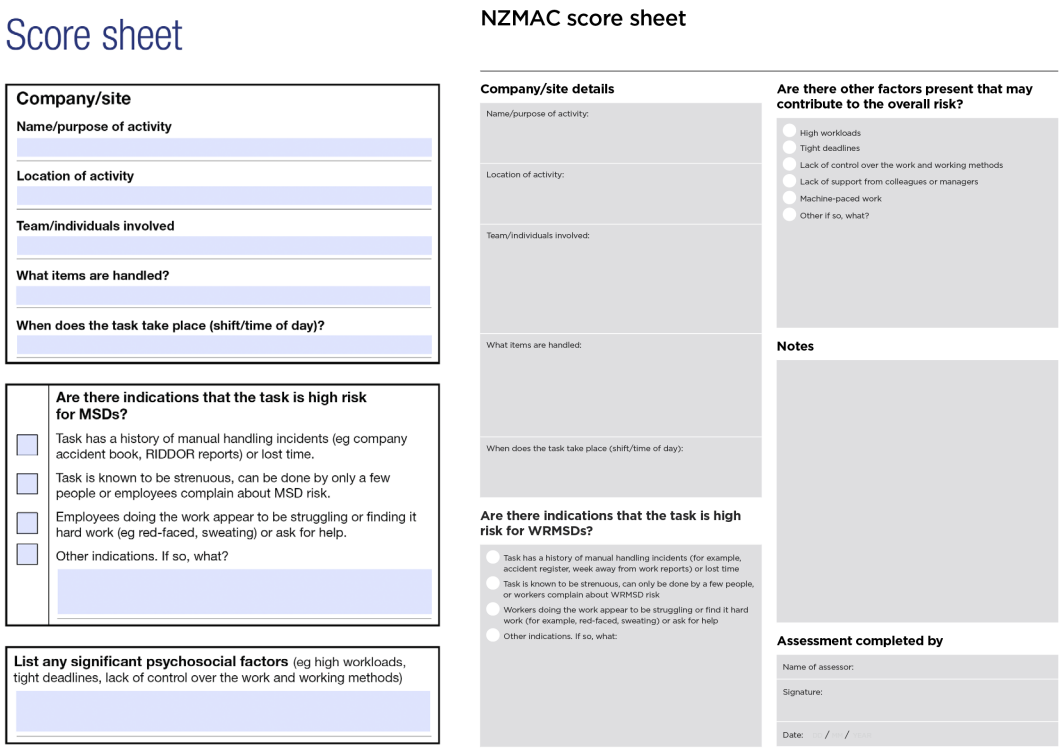
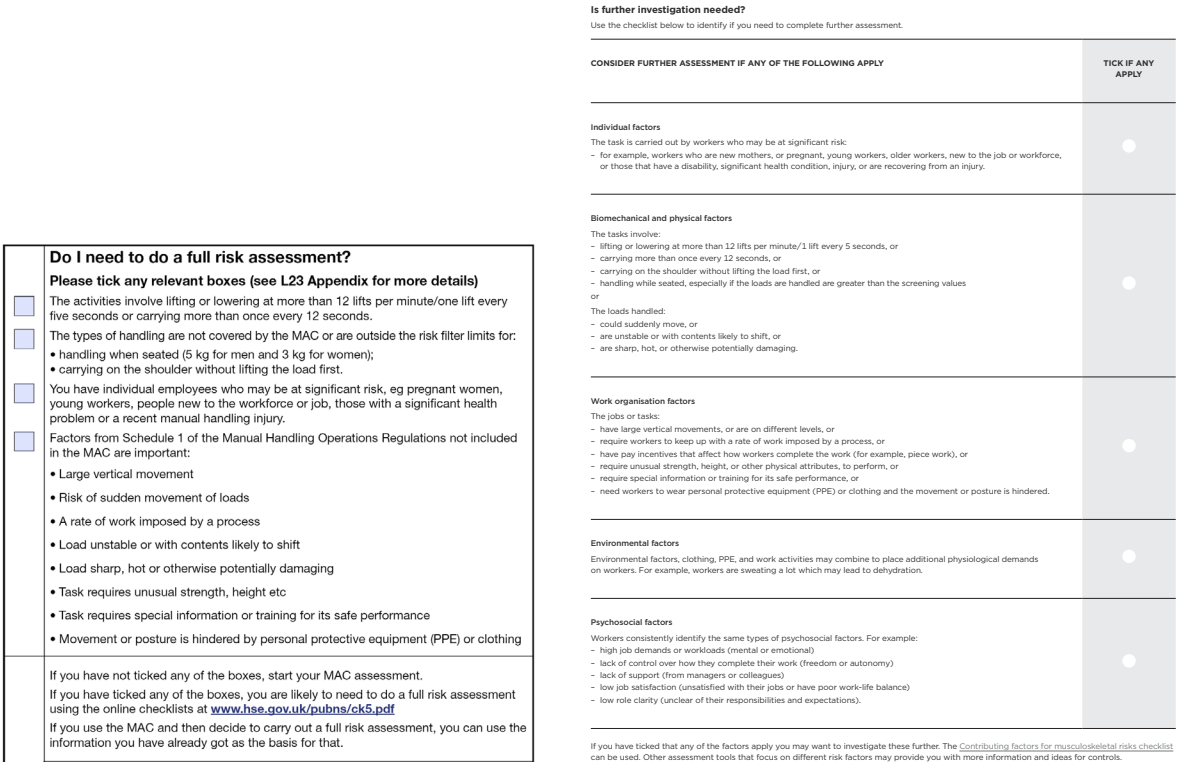


FIGURE 28: Comparison of the MAC, page 1 (left) and NZMAC, page 1 (right) score sheets

A more significant change in the NZMAC score sheet was removing the 'Do I need to do a full risk assessment?' section outlined in MAC on page 1 of the score sheets (shown in Figure 28). There were several reasons for removing what was effectively an additional screening tool from that page and using the information in a slightly different way.

- Workshop participants found it confusing as it added an extra layer of complication to the assessment.
  - For example, during the workshops we trained participants to use the screening tools, then introduced the MAC which effectively has another screening tool.
  - MAC outlines that if you ticked any of the factors then you should go straight to completing a 'full risk assessment using the online checklists'.
  - A further complication with this was that at the time of the workshops we didn't have a draft 'full risk assessment' ready for trial.
  - We also found that the full risk assessment for lifting and carrying mainly covered the risk factors that were assessed within MAC.
- We adjusted our thinking about how to use the MAC screening questions.
  - We saw the need to capture the factors in the MAC as they represent factors that it does not assess and could underestimate the level of risk.
  - But we also saw the benefit of completing a MAC assessment even if some of these factors were present. The MAC findings could provide assessors with valuable information about the range of risk factors.
  - This gave us the idea to ask the additional questions, after the MAC assessment has been completed rather than asking the questions before an assessment takes place. This section in the NZMAC is called 'Is further investigation needed?'.
- The NZMAC 'further investigation' section (Figure 29).
  - Following a NZMAC assessment we suggest that assessors use the brief checklist on page 30 of NZMAC (page 3 of the NZMAC score sheet) to consider if further assessment is needed. This should help capture those tasks or parts of the task that MAC does not assess and identifies as needing a 'full risk assessment'. This information is also outlined in Section 1.6, point 10 of 'Using the NZMAC' (WorkSafe New Zealand, 2024g)
  - We used the 'contributing factors for work-related musculoskeletal disorders' model (WorkSafe New Zealand, 2023) to group the factors that would alert the assessor to carry out further investigation. The risk factor headings (individual, biomechanical and physical, work organisation, environmental, psychosocial) were used to organise the factors identified in MAC that require further assessment plus some additional points that can contribute to the risk.
  - If any of the factors apply in the brief NZMAC checklist the assessor should look at those factors in more detail. They are then referred to the 'contributing factors for musculoskeletal risks checklist' (WorkSafe New Zealand, 2024b) which can be used as a guide to prompt further discussion and investigation (but other tools are available).



Do I need to do a full risk assessment?

Please tick any relevant boxes (see L23 Appendix for more details)

- ☐ The activities involve lifting or lowering at more than 12 lifts per minute/one lift every five seconds or carrying more than once every 12 seconds.
- ☐ The types of handling are not covered by the MAC or are outside the risk filter limits for:
  - handling when seated (5 kg for men and 3 kg for women);
  - carrying on the shoulder without lifting the load first.
- ☐ You have individual employees who may be at significant risk, eg pregnant women, young workers, people new to the workforce or job, those with a significant health problem or a recent manual handling injury.
- ☐ Factors from Schedule 1 of the Manual Handling Operations Regulations not included in the MAC are important:
  - Large vertical movement
  - Risk of sudden movement of loads
  - A rate of work imposed by a process
  - Load unstable or with contents likely to shift
  - Load sharp, hot or otherwise potentially damaging
  - Task requires unusual strength, height etc
  - Task requires special information or training for its safe performance
  - Movement or posture is hindered by personal protective equipment (PPE) or clothing

If you have not ticked any of the boxes, start your MAC assessment.

If you have ticked any of the boxes, you are likely to need to do a full risk assessment using the online checklists at www.hse.gov.uk/pubns/ck5.pdf

If you use the MAC and then decide to carry out a full risk assessment, you can use the information you have already got as the basis for that.

Is further investigation needed?

Use the checklist below to identify if you need to complete further assessment.

CONSIDER FURTHER ASSESSMENT IF ANY OF THE FOLLOWING APPLY	TICK IF ANY APPLY
Individual factors The task is carried out by workers who may be at significant risk: – for example, workers who are new mothers, or pregnant, young workers, older workers, new to the job or workforce, or those that have a disability, significant health condition, injury, or are recovering from an injury.	○
Biomechanical and physical factors The tasks involve: – lifting or lowering at more than 12 lifts per minute/1 lift every 5 seconds, or – carrying more than once every 12 seconds, or – carrying on the shoulder without lifting the load first, or – handling while seated, especially if the loads are handled are greater than the screening values or The loads handled: – could suddenly move, or – are unstable or with contents likely to shift, or – are sharp, hot, or otherwise potentially damaging.	○
Work organisation factors The jobs or tasks: – have large vertical movements, or are on different levels, or – require workers to keep up with a rate of work imposed by a process, or – have pay incentives that affect how workers complete the work (for example, piece work), or – require unusual strength, height, or other physical attributes, to perform, or – require special information or training for its safe performance, or – need workers to wear personal protective equipment (PPE) or clothing and the movement or posture is hindered.	○
Environmental factors Environmental factors, clothing, PPE, and work activities may combine to place additional physiological demands on workers. For example, workers are sweating a lot which may lead to dehydration.	○
Psychosocial factors Workers consistently identify the same types of psychosocial factors. For example: – high job demands or workloads (mental or emotional) – lack of control over how they complete their work (freedom or autonomy) – lack of support (from managers or colleagues) – low job satisfaction (unsatisfied with their jobs or have poor work-life balance) – low role clarity (unclear of their responsibilities and expectations).	○

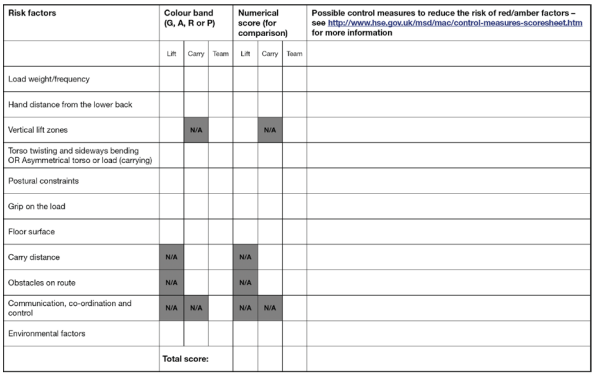
If you have ticked that any of the factors apply you may want to investigate these further. The Contributing factors for musculoskeletal risks checklist can be used. Other assessment tools that focus on different risk factors may provide you with more information and ideas for controls.

FIGURE 29: MAC screening questions 'do I need to do a full risk assessment?' (left) adapted into a checklist to prompt assessors to undertake further investigation in the NZMAC (right)

- By reordering when the questions are asked the NZMAC can:
  - Provide assessors information about the level of risk of certain risk factors by completing the relevant lifting, carrying, or team handling assessment.
  - Prompt assessors to undertake more detailed assessment for any factors that are not addressed in the NZMAC by completing the brief checklist. If any factors apply, they are directed to completing a more detailed assessment (for example, using the 'contributing factors for musculoskeletal risks checklist').

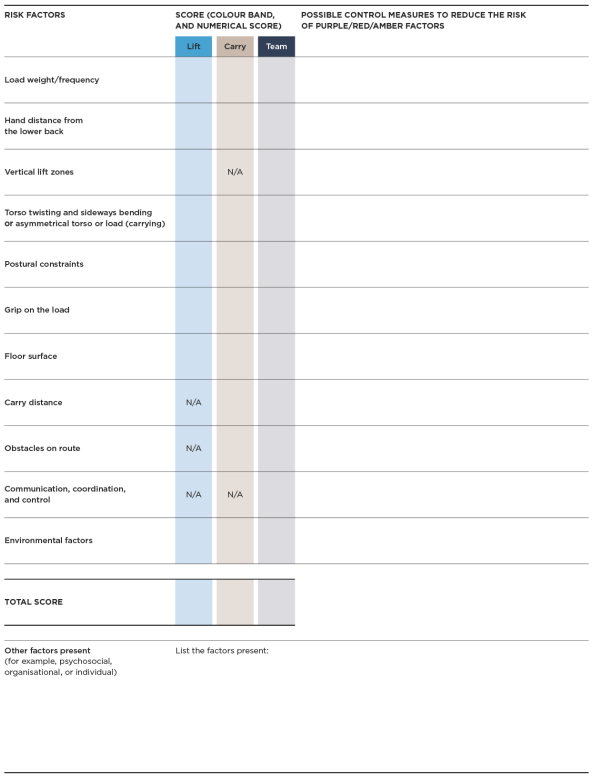
The scoring page in the NZMAC score sheet (page 29 NZMAC, or page 2 of the NZMAC score sheet) follows the same format as the MAC with some minor changes. The MAC and NZMAC versions are shown in Figure 30 and Figure 31.

- Colour band and numerical score columns were combined.
  - The reason being that people will tend to write the letter of the risk level rather than colour in the box. For example, write a 'G', 'A', 'R', or 'P'. So, it made sense to combine these into one box for assessors to record the letter and number, for example, G0, A2, R3.
  - Making this change also helped to simplify the look of the score sheet.
  - We have also assumed that many assessors will use the online tools which completes the score sheet automatically.
- Inclusion of a large box to record 'other factors' present, such as organisational or psychosocial factors. We thought that by including these factors under where the other risk factors are recorded will act as a further prompt for assessors to make sure they consider these factors as part of the assessment process. This should also help encourage worker engagement in the process.



Risk factors	Colour band (G, A, R or P)			Numerical score (for comparison)			Possible control measures to reduce the risk of red/amber factors – see http://www.hse.gov.uk/msd/mac/control-measures-scoresheet.htm for more information
	Lift	Carry	Team	Lift	Carry	Team	
Load weight/frequency							
Hand distance from the lower back							
Vertical lift zones		N/A			N/A		
Torso twisting and sideways bending OR Asymmetrical torso or load (carrying)							
Postural constraints							
Grip on the load							
Floor surface							
Carry distance	N/A			N/A			
Obstacles on route	N/A			N/A			
Communication, co-ordination and control	N/A	N/A		N/A	N/A		
Environmental factors							
	Total score:						

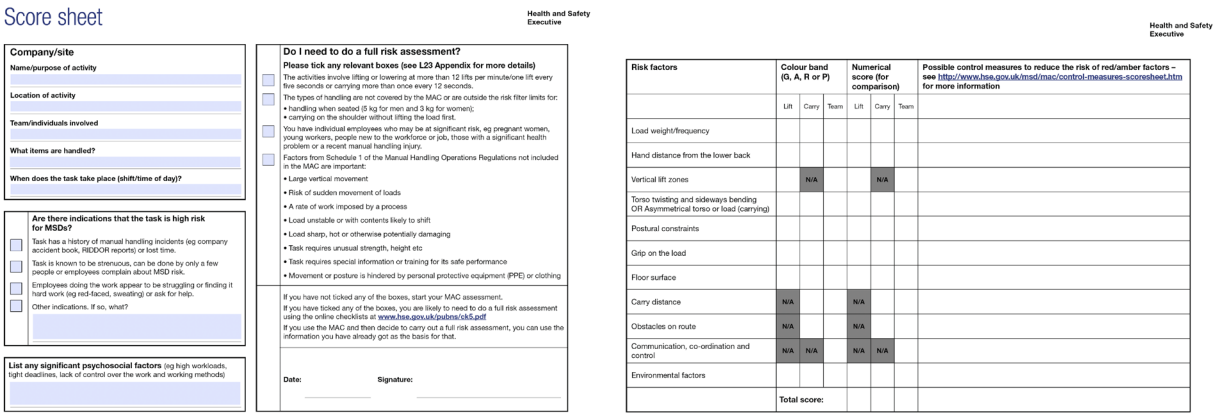
FIGURE 30: MAC score sheet, page 2



RISK FACTORS	SCORE (COLOUR BAND, AND NUMERICAL SCORE)			POSSIBLE CONTROL MEASURES TO REDUCE THE RISK OF PURPLE/RED/AMBER FACTORS
	Lift	Carry	Team	
Load weight/frequency				
Hand distance from the lower back				
Vertical lift zones		N/A		
Torso twisting and sideways bending or asymmetrical torso or load (carrying)				
Postural constraints				
Grip on the load				
Floor surface				
Carry distance	N/A			
Obstacles on route	N/A			
Communication, coordination, and control	N/A	N/A		
Environmental factors				
TOTAL SCORE				
Other factors present (for example, psychosocial, organisational, or individual)	List the factors present:			

FIGURE 31: NZMAC score sheet, page 2

A summary to provide an overall comparison of the MAC (Health and Safety Executive, 2019) and the NZMAC (WorkSafe New Zealand, 2024g) score sheets are shown in Figure 32 and Figure 33.



Score sheet

Health and Safety Executive

Company/site

Name/purpose of activity

Location of activity

Team/individuals involved

What items are handled?

When does the task take place (shift/time of day)?

Are there indications that the task is high risk for MSDs?

- Task has a history of manual handling incidents (eg company accident book, RIDDOR reports) or lost time.
- Task is known to be strenuous, can be done by only a few people or employees complain about MSD risk.
- Employees doing the work appear to be struggling or finding it hard work (eg red-faced, sweating) or ask for help.
- Other indications. If so, what?

List any significant psychosocial factors (eg high workloads, tight deadlines, lack of control over the work and working methods)

Do I need to do a full risk assessment?

Please tick any relevant boxes (see L23 Appendix for more details)

- The activities involve lifting or lowering at more than 12 lifts per minute/one lift every five seconds or carrying more than once every 12 seconds.
- The types of handling are not covered by the MAC or are outside the risk filter limits for:
  - handling when seated (5 kg for men and 3 kg for women);
  - carrying on the shoulder without lifting the load first.
- You have individual employees who may be at significant risk, eg pregnant women, young workers, people new to the workforce or job, those with a significant health problem or a recent manual handling injury.
- Factors from Schedule 1 of the Manual Handling Operations Regulations not included in the MAC are important:
  - Large vertical movement
  - Risk of sudden movement of loads
  - A rate of work imposed by a process
  - Load unstable or with contents likely to shift
  - Load sharp, hot or otherwise potentially damaging
  - Task requires unusual strength, height etc
  - Task requires special information or training for its safe performance
  - Movement or posture is hindered by personal protective equipment (PPE) or clothing

If you have not ticked any of the boxes, start your MAC assessment.

If you have ticked any of the boxes, you are likely to need to do a full risk assessment using the online checklists at www.hse.gov.uk/pubns/ck5.pdf

If you use the MAC and then decide to carry out a full risk assessment, you can use the information you have already got as the basis for that.

Date: **Signature:**

Health and Safety Executive

Risk factors	Colour band (G, A, R or P)			Numerical score (for comparison)			Possible control measures to reduce the risk of red/amber factors – see http://www.hse.gov.uk/msd/mac/control-measures-scoresheet.htm for more information
	Lift	Carry	Team	Lift	Carry	Team	
Load weight/frequency							
Hand distance from the lower back							
Vertical lift zones		N/A			N/A		
Torso twisting and sideways bending OR Asymmetrical torso or load (carrying)							
Postural constraints							
Grip on the load							
Floor surface							
Carry distance	N/A			N/A			
Obstacles on route	N/A			N/A			
Communication, co-ordination and control	N/A	N/A		N/A	N/A		
Environmental factors							
	Total score:						

FIGURE 32: MAC score sheet, page 1 (left), page 2 (right)

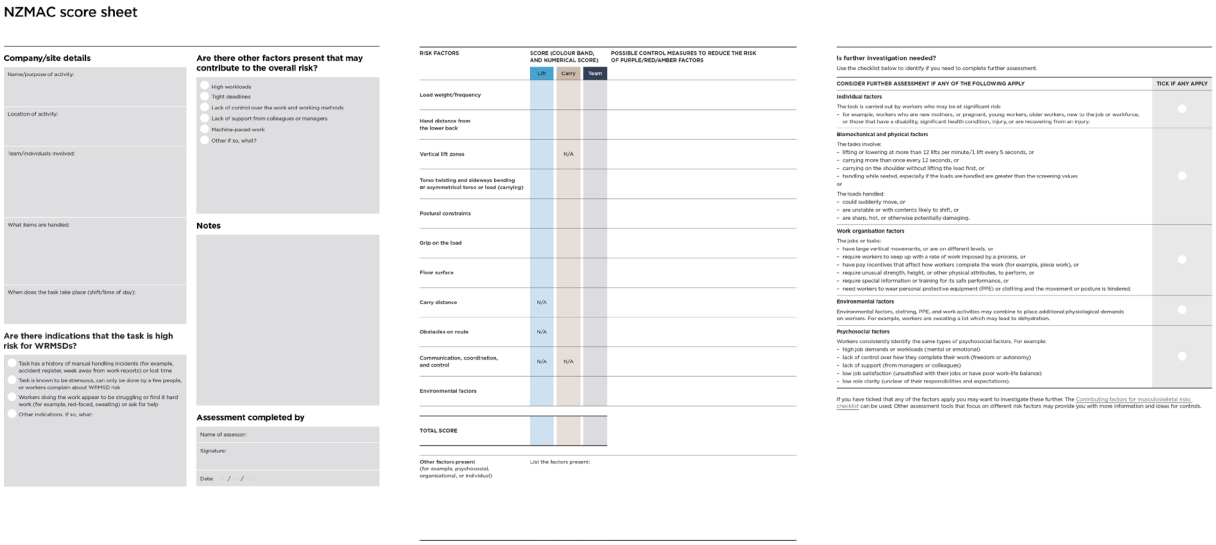


FIGURE 33: NZMAC score sheet, page 1 (left), page 2 (centre), page 3 (right)

5.6 Future opportunities – the online NZMAC

The current limitation with the NZMAC is that it only offered in a PDF format and a separate fillable PDF score sheet. Anyone can use the online UK MAC tool so the assessment scores will be the same (apart from possibly the 'obstacles on route' risk factor). But the information around the tool does make it feel a little different from the HSE version. While most of the changes aren't particularly significant, except possibly for the change in completing the NZMAC assessment and then checking to see if further investigation is needed, there are differences, and it would be ideal to have a standalone online New Zealand version.

There are real opportunities to develop the NZMAC into an online tool. Most people use smartphones and having the NZMAC as an online tool would likely enhance the use of the tool and ease of use. A similar approach could be taken as the UK online MAC, where the tool is hosted on a survey site and should be relatively cost-effective and easy to set-up. Likewise, it could be helpful to have the manual handling screening tools also developed into an online tool.

6.0 Development of the contributing factors checklist

IN THIS SECTION:

The *Contributing factors for musculoskeletal risks checklist* was developed to help assessors consider the broad range of risk factors associated with WRMSDs. It requires worker engagement and risk reduction measures should focus on higher-order controls.

6.1 Key steps involved in the development of the New Zealand checklist

Review of the HSE full risk assessment checklists

We reviewed the HSE full risk assessment checklists and factors or questions listed (Health and Safety Executive, 2016a). The manual handling risk assessments are divided into two sections: a lifting and carrying assessment, and a separate pushing and pulling assessment. Both have worked examples.

The first steps in creating a New Zealand version:

- The risk factors were grouped according to the 'contributing factors for work-related musculoskeletal disorders' model (WorkSafe, 2023). The main headings used were:
  - biomechanical and physical
  - work organisation
  - environmental
  - psychosocial
  - individual factors.
- This was a slight move away from the HSE 'TILE' approach. For example, the HSE categories asked questions about the 'tasks, individuals, loads, and environment (TILE), also known as LITE. Then they ask about 'other factors' such as protective clothing, and work organisation (psychosocial factors).
- Under each of the main headings, sub-categories were developed. These were aligned with the 'contributing factors for work-related musculoskeletal disorders' model (WorkSafe New Zealand, 2023). Some of the sub-categories were combined where relevant. For example, workplace layout/design, and awkward postures.
- Each of the questions or risk factors in the HSE full risk assessment column, 'questions to consider' were reviewed. These were allocated to one of the main headings and sub-categories in the New Zealand draft.

Cross-checking risk factors against other sources

When all the HSE questions had been allocated into the appropriate sub-categories they were cross referenced against the:

- New Zealand *Code of practice for manual handling* (Department of Labour *et al*., 2001)
- Hazardous manual tasks code of practice (Safe Work Australia, 2016)
- RAMP tools (the Swedish tools that offered coverage across all our risk factor categories) (KTH, 2022)
- APHIRM toolkit survey (La Trobe University, 2018).

The purpose of this was to check for consistency across the range of risk factors to consider. The same steps were followed for the listed tools.

- Each of the risk factors outlined in the New Zealand *Code of practice for manual handling* (Department of Labour *et al*., 2001) was checked first. We found some differences in the wording used or found that some factors had been combined. A record of any factors that were not in the HSE version, were considered for inclusion.
- The risk factors in the Hazardous manual tasks code of practice (Safe Work Australia, 2016) were checked and all were found within the draft checklist.
- The RAMP assessment (KTH, 2022) was reviewed and additional factors or rewording of factors was considered. For example, kneeling or squatting, standing or walking on a hard surface, and psychosocial risk factors.
- The APHIRM toolkit (La Trobe University, 2018) was cross-referenced with particular focus on the psychosocial questions.

This exercise found that the HSE full risk assessments (Health and Safety Executive, 2016a) provide comprehensive coverage, particularly of the physical factors. But there are only four questions that relate to 'work organisation/ psychosocial factors'. This was one area that we wanted to develop.

Firstly, we referred to the examples shown in the 'contributing factors for WRMSDs' model (WorkSafe New Zealand, 2023) and drafted some questions around those. We then looked at more detail into psychosocial and work organisation factors in the RAMP tool and the APHIRM toolkit.

Considering what the checklist should look like

During this stage in the development, we were deciding if we needed three different New Zealand 'full risk assessment checklists' or if we could combine the factors into one checklist. We reviewed the pushing and pulling checklist and the upper limb risk assessment worksheets. These assessments were compared with the factors listed in RAPP (Health and Safety Executive, 2016c) and ART (Health and Safety Executive, 2010). Finding that most of the factors were covered in these assessments and wanting to avoid duplication we decided to develop a single checklist that could be used for a range of manual tasks.

The lifting and carrying, and pushing and pulling checklists had four work organisation/psychosocial factors and the upper limb worksheets had ten questions. These were reviewed and compared to the questions in the draft New Zealand checklist and included where needed, in either the relevant work organisation or psychosocial risks sections.

One of the final steps was to look at the HSE stress (Health and Safety Executive, 2024d) and psychosocial factors (Health and Safety Executive, 2024c) web pages, the EU-OSHA (European Agency for Health and Safety at Work (EU-OSHA), 2007) website, and Comcare (Australia) (Comcare, 2024) to make sure we had selected most relevant risk factors. Based on these activities the New Zealand checklist has a total of 26 questions across the work organisation (14 questions) and psychosocial risk factors (12 questions) sections.

The final step involved a comparison of the checklist against the old ACC 'Contributory factors checklist' (ACC, 2009). This review found nothing additional that needed to be included.

Naming the New Zealand checklist

During the development of all the tools, the names of each of them were carefully considered. The HSE tools and supporting information at times could be a little confusing. Particularly when referring to risk assessments, more detailed assessments, or full risk assessments.

The simple manual handling risk filters referred to 'more detailed assessment'. This directs the assessor to use either the MAC or RAPP tools or, the full risk assessment checklists.

Information on the MAC webpage indicates that MAC is a 'more detailed assessment' to help '...identify high-risk manual handling activities' compared to the risk filters but that it may not '..comprise a full risk assessment.' And '...it is unlikely to be acceptable if relied upon alone.' (Health and Safety Executive, 2019)

This prompted us to consider what a 'full risk assessment' should contain. The HSE website states 'To be 'suitable and sufficient', a risk assessment will normally need to take account of additional information such as individual capabilities, and should conform to the requirements in the Manual Handling Operations Regulations 1992' (Health and Safety Executive, 2016b). But New Zealand does not have a 'regulation' for manual handling, which meant we could adapt the tools to suit our needs. This led us to develop the name of the 'Contributing factors for musculoskeletal risks checklist' based on the WorkSafe WRMSDs model. It provides a comprehensive and structured approach for businesses to consider the range of musculoskeletal risk factors workers' may be exposed to (WorkSafe New Zealand, 2024b).

6.2 Main differences between the HSE and New Zealand checklists

There are many similarities between the HSE 'full risk assessment checklists' and the 'contributing factors for musculoskeletal risks checklist'. Table 3 shows the main differences and our reasons for the changes that were made.

HSE FULL RISK ASSESSMENT	NEW ZEALAND CHECKLIST
Number of checklists and duplication There are three different checklists to assess: – lifting and carrying – pushing and pulling – upper limbs – risk assessment worksheets. Some duplication of checklist questions, in MAC, RAPP, ART.	**Number of checklists and duplication** One checklist, but initial thoughts were to follow the HSE approach and develop separate 'full risk assessments' for: – lifting and carrying – pushing and pulling – upper limb tasks. The tools available would start with the screening tools, then either the MAC, RAPP, or ART would be used, followed by the 'full risk assessments' if needed. We carefully considered and reviewed the questions in each of the full HSE risk assessments and found quite a bit of duplication with questions in the MAC, RAPP, and ART. Wanting to avoid duplication we set about creating questions that could be used for multiple manual tasks. One issue we considered was if users didn't use the MAC, RAPP, or ART and went straight to the checklist. This resulted in some questions from the MAC, RAPP, or ART being included in the checklist to ensure that if present, the checklist should capture some of those risk factors.

HSE FULL RISK ASSESSMENT	NEW ZEALAND CHECKLIST
General checklist structure The full manual handling risk assessment follows the 'TILE' or 'LITE' approach, where risk factors are grouped according to the: – task – individual – load – environment. Plus, the inclusion of other factors: – protective clothing – work organisation (psychosocial factors). The upper limb 'risk assessment worksheets' lists the risk factors: – repetition – working postures – force – working environment – psychosocial factors – individual differences	**General checklist structure** Follows the 'contributory factors for WRMSDs' model using the main risk factors: – biomechanical and physical – work organisation – environmental – psychosocial – individual. Uses sub-categories under the main headings to group questions. Can be used to assess any type of manual task (lifting, carrying, pushing/pulling, repetitive upper limb tasks) and possibly other types of hazardous manual tasks. It also provides links to other relevant guidance sources.
Assessing the risk Each of the questions or factors is assessed by ticking if the risk is considered low, medium, or high. Space for notes is provided. The problem with this type of assessment is that it is very subjective, and there is no guidance to help the assessor determine the risk level.	**Assessing the risk** Removal of the need to assess the risks as low, medium, or high. Replaced with a simple 'yes' or 'no' checkbox to indicate if a risk factor is present or not. Space for notes after each set of questions in each sub-category.
Controlling the risk Within the assessments there is space for notes and to record ideas for possible controls. The HSE full risk assessment checklists have a blank template for 'remedial actions/action plan'. The lifting and carrying, and pushing and pulling assessments have worked examples, but the upper limb worksheets do not.	**Controlling the risk** Like the HSE checklists space is provided for assessors to take notes and record potential controls. The New Zealand checklist does not provide a blank 'remedial action plan' template. But it does provide an example with headings that a business could use to develop their own 'action plan' to control the risk of exposure to their workers. No fully worked example is provided.
Specific risk factor categories *Individual capability* The HSE checklists use the term 'individual capability' and references those that we have considered to be 'vulnerable workers'. But the term 'vulnerable workers' is not used in the checklists.	**Specific risk factor categories** *Individual risk factors* The New Zealand checklist use the term individual risk factors with a vulnerable worker sub-category that uses the same definition as used in the screening tools. Anthropometry was also considered under the 'body size' sub-category. The idea being to capture the broad range of individual worker characteristics present in New Zealand.
Specific risk factor categories *Work organisation/psychosocial factors* The lifting/carrying and pushing/pulling checklists have the same 4 questions whereas the upper limb worksheet has 10 questions.	**Specific risk factor categories** *Work organisation and psychosocial factors* The checklist has a total of 12 questions in the psychosocial factors section. These are organised into three sub-categories. Some of the HSE factors we have included under the work organisation heading instead of the psychosocial heading. There are 14 work organisation factors. This means in total there are 26 questions in both categories.

HSE FULL RISK ASSESSMENT	NEW ZEALAND CHECKLIST
Specific risk factor categories *Vibration* There is no mention of vibration in the manual handling checklists for lifting/carrying, pushing/pulling. There is one question in the upper limb worksheet that refers to upper limb exposure to vibration. It is under the 'working environment' section.	**Specific risk factor categories** *Vibration* Two questions have been included in the checklist to quickly identify if there is exposure to either hand-arm or whole body vibration.
Incorporating the MAC screening questions On the first page of the MAC score sheet under the heading 'Do I need to do a full risk assessment?' the instructions tell the assessor to tick any relevant boxes that apply. There are 13 individual factors that are grouped into 4 sections (tick boxes) that an assessor could select. Most of these are broadly included in the lifting and carrying full risk assessment.	**Incorporating the MAC screening questions** The 13 MAC screening questions were included into the checklist. Some were combined and had slight wording changes. Noting that the RAPP and ART tools do not have any screening questions. This now clearly provides a link from the 'Further investigation' section of the NZMAC to the checklist and encourages worker engagement to discuss the issues and control the risk.

TABLE 3: Comparison of the HSE 'full risk assessment checklists' and the New Zealand 'contributing factors for musculoskeletal risks checklist'

6.3 Summary of the New Zealand checklist development

The 'Contributing factors for musculoskeletal risks checklist' (WorkSafe New Zealand, 2024b) provides a systematic way to assess risks associated with a range of manual tasks. It is structured using the WorkSafe 'contributing factors for WRMSDs' model (WorkSafe New Zealand, 2023). During the development process we opted for a single checklist rather than three different checklists to separately address lifting and carrying, pushing and pulling, and repetitive upper limb tasks.

This comprehensive checklist sought to address some of the concerns that have been raised in the literature about the limitations of task-based assessments, the lack of consideration given to psychosocial factors, and the lack of worker participation throughout the process. Adding more questions into the checklist on work organisation and psychosocial risk factors compliments the NZMAC which focuses more on the physical and environmental risk factors. This will also be the case when NZART (Stage 2) and NZRAPP (Stage 3) have been developed. The purpose of the checklist is to help prompt businesses to consider the wider range of contributing factors for WRMSDs.

Worker engagement is key throughout the entire risk assessment process and within the entire health risk management approach. Risk assessment is just one part of managing health risks. The focus should be on how the risks can be controlled by using the hierarchy of controls and not relying on lower order controls such as manual handling training.

Having the checklist already developed to include pushing and pulling and upper limb tasks means that Stages 2 and 3 are much simpler. Stage 2 will only need an upper limb screening tool and the NZART to be developed. Stage 3 will see the development of the NZRAPP.

7.0
Summary of the Stage 1 development process

The purpose of this report was to outline the development process of the New Zealand versions of the manual handling screening and risk assessment tools. It also acts as a record of the logic behind why decisions were made during development of specific tools.

Previous research (WorkSafe New Zealand, 2024i) indicated there was a need to improve hazardous manual task risk management in New Zealand. Resources and guidance to help businesses manage their risks associated with work-related musculoskeletal disorders is out of date and does not reflect current work health and safety legislation. There was a clear need for up-to-date tools and resources that businesses, inspectors, and those working across the various health and safety disciplines could use.

A review of forty-one hazardous manual task risk assessment methods or tools was completed (WorkSafe New Zealand, 2024i). This research recommended adopting the suite of tools from the Health and Safety Executive (HSE), United Kingdom (UK). These tools were found to provide a comprehensive approach to address the risk factors associated with hazardous manual tasks. But they were not without their limitations. They mainly focus on physical risk factors, with limited consideration of work organisation or psychosocial factors. And they reference the 'Manual Handling Operations Regulations 1992' (Health and Safety Executive, 2016b). Despite these limitations they were still considered suitable but would need to be adapted for New Zealand users.

This report outlined the Stage 1 development process of the three different types of New Zealand tools:

- **Manual handling screening tools**: For lifting and lowering, carrying, pushing and pulling, manual handling-while-seated. These are simple tools that can quickly identify if tasks are low-risk or if further assessment is needed.
- **Manual handling risk assessment tool (NZMAC)**: To assess lifting and lowering, carrying, and team handling tasks. This is a more detailed assessment method that identifies high-risk manual handling tasks.
- **Contributing factors for musculoskeletal checklist**: A comprehensive checklist to help identify other contributing factors that may not be covered in the NZMAC.

The development process for the screening tools and the NZMAC was the same. Draft versions were developed and trialled with 203 participants at 6 different workshops. Feedback on the draft tools was positive and gave us valuable information on how the tools could be improved. Feedback was carefully considered, and changes were made where needed.

The New Zealand manual handling screening tools use images and questions in a flowchart format which makes it look quite different to the original HSE simple manual handling risk filters. The NZMZAC, particularly the lifting, carrying, and team handling assessments look very similar to the HSE MAC. The biggest changes were in the introductory text, to the score sheet, and how the MAC screening questions in the score sheet are used. Instead of asking the MAC screening questions first, whereby if any of the conditions or factors apply the instructions are to skip completing the MAC and go straight to a full risk assessment. The NZMAC takes a slightly different approach. We saw the value in completing the NZMAC assessment in the first instance as it could provide valuable insights into certain risk factors associated with the tasks. But once finished, it uses the MAC screening questions and others to consider if further investigation of other contributing risk factors is needed.

The contributing factors checklist was initially based on the HSE full manual handling risk assessment checklists for lifting and carrying, and pushing and pulling. Because we decided to only have one checklist instead of a three separate checklists for lifting and carrying, pushing and pulling, and upper limbs, we also referred to the upper limbs risk assessment worksheets. Cross checking against the existing New Zealand *Code of practice for manual handling* risk factors (Department of Labour *et al*., 2001), the hazardous manual tasks guidance (Safe Work Australia, 2016) and other risk assessments such as RAMP (KTH, 2022) and APHIRM (La Trobe University, 2018), led to the development of the contributing factors for musculoskeletal risks checklist (WorkSafe New Zealand, 2024b). This checklist was finalised after the workshops so was not trialled by participants.

8.0
Discussion: Addressing concerns from the literature

During the development process we carefully considered concerns raised by some researchers about the effectiveness and limitations of risk assessment tools.

We wanted to address as much as we could to improve the resources and tools we adapted for use in New Zealand. Recognising that there are limitations with all types of risk assessment tools but keeping in mind the lack of up-to-date tools and guidance in New Zealand we needed to start somewhere.

The WorkSafe New Zealand (2024i) report identified some of these concerns, in particular:

- The fact that current risk assessment methods rely on worker observations, are subjective, and are not working well in preventing injuries (Lind *et al*. (2014), Macdonald and Oakman (2015), and Oakman *et al*. (2022)).
- Lind *et al*. (2014), Macdonald and Oakman (2015), and Rose *et al*. (2020) , suggested that there is a need to move on from traditional purely observation-based approaches to more participatory approaches. Both authors recommended a participatory risk management approach is adopted.

  We largely agree with the two points above. But suggest the risk assessments introduced within this report should be used as part of a health risk management approach. Identifying and assessing the risks are just the first part in the process. Effectively controlling the risks by either eliminating or minimising the exposure to the musculoskeletal risks is important. Controls then need to be reviewed and monitored to make sure they remain effective. To ensure this process is robust, worker engagement and participation, a requirement under the Health and Safety at Work Act (2015), at every stage in the health risk management approach is key.
- Oakman *et al*. (2022) identified that one problem is the lack of comprehensive tools that include identification and control of both physical and psychosocial hazards. They proposed that simple tools that take a hazard-by-hazard approach are not sufficient. Boocock *et al*. (2018) also identified that a comprehensive 'toolkit' of assessment methods is needed. They vary in complexity and recognise different levels of awareness, knowledge, expertise, and an organisations availability of resources, particularly those of small and medium-sized businesses.

  Authors such as Oakman *et al*. (2022) recommend a wider job-based approach, but we have opted for a task-based approach. For example, assessing lifting, carrying, and team handling tasks separately. This 'toolkit' approach was outlined by Boocock *et al*. (2018).

We decided on this approach for several reasons:

1. Knowledge regarding work-related musculoskeletal disorders risk management is still somewhat in its infancy in New Zealand.
2. Task-based tools allow businesses to focus on a specific task or area initially. Then if the contributing factors checklist is used it will give them a broader understanding of the range of risk factors that may be present.
3. The tools needed to be quick and easy to use and require little training. This is because we need to provide the large number of sole-traders, and small to medium sized employers operating within New Zealand up-to-date tools and resources. Other tools such as APHIRM (La Trobe University, 2018) and RAMP (KTH, 2022) may also have a place in an organisations health risk management tool kit but might be better suited to medium to large organisations or those with a maturing or mature health and safety culture and have good systems in place to manage WRMSDs risks.

– Organisational structure could impact how physical and psychosocial risks are managed if they are considered separately within a business (Oakman *et al*. 2022). They recommend that both physical and psychosocial risks are considered simultaneously, providing a holistic, multifactorial approach. Boocock *et al*. (2018) also recommended that emphasis needs to be placed on evaluating a range of hazards together rather than in isolation.

  While we can't change how a business sets up their internal structures on how they manage physical or psychosocial risks associated with WRMSDs, we have tried to increase the awareness and importance of addressing psychosocial risks in the tools. For example, by adding in additional reminders into the NZMAC flowcharts and prompts into the score sheets so assessors consider psychosocial and work organisation risks. Due to our need to make these resources available as quickly as possible we did not attempt to introduce a scoring system for these factors in the NZMAC. This would have involved additional research and would likely be of limited value. Instead, we added more information into the contributory factors checklist.

  The 'contributing factors for musculoskeletal risks checklist' has placed greater emphasis on work organisation and psychosocial risk factors with 26 questions in those categories out of a total of 64 questions. These questions address the most common psychosocial and work organisation risk factors attributed to the development of WRMSDs and provide businesses prompts to discuss with their workers.

9.0
Conclusions

There was a clear need to provide New Zealand businesses, those working across the health and safety disciplines, and inspectors, with manual task risk assessment tools that are up-to-date, quick and easy to use, and scientifically robust.

We did not have the resources to develop new tools so needed to adapt tools that already existed. Research showed that the HSE's (UK) suite of tools would be the most suitable for use in New Zealand. Adaptation of these occurred with consideration given to how they could more widely include the range of contributing risk factors associated with WRMSDs and some of the points raised in the literature.

The tools have been developed in a staged approach. Stage 1 outlined within this report, saw the development of the:

- manual handling screening tools – for lifting and lowering, carrying, pushing and pulling, and manual handling-while-seated,
- NZMAC – for lifting, carrying and team handling, and
- the contributing factors for musculoskeletal risks checklist – which can be used for all types of manual tasks.

The upper limb screening and assessment of repetitive tasks (NZART) of the upper limbs tool is planned for Stage 2 and the risk assessment of pushing and pulling (NZRAPP) tool is planned for Stage 3. The reason the NZRAPP tool is being developed last is because it is currently being reviewed by the HSE and we want to adapt the most current tool.

It is important to remember that while there are limitations to any risk assessment, they simply provide a structured approach to help assessors and businesses consider the musculoskeletal risks. This is a critical first step to build knowledge and understand the risks workers are exposed to.

This first suite of tools represents the start of a musculoskeletal assessment toolkit that is best used as part of a health risk management approach. The aim of any risk assessment should be to identify where the risk occurs and how it can be controlled. Businesses have a primary duty of care under the Health and Safety at Work Act (2015) and this includes the management of musculoskeletal risks. Following the hierarchy of control measures will help businesses to manage their musculoskeletal risks. Where practical, higher order controls such as removing the risk altogether (elimination) should be considered first. If not possible using substitution or engineering controls to minimise the risk will be the most effective.

Within New Zealand we must move on from the approach we have relied upon where 'manual handling training' is used as a primary control measure. There is much evidence that shows manual handling training is not an effective control. The main reason why it is ineffective is that it does not remove the exposure to the risks, nor does it reduce the incidence of musculoskeletal disorders. It simply relies on the worker to 'lift correctly'. The WorkSafe HFE team were involved in the joint Australia/New Zealand working group of the Heads of Workplace Safety Authorities. Together, a position statement was developed on why 'How to lift' training is ineffective, this was published in May 2024 on the WorkSafe website (Heads of Workplace Safety Authorities, 2022). We are not saying that all training is ineffective, there is still a need to provide adequate instruction and training. For example, on the specific hazardous manual task risk factors workers are exposed to; how to perform manual tasks safely and use any equipment or implement effective controls to manage the manual task risks; how to report problems or maintenance issues; and how to apply a risk management approach, are examples of what suitable and adequate training could include.

To get the best out of any of these tools and to effectively control the risk, worker engagement and participation is key. These task-based risk assessments should not be a desk-based exercise, rather completed with workers where the work is being done.

10.0 Recommendations and next steps

The development of the manual handling screening tools and risk assessments marks the completion of Stage 1. Further work is needed to develop the full initial set of musculoskeletal risk assessment tools for pushing and pulling, and repetitive upper limb tasks.

The short- and medium-term goals that were outlined in the WorkSafe New Zealand (2024i) risk assessment review report have mostly been achieved, but further activities need to occur.

Some of the activities in this report may look different from what was recommended, particularly regarding the trialling of the draft tools, but the outcomes have been achieved. In particular:

- confirmation from the HSE to adapt the suite of tools for use in New Zealand
- trialling the tools at six workshops with 203 participants. While this activity was slightly different to what was suggested, the purpose of the trial, to gain feedback on the tools and training was achieved
- publication of the Stage 1 manual handling tools was achieved in August 2024.

Feedback from the 6 workshops delivered to 203 participants supported the need that work health and safety professionals require new resources and tools for musculoskeletal risk management. Survey responses showed the extensive level of experience participants have and the varied sectors they work in, noting WorkSafe's current four priority sectors of manufacturing, construction, agriculture, and forestry were covered, plus healthcare which experiences high numbers of WRMSDs. This justifies our approach of engaging with this group first.

The closure of the ACC discomfort, pain, and injury (DPI) programme and removal of all resources by 2018 left a gap that is only now starting to be filled with the publication of the first suite of tools. It is vitally important that Stages 2 and 3 are completed. This will provide businesses with an initial set of musculoskeletal risk management tools available for use in New Zealand. But, there are further opportunities to develop other tools to add to this initial set, for example the Back injury risks in driving (BIRD) tool (Health and Safety Executive, 2023).

The following list of activities are recommendations for the next steps in the development of tools and resources to support businesses manage the risks associated with work-related musculoskeletal disorders:

- deliver training to other work health and safety disciplines. For example, the health and safety generalist groups, and sector, or industry groups
- create online versions of the NZMAC (in the first instance), and potentially the screening tools
- complete Stage 2, the development of the New Zealand upper limb screening tool and risk assessment (NZART)
- complete Stage 3, the development of the New Zealand risk assessment of pushing and pulling (NZRAPP)
- develop New Zealand case studies and other supporting resources
- develop resources to support inspectors' awareness and potential use of the tools
- consider the development of future stages, beyond Stage 3. For example, Stage 4 to include the recently published Back injury risks in driving (BIRD) tool, (Health and Safety Executive, 2023), or any other appropriate tools. Stage 5 consider other approaches such as the APHIRM (La Trobe University, 2018)
- develop an updated *Code of practice for manual handling*, or a new hazardous manual tasks code of practice (or similar) to provide businesses with updated guidance on WRMSDs risk management.

Appendices

IN THIS SECTION:

Appendix 1: Summary of the workshop survey

The following survey responses were provided to the HFE team by the WorkSafe Research and Evaluation team in an internal report (WorkSafe New Zealand, 2024f).

Survey questions

The demographic questions were designed to gather information on the reach of the workshop, and to assess if the workshop was suitable for all the groups of participants. The questions were:

- Which of the following best describes your work situation
- Which professional bodies do you belong to (select all that apply)
- How long have you been working in health and safety?
- Which industries do you provide services to (select all that apply)
- Which of the following tools had you used before attending the workshop? (select all that apply)

The questions on feedback included five statements that participants were asked to evaluate on a six-point scale of strongly agree, agree, neutral, disagree, strongly disagree, don't know. The five statements were:

- the workshop content was relevant for me
- the workshop length was suitable for the content
- the workshop content was easy to understand
- the workshop was well delivered
- the workshop content was useful for me.

Participants were also asked to rate the overall quality of the workshop on a five-point scale ranging from: very poor, poor, okay, good, and very good. There was also a final free text question asking for additional feedback on the workshop.

Survey results

171 participants completed the survey out of 203 participants, which equalled an 84% response rate.

DEMOGRAPHIC RESPONSES

Participants were mainly:

- employees of a primary business = 60 (35%)
- employees of a health and safety business = 56 (33%)
- sole-traders = 25 (15%)
- business owners = 18 (11%)
- other = 12 (7%)

Participants were from a range of professional bodies:

- NZOHNA = 35.67%
- Occupational Healthy Physiotherapy Group (PNZ) = 28.07%
- Vocational Occupational Therapists (OTNZ) = 16.96%
- Moving and Handling Association of NZ (MHANZ) = 12.87%
- HFESNZ = 6.43%
- Don't know = 3.51%.

Although invited there were no participants from the NZOHS, or either of the Occupational Medicine groups (AFOEM and ANZSOM).

Participants were generally experienced health and safety professionals. 66% had five or more years' experience and 11% had only one year or less of experience. About three-quarters of the participants had not used any of the tools before.

Participants provide services to a wide range of industries, including the four high risk sectors of agriculture, manufacturing, forestry, and construction, plus healthcare:

- Healthcare and social assistance = 60%
- Manufacturing = 48.82%
- Construction = 48.2%
- Agriculture, forestry and fishing = 40%
- Transport, postal and warehousing = 38.82%
- Electricity, gas, water and waste services = 35.29%
- Education and training = 35.29%
- Administrative and support services = 33.53%
- Professional, scientific and technical services = 29.41%
- Retail trade = 28.24%
- Wholesale trade = 27.65%
- Accommodation and food services = 25.88%
- Financial and insurance services = 21.76%
- Public administration and safety = 20.59%
- Information media and telecommunications = 17.06%
- Arts and recreation = 16.47%
- Other services = 13.53%
- Mining = 12.94%
- Rental hiring and real estate services = 11.76%

Workshop feedback results:

Statements:

- The workshop content was relevant for me:
  - 91.2% agreed or strongly agreed
  - 4.1% disagreed or strongly disagreed
  - 4.7% had a neutral response
- The workshop length was suitable for the content:
  - 88.3% agreed or strongly agreed
  - 5.3% disagreed or strongly disagreed
  - 4.1% had a neutral response
- The workshop content was easy to understand:
  - 98.2% agreed or strongly agreed
  - 1.75% disagreed or strongly disagreed
- The workshop was well delivered:
  - 95.9% agreed or strongly agreed
  - 1.75% disagreed or strongly disagreed
- The workshop content was useful for me:
  - 93.6% agreed or strongly agreed
  - 2.3% disagreed or strongly disagreed
  - 4.1% had a neutral response.

From these responses we can see that the workshop content was relevant, easy to understand, and useful.

Most people thought the workshops were well delivered but there are future opportunities for improvement, particularly as some participants felt the workshops could be shorted and that not as much time was needed on the practical scenarios (particularly for the screening tools).

Overall participants were satisfied with the workshop, with most rating it as 'good/very good' and 14 participants (8.2%) rated it as 'okay'. No one rated it as 'poor 'or 'very poor'.

Because the survey was completed immediately following each workshop, several limitations were identified:

- It only provided a short 'customer feedback' style approach. For example, to understand about the delivery of the workshops and relevance of content.
- It could not determine if the workshop improved participants understanding or confidence of using the tools.
- It was unable to identify if participants used the tools following the workshop and if their use resulted in any impact on musculoskeletal health outcomes.

We considered this last point before the workshops were delivered. We decided that if there was an opportunity to contact participants in the future that a follow up survey covering these points be completed. This made sense because part of the purpose of the workshops was to further develop the tools. The final versions of all the tools were different to what was presented at the workshops. This suggested that we should complete a follow up survey around 6 months after the workshops or publication of the tools on the WorkSafe website.

Appendix 2: Glossary

ABBREVIATION	TERM
ACC	Accident Compensation Corporation
APHIRM	A participative hazard identification and risk management toolkit
ART	Assessment of repetitive tasks of the upper limbs
BIRD	Back injury risks in driving tool
DPI	Discomfort, Pain, and Injury
HSE	Health and Safety Executive (United Kingdom)
HSWA	Health and Safety at Work Act
HFE	Human Factors/Ergonomics (team)
HWSA	Heads of Workplace Safety Authorities (Australia & New Zealand)
Kaimahi	Workers
KTH	Royal Institute of Technology (Sweden)
MAC	Manual Handling Assessment Charts
MSDs	Musculoskeletal disorders
NZART	New Zealand assessment of repetitive tasks of the upper limbs
NZISM	New Zealand Institute of Safety Management
NZOHNA	New Zealand Occupational Health Nurses Association
NZMAC	New Zealand manual handling assessment charts
NZRAPP	New Zealand risk assessment of pushing and pulling
PCBU	Person conducting a business or undertaking
RAMP	Risk management assessment tool for manual handling proactively
RAPP	Risk assessment for pushing and pulling
UK	United Kingdom
WEPR	Worker engagement, participation, and representation
WRMSDs	Work-related musculoskeletal disorders

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