

RESEARCH PROJECT IN OCCUPATIONAL SAFETY  
AND HEALTH

THE COST OF MANUAL HANDLING INJURIES  
IN THE NZ WASTE INDUSTRY

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October 2005

## The Cost of Manual Handling Injuries in the NZ Waste Industry.

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### **Abstract**

Manual handling in the New Zealand Waste Industry includes a number of different collection activities. Traditionally domestic waste is collected by way of plastic refuse bags, recycle crates and inorganic waste. Accident Compensation Corporation (ACC's) injury prevention team conducted an analysis of the injuries associated with Waste Collection Services in New Zealand, for the 10 months, July 2004 to April 2005 there was a total of 128 new claims lodged at a cost of \$414,748 and 63 ongoing claims at a cost of \$919,033. The Occupational Safety and Health Service of the Department of Labour (OSH) has conservatively used 5 times the costs of insured costs as the benchmark in New Zealand to determine the true total cost of accidents.

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### **Objectives**

1. Identify the main types of manual handling tasks undertaken in the collection of domestic refuse.
2. Identify the specific injuries caused by the identified manual handling tasks.
3. Costs associated with injury, including direct and indirect costs.
4. Costs created by specific injuries.

### **Main Findings**

1. There is little published literature related to Health and Safety in the New Zealand Waste Industry.
2. There are a number of overseas scientific research papers written about manual handling in the refuse industry, most of it European and English.
3. For the 10 months, July 2004 to April 2005 there were a total of 128 new ACC claims lodged by people employed in Waste Collection Services at a cost of \$414,748 and 63 ongoing claims at a cost of \$919,033.
4. OSH has conservatively used 5 times the costs of insured costs as the benchmark in New Zealand to estimate the true total cost of accidents.
5. Two New Zealand waste companies found that 47% of all injuries suffered while collecting domestic waste using a rear load vehicle were caused by manual handling tasks during lifting and manoeuvring refuse bags, MGB's and inorganic waste from the curb into the rear of the vehicle.

6. It is estimated that from the analysis of the injuries suffered between July 2004 to April 2005 that at least 57 of them can be accurately related to manual handling and if estimating the total cost of these injuries using the OSH calculation the figure would be in the vicinity of 2.4 million dollars.
7. Heart rates studies conducted on waste collectors have found that during collection of bags heart rates were above the average recommended rate of 110 beats per minute over 8 hours. (This compares with 107 bpm when collecting 240l MGB's)
8. Optimal energetic workload of between 23% of VO<sub>2</sub>max (Legg S J & Pateman C M 1983) and 30% of VO<sub>2</sub>max (Frings-Dresen et al (1995a)) has been identified as the recommended average level that should not be exceeded by workers involved in repetitive lifting workload over an 8 hour day.
9. In studies conducted by Frings Dresen oxygen uptake was measured at 59% of VO<sub>2</sub>max while collecting refuse bags.
10. "Half of the male working population in the UK would have problems throwing the heaviest bags into refuse collection vehicles due to the height at which the bags have to be thrown".
11. "Refuse collectors were 1.9 times more likely to develop musculoskeletal problems than the rest of the Danish working population"

### **Main Recommendations**

1. ACC funding to undertake investigation into musculoskeletal disorders suffered by refuse collectors due to the manual handling nature of their job.
2. Safety@WasteMINZ to review the hazards associated with the manual collection of waste.
3. Safety@WasteMINZ to review systems to collect meaningful data across the industry to enable targeting of area's where injury prevention or injury management initiatives would help reduce work related injuries.
4. Local Authorities should consider the health effects of refuse collectors with a view to moving to waste collection by mobile garbage bins when waste collection contracts come up for renewal.
5. Key elements of this research to be presented at the annual WasteMINZ conference in November 2005.
6. As part of the New Zealand Workplace Health and Safety Strategy to 2015 Safety@WasteMINZ together with ACC work together to develop industry specific standards and guidance material related to the manual collection of waste.

## **Background**

Manual handling in the New Zealand Waste industry includes a number of different collection activities. This research project is specifically aimed at identifying the cost of manual handling injuries associated with the collection of domestic refuse, traditionally collected by way of plastic refuse bags, recycle crates and inorganic waste. Generally there are three different collection systems used to collect three different types of domestic waste.

1. Domestic Refuse generally collected in plastic bags. The bags can range in size from region to region depending on what system the local authority has in place.
2. Recyclable materials (glass and plastic bottles, tins) collected from a variety of different containers including MGB's, 45 or 60 litre crates, or supermarket plastic bags.
3. Inorganic waste including fridges, stoves and washing machines, to old toys, tools, furniture and general inorganic waste.

Operators on a residential refuse bag collection can lift upwards of 1500 units per day 5 days a week. A recent Wellington City Council waste audit identified that the average bag weight was 5.69 kilograms, with the heaviest bag weighed being 17 kilograms and the lightest 0.5 kilograms.

In "Are bags better? Balancing safety, health and environmental benefits" Burke calculated that based on collecting between 800 & 2000 bags per day (collection method determines exact number) that a person collecting these bags would pick up a bag every 45 seconds, collect 200,000 bags per year and collect 8000 kg per day. It was also found that less than 5% of the domestic waste collected in Australia uses bags and estimates of up to 90% of the local authorities in the United Kingdom use MGB's for household waste collection.

In the case of recycle collections there are a number of different methods of transferring the contents of the bins into the trucks.

The Ministry for the Environment (mfe) released a report in October 2005 entitled "Waste Management in New Zealand, A decade of Progress" in this report it is shown that the percentage of councils who operate a kerbside recycling collection has increased from less than 5% in 1989 to nearly 75% in 2005.

On many occasions the methods used for collecting recyclables means the operator is working at or above shoulder height.

A third part of some municipal contracts is a collection of inorganic waste. This collection has a high manual handling content, and even with the assistance of machinery it is unlikely that the manual handling content will be eliminated in the near future.

**Literature Review**

**MANUAL HANDLING**

Accident Compensation Corporation claim statistics for the Waste Collection Services for the year July 2004 through to April 2005 were reviewed. A report into the type of claim data collected was reviewed and found that the following information was available,

Recent Trends in claim numbers and costs	Claims by work related (non motor vehicle reports)
Claims by entitlement type	Claims by industry (non motor vehicle reports)
Claims by age and gender	Claims by activity prior
Claims by ethnicity	Claims by sport
Claims by employment status	Claims by cause of accident
Claims by occupation (non motor vehicle reports)	Claims by agency involved in accident (road / non road)
Claims by diagnosis of injury	Claims by contact prior to accident
Claims by site of injury	Claims by premium fund
Claims by scene of injury	Claim by location of accident
Claims by serious injury	
Fatal claims	
Claims by month	

In trying to identify cause of injuries it would seem that the data collected at the time of a doctors consultation is not particularly thorough in some cases, in both the “activity prior to the accident” and “cause of accident” there were extremely high figures allocated to “unknown” “NEC”(not elsewhere confirmed) & “other or unclear cause” this suggests that not enough questioning or investigation is conducted at the time of completion of the ACC45.

When measuring “activity prior to accident” of the 128 claims there were 71 allocated to NEC and 20 to unknown, these were the two highest denominators, however there were 10 other categories. In the section “cause of accident” 11 of the 128 were allocated “other or unclear cause, with 22 other categories.

In reviewing ACC Claim Statistics “WPS Waste Collection Services” the following are some key findings.

Figure 1 shows 128 new claims have been lodged and accepted by ACC during July 2004 through to April 2005, with 63 ongoing claims on file.

Figure 2 shows the costs associated with those claims, being \$414,748.00 for new claims and \$919,033.00.

Figure 1

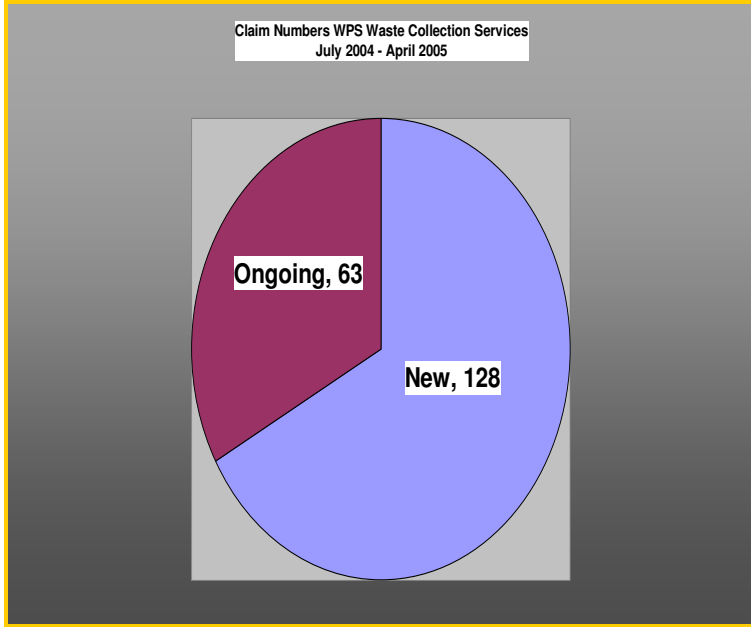


Figure 2

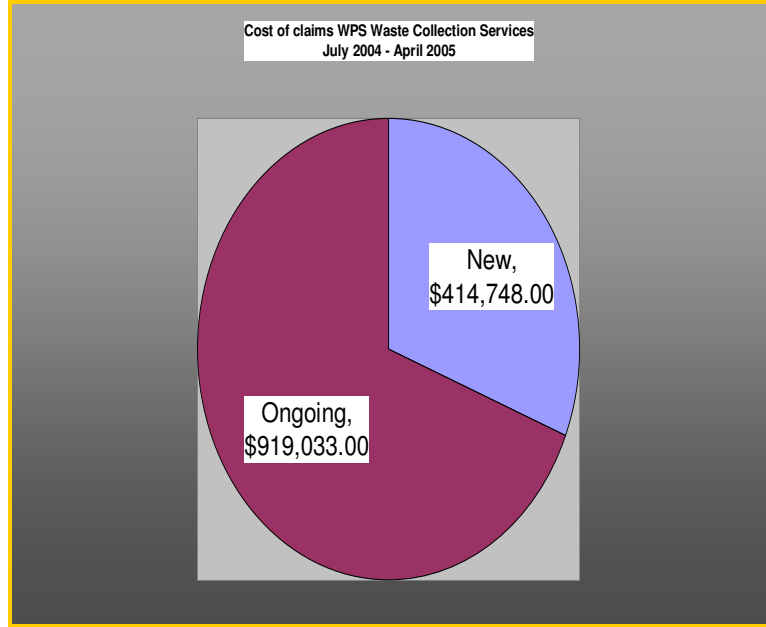


Figure 3 & 4 shows the number of claims and cost of those claims by diagnosis, with soft tissue injuries far in excess of the other categories for both number of claims and costs. The total costs for these combined 95 injuries being \$831,909.00 for the 10 month period.

Figure 3

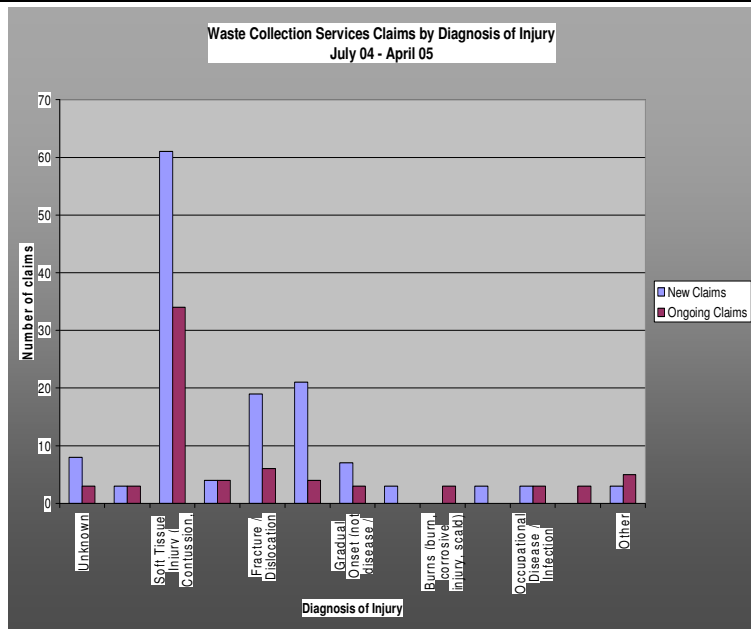
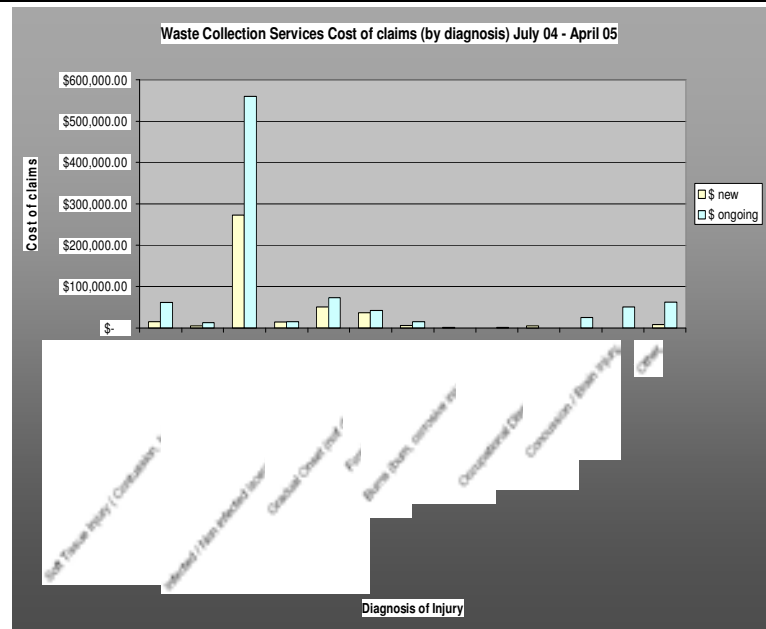


Figure 4



NOTE: Any statistics related to ACC will only include claims where an ACC claim has been lodged, the costs quoted include medical fees, compensation payments and rehabilitation and exclude incapacity during first weeks for which ACC is not responsible and costs associated with medical fees paid to health providers only. All costs are exclusive of GST.

In a “Submission Supporting the Code of Practice for Rear Loading Compaction Trucks”, Safety@WasteMINZ 2005, two New Zealand waste companies conducted an analysis of injuries associated with the collection of domestic waste using rear load compaction vehicles over a two year period (1 January 2003 – 31 December 2004). This study determined that there were 86 recorded injuries associated with the collection of waste using rear load compaction vehicles, of those 86 injuries 47% were caused by a manual handling tasks during lifting and manoeuvring refuse bags, MGB’s and inorganic waste from the curb into the rear of the vehicle.

Pinder ADJ and Milnes E from the Human Factors Group conducted a study into Manual Handling in refuse collection on behalf of the Field Operations Directorate (FOD) of the Health and Safety Executive (HSE) Bristol Area Office. As part of this study, they referred to a European study by Poulsen et al (1995) that looked at the occupational health problems that occur in refuse collection. The risk factors for refuse collections were identified and found that “refuse collectors were 1.9 times more likely to develop musculoskeletal problems than the rest of the Danish working population”

They identified the following findings in relation to the lifting of refuse bags / sacks.

- Refuse sacks are usually thrown into the back of the vehicle rather than being lifted and placed into it. This action is usually undertaken while the person is walking.
- Throwing bags into a refuse truck usually requires the hands to be lifted above the head, although this occurs for relatively short durations.
- The heights that bags are thrown into refuse trucks commonly known as the “rave height” is at such a height that approximately half the male working population would have problems throwing the heaviest bags into the truck.
- Refuse in bags can be hazardous due to the presence of sharp objects such as broken glass or discarded syringes.

Frings-Dresen et al (1995a) undertook a field study of 116 male refuse collector’s. They identified the following during the collection of refuse bags.

- Refuse bag collectors spent a substantial part of the day stooping throwing and carrying.
- That lifting bags involved lifting smaller weights many times per day, compared with handling wheelie bins which requires pushing and pulling larger loads less frequently.
- From their studies they concluded that “the results of oxygen consumption from heart rate data that the collection of refuse using bags should be increasingly replaced with wheeled containers”

A number of studies have suggested an optimal energetic workload of between 23% & 30% of VO<sub>2</sub>max being identified as the recommended average level that should not be exceeded by workers involved in repetitive lifting workload over an 8 hour day, with 50% being identified as the upper limit of endurance tolerance.

In Frings-Dresen et al (1995a) the field study identified the following VO<sub>2</sub>max figures as they related to the collection of bags and 240 litre MGB's

**Table 1 Field study of refuse collection (Frings-Dresen et al (1995a))**

Collection Method	No Of items	Mean weight	Weight collected	Time collecting	Time on breaks	%>30% VO <sub>2</sub> max	%>1hr VO <sub>2</sub> max
Bags	1500	7kg	11000kg	240min	80min	59	55
240litre MGB's	500	22kg	11000kg	300-360 min	100min	51	32

From the above study they recommended the following.

(Frings-Dresen et al (1995a))

“....collection of polythene bags is only acceptable for very short working hours and small amounts of refuse.....workers aged over 40 years should work for only 1.7 hours per day and collect only 4000kg of bagged refuse”

It was therefore recommended by Frings-Dresen et al (1995a) that the collection of refuse from bags be replaced with MGB's.

In “A physiological study of the repetitive lifting capabilities of healthy young males” Legg S J & Pateman C M 1983, considered that the energetic workload for repetitive lifting over an 8 hour shift with no evidence of fatigue resulting, that the VO<sub>2</sub>max might be more in the vicinity of 23%.

Bomel Limited undertook a study of Health and Safety Standards in the UK waste industry, from their investigations into the manual handling in refuse collection one of their findings was that half of the male working population in the UK would have problems throwing the heaviest bags into refuse collection vehicles due to the height at which the bags have to be thrown.

Further to this Bomel identified the following trends,

- Between 1996 & 2001 handling and sprain accidents were the cause of the most injuries.
- The most common agent of injury was the weight factor associated with manual handling.
- Employees between the age of 35 – 39 were most likely to suffer injury

Two key conclusions reached by Bomel were,

- “Handling and sprain injuries accounted for the majority of accidents resulting in over three days off work and those injuries that did result in the injured person being off work for three days or more accounted for around 85% of all injuries”
- “From “ALL” injuries analysed handling and sprain injuries associated with the collection of heavy weights, sharp items and awkward loads were the most significant”

In “A physiological study of the repetitive lifting capabilities of healthy young males” Legg S J & Pateman C M 1983, cited Brouha (1967) suggested that the average heart rate over an 8 hour shift should not exceed 110 beats per minute. Pinder & Milnes referred to the Frings Dresen study that showed the following results regarding mean Heart Rates.

1. Collecting Bags in a city area 121 (bpm)
2. Collecting Bags in a suburb 113 (bpm)
3. Collecting 240 litre wheelie bins 107 (bpm)
4. Quiet Standing at rest 86 (bpm)

Schibye. B, Sogaard. K, Martinsen. D, Klausen. K conducted a study to compare the mechanical load on low back and shoulders during pushing and pulling of two wheeled waste containers compared with lifting and carrying of bags and bins. The results of their studies found that during pushing and pulling of two wheeled carts the subjects did not reach or exceed the National Institute for Occupational Safety and Health (NIOSH) accepted compression force of 3400N.

They took measurements of disc compression at L4/L5 and the results showed that the compression force did not go above 1600N, this compared with disc compression force when lifting bags and bins which ranged between 2321 – 4195N.

The 2003 Occupational Health and Safety Guidelines for the collection, transport and unloading of non hazardous waste and recyclable material, published by Worksafe Victoria, it is recommended that when handling waste and recycling materials that where practicable organisations should use mechanical aids as part of implementing a “no lift” policy

In “Are bags better? Balancing safety, health and environmental benefits” a survey of 12 local authorities was undertaken to determine reasons and attitudes towards use of bags and MGB’s as a method for domestic waste collection, some key results from that survey were,

75% of councils had bag collections in place

83% suggested that bags were the best tool to reduce waste

75% believed that the use of MGB’s was a risk to waste minimisation programmes

**COSTS OF ACCIDENTS**

ACC’s injury prevention team conducted an analysis of the injuries associated with Waste Collection Services in New Zealand for the 10 months, July 2004 to April 2005.

This analysis identified the following,

There were a total of 128 new claims lodged at a cost of \$414,748 and 63 ongoing claims at a cost of \$919,033.

Claim analysis included identifying,

- Activity prior to accident
- Cause of accident
- How the injury was inflicted

There were 23 new and ongoing claims where the **activities prior to accident** were related to lifting/lowering, loading/unloading these came at a cost of \$220’610.

In further analysis the claims by **cause of accident** identify 53 new and ongoing claims with a cause related to lifting / carrying / strain, these came at a cost of \$406’437

The question of **how the injury was inflicted** identified 57 new and ongoing claims where injuries were inflicted by a manual handling task being either strenuous movement while lifting or contact with object carried / handled, these claims came at a cost of \$482’038.

	<b>Number of new Claims</b>	<b>Cost of claims</b>	<b>Number of ongoing claims</b>	<b>Cost of claims</b>
Total	128	414,748	63	919,033
<b><u>Claims by activity prior to accident</u></b>				
Lifting/Lowering, Loading/Unloading	11	17,564	12	203,046
<b><u>Claims by cause of accident</u></b>				
Pushed or pulled	<=3	7,680	<=3	4,671
Loss of hold	<=3	34,994		85
Lifting / carrying / strain	35	123,190	18	283,247
<b><u>How injury inflicted</u></b>				
Impact / Contact with object	36	78,138	10	73,248
Strenuous movement with lifting	32	93,203	17	329,457
Contact with object carried / handled	5	53,482	<=3	5,896

In October 1998 the Occupational Safety and Health division of the Department of Labour published a press release outlining the costs of accidents in New Zealand. The cost was estimated at \$4.2 billion a year, OSH made reference to the fact that there is a large amount of research worldwide into the costs of accidents and confirmed that estimates that the total costs of accidents including “insured costs” and “uninsured costs” comes to between 6 & 53 times the insured costs, OSH have conservatively used 5 times the costs of insured costs as the benchmark in New Zealand to arrive at their estimate of \$4.2 billion.

Using the above template would result in total costs of the 191 new and ongoing claims lodged with ACC between July 2004 to April 2005 being \$6,668,905.00.

It is estimated that from the analysis of the injuries suffered between July 2004 to April 2005 that up to 57 of them can be accurately related to manual handling and if estimating the total cost of these injuries using the OSH calculation the figure would be in the vicinity of 2.4 million dollars.

There are a number of “costs” associated with accidents. Direct costs or insured costs are those costs related to medical fees, compensation payments and rehabilitation. Indirect or uninsured costs are those other costs that can be related to the overall cost of the accident. In TOSHA’s accident / incident reporting and investigation course including unit standard 17601, the following costs are identified as being costs related to accidents.

Direct Costs of 1 <sup>st</sup> week 100%	Staff to progress and control rehabilitation programme
Direct Cost 20% of wages for subsequent weeks	Labour costs interface with ACC and rehabilitation admin costs
Direct cost supervisor / manager or area time to reinstate activities	Accident investigation time for manager, supervisor and other workers
Indirect wage lost time spent on other staff involved	Investigation report development and circulation
Downtime loss of morale in the workforce	Interface time and liaison with statute authorities of OSH, MOED, Police
Other staff to do work on overtime	Counselling time for injured party and fellow workers
Loss of production cost until new worker trained	Time to share learning experience from accident with other staff
Loss of revenue through cancelled orders	Legal costs for court appearance for defence
Cost of equipment damage or repairs	Prosecution costs and fines
Material damage replacement of soiled goods	Bad publicity costs – consumer resistance
Medical / hospital costs charged to ACC account	Increased insurance costs for equipment / assets, business interruptions, ACC insurance

## Conclusion

With the lack of documented research on the subject of manual handling in the NZ Waste Industry it is difficult to identify the size of any potential health and safety issues or if there are indeed any health and safety issues at all related to the manual collection of waste in New Zealand. With the work now being done by Safety@WasteMINZ it is likely that we will see some research around the subject of manual handling in the industry being conducted.

Based on international studies, these would suggest that the physical and energetic workload of waste collectors collecting bagged domestic refuse results in the refuse collectors working above the recommended limits for heart rate and oxygen uptake over an 8 hour working day. Along with this there is documented evidence that during the collection of waste from bags the compression forces on the spine of a refuse collector is above the recommended limit and in some cases up to twice the compression rate than that measured while pushing a mobile garbage bin (MGB).

The international studies have little if anything on the collection of recyclable materials or inorganic waste.

Collecting waste in New Zealand by rubbish bag and recycle crate is something that the rest of the world seems to be moving away from, with recommendations for this move being made on the basis of improved health and safety of the refuse collector.

ACC data has provided an indication of the costs associated with injuries sustained in the industry however it is difficult to quantify the exact causes and costs of these injuries to determine if there are trends in certain collection methods mainly due to what seems to be a lack of specific information recorded at the time of the medical consultation.

Safety@WasteMINZ is about to start work on promoting a data collection system for the waste industry to enable industry players to determine where in fact the risk's are from a health and safety perspective, this database proposal should enable the industry to identify collection methods that are causing the greatest number of injuries and health and safety concerns.

In 2005 the biggest residential waste collection contract in New Zealand was started. As part of this venture between North Shore City Council, Waitakere City Council and Rodney District Council the recycle crates which had been used since the early 90s for the collection of glass, tins and plastic was replaced by a 120litre MGB. Whether this decision to move to an MGB collection was done for reasons of improved Health and Safety for the recycling collectors or for other reasons, ie improved percentage of recycling from households, it is this system that local authorities should consider more and more as their current waste and recycling collection contracts come up for renewal. Some councils have been using MGB's as a method of collecting domestic refuse for a number of years and the waste industry needs to promote this to more local authorities in an effort to increase the percentage of councils using MGB's as their preferred collection method.

With 229'489 work related injury claims lodged with ACC for the year ending 2002, the wider industry should be looking at methods to reduce the percentage of those injuries that are suffered by the people employed to collect rubbish.

## **Acknowledgements**

- Accident Compensation Corporation (ACC)
- Waste Management Institute of New Zealand (WasteMINZ)
- Safety@WasteMINZ
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**Note: (Safety@WasteMINZ is an Interest Group of the Waste Management Institute of New Zealand (WasteMINZ))**

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## **Definitions**

### **Domestic Refuse**

Waste which cannot be recycled or composted, and is non hazardous.

### **Inorganic Waste**

Tyres, whiteware eg fridges, furniture, electrical appliances

### **Insured costs**

Costs associated with accidents that can be quickly identified such as medical treatment, lost wages and decreased productivity.

(Another term used to describe insured costs is Direct Costs).



### **MGB**

Mobile Garbage Bin

### **Manual Handling**

Any activity that requires a person to interact with their environment and use any part of their muscles or skeletal system to lift, lower, push, pull, carry, throw, move, restrain or hold an animate or inanimate, object

### **Recyclable Materials**

Plastic bottles with  ,  on the base (not yoghurt, Tetra Pak or motor oil containers).

Glass bottles and jars – no broken or window glass and no mirrors.

Aluminium and steel cans.

Aerosol containers - remove the plastic top.

### **TOSHA**

Taranaki Occupational Safety and Health Association

### **Uninsured costs**

Less evident expenses associated with accidents are known and can be several times greater than the value of the direct costs.

(Another term used to describe uninsured costs is Indirect Costs).

### **VO<sub>2</sub>max**

The maximum volume of oxygen that the body can consume during intense whole body exercise.